



Lara Sofia Nascimento Palmeira

WHEN WEIGHT STIGMA GETS UNDER THE SKIN: THE DEVELOPMENT OF KG-FREE - A NEW INTEGRATED ACCEPTANCE, MINDFULNESS AND COMPASSION-BASED GROUP INTERVENTION

Tese de doutoramento em Psicologia, especialidade em Psicologia Clínica, orientada pela Professora Doutora Marina Isabel Vieira Antunes da Cunha e pelo Professor Doutor José Augusto da Veiga Pinto Gouveia, e apresentada à Faculdade de Psicologia e Ciências da Educação da Universidade de Coimbra

Março de 2017



UNIVERSIDADE DE COIMBRA

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À Professora Doutora Marina Cunha

Ao Professor Doutor José Pinto Gouveia

START CLOSE IN

David Whyte

*Start close in, don't take the second step or the third,
Start with the first thing close in,
The step you don't want to take.*

*Start with the ground you know,
The pale ground beneath your feet,
Your own way of starting the conversation.*

*Start with your own question,
Give up in other people's questions,
Don't let them smother something simple.*

*To find another's voice,
Follow your own voice,
Wait until that voice becomes a private ear listening to another.*

*Start right now take a small step you can call your own
Don't follow someone else's heroics,
Be humble and focused,
Start close in, don't mistake that other for your own.*

*Start close in, don't take the second step, or the third.
Start with the first thing close in,
The step you do not want to take.*

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O ser humano é profundamente dependente dos restantes seres humanos. Quando ponderamos bem esta ideia percebemos que estamos todos interligados (mesmo de formas muitas vezes negligenciadas), e que nada sem faz sentido sem os demais. Assim, também nenhuma dissertação se faz sem os outros e esta não é a exceção. Feita de bons e maus momentos, de muitas aprendizagens, de sucessos e desilusões, esta dissertação foi também um processo colaborativo na qual participaram (cada um à sua maneira) orientadores, colegas, instituições, participantes, amigos e família. Por que sem todos vocês este trabalho nunca veria a luz do dia, quero expressar o quanto estou grata por vos ter e por terem feito parte deste percurso.

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When weight stigma gets under the skin: The development of Kg-Free - a new integrated acceptance, mindfulness and compassion-based group intervention

ABSTRACT

Introduction: Obesity is a complex chronic health condition which prevalence continues to increase. Literature emphasises the detrimental role of weight stigma internalisation in unhealthy eating behaviours and quality-of-life of those living with overweight and obesity. However, the psychological mechanisms involved in the relationship between weight self-stigma and negative outcomes are still scarcely explored. The ‘third wave’ behavioural therapies have been showing promising results for people struggling with weight and eating issues and obesity. More recently, interest exists in integrating (self)compassion into acceptance and mindfulness-based interventions, especially to target shame and stigma. Additionally, self-disgust seems to play an important role in unhealthy eating behaviours in eating disorders samples. Nevertheless, self-disgust is a concept unexplored in people with overweight and obesity. Therefore, this thesis unfolds three main goals. Firstly, it aims to explore the psychological mechanisms that underlie the link between weight self-stigma and unhealthy eating patterns and quality-of-life in women with and without binge eating symptomatology. Secondly, the main goal was to develop and test the efficacy of a new and integrated group-intervention (Kg-Free) based on acceptance, mindfulness and compassion for women with overweight and obesity. The third goal is to unveil the role of self-disgust in eating and depressive psychopathological symptoms.

Methods: This thesis includes eight empirical studies with cross-sectional and longitudinal designs, including a randomised controlled trial (RCT). The majority of the studies were conducted in samples of adult individuals with overweight and obesity. Nonetheless, two different community samples were also included. Distinct methods were used to assess participants, including self-report questionnaires, structured clinical interviews, anthropometric measures and blood samples.

Results: Results of study I revealed that the proposed revised version of the *Acceptance and Action Questionnaire for Weight-related Difficulties* is a reliable and stable measure. Moreover, the Portuguese version of the *Weight Self-Stigma Questionnaire* corroborated the original factorial structure and presented good psychometric characteristics. Overall, results highlighted that weight-related experiential avoidance and self-criticism played a key mediator role in the relationship between weight self-stigma and unhealthy eating behaviours and quality-of-life.

Additionally, these studies also emphasise significant differences between women with overweight and obesity with and without binge eating symptoms. Results from the RCT provided evidence for the efficacy of Kg-Free in diminishing weight self-stigma, unhealthy behaviours and promoting well-being and quality-of-life. All improvements were sustained at 3-months follow-up, and the targeted emotional regulation mechanisms mediated the changes in main outcomes. Additionally, the negative role of self-disgust and self-criticism in eating psychopathological and depressive symptoms was also unveiled, particularly for women and those with higher BMIs. Finally, results also point the development of self-compassion as a key resource against self-disgust and self-directed hostility.

Conclusions: Overall, our findings emphasise the relevance of promoting the development of adaptive emotional regulation skills to enhance healthy eating patterns and quality-of-life in people with overweight and obesity. Among women with overweight and obesity, those presenting binge eating seem to be more vulnerable and have poorer emotional regulation skills. Results supported the efficacy of Kg-Free. By fostering acceptance, mindfulness and self-compassion participants were able to develop a more positive, flexible and healthy way for people to relate to themselves and their unwanted internal experiences. Additionally, self-compassion seems to be a key resource to help individuals to break free from a self-perpetuating cycle of weight stigma, self-disgust and self-criticism that are associated with negative health outcomes. To sum up, all these adaptive emotional regulation seem to be crucial to help people adopt and maintain healthy behaviours and pursue a valued and meaningful life. This thesis' findings open new opportunities for future research and entail relevant clinical implications particularly to improving the lives of those living with overweight and obesity.

Keywords: Overweight and Obesity; Weight self-stigma; Self-disgust; Eating behaviours; Quality-of-life; Kg-Free; Weight-related experiential avoidance; Self-criticism; Acceptance and Commitment Therapy; Mindfulness; Self-compassion.

Quando o estigma vive em nós: O desenvolvimento do Kg-Free – uma intervenção grupal inovadora baseada na aceitação, mindfulness e compaixão

RESUMO

Introdução: A obesidade é uma doença crónica complexa, cuja prevalência continua a aumentar. A literatura existente enfatiza o papel negativo do autoestigma em relação ao peso na adoção de comportamentos alimentar desajustados e pior qualidade de vida das pessoas com excesso de peso e obesidade. Contudo, os mecanismos psicológicos envolvidos na relação entre o autoestigma em relação ao peso e piores resultados continuam pouco explorados. As terapias cognitivo-comportamentais de terceira geração tem demonstrado resultados promissores em pessoas com problemas alimentares e obesidade. A isto acresce o crescente interesse em integrar a autocompaixão nas terapias baseadas na aceitação e mindfulness, especialmente quando se pretende diminuir a vergonha e o estigma. Por outro lado, o autoenojo parece ter um papel relevante nos problemas de comportamento alimentar em indivíduos com perturbação alimentar. No entanto, este conceito permanece por explorar em pessoas com excesso de peso e obesidade. Neste sentido, a presente dissertação contém três objetivos principais. Pretendemos estudar os mecanismos psicológicos envolvidos na relação entre o autoestigma em relação ao peso e o comportamento alimentar perturbado e a qualidade de vida de mulheres com e sem sintomas de ingestão alimentar compulsiva. O objetivo central foi o desenvolvimento e teste da eficácia de uma intervenção grupal inovadora (Kg-Free) baseada na aceitação, mindfulness e compaixão para mulheres com excesso de peso e obesidade. Por último, este trabalho pretende explorar o papel da autoaversão no comportamento alimentar desajustado e sintomatologia depressiva.

Metodologia: Esta tese inclui oito estudos empíricos de natureza transversal e longitudinal, incluindo um ensaio clínico aleatorizado. A maioria dos estudos foram realizados em amostras de adultos com excesso de peso e obesidade, tendo-se também incluído duas amostras diferentes da comunidade. Foram utilizados vários métodos para avaliar os constructos em estudo, incluindo questionários de autorresposta, entrevistas clínicas estruturadas, medidas antropométricas e recolha de amostras sanguíneas.

Resultados: Os resultados do primeiro estudo mostraram que a versão revista do *Questionário de Aceitação e Ação em relação ao Peso* é uma medida estável e fiável. A versão Portuguesa do *Questionário de Autoestigma em relação ao Peso* apresentou uma estrutura fatorial idêntica à versão original e boas propriedades psicométricas. No seu conjunto, os resultados salientam o

papel mediador do evitamento experiencial em relação ao peso e do autocriticismo na relação entre o autoestigma em relação ao peso e o comportamento alimentar perturbado e pior qualidade de vida. Foram ainda verificadas diferenças significativas entre as mulheres com e sem sintomas de ingestão alimentar compulsiva. A intervenção Kg-Free mostrou-se eficaz na redução do autoestigma relativo ao peso, do comportamento alimentar perturbado e na melhoria da qualidade, existindo uma manutenção dos resultados num seguimento a três meses. Para além disso, os processos de regulação emocional promovidas na intervenção revelaram-se mediadores importantes das mudanças observadas. Os resultados sugerem também que a autoaversão e o autocriticismo detém um papel negativo preponderante no desenvolvimento de sintomatologia depressiva e comportamento alimentar desajustado, particularmente em mulheres e pessoas com excesso de peso e obesidade. Por fim, o desenvolvimento de autocompaixão surge como um recurso crucial para diminuir os efeitos do autoestigma e o autocriticismo.

Conclusões: No seu conjunto, os resultados dos estudos empíricos enfatizam a importância de promover o desenvolvimento de estratégias de regulação emocional adaptativas que permitam aumentar o comportamento alimentar saudável e a qualidade de vida de pessoas com excesso de peso e obesidade. As mulheres com excesso de peso e obesidade com ingestão alimentar compulsiva apresentam menos competências de regulação emocional e parecem ser particularmente vulneráveis. O programa Kg-Free apresentou resultados muito promissores, promovendo o desenvolvimento de competências de aceitação, *mindfulness* e autocompaixão. Isto permitiu que as participantes criassem uma relação mais positiva e saudável com elas mesmas e com as suas experiências internas indesejadas. Para além disso, a autocompaixão parece ser um recurso fulcral para ajudar a quebrar o ciclo autopropagador do estigma, autoaversão e autocriticismo que se encontra relacionado com piores resultados. Todas estas estratégias de regulação emocional parecem ser essenciais para manter os comportamentos saudáveis e caminhar na direção de uma vida valorizada. A presente tese de doutoramento lança novos desafios à investigação futura e tem importantes implicações clínicas, em particular para melhorar a qualidade de vida das pessoas que vivem com excesso de peso e obesidade.

Palavras-chave: Excesso de peso e Obesidade; Autoestigma em relação ao peso; Autoestigma; Comportamento alimentar; Qualidade de vida; Kg-Free; Evitamento experiencial em relação ao peso; Autocriticismo; Terapia da aceitação e Compromisso; Mindfulness; Autocompaixão.

LIST OF PUBLICATIONS

- I. Palmeira, L., Cunha, M., Pinto-Gouveia, J., Carvalho, S., & Lillis, J. (2016). New developments in the assessment of weight-related psychological inflexibility (AAQW-Revised). *Journal of Contextual Behavioral Science*, 5(3), 193-200. doi: 10.1016/j.jcbs.2016.06.001
- II. Palmeira, L., Cunha, M., & Pinto-Gouveia, J. (2017). *The weight of weight self-stigma in unhealthy eating behaviors: The mediator role of weight-related experiential avoidance*. Manuscript under revision.
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PREFACE

PREFACE

This thesis is rooted in both my previous work as a clinical psychologist in the area of obesity and bariatric surgery, as well as my genuine interest and curiosity for research. In my clinical work it became apparent that the health care provided for those living with obesity could be improved to foster their well-being and quality-of-life. Interventions seem to have an excessive emphasis on dieting and weight loss and sometimes a lack of empathy, understanding and compassionate attitudes towards those people, at times even from themselves. I strongly believe that psychology, as the science that studies human behaviour, should also play a major role in the treatment that is provided to those who are struggling with eating and weight issues. Instead, what we frequently find is a set of depersonalised and mechanic procedures and recommendations that most of the time are not useful to patients. Frequently patients feel they are alone in their struggles and that no one is on their side (sometimes not even themselves).

When weight is not lost or is regained, there is little (if anything) new to offer and patients are instructed to try harder and find the willpower to comply with those instructions. When we look at this picture, it is understandable why it is easy to find frustrated health care professionals and desperate and ashamed patients that are sometimes frightened to go to their next appointment. At least partially, this may account for the high dropout rates and the enormous history of dietary attempts that people with overweight and obesity commonly have. Unfortunately, this is also related to weight gain over time.

I believe that given this scenario and the difficulties entangled with the treatment of a chronic disease such as obesity in the current obesogenic environment, psychological interventions must be an essential component of the treatments offered for those struggling with their weight. Still, and although several psychological mechanisms related to weight gain and difficulties in weight maintenance have been identified for more than a decade, most interventions do not include any psychological intervention. Even the most comprehensive treatments that include some behavioural component do not directly tackle those psychological factors associated with difficulties in weight management, and rather focus on increasing adherence to dietary and physical exercise plans. Although behavioural strategies are needed, it seems that they are insufficient to promote well-being and quality-of-life in people with overweight and obesity.

On the other hand, my passion for research emerged from my Master degree, completed in 2008. Until then research and statistics were quite daunting, and so I had decided not to like them. Nonetheless, the opportunity to complete my master degree was there and I just had to take it.

That was quite a journey! By the end of that year, I was completely surrendered to research and had made friendship with my former enemy, the SPSS. I was mostly fascinated with making sense out of things, exploring new hypothesis and learn.

By that time the ‘third wave’ contextual behavioural therapies were already invading our research centre. Guided by my curiosity, I became very interested in exploring that too. I am not sure what I have explored first, but I remember that Acceptance and Commitment Therapy (ACT) got my attention and completely changed the way I relate to my mind. I felt liberated and thought I never wanted to go back. At a slower pace mindfulness started to gain some space within me, and by the end of 2008 I did my first Mindfulness-Based Stress Reduction program. At that time I was writing my master thesis and it really helped me to acknowledge and distance myself from my struggles. Not long time after, Professor Gilbert came to do a workshop on Compassion Focused Therapy. That workshop was probably one of the first times I thought about the importance of being compassionate and developing self-compassion with my clients and myself.

By the time I ended my Master degree, I already knew I wanted to pursue a PhD, I was just not ready yet. After some years of clinical experience and deepening knowledge and skills in the ‘third wave’ therapies (particularly ACT) in individual and group settings I felt ready for a new adventure. It was the year of 2012 when I approached Professor Pinto Gouveia to ask if he would give me the pleasure of walking in this new adventure with me. I imagined a research project that could improve the treatment offered to people living with overweight and obesity and that had a strong clinical emphasis. We were able to develop such a project, together with Professor Marina Cunha. The project aimed essentially to develop a new and integrated group-based intervention for women with overweight and obesity.

While reviewing the literature to support the project we had in mind, I came across studies on the role of weight stigma, specifically those showing the damaging impact of weight stigma internalisation on quality-of-life and eating behaviours. Surprisingly, only a few studies had explored the psychological processes involved in those relations. Thus, soon exploring the psychological mechanisms involved in those relationships and tackling weight self-stigma became two central goals of our project. Still, the project’ main idea was to develop a comprehensive group intervention that integrated acceptance, mindfulness and self-compassion elements to tackle weight self-stigma, unhealthy eating behaviours and promote well-being and quality-of-life for women with overweight and obesity. The challenge was to test whether those elements from distinct and yet related approaches could be useful and effective for this population.

The development of the intervention was challenging but incredibly fulfilling and a powerful clinical learning experience. The intervention’s main goal was to tackle weight self-stigma,

decrease unhealthy eating behaviours and foster quality-of-life in women with overweight and obesity. Thus, we created a new and integrative group intervention that promoted the development of mindfulness, acceptance and (self)compassion skills. I have to confess that the main struggle was to refrain myself from including every exercise and tapping into every process within each session. One valuable lesson learned was that sometimes less is more, and with groups this seems to be the case. I will always remember the useful advice from my supervisors along the way, that helped me to be centred and focused on what we were trying to achieve in each session, and not lose the session's goal.

During that process, all the ACT and CFT introductory and advanced workshops I attended were of inestimable value and provided the most needed inspiration for the development of the sessions' content. Additionally, and given that incorporating self-compassion was a key element to the intervention, I felt the need to deepen my knowledge on CFT. This led me to a new adventure in the United Kingdom for three very rewarding months where I was welcomed by Ken Goss and his team at Coventry Eating Disorders Service (CEDS). CEDS is specialised in delivering CFT group-based interventions for people with eating disorders.

During my stay, I was able to integrate several group sessions comprising the psychoeducation and compassion skills building and several other workshops led by Ken Goss on CFT for eating disorders. This experience was crucial for developing the skills needed to integrate compassion focused work into the Kg-Free intervention. This experience with Ken Goss was both an experience of enormous personal and professional growth. When I look back, I see the courage and determination needed to enrol in this adventure and the strong, genuine and compassionate connections it created. More than a learning experience, this was truly a valued-based journey that enhanced my understanding of what it means to be compassionate.

Interestingly, this experience also brought new research venues. Together with Ken Goss, we became interested in exploring an under-studied field of research in overweight and obesity. This led to a new set of studies aiming to unveil the role of self-disgust and psychological processes such as self-compassion and self-criticism in people with overweight and obesity and look for differences between dieters and non-dieters. The first results from this collaboration are also included as the last two studies of this thesis.

Overall, the research that comprises the present thesis encloses eight empirical studies. From those studies, six are published or accepted for publication in several international scientific journals with peer review (empirical studies, I, III, IV, V, VI, VII). Empirical study II is currently under review and empirical study VIII is submitted to publication. This thesis is organised into four chapters. Throughout this thesis, we used the term individuals with overweight and obesity,

instead of overweight and obese individuals, to avoid the use of stigmatizing language. We wanted to make sure we did not label people by their medical condition, following the APA's guidelines for nonhandicapping language. We believe this is essential, particularly as this thesis focuses on the detrimental role of weight stigma.

Chapter I | The Theoretical background provides a literature review that supported the empirical studies that comprise this present work. Firstly, we present an overview on obesity, psychological-related constructs (with particular emphasis on weight self-stigma and self-disgust) and existent obesity interventions. Additionally, we explore what role might the contextual-behavioural therapies, especially ACT, mindfulness and compassion-based approaches, play in the context of weight management and obesity. Finally, and given the promising results showed by all the above-mentioned approaches, we highlight how these approaches may be integrated into a comprehensive clinical intervention.

Chapter II | Research Goals and Methodology. In this chapter, we provide an overview of this thesis main aims and describe the specific goals for each empirical study. Additionally, we provide a description of the Kg-Free intervention and outline the main goals and exercises included in each session. We also describe the global methodological procedures and study designs selected. Finally, we present a summary of the measures included throughout this thesis's empirical studies.

Chapter III | This chapter includes the eight **Empirical Studies** that comprise the current work. Empirical studies I and II were preliminary works that refer to the validation of the main instruments for Portuguese individuals with overweight and obesity. Empirical studies II, III and IV focus on the psychological processes involved in the link between weight self-stigma and unhealthy eating behaviours and quality-of-life. Studies V and VI explore the efficacy and processes of change of the Kg-Free intervention. Finally, studies VII and VIII focus on the role of self-disgust on depressive and eating psychopathological symptoms and on the mediator role of self-compassion and self-criticism. All studies, except empirical studies I and VIII, were conducted exclusively with people with overweight and obesity enrolled in nutritional treatment for weight loss. Empirical studies I and VIII include both this population, as well as community samples. Next, we provide a brief overview of each empirical study presented.

Empirical study I, *New developments in the assessment of weight-related psychological inflexibility (AAQW-Revised)*. This study aimed to contribute to the development of the Acceptance and Action Questionnaire for Weight-Related Difficulties (AAQW), by testing the

confirmatory factor analysis based on the existent factor structures and testing the measurement invariance across groups.

Empirical study II, *The weight of weight self-stigma in unhealthy eating behaviours: The mediator role of weight-related experiential avoidance*. Given that there was no validated measure to assess weight self-stigma in Portugal, this study aimed to perform a confirmatory factor analysis on the Weight Self-Stigma Questionnaire (WSSQ) and explore its psychometric properties in a sample of Portuguese women with overweight and obesity. In addition, we also explored the mediator role of weight-related experiential avoidance on the relationship between weight self-stigma and unhealthy eating patterns.

Empirical study III, *The role of weight self-stigma on the quality of life of women with overweight and obesity: A multi-group comparison between binge eaters and non-binge eaters*. This third empirical study main goal was to test the mediator role of weight-related experiential avoidance on the relationship between weight self-stigma and obesity-related quality-of-life. Moreover, it was examined the model invariance in women with overweight and obesity with and without binge eating.

Empirical study IV, *Finding the link between internalized weight-stigma and binge eating behaviours in Portuguese adult women with overweight and obesity: The mediator role of self-criticism and self-reassurance*, explored differences in self-criticism and self-reassurance between women with overweight and obesity with and without binge eating disorder. It also unveiled the mediator role of self-criticism and self-reassuring on the relationship between weight self-stigma and binge eating symptomatology.

Empirical study V, *Exploring the efficacy of an acceptance, mindfulness & compassionate-based group intervention for women struggling with their weight (Kg-Free): A randomized controlled trial*. This empirical study main goal was to test the efficacy of Kg-Free intervention through a randomized controlled trial.

Empirical study VI, *Processes of change in quality-of-life, weight self-stigma, BMI and emotional eating after an acceptance, mindfulness and compassion-based group intervention (Kg-Free) for women with overweight and obesity*, explored efficacy of the Kg-Free intervention at post-treatment and 3-month follow-up and unveiled the psychological processes that underlied changes in quality-of-life, weight self-stigma, BMI and emotional eating at post-treatment.

Empirical study VII, *The role of self-disgust in eating psychopathology in overweight and obesity: Can self-compassion be useful?* This study examined the role of self-disgust in eating psychopathological symptoms in a sample of people with overweight and obesity seeking

treatment for weight loss from both genders. The mediator role of self-compassion in the above-mentioned relationship is also explored.

Empirical study VIII, *Self-disgust as a pathway to depressive and eating-disordered symptoms in dieters and non-dieters: The mediator role of self-criticism and self-reassurance*. This last study main goal was to test whether self-criticism and self-reassurance mediated the relationship between self-disgust and depressive and eating psychopathological symptoms and explore differences between dieters and non-dieters.

Chapter IV | General discussion. This last chapter intends to provide a comprehensive and integrated discussion on the results from the eight empirical studies presented. In this chapter, we also highlight this work's strengths and acknowledge its main limitations. We present a section suggesting future directions for research in this field and offer a reflection on the relevant clinical implications for assessment and treatment with people living with overweight and obesity and preventive actions. Lastly, final considerations are included and discussed.

Finally, the bibliographic references used in chapters 1, 2 and 4 are listed. The bibliographic references used in the empirical studies are presented at the end of each study.

CHAPTER I |

THEORETICAL BACKGROUND

1. THEORETICAL BACKGROUND

In this introductory chapter, we offer a comprehensive literature review on the aspects that informed the studies presented in this thesis. This chapter can be divided into two distinct sections. The first provides an overview on obesity and related psychological constructs. We start by providing an overview of the prevalence, causes and consequences of obesity in the lens of the current obesogenic environment. Then we emphasise binge eating as a distinct neurobiological phenotype within obesity and the challenges it carries to clinical interventions. Next, we highlight the psychological factors associated with weight regain and difficulties in weight maintenance. The damaging role of weight stigma and weigh self-stigma on the life of those with overweight and obesity is explored in depth. Finally, we look at one of the least studied basic emotions – disgust – and explore the role of self-disgust in eating psychopathology. In the second part, we start by providing an overview of the current guidelines for weight loss treatments and the importance of promoting quality-of-life of those living with a chronic condition such as obesity. Then, we focus on how the ‘third wave’ contextual behavioural therapies may bring a significant contribution to weight management and obesity interventions. Lastly, we explore a new venue that promotes the integration of distinct (but yet related) approaches based on acceptance, mindfulness and compassion. To sum up, with this chapter we aim to clarify what motivated us to conduct the studies that comprise this thesis.

1.1. THE OBESITY EPIDEMIC

Obesity is one of the most relevant public health problems in Western societies, being the fifth leading cause of mortality (Direção Geral de Saúde [DGS], 2014; World Health Organization [WHO], 2016). It has been referred as the XXI century epidemic, given its high prevalence, increased mortality and morbidity risks and the difficulties associated with treatment (DGS, 2014). Obesity is a multidetermined chronic medical condition characterised by the excess of body fat that may impair one’s health (WHO, 2016). Typically, in adults, overweight and obesity are determined and classified using Body Mass Index (BMI). BMI (kg/m^2) is calculated dividing one’s weight (in kilogrammes) by their height (in meters). Table 1 displays the World Health Organization (WHO, 2016) classifications of overweight and obesity by BMI. As can be seen, someone with a BMI between 25 and $29.9\text{kg}/\text{m}^2$ is considered overweight, whereas someone with a BMI above $30\text{kg}/\text{m}^2$ is considered obese. Additionally to BMI, measuring waist circumference (WC) is clinically relevant as the excess of fat in the abdomen is an independent predictor of risk

factors and morbidity. The waist circumference cut-offs may be used to determine one's increased relative risk for type 2 diabetes, hypertension, and cardiovascular disease when comparing with normal weight. For females, a WC > 88cm and for males a WC > 102 cm indicate the presence of increased risk. Waist circumference is especially relevant for those with BMI between 25 and 34.9 kg/m² since those with BMI < 35 kg/m² will certainly exceed the above-mentioned cut points (National Institutes Health [NIH], 1998).

Table 1

Overweight and Obesity classifications by BMI, Waist circumference and Relative Risk for disease.

		Risk for disease comparing to normal weight and Waist Circumference	
Classification	BMI (kg/m²)	Men ≤ 102 cm	Men ≥ 102 cm
		Women ≤ 88 cm	Women ≥ 88 cm
Overweight	25.0 – 29.9	Increased	High
Obesity class I	30.0-34.9	High	Very High
Obesity class II	35.0-39.9	Very High	Very High
Extreme Obesity (class III)	≥ 40.0	Extremely High	Extremely High

Note: Adapted from WHO, 2000; NIH, 1998

Despite the increasing number of weight loss treatments, the prevalence of obesity is still rising. In fact, it has doubled between 1980 and 2014 (WHO, 2016). The most recent data (WHO, 2016) report that in 2014 around 13% of the world's adult population was obese (600 million people) and nearly 40% overweight (1.9 billion people). Overweight and obesity are slightly more prevalent among women (40% with overweight and 15% with obesity) than men (38% with overweight and 11% with obesity).

In Portugal, we encounter a similar reality with the most recent representative study (Sardinha et al., 2012) revealing that more than two-thirds of the Portuguese adult population are overweight or obese. The prevalence of overweight is 46.7% for men and 38.1% for women and the prevalence of obesity is around 20% for both genders.

1.2. CAUSES AND CONSEQUENCES OF OBESITY

Obesity is a complex multifactorial chronic health condition that typically results from a combination of genetic, metabolic, physiological, behavioural, cultural and environmental factors (NIH, 1998). The risk of having overweight and obesity partially depends on one's genetic endowment. In fact, weight and fat distributions are somehow heritable (e.g., Bouchard, Després, & Tremblay, 1991). It is well known that lower resting metabolic rates and having an increased number of fat cells are two mechanisms associated with higher BMIs (Brownell & Wadden, 1991). On the other hand, according to the set point theory, body weight is regulated at relatively constant levels, just as body temperature and blood pressure. This means that our bodies have a homeostatic physiological mechanism to fight against changes in energetics (Brownell & Wadden, 1991; Moore, 2000). This mechanism may account for difficulties in maintaining weight loss in the long-term, given that after a significant weight loss the organism will activate compensatory responses to return to the original weight (e.g., Brownell & Wadden, 1991).

Although genetic, metabolic and physiological factors may increase the likelihood of having overweight and obesity, overall obesity and overweight reflect a lasting energy imbalance between the calories consumed and the energy expended (WHO, 2016). Just like other species, humans eat to meet their physiological needs, depending on the environmental constraints (Emmans & Kyriazakis, 2001). However, unlike other animals, food also plays other roles for humans, as it is also a source of pleasure and comfort (Goss, 2011; Lillis, Dahl, & Weineland, 2014; Mela, 1996). From an evolutionary perspective, the human brain did not evolve with any mechanism to restrain us from eating, simply because there was not any evolutionary advantage in doing so. Contrarily, humans evolved, like other animals, for the "see-food diet", which means when there is food we must eat it. This has been a useful mechanism for over millions of years given that the primary concern was to consume enough calories to guaranty survival, which is still the case for many animals (Pin-Sunyer, 2003). However, the fact that our brain does not have any restraining mechanism to stop us from eating may be problematic in the current western societies, where food is easily and readily available at all times (Goss, 2011). Moreover, just like other animals, humans have a preference for palatable foods and may overeat when food is available (Ulijaszek, 2002). On the other hand, unlike other animals, personal and psychological constraints play a major role in humans eating patterns and may lead to overconsumption, depending on food availability (Ulijaszek, 2002). In fact, eating patterns are strongly determined by the social context of eating and the expectations from foods before eating (Mela, 1996).

The current environment has been considered an obesogenic context, given the high palatable and high-density food availability and the attractiveness of food packages and labels (e.g., Goss, 2011; Wansink, 2006). This high food availability, when we have very limited homeostatic mechanisms to restore energy balance, turns weight gain easy and weight loss extremely difficult (Ulijaszek, 2002).

At the same time that food availability has increased, the amount of calorie expenditure has fallen drastically with the development of transports, several energy saving devices (e.g., remote control, elevators) and sedentary employments (Brownell & Wadden; 1991; Phillipson & Posner, 2008). Thus, spending enough energy to balance the dietary energy intake involves a conscious effort and is no longer the rule. Altogether, our current environment promotes steady weight gain (French, Story, & Jeffery, 2001; Lillis et al., 2014). Still, the risk of becoming overweight or obese relies on a complex combination of environmental, genetic, individual (e.g., susceptibility to hunger) emotional and behavioural factors (Brownell & Wadden, 1991).

Obesity is a major risk factor for several medical conditions such as: diabetes, hypertension, dyslipidemia (high LDL cholesterol, low HDL cholesterol and high levels of triglycerides), coronary heart disease, sleep apnea, stroke, some types of cancer, osteoarthritis, anxiety and depressive disorders (Luppino et al., 2010; NHLBI, 2013). Furthermore, obesity can hinder almost every domain of one's life, significantly reducing quality-of-life (Fontaine, Barofsky, Barlett, Franckowiak, & Anderson, 2004; Ford, Moriarty, Zack, Mokdad, & Chapman, 2001; Kearns, Ara, Young, & Relton, 2013; Manucci et al., 1999; Taylor, Forhan, Vigod, McIntyre, & Morrison, 2013) and being a source of stigma and discrimination (e.g., Puhl & Heuer, 2009; Puhl & King, 2013). It has substantial social and economic consequences, involving significant direct and indirect health costs (e.g., Andreyeva, Sturm, & Ringel, 2004; Cawley & Meyerhoefer, 2012).

Furthermore, evidence suggests that living with a chronic condition such as obesity not only relates to significant health impairments but also influences one's psychological condition (Ogden & Clementi, 2010; Taylor et al., 2013). Obesity has frequently been associated with increased depressive and anxiety symptoms (Wadden et al., 2006a; Simon et al., 2006; Tuthill, Slawik, O'Rahilly, & Finer, 2006), body image dissatisfaction and lower self-esteem (Grilo, Wifley, Brownell, & Rodin, 1994; Hill & Williams, 1998) particularly for women (Kolotkin, Head, Hamilton, & Tse, 1995). Nonetheless, the link between obesity and mental illness seems to be bidirectional and dose-dependent, which makes it difficult to determine causality (Taylor et al., 2013). Evidence suggested that the higher the BMI, the increased risk for mental illness, particularly for those with BMI > 35, with 40% to 70% of bariatric surgery patients presenting

mental illness comorbidities (e.g., Livhits et al., 2012). A recent literature review (Pickering et al., 2011), involving twenty-five studies, concluded that overweight and obesity are moderately associated with mood disorders, major depressive disorder and many anxiety disorders (including panic disorder, social and specific phobias). Still, not all individuals with obesity present enhanced psychopathology suffering (e.g., Jorm et al., 2003). In fact, research has highlighted some socio-demographic characteristics – such as being female, adolescent and severely obese – as important risk factors for psychological impairment (Friedman & Brownell, 2002; Wadden et al., 2006).

On the other hand, there is evidence that even small weight losses (from 5 to 10% of one's initial weight) may produce significant health improvements, including reduce risks for diabetes and coronary diseases and improve blood pressure and lipid profiles (Butryn, Webb, & Wadden, 2011; DGS, 2014; NIH, 1998; Franz et al., 2007). Furthermore, a recent systematic literature review (Lasikewicz, Myrissa, Hoyland, & Lawton, 2014) including thirty-six intervention studies, concluded that behavioural and dietary interventions can produce significant psychological improvements in depressive symptoms, self-esteem, body image and health-related-quality-of-life. These results mirror the ones found in Blaine, Rodman and Newman (2007) meta-analysis that also found significant improvements in psychological outcomes following pharmacological, surgical and behavioural weight loss interventions.

Nevertheless, it seems that improving psychological outcomes does not depend necessarily on actual weight loss (Lasikewicz et al., 2014). In fact, some studies have found improvements in psychological functioning without any weight loss (e.g., Bryan & Tiggeman, 2001) or even with weight gain (Nauta, Hospers, & Jansen, 2001).

1.3. OBESITY AND BINGE EATING DISORDER

People with overweight and obesity represent a heterogeneous group, given the complexity of factors enrolled in the development of this condition (Brownell & Wadden, 1991, NIH, 1998). Among those with overweight and obesity, those with binge eating seem to represent a specific and distinct sub-group within the obesity spectrum (Wang et al., 2011; Leehr et al., 2015). Binge eating behaviours refer to the existence of episodes of eating characterised by the consumption of a large amount of food in a discrete period of time. In these episodes, individuals experience a sense of lack of control over eating as if they could not stop eating, once the episode starts. This type of episodes constitute one of the key criteria for the diagnosis of Binge Eating Disorder

(BED) and Bulimia Nervosa (BN) and can also be present in other types of eating disorders (American Psychiatric Association, 2013). According to the DSM-V, BED involves the existence of binge eating episodes at least once a week for a minimum of three consecutive months without the use of any compensatory behaviour (e.g., vomiting, fasting). The binge eating episode must involve, at least, three of the following characteristics: eating faster than normal; eat until feeling uncomfortably full; consuming large amounts of food, even when not hungry; eating alone due to feelings of embarrassment; feeling self-disgust, depressed or guilty after eating (American Psychiatric Association, 2013). Several studies suggest that binge eating is frequently triggered by emotional distress (e.g., Haedt-Matt & Keel, 2011; Stice, Akutagawa, Gaggan, & Agras, 2000). Thus, binge eating may be conceptualised as a maladaptive emotional regulation strategy, where one tries to avoid or eliminate negative affect (Masheb & Grilo, 2006; Polivy & Herman, 1993; Stice, et al., 2001).

A recent community-based World Health Organization World Mental Health (WMH) Survey, including 24124 participants from fourteen different countries and using the DSM-V criteria, found that the lifetime BED prevalence was around 2% (Kessler et al., 2013). A similar prevalence was found in a population-based study from the United States of America (Cossrow et al., 2016). BED is the most common eating disorder, and its prevalence even surpasses the prevalence of anorexia and bulimia nervosa combined (Kessler et al., 2013). Furthermore, binge eating behaviours are prevalent even among people without eating disorders (e.g., Johnsen, Gorin, Stone, & Le Grange, 2003) and are particularly prevalent among women (Hudson, Hiripi, Pope, & Kessler, 2007; Kessler et al., 2013). Data shows that binge eating (BE) prevalence among community samples is raising (De Zwaan, 2001; Ribeiro, Conceição, Vaz, & Machado, 2014). High prevalence of binge eating has been reported in female college students, with 40% showing binge eating symptoms and 8.4% displaying criteria for BED (Napolitano & Himes, 2011; Saules et al., 2009).

Given the amount of food consumed during binge eating episodes, it is not surprising that binge eating is closely related to overweight and obesity (Darby, Hay, Mond, Rodgers, & Owen, 2007; De Zwaan, 2001; Kessler et al., 2013; Wilfley, Wilson, & Agras, 2003). In fact, studies show that 23% to 46% of individuals with obesity engage in binge eating behaviours (Bulik, Sullivan, & Kendler, 2002; Gormally, Black, Daston, & Rardin, 1982). Binge eating has been consistently associated with an early onset and maintenance of overweight and obesity (De Zwaan et al., 1994; Mussell, Mitchell, Weller, Raymond, Crow, & Crosby, 1995) and to higher BMIs (e.g., Kessler et al., 2013; Wilfley et al., 2003).

A substantial body of literature points to significant differences between people with overweight and obesity with and without binge eating. The presence of binge eating has consistently been associated with severe complications for physical and mental health, higher levels of psychopathology in both community and clinical populations and poorer outcomes in weight loss treatments (Bulik et al., 2002; Hudson et al., 2007; Kessler et al., 2013; Wilfley et al., 2003). Among those who struggle with overweight or obesity, individuals also struggling with binge eating symptoms tend to present higher body image dissatisfaction, overvaluation of weight, shape and body image and more chaotic eating patterns (Gianini, White, & Masheb, 2013; Wilfley et al., 2003), decreased self-esteem (Herbozo, Schaefer, & Thompson, 2015), physical activity levels (Hrabosky, White, Masheb, & Grilo, 2007) and greater medical and psychiatric morbidity, including: anxiety and depressive symptoms (e.g., Bulik et al., 2002; Durso et al., 2012a; Grilo, White, & Masheb, 2009; Linde et al., 2004; Wilfley et al., 2003). Research also suggests that binge eating enhances the lifetime prevalence of other psychiatric conditions, including panic disorder, phobias, depression, and alcohol dependence (Bulik et al., 2002; Jones-Corneille et al., 2012; Pagoto et al., 2007). Specifically, depression is considered an important risk factor for the development of BED (Linde et al., 2004; Meno, Hannum, Espelage, & Low, 2008).

Additionally, binge eating has been consistently found to be related to more work and social impairments (Hsu et al., 2002) and poorer health-related quality of -life even when compared with patients with obesity without BE (see Baiano et al., 2014 for a meta-analysis). Health-related-quality-of-life refers to the effect of medical conditions on an individual well-being and physical and mental functioning (Baiano et al., 2014; Mannucci et al., 1999; Masheb & Grilo, 2004; Rieger, Wilfley, Stein, Marino, & Crow, 2005; Vancampfort et al. 2014; De Zwaan et al., 2002). Binge eaters were found to present both decreased levels of mental and physical health-related-quality-of-life (Vancampfort et al. 2014). In fact, a recent literature review (Jenkins, Hoste, Meyer, & Blissett, 2011) suggests that from all the eating disorder diagnosis, BED seems to be the one that impairs individual's quality-of-life the most. Overall, binge eating carries significant physical and psychosocial impairments and decreases ones' quality-of-life beyond the experience of being obese (De Zwaan et al., 2002; Herbozo et al., 2015).

In a recent systematic review, Leehr and collaborators (2015) concluded that binge eaters represent a distinct neurobiological phenotype within obesity that involves a deficit in emotional regulation strategies. In fact, individuals with obesity with binge eating symptomatology have been found to experience more difficulties in handling emotions (e.g., Whiteside, Chen, Neighbors, Lo, & Larimer, 2007) and to use more maladaptive emotional regulation

competencies, such as distraction, suppression and experiential avoidance (Kingston, Clarke, & Remington, 2010; Lillis, Hayes, & Levin, 2011; Whiteside et al., 2007).

Taken together, all marked differences found between individuals with and without BE provides evidence for the assumption that individuals with obesity and binge eating constitute a distinct group from those with obesity without BE and need specific treatments (e.g., De Zwaan, 2001; Leehr et al., 2015).

1.4. BEHAVIOURAL AND PSYCHOLOGICAL FACTORS ASSOCIATED WITH WEIGHT LOSS MAINTENANCE AND WEIGHT REGAIN

Literature has been pointing the importance of several behavioural and psychological factors related to weight maintenance and weight regain (Byrne, Cooper, & Fairburn, 2003; Wing & Hill, 2001). The vast majority of these studies have focused on exploring the differences between those who can maintain their weight loss (maintainers) and those who regain weight (regainers) in the long term.

The specific behaviours related to successful weight maintenance have been consistently studied (Cooper, Fairburn, & Hawker, 2002; Elfhag & Rossner, 2005; Wing & Hill, 2001). Literature has shown that, in order to successfully maintain weight loss, individuals need to be able to persist in the weight control behaviours that led to the initial weight loss (Cooper et al., 2002; Wilson & Brownell, 2002). In fact, those who are able to maintain their weight loss in the long-term maintain a low-calorie low-fat diet, eat breakfast regularly, are able to maintain a consistent eating pattern during weekdays and weekends, have decreased levels of disinhibition, regularly engage in physical exercise and monitor their weight (Butryn, Phelan, Hill, & Wing, 2007; McGuire, Wing, Klem, & Hill, 1999; Wing, & Phelan, 2005). Although knowledge on the behaviours and strategies required to maintain weight successfully is crucial, it does not shed light on the reasons why some can maintain those behaviours when others do not. Existent research has been highlighting several psychological factors (both cognitive and emotional) that seem to play a significant role in the ability to adopt and maintain healthy behaviours (Byrne et al., 2003; Dalle Grave, Calugi, & Marchesini, 2014).

Overall, when compared to those who successfully maintain their weight loss, regainers present a history of more weight cycling, unrealistic weight goals, unhealthy eating patterns such as emotional and disinhibit eating, binge-eating, more hunger and poorer coping or problem-solving skills (Byrne et al., 2003; Byrne, Cooper, & Fairburn, 2004; Elfhag & Rossner, 2005;

Dalle Grave, et al., 2014; Teixeira et al., 2004). In contrast, maintainers seem to be guided by intrinsic motivation to lose weight, have more efficient coping strategies to deal with life stress, more social support, and are more psychologically stable (Byrne et al., 2003; 2004; Elfhag & Rossner, 2005).

Among the psychological factors related to weight regain, dichotomous and rigid thinking style has emerged as a key cognitive feature that distinguishes maintainers from regainers (Byrne et al., 2003, 2004). Regarding eating behaviours, this rigid control pattern is characterised by a “*black and white*” or “*all or nothing*” type of thinking and shifting between periods of severe restriction or absolute no restriction (Westenhoefer, 1991, 2001). This rigid control frequently reflects significant weight cycling, which refers to repeated attempts to lose weight followed by significant weight regain (Hill, 2004; Strohacker, Carpenter, & Mcfarlin, 2009). Rigid control patterns have been associated with weight regain after weight loss treatments, more disordered eating behaviours, including binge eating and with increased cardiovascular disease and mortality (Brownell & Rodin, 1994; Elfhag & Rossner, 2005; Hill, 2004).

Individuals with a dichotomous type of cognitive functioning may be more prone to believe that failing to achieve their weight goal represents a global failure and tend to become dissatisfied with the amount of weight loss (Byrne et al., 2004). This may lead one to believe that he/she is not capable of controlling one’s weight, which in turn may result in the abandonment of the weight maintenance behaviours (Byrne, 2002; Byrne et al., 2003; Cooper et al., 2002; Elfhag & Rossner, 2005). Research has consistently shown that those who are dissatisfied with their weight loss results are more likely to drop out from treatment and regain weight (Byrne et al., 2004; Elfhag & Rossner, 2005; Grossi et al., 2006). In contrast, a flexible cognitive style around eating and food involves being able to consistently restrict food intake in a balanced way, without the need to exclude any type of food and maintaining a long-term outlook. A flexible cognitive style has been associated with weight loss and lower BMIs (Westenhoefer, 1991; 2001). Moreover, those who regain weight after weight loss treatments are also more likely than maintainers to overvalue their weight and shape as measures of their self-worth (Byrne et al., 2003). This overvaluation of one’s weight, shape and body image is considered to be a core feature of eating disorders presentations (Fairburn, 2008; Fairburn, Cooper, & Shafran, 2003).

Motivational factors are likely one relevant aspect of weight loss and weight loss maintenance. Individuals’ motivation is of particular importance given that the lack of motivation is closely related to poor treatment adherence and poorer outcomes (e.g., Teixeira et al., 2004; Wadden et al., 2006b). Thus, the majority of weight loss interventions to include strategies to maintain or increase individuals’ motivation towards weight loss (Wadden et al., 2006b).

Nevertheless, it seems that different types of motivations (intrinsic versus extrinsic) for weight loss and weight maintenance may lead to very distinct outcomes (Teixeira, Silva, Mata, Palmeira, & Markland, 2012). For instances, intrinsic or personal motivations, such as wanting to lose weight to improve health and quality-of-life have been linked to weight maintenance. On the contrary, individuals' that are motivated to lose weight for external reasons, such as a need to comply or feeling pressured by health professionals, family members or simply to decrease body dissatisfaction and improve physical attractiveness tend to present poorer outcomes and regain their weight (Ogden & Clementi, 2000). These data suggest that presenting motivations based on avoidance of social, psychological or emotional consequences or just to comply with external pressures hinders one's ability to achieve one's goals. Contrarily, including the desire to lose weight as a large pattern of a valued and healthier lifestyle seems to help individuals to meet their targets (Lillis, Hayes, Bunting, & Masuda, 2009; Teixeira et al., 2012).

In the same line, having adequate coping skills to deal with stressful events and setbacks is also considered an important competence for maintaining healthy behaviours even in the face of adversity (Byrne et al., 2003; Gormally, Radin, & Black, 1980). Research comparing maintainers and regainers shows that the difference does not rely on a number of stressful events but rather on the strategies that the individuals use to deal with those stressors. When faced with challenging life events or negative emotions, regainers tend to use avoidance coping styles that may include overeating, sleeping or simply being passive rather than directly addressing the situation. In fact, using food to seek comfort or to avoid negative emotional states, a phenomenon that is also known as emotional eating, is considered a maladaptive emotional regulation strategy associated with weight regain and poorer outcomes (Byrne et al., 2003; Elfhag & Rossner, 2005). Furthermore, regainers also show higher levels of impulsivity and decreased abilities to resist food cravings (Fassino et al., 2002; Rydén et al., 2003).

To sum up, research has been highlighting that several psychological processes seem to be involved in the difficulties in maintaining healthy eating behaviours and weight loss in the long-term. In fact, results from a literature review (Elfhag & Rossner, 2005) suggest that the issue with weight management should be approached primarily from a psychological point of view. Still, the majority of weight loss interventions do not include any psychological component (for a review see Avenell et al., 2004). Even the most comprehensive weight loss treatments that include a behavioural component focus on behaviour modification (e.g., self-monitoring, stimulus control, cue avoidance, problem-solving). These interventions do not target (at least directly) any of the psychological variables that seem to influence the adoption and maintenance of healthier behaviours in the long-term in a society where high palatable food is cheap and easy to buy and

where energy expenditure is minimal (Lillis et al., 2009; Teixeira et al., 2012). At least partially, this might account for the high relapse rates in obesity after weight loss treatments, with the majority of individuals abandoning healthy behaviours once weight loss stops or feeling the need for constant surveillance and support for health experts to avoid weight regain. In fact, clinical experience suggests that most individuals that engage in weight loss interventions are aiming to lose weight to avoid negative consequences rather than truly reflect on why it is important to lower their weight or to change unhealthy behaviours (Teixeira et al., 2012). This may be problematic in the long-term, given that avoidance-based changes are unlikely to be sustained in the long-term and meaningful changes need to be aligned with one's core values (Hayes, Strosahl, & Wilson, 2012a; Teixeira et al., 2012).

1.5. WEIGHT-BASED STIGMATISATION AND DISCRIMINATION

Stigma is a multidimensional concept that involves both an external (enacted stigma) and an internal dimension (internalised stigma or self-stigma; Lillis, Luoma, Levin, & Hayes, 2010; Link & Phelan, 2001; Bos, Pryor, & Reeder, 2013). The external dimension refers to the experience of being discriminated against in social situations, whereas the internal dimension reflects the self-devaluation and fear of enacted stigma (Link & Phelan, 2001). Stigma is a serious and common problem affecting those with some disability, such as a developmental or physical disability or a chronic disease like obesity (Puhl & Brownell, 2006; Malterud & Ulriksen, 2011). Stigma exists in the mind and involves overlooking all the good qualities of a person and focusing solely on one given aspect (e.g., a physical aspect or character trait) that is the target of the stigmatisation. Stigma poses the individual in an unfavourable social position, and thus vulnerable to discrimination (Link & Phelan, 2001; Pescosolido & Martin, 2015).

Specifically, weight-based stigmatisation refers to negative weight-related stereotypes and attitudes towards people with obesity (Ogden & Clementi, 2010; Phul & Heuer, 2009). These are the basis for discriminatory behaviours (e.g., rejection, teasing, bullying) that may invade all life domains and may start early in life (Phul & Heuer, 2009; Puhl & King, 2013). The weight-biased messages are globally widespread and its intensity tends to increase over time (Andreyeva, Puhl, & Brownell, 2008; Latner & Stunkard, 2003). Weight discrimination is, in fact, one of the most accepted (and sometimes even encouraged, as a way of fighting against obesity) forms of social discrimination, and its prevalence equals or even surpasses other forms of discrimination such as racism, sexism, homophobia (Andreyeva et al., 2008; Puhl, Andreyeva, & Brownell, 2008; Phul & Brownell, 2001; Wang, Brownell, & Wadden, 2004). Although other forms of discrimination are socially discouraged or even criminalised, little has been done to protect against weight stigma

(Latner, O'Brien, Durso, Brinkman & MacDonald, 2008), with some obesity-related public health campaigns having a paradoxical effect and even contributing to weight stigmatisation (e.g., Puhl, Peterson, & Luedicke, 2013).

People with overweight and obesity are frequently characterised by negative self-related attributes such as being weak, lazy, stupid, untidy, sloppy, unattractive and less successful and intelligent (e.g., Greenleaf, Chambliss, Rhea, & Morrow, 2006; Puhl & Suh, 2015; Wang et al., 2004), even by children as little as three-years-old (Cramer & Steinwert, 1998). Moreover, obesity is frequently perceived as an individual's fault, lack of will power, failure, and responsibility and a matter of lacking the motivation to lose weight and improve one's health status (e.g., Brewis, 2011; Puhl & Suh, 2015). These negative stereotypes regarding those with overweight and obesity are so prevalent that even exist among health professionals treating obesity (physicians, nutritionists and mental health professionals), within some weight-focus prevention and treatment approaches (Puhl & Heuer, 2009; Schwartz, Chambliss, Brownell, Blair, & Billington, 2003) and among those with overweight and obesity (e.g., Durso & Latner, 2008; Wang et al., 2004). Additionally, weight-based stigmatisation seems to exist even at implicit levels (e.g., Azevedo, Macaluso, Viola, Sani, & Aglioti, 2014; Puhl & Brownell, 2006).

Moreover, these negative stereotypes can have substantial adverse consequences in almost all life domains of the overweight and obese individuals, such as relationships, employment, education and even health care (Puhl & Brownell, 2001, 2006; Puhl & Heuer, 2009). Weight stigma is considered to be especially pervasive given that one's weight is something that cannot be concealed from others (Crocker, Cornwell, & Major, 1993). This is particularly relevant for women and girls that tend to report more weight discrimination experiences than males (Davison, Schmalz, Young, & Birch, 2008; Puhl et al., 2008).

There is a significant amount of evidence showing that weight-based stigmatisation exacerbates disparities and affects people's physical and psychological health outcomes (Crocker et al., 1993; Kolotkin, Meter, & Williams, 2001; Nolan & Eshleman, 2016; Puhl & Brownell, 2001; Puhl & Heuer, 2010). Weight stigma has been consistently related to psychopathological symptoms, including depressive and anxiety symptoms, decreased self-esteem and suicidal ideation (e.g., Ashmore, Friedman, Reichmann, & Musante, 2008; Puhl & Heuer, 2009) and increased cortisol levels (Tomiyama, 2014). Furthermore, a recent literature review (Vartanian & Porter, 2016) highlights the potential impact of weight stigma in unhealthy eating behaviours. Studies conducted in samples with individuals with overweight and obesity, consistently relate weight-related stigmatization experiences with higher levels of body image concerns, unhealthy eating behaviours, such as skipping meals, using diet pills or vomiting (Durso, Latner, & Hayashi,

2012b), binge eating (Ashmore et al., 2008; King, Puhl, Luedicke, & Peterson, 2013; Puhl & Latner, 2007; Wott & Carels, 2010), physical exercise avoidance (Faith, Leone, Ayers, Heo, & Pietrobelli, 2002; Vartanian & Novak, 2011). Puhl and Brownell (2006) found that around 80% of the individuals with overweight and obesity tend to deal with stigmatising and discriminatory experiences by refusing to diet or eating more food.

Recently, two randomised controlled studies (Major, Hunger, Bunyan, & Miller, 2014; Schvey, Puhl, & Brownell, 2011) concluded that weight stigma has a direct and harmful effect on healthy eating. Another recent study (Sutin & Terracciano, 2013) with 6157 individuals with obesity found that those weight-based stigmatising experiences can lead to weight gain over a four-year period. Weight stigma has been considered a major obstacle to the efficacy of weight loss interventions, being associated with diminished treatment compliance, avoiding seeking medical care, higher attrition rates and poorer weight loss outcomes (Carels et al., 2009; Dovidio & Fiske, 2012; Malterud & Ulriksen, 2011; Puhl & Heuer, 2009; Sutin & Terracciano, 2013; Tomiyama, 2014; Wott & Carels, 2010). Additionally, there is evidence suggesting that even losing weight may not diminish weight-related stigma (Fardouly & Vartanian, 2012; Latner, Ebner, & O'Brien, 2012) and that weight stigma mediates the link between BMI and self-reported physical and psychological health (Hunger & Major, 2015).

1.5.1. WHEN WEIGHT-STIGMA BECOMES INTERNALISED

Despite a large amount of evidence linking weight stigma with poorer health and psychological outcomes, the mechanisms involved are still scarcely studied (Ratcliffe & Ellison, 2015; Tomiyama, 2014). Especially as not everyone equally endorses those negative weight-biased stigmatisation messages. Thus, weight bias internalisation or weight self-stigma is likely to be one of the processes involved in the relationship between weight stigma and poorer outcomes (Brewis, 2014). Weight self-stigma is thought to arise from the internalisation of the existent social weight-biased messages (Durso et al., 2012a; Lillis et al., 2010; Ratcliffe & Ellison, 2015). According to Lillis and collaborators (2010) weight self-stigma reflects a multidimensional concept that encloses weight-based self-devaluation, as well as, fear of enacted stigma. While self-devaluation relates to negative thoughts and emotions about being overweight, fear of enacted stigma arises from the perception that one belongs to a stigmatised group (Lillis et al., 2010; Link & Phelan, 2001; Bos et al., 2013).

Among clinical and non-clinical samples of adults with overweight and obesity, weight self-stigma has consistently being linked with unhealthy eating behaviours and lower self-esteem

(Durso & Latner, 2008; Lillis et al., 2010), more psychological distress, anxiety and depressive symptoms (Farhangi, Emam-Alizadeh, Hamed, & Jahangiry, 2016; Pearl, White, & Grilo, 2014), overall experiential avoidance patterns (Lillis et al., 2010) and diminished quality-of-life (Durso et al., 2012a; Farhangi et al., 2016; Latner, Durso, & Mond, 2013, Lillis et al., 2010). Interestingly, one study (Latner et al., 2013) found that internalised weight stigma significantly impaired both physical and psychological quality-of-life, above the contributions of BMI, age and medical comorbidities. Another study showed that weight self-stigma, alongside with psychological distress, mediated the relationship between weight-related stigmatisation experiences and eating psychopathological symptoms (O'Brien et al., 2016). Similarly, Vartanian and Novak (2010) found that the impact of weight stigma on physical exercise avoidance is stronger for those who present higher levels of weight self-stigma.

Nonetheless, inconsistent results have been found regarding the association between weight self-stigma and BMI. While some studies failed to find a significant association (Durso & Latner, 2008), others (e.g., Hain et al., 2015) found that individuals with a BMI \geq 50 presented significantly higher levels of weight self-stigma when compared to people with BMI between 35 and 50. Still, it is likely that these different patterns of results reflect the use of samples with very different BMI ranges and different methods in weight assessment (e.g., self-reported vs. measured weight). Furthermore, weight self-stigma has been found to play a crucial role in the relationship between BMI and obesity-related quality-of-life (Latner, Barile, Durso, O'Brien, 2014; Lillis et al., 2011), emphasising the importance of this process on individuals quality-of-life.

Globally, weight self-stigma has been considered a key risk factor for unhealthy eating patterns (e.g., Durso et al., 2012a; Hilbert, Braehler, Haeuser, & Zenger, 2013) and a strong predictor of body image dissatisfaction, binge-eating, depressive and anxiety symptoms and diminished physical and psychological health (Durso & Latner, 2008; Latner, et al., 2013).

Preliminary evidence for the multidimensional nature of the weight self-stigma was found, with self-devaluation being stronger related to psychopathological symptoms (e.g., anxiety and depressive symptoms) and disinhibit eating, whereas fear of enacted stigma showing a closer relationship with decreased quality-of-life (Lillis et al., 2010).

In addition, research has just started to explore how weight self-stigma contributes to unhealthy eating patterns and quality-of-life. Specifically, Lillis and collaborators (2011) found that weight self-stigma and general experiential avoidance partially mediated the relationship between body mass index and health-related-quality-of-life. Another recent study conducted in a sample of college women demonstrated that the negative association between weight self-stigma and intuitive eating occurred through body-image flexibility, body-shame and self-compassion

(Webb & Hardin, 2016). Finally, a German population survey with 1158 individuals with overweight and obesity found that the effect of weight self-stigma on mental and global health outcomes occurred partially through individuals' inability to be compassionate towards themselves (Hilbert et al., 2015)

Nonetheless, in their literature review, Vartanian and Porter (2016) highlighted that future research is necessary to explore further the mechanisms that underlie the relationship between internalised weight stigma and unhealthy eating behaviours.

1.6. UNVEILING SELF-DISGUST: THE FORGOTTEN EMOTION

So far, research on disgust, disgust propensity and particularly on the link between self-disgust and psychopathology is scarcely studied (e.g., Davey, 2011). The existent findings point for the importance of self-disgust in many mental health conditions (Davey, 2011; Phillips, Fahy, David, & Senior 1998) and highlight its role on the maintenance of eating disorders (Fox & Power, 2009).

Disgust is considered one of the human's basic emotions since Darwin (1965), involving a feeling of revulsion when one touches or ingests dangerous materials. Disgust evolved within the threat-protection system, as an adaptive mechanism to avoid contamination and disease and elicit avoidance or rejection responses (Gilbert, 2015; Oaten, Stevenson, & Case, 2009; Rozin, Haidt, McCauley, Dunlop & Ashmore, 1999). Although the origin of disgust responses relied on disease avoidance, the disgust responses changed throughout the biological and sociocultural evolution, currently representing a multifaceted construct. Disgust responses can be stimulated by distinct stimuli (e.g., animals, immoral behaviours or traits, physical appearance features), producing different response patterns (Powell, Simpson, & Overton, 2015; Roberts & Goldenberg, 2007; Rozin, et al., 1999; Simpson, Carter, Anthony, & Overton, 2006). In fact, the development of a full disgust-eliciting repertoire depends on one's sociocultural environment, since what is unacceptable or disgusting is shaped by one's social context (Gilbert, 2015; Power & Dalgleish, 2008; Powell, Simpson, & Overton, 2013).

Although disgust responses are crucial to guaranty survival, they may become dysfunctional for three main reasons (Powell et al., 2015). Firstly, because individuals can be especially sensitive or de-sensitive to adaptive disgust-elicite stimuli (Haidt, McCauley, & Rozin, 1994). Secondly, the disgust experience itself can be felt as aversive, eliciting distress (Van Overveld, de Jong, Peters, Cavanagh, & Davey, 2006) and being related to enhanced psychopathology (Davey, 2011). Finally, disgust responses can be generalised to other stimuli, such as (certain attributes of) the self and become maladaptive (Powell et al., 2013).

Evolutionarily, although having a generalizable disgust response repertoire offers significant social advantages, it may also unintentionally turn some individuals more vulnerable to adopt the same responses towards themselves, if they perceive some parts of themselves as physically or socially disgusting (Powell et al., 2013; 2015). When directed at the self, disgust can be an extremely pathogenic, given that it is an emotion focused on getting rid of, avoiding and eradication of the object of disgust (Gilbert, 2015; Overton, Markland, Taggart, Bagshaw, & Simpson, 2008). Self-disgust can be defined as an emotional schema. It arises from the internalisation of the natural and adaptive disgust response. Self-disgust involves an enduring feeling of aversion, revulsion or deep grief about features of the self (physical or behavioural) that are viewed as toxic and repulsive, involving a noxious and embodied feeling state (Gilbert, 2015; Roberts & Goldenberg, 2007; Powell et al., 2015). It is a multidimensional experience that includes physiologic (e.g., repulsion and nausea), emotional (revulsion, contempt, anger), cognitive (disgust-based negative evaluations) and behavioural (e.g., avoid and reject) reactions (Carreiras, 2014; Powell et al., 2015). Rather than an impermanent emotional response, self-disgust has been considered a persistent cognitive-affective trait (Powell et al., 2013).

According to Powell and collaborators (2015), self-disgust is not pathogenic per se, but it can be particularly pervasive when is persistent and directed at stable or relatively unchangeable aspects of the self (e.g., one's weight or specific unwanted internal experiences, behaviours or even the whole self) that are essential to one's self-concept. In fact, individuals may differ on the attributes they are disgusted by, whereas some are mainly disgusted with their physical appearance, others may feel aversion towards some psychological traits. Still, self-disgust is likely to have a greater impairment on well-being when the whole self is seen as toxic or repugnant (Powell, Overton, & Simpson, 2014).

Just as disgust responses to external stimuli elicit avoidance responses, self-disgust responses also involve attempts to avoid, change or eradicate those aspects of the self that are considered repugnant. Self-disgust may lead individuals to avoid looking at their bodies, concealing the aspects seen as repugnant or engage in distraction techniques (Espeset, Gulliksen, Nordbo, Skarderud, & Holte, 2012; Powell et al., 2013). Nonetheless, unintentionally these avoidance-based responses tend to increase and intensify the self-disgust response, turning it hard to unlearn (Espeset et al., 2012; Powell et al., 2014).

The origins of self-disgust are yet to be fully unveiled, but evidence suggests that self-disgust may arise during childhood and adolescence (Powell et al., 2013; Powell & Dalgleish, 2008). Still, self-disgust may also be elicited in adulthood, as a result of significant changes in relevant features of the self (e.g., trauma or weight gain; Powell et al., 2015). Regardless, research

highlights that self-disgust arises from a combination of several factors, including temperament and personality traits, the social context and rearing experiences and individuals characteristics (Powell et al., 2015). Having a history of physical and emotional abuse or several early social learning experiences, such as disgust-based and harsh criticism, negative social comparisons and the internalization of others disgust responses, alongside with the existence of characteristics that may be perceived as repugnant are likely to contribute to the development of self-disgust (Powell et al., 2014, 2015).

Increasing interest exists in understanding the associations between self-disgust and other related psychological phenomena, particularly shame and self-criticism, given that all are rooted in the same threat-protection system (Gilbert, 2015) and play a fundamental role in psychopathology. The distinction between self-disgust and shame is not always clear, with some authors proposing that shame may be a specific aspect of self-disgust (Power & Dalgleisgh, 2008), while others emphasise the uniqueness of the self-disgust construct (Roberts & Goldenberg, 2007; Simpson et al., 2006). Shame involves the perception of the self as flawed, inferior or defected and thus at risk of being criticised or excluded (e.g., Gilbert, 2000, 2010). Shame has been linked to sadness rather than to disgust feelings (Ekman & Cordaro, 2011), while self-disgust involves a particularly noxious and embodied feeling state (Roberts & Goldenberg, 2007). Still, self-disgust and shame are distinct (and yet related) phenomena that involve distinct physiological and expressive profiles (Tracy, Robins, & Schriber, 2009) and evolved for distinct evolutionary functions (Powell et al., 2015). While self-disgust evolved as a disease prevention mechanism, shame operates as an alarm that signals when the self is seen as inferior or inadequate, eliciting defensive strategies (e.g., submission) (Gilbert, 2010). Nevertheless, shame and self-disgust are closely linked, given that shame feelings may be a common consequence of being the object of disgust (Powell et al., 2015; Simpson et al., 2010; Troop & Redshaw, 2012).

Although the experience of self-disgust may include some kind of self-criticism (particularly self-hatred), Gilbert, Clarke, Hempel, Miles and Irons (2004) argue that it is possible for someone to criticise parts of the self without necessarily experiencing self-disgust. Contrarily, disliking certain features of the self is insufficient (although necessary), to experience self-disgust (Powell et al., 2014). Thus, self-disgust and self-criticism reflect distinguishable constructs, with different cognitive-affective content (with self-disgust explicitly focusing on aversion), that often co-exist (Carreiras & Castilho, 2014; Gilbert et al., 2004; Powell et al., 2014; Whelton, & Greenberg, 2005). It is possible that when part or the whole self is perceived as repugnant, the threat-protection system may become activated and individuals may engage in hostile and attacking self-

to-self relationship (Gilbert, 2000). In turn, this may have unintended consequences and lead to the adoption of defensive-based strategies.

Research concerning self-disgust is still in its infancy. Nonetheless, existent data suggest that self-disgust plays a role in different mental health conditions (Davey, 2011; Phillips et al., 1998), namely: depression, physical appearance, eating and interpersonal problems (Espeset et al., 2012; Powell et al., 2014). A recent study (Ille et al., 2014), compared self-disgust in individuals with spider phobia, major depression, schizophrenia, borderline personality disorder and eating disorders (Anorexia and Bulimia Nervosa) with healthy controls. Results revealed that people with psychiatric conditions (except spider phobia) showed higher levels of self-disgust than healthy controls. Moreover, patients with eating disorders and borderline personality disorders stand out, revealing higher levels of self-disgust (Ille et al., 2014). It seems that although the cognitive content of self-disgust may vary, its affective domain may be shared across distinct disorders (Powell et al., 2015).

Self-disgust has been found to be a key feature of the depressive experience (mediating the relationship between dysfunctional cognitions and depressive symptoms) rather than just an epiphenomenon of depression symptomatology (Overton et al., 2008; Powell et al., 2013, 2015). A longitudinal study (Powell et al., 2013) found that self-disgust predicted depressive symptoms over a 12-month period. In addition, this study also revealed that body-related disgust was more stable and had a greater impact on depressive symptoms, than disgust towards specific behaviours. In the same line, some evidence suggests that self-disgust may be a major predictor of anxiety symptoms and suicidality, even when controlling for depressive symptoms (Carreiras & Castilho, 2014).

Despite being scarce, the existent research highlights the central role of self-disgust in the maintenance of eating disorders (Fox & Power, 2009) and body dysmorphic disorder (Lambrou, Veale, & Wilson, 2011), being associated with body dissatisfaction and stigma (Griffiths & Page, 2008). According to Roberts and Goldenberg (2007), the objectification of the female body and the current cultural environment may lead to disgust feelings towards one's body. Given that disgust relies on a social audience, when others perceive some of one's physical appearance features as disgusting, this may become inbuilt in the self-system as a target of disgust (Gilbert, 2015), and enhance avoidance strategies. In fact, individuals with eating psychopathology tend to present higher levels of disgust towards their bodies (e.g., Espeset et al., 2012), which in turn may lead to body awareness avoidance, avoiding social interactions and engaging in unhealthy eating behaviours, such as restrictive eating and purging (Espeset et al., 2012).

Astonishingly, no studies have explored self-disgust in people with overweight and obesity. Still, this may be of particular interest given that this population presents a physical appearance very different from the socially valued one and that may be judged as repulsive. Overall, growing attention is being given to understand how weight stigma, weight stigma internalization and self-disgust have influence the adoption and maintenance of unhealthy eating patterns and individuals' abilities to manage their weight.

1.7. WEIGHT LOSS INTERVENTIONS FOR OVERWEIGHT AND OBESITY

In 1998, based on a systematic review, the USA National Institutes of Health (NIH) published the first clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. These guidelines recommend that the goal of weight loss therapy should be to reduce 10% of one's weight in approximately six months (NIH, 1998). After the initial six months, the NIH recommends a weight maintenance stage of treatment that may last indefinitely. These guidelines were recently updated (Jensen et al., 2014) suggesting cognitive-behavioural treatments (including dietary and physical activity psychoeducation and prescriptions, as well as behavioural skills) as the first line and gold standard treatments for obesity.

Typically, obesity treatments involve changing people's eating and physical activity patterns. From a nutritional point of view, to lose weight, people with overweight need to create a daily energy intake deficit between 300-500 Kcal. For people with obesity, the NIH guidelines (1998) recommend a reduction of 500 to 1000 Kcal/ day to produce a 10% sustainable weight loss over six months. Concomitantly, increasing physical exercise is also an important part of a comprehensive weight loss or weight maintenance intervention. Initially, thirty to forty-five minutes of moderate to intense physical exercise 3 to 5-days a week is recommended for weight loss. In fact, the NIH guidelines (1998) recommended the combination of a reduced-calorie diet and increased physical exercise to achieve weight loss successfully, decrease abdominal fat and improve cardiovascular fitness.

Moreover, the most comprehensive weight loss or weight management programs also include a behavioural therapy component. This component usually involves enhancing motivation towards healthier eating and physical exercise patterns and includes a set of skills such as: self-monitoring of eating and physical exercise habits, problem solving, stress management, stimulus control, contingency management, cognitive restructuring, and social support (Avenell et al., 2004; Brownell, 2000; NIH, 1998). Results from the NIH systematic review concluded that

behaviour therapy was “*a useful adjunct when incorporated into treatment for weight loss and weight maintenance*” (NIH, 1998, page 27). This combination is associated with weight loss for up to 36 months. However, no evidence was found for the benefits of behaviour therapy beyond the first twelve months of weight loss therapy (Avenell et al., 2004).

In addition to the lifestyle changes, pharmacotherapy may also be included in some weight loss treatments to enhance weight loss (NIH, 1998). Still, weight loss medication may have side effects and unwanted consequences, as weight regain is likely to occur after stopping the pharmacological treatment (Halpern & Mancini, 2003). The NIH guidelines also point bariatric surgery as a viable option for patients with morbid obesity (BMI \geq 40) or BMI \geq 35 with several comorbidities, when prior weight loss treatments have failed and there is an increased risk for obesity-related morbidity or mortality. There are several distinct types of bariatric surgery and all can lead to a dramatic weight loss in a short period of time. Nonetheless, bariatric surgery also encloses considerable risks, including surgical complications, nutritional deficits and even death (Maggard et al., 2005).

Overall, the NIH guidelines suggest that comprehensive weight loss therapies should use multiple strategies and may combine several interventions, such as dietary therapy, physical activity, behaviour therapy, pharmacotherapy, and bariatric surgery, as well as combinations of these strategies (NIH, 1998).

Although most weight loss interventions can produce significant weight losses in the short-term, half of the weight loss is regained in the first year following treatment (Butryn et al., 2011; Franz et al., 2007; NIH, 1998). Moreover, 80% the individuals will completely regain the weight lost within a five-year period or even surpass their initial weight (NIH, 1998; Wadden & Frey, 1997; Wadden & Butryn, 2003; Wadden, Webb, Mora, & Bailer, 2012). Even after bariatric surgery around 20 a 30% of patients regain their initial weight between the first 18 to 36 months post-surgery (e.g., Courcoulas et al., 2013; Herpertz, Kielmann, Wolf, Hebebrand, & Senf, 2004). In fact, weight maintenance is one of the most difficult challenges in obesity treatments. Especially given humans’ biologic predisposition to prefer high caloric and minimal energy expenditure and the current obesogenic environment, which makes difficult to make or maintain the recommended changes in dietary and physical activity prescriptions (e.g., Lowe, 2003; Forman, Butryn, Manasse, & Bradley, 2015). This daunting reality led the NIH guidelines to recommend that a weight maintenance phase, including diet, physical activity and behaviour therapy, should last indefinitely (NIH, 1998).

1.8. IMPROVING QUALITY-OF-LIFE OF PEOPLE WITH OVERWEIGHT AND OBESITY

As mentioned above, traditionally individuals with overweight and obesity seeking treatment are offered weight-focused health interventions, which pose weight loss as the main (and sometimes) only goal for determining success. However, a growing body of empirical evidence suggest that not only the diet-focused interventions may be ineffective and counterproductive, (given that weight loss is rarely maintained at long-term), but may also pose significant unwanted harmful effects (Berg, 2001; O'Hara & Gregg, 2006; Robinson, 2003; see Tylka et al., 2014 for a review). In fact, dieting is related to higher weight fluctuations which are a more serious risk factor for several health problems (including cardiovascular diseases, hypertension) and higher mortality than a steady heavier weight (Ernsberger & Koletsky, 1999; Field, Manson, Taylor, Willett, & Colditz, 2004; Rzehak et al., 2007). Furthermore, the number of failed diet attempts has been related to higher body weight and significant physical and emotional negative consequences (Ernsberger & Koletsky, 1995).

Diet-focused interventions have been found to have iatrogenic effects, namely: increased body dissatisfaction and unhealthy eating patterns such as chronic dieting, undereating, overeating binge eating and bulimic symptoms (Bacon et al., 2002; Bacon, Stern, Van Loan, & Keim, 2005; Polivy & Herman, 2002, Stice, 2002). Thus, instead of providing the development of a healthier and more positive relationship with food and one's body image, promoting an ongoing diet may lead to increased body shame and hatred and over preoccupation with food and weight, which are considered essential features of eating disorders (Berg, 2001; Robinson, Putnam, & McKibbin, 2007, Stice, 2002). In turn, this is associated with poorer results in weight maintenance and greater psychological impairments (Bacon et al., 2002, 2005; Robinson et al., 2007). These interventions may also unintentionally increase shame feelings and self-criticism by putting the responsibility of achieving a low and healthy weight on the individuals and assuming that low weight is synonymous with being healthy (Bacon, 2006, 2010; Puhl, Moss-Racusin, & Schwartz, 2007; Tylka et al., 2014; Wang et al., 2004). In fact, the relationship between BMI and health status seems to depend on several factors, including exercise levels, nutrition, insulin resistance and weight stigma (e.g., Berrington de Gonzalez et al., 2010; Schvey et al., 2011). Moreover, this weight-focused approach has also been related to increased weight stigma and discrimination, even from health care providers, and poorer treatment adherence (e.g., Latner et al., 2012; Puhl & Heuer, 2009; Schwartz et al., 2003).

Overall, diet-focused interventions have been found to pose a damaging impact on the health and well-being of the individuals and general community (Bacon et al., 2002; O'Hara & Gregg, 2006; Robinson et al., 2007; Tylka et al., 2014). There is also evidence that even weight loss may

not improve individual's psychological health or diminish weight-related stigma (e.g., Latner et al., 2012; Puhl & Heuer, 2009). Thus, it seems that focusing only on weight loss is not sufficient to promote health and well-being of those living with a chronic illness such as obesity, and may even contradict the medical ethical principle of doing no harm (O'Hara & Gregg, 2006; Tylka et al., 2014).

Given the detrimental effects of strictly focusing on weight loss, during the 1970's a different approach has emerged – focused on promoting physical and psychological health and increasing quality-of-life over weight loss – and has been gaining empirical support (Forhan & Salas, 2013; Hilbert et al., 2013; Puhl & Heuer, 2009; Tylka, et al., 2014). Interventions within the weight-inclusive approach aim at helping individuals to develop a healthier and more accepting relationship with their eating, weight and weight-related experiences (including weight stigma) in order to increase their health-related-quality-of-life (e.g., Blaine et al., 2007; Durso et al., 2012a; Hilbert, et al., 2013; Latner et al., 2014; Murakami & Latner, 2015; Puhl & Brownell, 2001; Puhl & Heuer, 2009; Tylka, et al., 2014) in an obesogenic society that makes it difficult to constantly adhere to food restriction and physical activity prescriptions.

One of these weight-inclusive approaches is the Healthy At Every Size (HAES) movement that emphasises the adoption of healthier and meaningful lifestyle over weight loss outcomes. HAES is a no-dieting approach focused on promoting self-acceptance, reasonable, sustainable and enjoyable physical exercise and healthy eating patterns for individuals of all shapes and sizes, to promote health and quality of life (Bacon, 2006, 2010; Robinson et al., 2007).

An increasing number of empirical research provides evidence for the effectiveness of these health-focused interventions (Bacon et al., 2002, 2005; Gagnon-Girouard et al., 2010). Results revealed that these interventions can promote healthy eating and physical activity patterns, improve quality-of-life (including the reduction of well-known risk factors such as elevated blood pressure, cholesterol and glucose levels) and psychological functioning, including the reduction of weight stigma and increasing acceptance, even without significant weight changes at both one and two years follow-up (Bacon et al., 2002, 2005; Provencher et al., 2009). A recent review of six randomised controlled trials concluded that HAES interventions increase adherence and have no adverse outcomes (Bacon & Aphramor, 2011).

In addition, a recent study by Murakami and Latner (2015) found that people who were able to accept their body size (even if obese) were less stigmatised and perceived as mentally healthier when compared to those experiencing body dissatisfaction. Given these results, the authors suggest weight acceptance as a public health recommendation. Taken together, these findings have led several researchers to propose a perspective shift in obesity treatments, calling for a more

compassionate approach to health and highlighting the need not to focus only on weight loss but mainly in improving individuals' health and quality-of-life, targeting the reduction of weight-related stigma (Forhan & Salas, 2013; Hilbert et al., 2013; Puhl & Bronwell, 2001; Puhl & Heuer, 2009; Robinson et al., 2007; Tylka, et al., 2014).

1.9. THE THIRD WAVE COGNITIVE-BEHAVIOURAL APPROACHES IN WEIGHT MANAGEMENT

The 'third wave' behavioural therapies emerged in earnest in the 1990's. They include a range of distinct therapies that share a common ground by fostering the development of acceptance and mindfulness skills and promote well-being (Hayes, Follette, & Linehan, 2004). These 'third wave' behavioural therapies include: Acceptance and Commitment Therapy (ACT; Hayes et al., 2012a), Dialectical Behaviour Therapy (DBT, Linehan, 1993), Mindfulness-Based Cognitive Therapy (MBCT; Segal, Williams, & Teasdale, 2002), Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1982), Compassion Focused Therapy (CFT; Gilbert, 2009), and Mindful Self-Compassion (Neff & Germer, 2013), just to mention a few. In 2004, Steven Hayes defined this third generation approaches as *“particularly sensitive to the context and functions of psychological phenomena, not just their form, and thus tends to emphasise contextual and experiential change strategies in addition to more direct and didactic ones. These treatments tend to seek the construction of broad, flexible and effective repertoires over an eliminative approach to narrowly defined problems, and to emphasise the relevance of the issues they examine for clinicians as well as clients”* (p. 658).

Although these approaches also considered language and cognition in the genesis and treatment of psychopathology, they bring a new and distinct emphasis. Rather than trying to change the form and content of internal experiences (e.g., thoughts, emotions, sensations), the contextual approaches focus on changing the function and context of those events and the way the individual relates to them, by promoting an open, accepting and non-judgmental attitude (Hayes, 2004; Herbert & Forman, 2012).

Given that providing a complete overview of all therapies included in the 'third wave' behavioural approaches goes beyond the aim of this thesis, next we will provide only an outline of the approaches that informed the studies conducted in this thesis. Thus, we will only focus on, mindfulness, ACT and compassion-based approaches. Within each approach we start by outlining general considerations and then address their use in the context of obesity and weight management.

1.9.1. MINDFULNESS-BASED INTERVENTIONS IN WEIGHT MANAGEMENT

General considerations

The term mindfulness was drawn from the Buddhist psychology and even earlier from the Hindu practices. Existent literature remains somehow inconsistent when it comes to the operationalization and definition of mindfulness, with distinct components, psychological processes involved and results being highlighted (Bishop et al., 2004; Hayes & Wilson, 2003). One of the most used definitions was provided by Kabat-Zinn (1994) that defined mindfulness as being aware of the present moment experiences with an open, accepting and non-judgmental attitude. Mindfulness is considered to be a recent evolutionary achievement and linked with activity in the middle prefrontal regions of the brain (Siegel, 2007). The term mindfulness may be used to refer to a multifaceted dispositional trait (Bishop et al., 2004), to a skill that can be developed through the practice of meditation (e.g., Shapiro, 2009) and to a psychological process (being mindful; Germer, 2005).

Several authors have been proposing distinct operationalized mindfulness conceptualizations. For instances, Germer (2005) stated that mindfulness involves awareness of present experience with acceptance. Baer, Smith, Hotpkins, Krietemeyer and Tonesy (2006) argued that mindfulness enclose five key facets, namely: *observing* both internal (e.g., thoughts, emotions, physical sensations, urges) and external experiences (e.g., what can be seen, touched, smelled); *describing* internal events; *acting with awareness* instead of acting in ‘automatic pilot’; *non-judging* and *non-reacting* to internal experiences, which involves the ability to not evaluate and simply allowing the experiences to occur without the need to react to them.

Mindfulness meditation enhances the development of metacognitive awareness, allowing for internal experiences to be seen as transient mental events instead of a representation of the reality (Bishop et al., 2004), which has also been named decentering (Shapiro, Carlson, Astin, & Freedman, 2006). Decentering abilities help individual to break free from the maladaptive cognitive processes, such as self-criticism and rumination and promotes adaptive behaviours (Hayes, Villate, Levin, & Hildebrandt, 2011; Ogden et al., 2006). In addition, mindfulness meditation involves learning to develop an acceptance and non-judgmental stance towards all internal experiences as they arise, without judging them as good or bad, comfortable or uncomfortable (e.g., Baer, 2003). When one is able to bring an acceptance stance towards all internal events, even in the presence of challenging emotional states or disturbing thoughts, an automatic reaction is not required (e.g., Baer, 2003; Ogden et al., 2006). Mindfulness gives the opportunity to experience all internal events in a more open and a less biased manner (Segal, Teasdale, Williams, & Gemar, 2002; Teasdale, Segal, & Williams, 2003), changing the

individual's relationship with their mental processes (Neff & Dahm, 2015; Siegel, 2007), leading to enhanced self-regulation and more cognitive and behavioural flexibility (e.g., Carmody, Baer, Lykins, & Olendzki, 2009).

Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1982) was one of the first formal mindfulness programs to be developed. Recently several meta-analyses (e.g., Gotink, Meijboom, Vernooij, Smits, & Hunink, 2016; Gu, Strauss, Bond, & Cavanagh, 2015; Khoury, Sharma, Rush, & Fournier, 2015) concluded that MBSR is effective in diminishing depressive and anxiety symptoms in clinical and non-clinical populations and produces significant changes in the brain. Mindfulness-based cognitive therapy (MBCT; Segal et al., 2002), was later developed and integrated elements of cognitive-behavioural therapy to prevent relapse in individuals with three or more depressive episodes (e.g., Williams & Kuyken, 2012). Literature highlights that mindfulness-based interventions can be beneficial for people with a broad range of medical and mental health issues (for a meta-analysis see Gotink et al., 2015), including (among others): chronic pain (Kabat-Zinn, 1982), depression and relapse prevention (Kingston, Dooley, Bates, Lawlor, & Malone, 2007; Segal et al., 2002), anxiety (Evans et al., 2008) and psychosis (Bach & Hayes, 2002; Gaudiano & Herbert, 2006). Mindfulness-based interventions are also able to improve psychological functioning, decrease negative affect and promote well-being in non-clinical populations (Baer, 2003; Chambers, Lo, & Allen, 2008; Davidson et al., 2003; Shapiro, Schwartz, & Bonner, 1998).

Hofmann, Sawyer, Witt and Oh (2010) in a systematic review comprising 1140 participants with different medical and psychological conditions from thirty-nine studies found that mindfulness-based interventions are effective in reducing anxiety, depression and stress. In a systematic review including twenty-three studies, Chiesa, Calati, & Serretti (2011) concluded that mindfulness training enhances attentional and cognitive memory capacity, executive functions and stimulated the prefrontal cortex. Additionally, mindfulness meditation was found to generate observable neural activation patterns and linked to improvements in the immune system (Davidson et al., 2003). Other studies suggest (see Chambers, Gullone, & Allen, 2009 for a review) that changes in several neurocognitive functions may occur even with little amounts of meditation practice, although the magnitude of these changes is enhanced with the amount of practice.

Overall, research demonstrates that changes in mindfulness mediate the relationship between meditation practice and well-being, increased quality-of-life, decreased psychopathological symptoms and rumination (e.g., Baer et al., 2008; Bränström, Kvillemo, Brandberg, & Moskowitz, 2010; Carmody & Baer, 2008; Gu et al., 2015). Another study (Keng, Smoski,

Robins, Ekblad, & Brantley, 2012), revealed that mindfulness had a unique mediator effect of MBSR on emotional regulation difficulties, even when controlling the effect of self-compassion. The effect of mindfulness is likely to occur through the development of awareness of internal experience, decreased stress reactivity, smashed conditioned patterns, and enhanced acceptance and sense of control (Bishop et al. 2004; Lynch, Chapman, Rosenthal, Kuo, & Linehan, 2006; Teasdale, Segal, & Williams, 1995)

Mindfulness in the context of weight management

Increasing evidence suggest that mindfulness-based interventions may be relevant to reduce unhealthy eating patterns, as mindfulness enhances awareness and clarity of emotional states and sensory physiological signs (e.g. hunger and satiety) that are frequently overridden in individuals with eating disorders and obesity (Capaldi, 1996; Kristeller & Wolever, 2011). Additionally, eating is a daily automatic behaviour, which has been linked to overeating and poses difficulties in healthy food choices in the current environment (Blair, Lewis, & Booth, 1990; Cohen & Farley, 2008).

Training mindfulness skills may be essential to target the physiologic, affective, cognitive and behavioural dysregulation involved in binge eating and obesity (Fairburn, Wilson, & Schleimer, 1993; Kristeller, Baer, & Quillian-Wolever, 2006; Kristeller & Wolever, 2011). By helping individual's to develop a more open and accepting stance towards internal (including those related to food, eating and body-image) and external experiences (seeing and smelling food) without the need to avoid or suppress them, mindfulness enhances individual's abilities to take healthier decisions regarding what to eat, how to eat and when to stop eating (Kristeller & Wolever, 2011; O'Reilly, Cook, Spruijt-Metz, & Black, 2014). It seems especially relevant to decrease overeating, as it promotes greater awareness and equanimity towards all internal experiences (Sojcher, Gould Fogerite, & Perlman, 2012). Furthermore, as mindfulness fosters a non-reactivity posture, it may also be helpful to decrease external eating tendencies, by creating the ability to notice and distance oneself from eating cravings and impulses without necessarily acting upon them (Alberts, Thewissen, & Raes, 2012; O'Reilly et al., 2014).

Particularly, one intervention – Mindfulness-based eating awareness training (MB-EAT; Kristeller et al., 2006) – was developed for targeting binge eating disorder. MB-EAT includes traditional mindfulness meditation exercises and specific meditations to target eating self-regulatory processes. It aims to increase awareness of physiological, emotional and external triggers to eating in order to stop the binge eating and self-recrimination cycles and promote

healthier food choices (Kristeller & Wolever, 2011). Results from the RCT (Kristeller, Wolever, & Sheets, 2014) with 150 patients with overweight and obesity that compared MB-EAT with psychoeducational/cognitive-behavioural intervention and a wait list, revealed that MB-EAT decreased binge eating episodes and depressive symptoms, increased self-regulation skills and even produced weight loss, with results depending on the amount of mindfulness practice. A literature review (O'Reilly et al., 2014) comprising twenty-one studies revealed that MBIs are effective to decrease unhealthy eating patterns (e.g., binge eating, emotional and external eating) associated with overweight and obesity and offer promising results for weight management. Moreover, a recent meta-analysis (Rogers, Ferrari, Mosely, Lang, & Brennan, 2016) specifically analysed the effects of MBIs on psychological and physical health outcome of people with overweight and obesity. Overall, 560 individuals involved in fifteen studies were included in the meta-analysis. Results highlight that MBIs can have beneficial improvements in psychological and physical health outcomes up to six months. Still, the authors' stress that more research is needed to better understand the mechanisms that underlie these interventions (Rogers et al., 2016).

Together, the authors concluded that mindfulness training might be an important in preventing and treating obesity, since it helps individuals to improve their responses to emotional distress, change their eating behaviours and develop a more aware, accepting and positive relationship with food and eating, which in turn may lead to weight changes (O'Reilly et al., 2014; Rogers et al., 2016).

1.9.2. ACCEPTANCE AND COMMITMENT THERAPY (ACT) IN WEIGHT MANAGEMENT

General considerations

Acceptance and Commitment Therapy was developed by Steven Hayes in 1986 and is one of the 'third wave' therapies that has received most empirical support (Graham, Gouick, Krahé, & Gillanders, 2016; Herbert & Forman, 2012; Ruiz, 2010). ACT is rooted in a philosophical functional contextualism (e.g., Biglan & Hayes, 1996), a basic model of language and cognition (Relational Frame Theory (RFT); Hayes, Barnes-Holmes, & Roche, 2001), and an applied theory of psychopathology and psychological change. From an ACT/ RFT perspective, language and cognition are main sources for psychopathology, and psychological suffering is seen as a natural consequence of the human condition. The use of language carries enormous advantages, as it allows humans to derive relations, anticipate and solve problems. Unfortunately, what is a key skill to relate to the external world, can have, at the same time, harmful and counterproductive effects, particularly when it inhibits the ability to maintain or change behaviours that serve ones' life values (e.g., Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Thus, ACT sees suffering as

inherent to the human condition and as caused by the intrusion of language where it is not functional (Hayes et al., 2012a).

The ACT psychological flexibility model, also known as the hexaflex, intends to promote psychological flexibility through six core overlapping and interrelated processes, namely: experiential acceptance, cognitive defusion, contact with the present moment, self-as-context, values and committed action (e.g., Hayes et al., 2012a). Using a transdiagnostic approach, ACT processes may be applied to a broad range of medical, clinical and non-clinical problems in living (Hayes, Levin, Plumb-Villardaga, Villatte, & Pistorello, 2013; Luoma, Hayes, & Walser, 2007). Recently, Hayes and collaborators (2011) argued that psychological flexibility could be further chunked into three “dyadic” processes: 1) “*openness to experience and detachment from literalness*” (involving acceptance and defusion); 2) “*self-awareness and perspective-taking*” (including present moment awareness and self as context); 3) “*motivation and activation*” (involving values and committed action).

Psychological flexibility refers to the ability to be in contact with present moment experiences while sticking to behaviours that are in line with one’s core values (Hayes et al., 2004, 2006, 2012a). ACT’s main goal is for people to live a more vital and meaningful life, where behaviours are based on one’s values rather than guided by experiential avoidance patterns (Hayes et al., 2012a).

All processes promoted in ACT are not ends in themselves, but rather aim to clear the path for a more vital, values consistent life. The development of the willingness and acceptance of unwanted internal events is taught as an alternative to experiential avoidance and control patterns. Experiential avoidance is considered a maladaptive emotional regulation strategy that involves attempts to modify, suppress or avoid unwanted internal experiences when is not contextually appropriate and restricts one’s behavioural responses (e.g., Wilson & Murrell, 2004). However, these attempts usually backfire, enhancing the frequency and intensity of those internal events and it has been consistently related to poorer outcomes, diminished quality-of-life and higher levels of psychopathology in several medical and psychological conditions (see Hayes et al., 2006 for a meta-analysis; Ruiz, 2010 for a review). Contrarily, the ability to be aware and have an open and accepting stance towards all internal events is linked to decreased psychopathology, increased well-being and quality-of-life (see Hayes et al., 2013, for an overview).

ACT interventions directly promote cognitive defusion, which refers to the ability to see thoughts as transitory products of the mind, without trying to change their frequency or intensity, and not misperceive them with the reality or the truth. In a state of cognitive defusion individuals’ can create a new and more detached relationship with their uncomfortable internal experiences, which increases their behavioural repertoire. Intrinsically linked to acceptance and cognitive

defusion is self as context. Self as context refers to the transcendent sense of being, where one can observe all internal experiences without being attached to any specific content. It allows differentiating the content of consciousness and the self as a perspective-taking context for that content.

Mindfulness awareness is an overarching key meta-skill involved in several ACT processes. It relates to the ability to be in contact with present moment experiences with a non-judgmental attitude, allowing one to experience the world as it is and not through the lens of ones' mind. From an ACT perspective, the development of acceptance, defusion and being present skills are needed so that uncomfortable internal experiences do not block the path towards a vital and meaningful life. Thus, a critical component of ACT interventions is to help individuals clarify what they value in life in several important domains (e.g. family, career, work, health). The above-mentioned ACT processes aim to facilitate patterns of behavioural change that involve setting goals and commit to actions that move people towards their valued directions, even if those actions involve being in contact with difficult internal experiences. Together, all these processes foster psychological flexibility.

Research on ACT interventions has grown exponentially and consistently shows promising results in several chronic medical conditions (Graham et al., 2016 for a systematic review), including: chronic pain (Trompetter, Bohlmeijer, Veehof, & Schreurs, 2015; see Veehof, Oskam, Schreurs, & Bohlmeijer, 2011 for a meta-analytic review), diabetes (Gregg, Callaghan, Hayes, & Glenn-Lawson, 2007), obesity (e.g., Forman et al., 2016; Lillis et al., 2009), epilepsy (Lundgren, Dahl, & Hayes, 2008) and cancer (Hawkes et al., 2013, Hawkes, Pakenham, Chambers, Patrao, & Courneya, 2014), mental health problems (A-Tjak et al., 2015; see Davis, Morina, Powers, Smits, & Emmelkamp, 2014 for recent meta-analysis), smoking cessation (e.g., Gifford et al., 2004) reducing stigma in mental health problems (e.g., Masuda et al., 2007) and substance abuse (e.g., George, 2015; Thekiso et al., 2015) and increases in physical exercise (Ivanova, Jensen, Cassoff, Gu, & Knäuper, 2015; Moffitt & Mohr, 2015). Overall, results highlight that ACT interventions are able to promote adaptive behaviours, improve disease self-management, quality-of-life, and symptom control and reduce distress and stigma (see Graham et al., 2016 for a systematic review).

Finally, there is empirical evidence that ACT interventions decrease experiential avoidance, cognitive fusion and increase psychological flexibility (Hayes et al. 2006) and that improvements in outcomes occur through the development of these ACT core processes (Hayes et al., 2011; Hayes, Levin, Yadaoia, & Vilaradaga, 2012b). For instances, increases in psychological flexibility after an ACT intervention for chronic pain have been found to mediate changes in outcomes (McCracken & Gutiérrez-Martínez, 2011; Wiscksell et al., 2013). Another study by

Zettle, Rains and Hayes (2011) revealed that the degree in which individuals believed in their depressogenic thoughts (and not the frequency of those thoughts) mediated changes in depression at follow-up.

ACT in the context of weight management

Although existent standard behavioural weight loss intervention strategies (e.g., self-monitoring, goal setting, stimulus control) are important to increase adherence to dietary and physical exercise prescriptions, evidence suggest that they are insufficient to maintain those behaviours in long-term resulting in poorer weight loss or weight maintenance outcomes (Forman & Butryn, 2015; Wadden et al., 2012). In part, this may rely on the fact that these interventions do not cultivate the psychological skills that are considered key to maintaining healthy behaviours in the current obesogenic environment (Forman et al., 2013a; Lillis & Kendra, 2014).

Standard behaviours interventions also include sessions where participants are trained to control or change their unwanted and dysfunctional thoughts and emotions, using distraction and cognitive restructuring (Brownell, 2000). However, two studies (Forman et al., 2007; Forman, Hoffman, Juarascio, Butryn, & Herbert, 2013b) comparing acceptance and control-based strategies for coping with food cravings found that for people with high susceptibility to food, the acceptance-based strategies seem to offer better results. Contrarily, control-based strategies may unintentionally enhance one's food cravings and may even lead to greater food consumption (Forman et al., 2007, 2013b).

Our biological predisposition to eat when food is available and maximize energy conservation paired with the current environment, where food is easily accessible and there is little need to consume energy, makes overeating and being sedentary the human default position and contribute to weight gain (Finlayson, King, & Blundell, 2008; Forman et al., 2013a; 2015). In addition, human minds are programmed to seek hedonic states and avoid discomfort and suffering, which may be potentially problematic to healthy behaviours where distress tolerance skills seem crucial. This means that one needs to deliberately develop certain psychological mechanisms to override this countervailing forces (Chandon & Wansink, 2011; Forman et al., 2013a; 2015) to maintain a healthy weight.

Research has highlighted several crucial psychological factors related to difficulties in maintaining weight loss such as: emotional and disinhibit eating patterns, rigid control over eating, avoidance-based motivations and high impulsivity (Avenell et al., 2004; Byrne et al., 2003; Fassino et al., 2002). It has been proposed that these characteristics may reflect a pattern of

experiential avoidance towards one's weight and eating-related internal experiences (thoughts, emotions, memories and urges; Lillis et al., 2009). In fact, eating in response to internal (e.g., emotional states, such as sadness, hopelessness, anxiety, anger or boredom) and environmental signals (presence of palatable high-calorie food) can be, in part, conceptualized as ineffective attempts to regulate internal experiences perceived as negative or unwanted (Baer, Fischer, & Huss, 2005; Byrne et al., 2003; Fassino et al., 2002; Ogden, 2000). The existent research consistently associates weight-related experiential avoidance patterns with body dissatisfaction, both general and eating psychopathology, binge eating symptoms and diminished quality of life (Lillis & Hayes, 2008; Lillis et al., 2009, 2011; Weineland, Lillis, & Dahl, 2012).

ACT may be particularly relevant in weight management and obesity, as it aims to increase willingness and acceptance of unpleasant internal experiences (particularly needed to comply with dietary and physical activity prescriptions), while at the same time, promoting the engagement in valued-based behaviours (Forman et al., 2015; Forman & Butryn, 2015; Hayes et al., 2012a). This approach relies on the assumption that humans have limited capabilities to control, suppress or modify unwanted internal experiences (such as food cravings, hunger, fatigue, discomfort) and that avoiding all eating stimuli is inescapable in our current context. Thus, to sustain adaptive and healthy behaviours in the modern context, one needs to develop distress tolerance abilities (Forman & Butryn, 2015; Forman et al., 2015; Lillis & Kendra, 2014).

Additionally, ACT promotes intrinsic motivation, which has been associated with weight maintenance, through values clarification. From an ACT perspective, people need to be in contact with their valued directions in order to sustain committed actions (e.g., following ones' dietary plans and exercising regularly), especially when those actions involve facing difficult internal experiences (Forman & Butryn, 2015; Forman et al., 2015; Lillis & Kendra, 2014). Finally, another key component of ACT interventions to assist weight loss and weight maintenance is metacognitive awareness (Forman & Butryn, 2015; Forman et al., 2015). Enhancing mindfulness skills is crucial as it promotes awareness of one's eating triggers, hunger and satiety cues, eating patterns and decision-making processes, which is likely to lead to healthier choices (Forman & Butryn, 2015; Forman et al. 2015; Lillis & Kendra, 2014).

Acceptance-based approaches have been receiving empirical support for eating and weight issues namely: decreasing disordered eating attitudes and behaviours, body dissatisfaction (Pearson, Follette, & Hayes, 2012), and food cravings (Forman et al., 2007), increasing physical activity (Butryn, Forman, Hoffman, Shaw, & Juarascio, 2011) and prevent weight gain (Katterman, Goldstein, Butryn, Forman, & Lowe, 2014) in community and student samples. Furthermore, two RCT comparing brief ACT-interventions to control groups showed promising

results in reducing weight self-stigma, psychological distress, increasing physical activity and health-related-quality-of-life and promoting weight loss (Lillis et al., 2009, Tapper et al., 2009) in individuals with overweight and obesity. A recent pilot study (Bradley et al., 2016) also found preliminary support for acceptance-based interventions to tackle weight regain after bariatric surgery.

Evidence for the efficacy of combining acceptance-based interventions with standard behavioural strategies to assist weight loss has also been found in two uncontrolled trials (Forman, Butryn, Hoffman, & Herbert, 2009; Niemeier, Leahy, Reed, Brown, & Wing, 2012) and one randomized controlled trial (Forman et al., 2013a). Results from these studies suggest that these interventions are useful to promote weight loss and weight maintenance, particularly for those individuals that present higher susceptibility to eating cues (emotional and external eating and food craving) and more depressive symptoms (Forman et al., 2009, 2013a; Niemeier et al., 2012).

Furthermore, several trials using ACT have found that reductions in experiential avoidance represent a key mediator of changes in binge eating and weight loss (Lillis et al., 2011; Niemeier et al., 2012). Also, increasing interest exists in assessing and integrating compassion into ACT interventions. Particularly, given the evidence suggesting that mindfulness and self-compassion seem to have specific and independent contributions as mediators of changes in ACT interventions (e.g., Forman et al., 2009).

1.9.3. COMPASSION-BASED INTERVENTIONS IN WEIGHT MANAGEMENT

General considerations

Interest in compassion has been growing exponentially, particularly within the third-wave cognitive behavioural therapies that focus on developing a more open and acceptance stance towards one's experiences and promoting well-being and mental health. This involves the development of a non-judgmental and compassionate relationship with oneself and one's difficulties (MacBeth & Gumley, 2012).

Depending on the theoretical model, different definitions for compassion have been proposed. The Buddhist tradition considers intentionality and motivation as the key aspects of compassion (The Dalai Lama, 2001). Dalai Lama (1995) defined compassion as being sensitive to the suffering of self and others, with a deep commitment to try to alleviate it. From the Buddhist point of view, compassion belongs in a system of motivational constructs that also include loving-kindness and equanimity (Hofmann, Grossman, & Hinton, 2011) which are thought to be central

to enlightenment. On the other hand, Goetz, Keltner and Simon-Thomas (2010) view on compassion focuses on the affective state involved in compassion. Compassion is defined as “*a distinct affective experience whose primary function is to facilitate cooperation and protection of the weak and those who suffer*” (Goetz et al., 2010, p.351). According to these authors, compassion evolved from the caregiving response and is considered an advantageous evolutionary trait.

Compassion Focused Therapy (CFT) approaches compassion from an evolutionary, neuroscience and social psychology perspective of caring (Gilbert, 2005, 2010, 2014). CFT arises from the clinical observation that patients with higher shame and self-criticism tendencies struggle to be warm and compassionate towards themselves (Gilbert, 2005). Compassion is conceptualised as an evolved motivational system design to regulate negative affect, rooted in the mammal’s ability to cooperate and care for others of their kin and from the attachment systems of caring (Bowlby, 1973; Gilbert, 1989, 2005). This caregiving system has evolved to nurture and protect the young and is particularly important in humans (e.g., Gilbert, 2005). The ability to be compassionate and self-compassionate is closely linked to early childhood experiences (Gilbert & Procter, 2006; Neff & MacGeehee, 2010). Thus, having a childhood characterised by neglect, violence, competitiveness and few warm and safeness hinders the development of the ability to be self-reassuring and self-compassionate (Gilbert, McEwan, Matos, & Ravis, 2011). Furthermore, Gilbert (2000, 2005) also point out that humans have the ability to relate to themselves just as others may relate to them, which may produce identical neurophysiological effects.

According to Gilbert (2010), humans have three basic interactive affect-regulation systems: the threat-protection system (focused on detecting and avoiding threats), the drive system (focused on achieving and resource seeking) and the soothing system (related to feelings of contentment and safeness). Ideally, these three systems would be balanced, given that each system has a different function, recruits distinct emotions that allow seeking resources and avoiding hazards (Gilbert, 2010). The development of self-compassion is key since it enables the deactivation of the threat/ protection system and promotes the activation of the soothing system (Gilbert, 2009; Gilbert & Irons, 2005). Thus, CFT focuses on helping individuals to access the soothing system to regulate the threat-processing system.

Gilbert (1989) suggests that compassion involves thoughts, feelings and behaviours that aim to nurture, protect, look after, guide, soothe and provides acceptance and a sense of belonging. Compassion is seen as an adaptive emotional regulation strategy, especially important to deal with negative affect, which involves being attuned with our own and others suffering and the

ability to express warmth and safety (Gilbert, 2010). CFT perceives compassion as a flow in three directions: compassion for others, compassion from others and compassion directed towards the self (e.g., Gilbert, 2014). According to the CFT model, self-compassion can be seen as an antidote to shame feelings and self-criticism, particularly when one is facing errors and failures (Gilbert, 2010). Shame and fear-based self-criticism are linked to powerful negative emotions (e.g., anger, contempt, frustration), focus on flaws and fear of failure, involves a desire to punish and condemn, increases avoidance and withdrawal and has been consistently related to psychopathology (Castilho, Pinto-Gouveia & Duarte, 2015; Dunkley & Grilo, 2007; Gilbert et al., 2004). Gilbert and collaborators (2004) distinguish between two phenomenologically distinct forms of this critical self-to-self relating, namely: inadequate-self and hated-self. Inadequate-self involves the desire for self-improvement and self-correction, by focusing on one's flaws and feelings of inferiority. Although inadequate-self focuses on self-improving, it usually backfires leading to greater negative affect. In contrast, hate-self constitutes a more toxic form of self-criticism, aimed at condemning, attacking and persecuting the self, fuelled by feelings of anger, disgust and aversion (Gilbert et al., 2004) and has been consistently linked to psychopathology (e.g., Castilho et al., 2015; Duarte, Pinto-Gouveia, & Ferreira, 2014). Contrarily, self-compassion focuses on wellbeing and involves encouragement, support, kindness and a desire to improve, increasing the chances of engaging (Gilbert, 2010).

Neff (2003a, b) proposed that being compassionate towards the self is particularly relevant when one faces setbacks, errors, failures or experiences suffering in life and allows a new perspective on ourselves and our lives. The author argued that a self-compassionate frame of mind arises from three main overlapping but distinct components: mindfulness *vs.* over-identification, common humanity *vs.* isolation and self-kindness *vs.* self-judgment. Mindfulness is an essential first step for self-compassion, as one needs to be aware of one's internal difficult experiences to offer compassion. Frequently individuals may not acknowledge the pain they are experiencing, especially the one that arises from their inner critic. Thus, mindfulness enhances awareness of difficult thoughts and emotions, without becoming overidentified with them (Neff, 2003b) and helps to approach them with equanimity (Bishop et al., 2004).

Common humanity involves recognising errors, difficulties, failures and struggles as part of the human experience (Neff & Dahm, 2015; Neff & Tirsch, 2013). This is important because when experiencing failures or difficult times, people often feel isolated and different from others, which often increases suffering (Neff, 2011; Neff & Tirsch, 2013). By recognising that life involves suffering and experiencing difficulties, one can take a broader perspective on the self and life (Neff & Dahm, 2015). Lastly, self-kindness refers to being able to give ourselves support, acceptance,

courage and warmth, rather than being critical, harsh and judgmental when things go wrong (e.g., Neff & Dahm, 2015). In fact, it is frequent for people to be able to treat others with kindness and support when they face difficult times. Nonetheless, when facing similar experiences, most people become highly self-critical, beating themselves up for not being good enough or not achieving their expectations (Neff, 2003a). Self-kindness involves acknowledging that we do the best we can, that perfection is unattainable and that life is difficult. It includes the ability to soothe and nurture ourselves, particularly in the face of countervailing forces (e.g., Neff & Dahm, 2015).

Recently a comprehensive definition of compassion has been proposed (Strauss et al., 2016) drawn upon the common elements of the definitions mentioned above. The authors defined compassion as including the ability to recognise suffering, understanding that suffering is a common human experience, to feel empathy for the one that is suffering and connected with the distress, being able to tolerate that suffering and the motivation to act to alleviate that suffering (Strauss et al., 2016).

Self-compassion has been considered key in reducing negative affect and emotional distress and increasing well-being, positive affect and life satisfaction (e.g., Gilbert, 2010; Hofmann et al., 2011; Neff, 2003a; Öst, 2008). A recent meta-analysis (MacBeth & Gumley, 2012) including twenty studies, found that self-compassion was related to lower levels of psychopathology (namely: anxiety, depression and stress symptoms) and increased well-being and mental health, with results expressing large effect sizes. It has also been associated with lower rumination and emotional suppression tendencies (Neff, 2003a; Neff, Rude, & Kirkpatrick, 2007) and a more open and tolerant attitude towards one's emotional states (Leary, Tate, Adams, Batts Allen, & Hancock, 2007).

Self-compassion has also been linked to greater cognitive flexibility, intrinsic motivation and perceived self-efficacy (Martin, Staggars & Anderson, 2011; Neff, Hsieh, & Dejitterat, 2005; Neff et al., 2007). In an experimental study, self-compassion was linked to enhanced motivation to change, to try harder to learn and to avoid repeating the same mistakes (Breines & Chen, 2012). In fact, other study showed that people that are self-compassionate are more likely to try again after a failure and present less fear of failure (Neely, Schallert, Mohammed, Roberts, & Chen, 2009). Another meta-analysis focused on exploring gender differences found that women are less compassionate towards themselves and more self-critical than men, which may enhance their vulnerability to psychopathology (Yarnell et al., 2015). Additionally, self-compassion has been found to mediate the relationship between attachment and mental health (Raque-Bogdan, Ericson, Jackson, Martin, & Bryan, 2011) and to act as a protection mechanism on the impact of negative life events and emotional functioning (e.g., Leary et al., 2007).

Given the evidence suggesting the link between self-compassion and well-being and mental health, interventions focused on increasing self-compassion have been developed, such as Compassion Focused Therapy (CFT; Gilbert, 2009), Compassion Cultivation Training (e.g., Jazaieri et al., 2013) and Mindful Self-compassion (MSC; Neff & Germer, 2013). CFT focuses on developing self-compassion through the compassion mind training, which involves building a set of skills, namely: sensitivity to distress, sympathy, desire to care for others, distress tolerance, empathy, nonjudgment and an emotional tone of warmth. Thus, self-compassion involves the ability to direct those skills inwards (Gilbert, 2010). CFT interventions have been applied to several clinical and non-clinical populations. Overall, results from those studies consistently found that developing a compassionate frame of mind helps to reduce shame feeling and self-criticism and to promote positive affect (see Leaviss & Uttley, 2015 for an early systematic review). Moreover, in a recent randomised controlled trial (Neff & Germer, 2013) the MSC program was found to significantly decrease depression, anxiety and stress symptoms and increase self-compassion and life satisfaction over one year. Moreover, increases in self-compassion were linked to the amount of practice (Neff & Germer, 2013).

Both in the Buddhist tradition and most psychological studies, compassion-based meditation is frequently associated with loving-kindness meditation practices (e.g., Kabat-Zinn, 1990). Loving-kindness meditation intends to cultivate unconditional love, benevolence and kindness to all living beings, including oneself (Chödrön, 1996; Hofmann et al., 2011; Salzberg, 1995), rather than compassion for personal experiences of suffering. From the Buddhist tradition, loving-kindness (*metta*), together with compassion (*karuna*), sympathetic joy (*mutida*) and equanimity (*upekkha*) constitute the four sublime states that can be cultivated (*brahma viharas*). Together, compassion-based meditation and loving-kindness have been related to stress reduction (Lutz, Brefczynski-Lewis, Johnstone, & Davidson, 2008), decreased illness symptoms and increased positive affect, mindfulness and social support (Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008; Hofmann et al., 2011).

Alongside with mindfulness, self-compassion was also found to be a key mediator in changes after mindfulness-based interventions (Birnie, Speca, & Carlson, 2010; Hollis-Walker & Colosimo, 2011; Kuyken et al., 2010). Furthermore, there is some evidence suggesting that self-compassion may be a stronger predictor of happiness, psychological well-being and reduced depression than mindfulness alone (Neff & Dahm, 2015).

(Self)Compassion in the context of weight management

The importance of developing of self-compassion among those who struggle with eating, body image and weight-related issues has been highlighted. Evidence points to the existence of high levels of shame and self-criticism among individuals with eating disorders (Duarte, Pinto-Gouveia, Ferreira, & Batista, 2015; Ferreira, Pinto-Gouveia, & Duarte, 2013; Goss & Gilbert, 2002; Goss & Allan, 2009; Kelly & Carter, 2013; Troop, Allan, Serpell, & Treasure, 2008). Empirical studies suggest that patients with eating disorders tend to present higher levels of shame even when compared to other clinical groups and that those shame feelings focus largely on body and eating issues (Masheb, Grilo, & Brondolo, 1999; Frank, 1991). In the same line, self-criticism tendencies have been found to predict eating disorders symptomatology (Ferreira, Pinto-Gouveia, & Duarte, 2013; Fenning et al., 2008; Pinto-Gouveia, Ferreira, & Duarte, 2014) and interfere with treatment outcome (Bulmash, Harkness, Stewart, & Bagby, 2009).

Goss and Gilbert (2002) have proposed that eating disorder behaviours may arise as maladaptive strategies used to decrease feelings of inadequacy and inferiority and avoid being criticised and rejected by others due to one's physical appearance or weight. This seems particularly pertinent to women, given that in Western societies presenting a socially valued physical appearance (e.g., being thin) is associated with several social advantages and enhances one's social status within the group (Gilbert & Miles, 2002; Pinto-Gouveia, Ferreira, & Duarte, 2014; Troop, Allan, Treasure, & Katzman, 2003). On the contrary, having a body image or weight that is the opposite of what is socially valued (e.g., being overweight or obese) may put someone at risk of being judged as inferior, defective, flawed, which in turn may lead to criticism and rejection. Thus, unhealthy eating behaviours may function as a way to avoid feeling shame, to improve one's social rank and strive for others acceptance and approval (Gilbert & Miles, 2002; Goss & Allan, 2009; Goss & Gilbert, 2002). Additionally, there is evidence that shame and self-criticism may increase the tendency to overeat and use food to regulate negative affect (e.g., Gilbert & Miles, 2002). Shame and self-criticism may be particularly problematic for those with binge eating disorder (Duarte et al., 2014; Dunkley & Grilo, 2007) and obesity (Frank, 2011; Stotland & Larocque, 2004). A recent large study comprising 2236 women with overweight and obesity enrolled in Slimming World highlighted the damaging role of shame, self-criticism and unfavourable social comparisons in the regulation of eating behaviours (Duarte et al., 2017). Results suggest that those negative self-evaluations may elicit negative affect related to one's body weight that in turn is linked to higher disinhibit eating and susceptibility to hunger.

On the other hand, the evidence is huddling on the importance of developing self-compassion to tackle body image dissatisfaction and unhealthy eating behaviours (see Braun, Park, & Gorin,

2016 for a literature review). Research has been consistently associating self-compassion with positive body image characteristics (Ferreira, Pinto-Gouveia, & Duarte., 2011; Wasylikiw, MacKinnon, & MacLellan, 2012), mindful eating (Taylor, Daiss, & Krietsch, 2015), increased quality-of-life (Duarte, Ferreira, Trindade, & Pinto-Gouveia, 2015), decreased shame and body-image dissatisfaction (Albertson, Neff, & Dill-Shackleford, 2015; Ferreira et al., 2013), lower drive for thinness, BMI, eating psychopathology and binge eating symptoms (Pinto-Gouveia et al., 2014; Taylor et al., 2015; Webb & Forman, 2013) in clinical samples and nonclinical student and community samples. Being self-compassionate has also been related to enhanced abilities to stick to one's diet (Adams & Leary, 2007) and maintain physical exercise (Magnus, Kowalski, McHugh, 2010).

More recently, low levels of self-compassion have been found to mediate the impact of two well-known risk factors (e.g., body image dissatisfaction and negative social comparisons) for eating disorders and quality of life in normal weight and overweight samples (Ferreira, Fortunato, Marta-Simões, & Trindade, 2016).

Overall, studies highlight that self-compassion may act at different levels and be linked to eating pathology in multiple ways. For instances, self-compassion may act as a protective factor against eating psychopathology and also as a mediator of the relationship between risk factors and eating psychopathological symptoms (Braun et al., 2016; Tylka & Kroon Van Diest, 2015).

Given this evidence, some compassion-based interventions have been adapted for people with eating disorders. Compassion Focused Therapy for Eating Disorders (CFT-E; see Goss & Allan, 2010 for an overview of the intervention) is one of those interventions that aims specifically to target affect dysregulation, shame and self-direct hostility. Overall, CFT-E showed promising benefits for the treatment of patients with eating disorders, particularly for those with Bulimia Nervosa (Gale, Gilbert, Read, & Goss, 2012). CFT-E is being modified and adapted for those with obesity and extremely low weight (Goss & Allan, 2014).

In a pilot randomised controlled trial study, Kelly & Carter (2015) compared a CFT-based self-help intervention with a behavioural-based self-help intervention to forty-one adults, mostly women, with binge eating disorder. The authors found preliminary evidence for the importance of developing self-compassion and addressing the fear of self-compassion in people with BED (Kelly & Carter, 2015).

Nevertheless, the role of self-compassion in obesity is still relatively unexplored. Recently, a qualitative study (Gilbert, Stubbs, Gale, Gilbert, Dunk, & Thomson, 2014) revealed that although people with obesity recognise the usefulness of being compassionate when dealing with relapses,

they seem to be unable to put it in practice. Instead, individuals struggling with their weight find it hard (if not impossible) to be self-compassionate when facing errors or failures. When setbacks occur, these individuals report seeing themselves as failures, becoming highly shameful and self-critical, rather than being reassuring and supportive towards themselves. In turn, this tendency to criticise the self has been related to unhealthy eating patterns (Adams & Leary, 2007; Gilbert et al., 2014). Another study, using a large sample of individuals with overweight and obesity found that self-compassion mediated the relationship between weight self-stigma and health outcomes (Hilbert et al., 2015).

Altogether, there is evidence pointing to the importance of directly developing self-compassion skills with people struggling with weight and eating issues.

1.9.4. COMMON GROUND AND OPPORTUNITIES FOR INTEGRATION

As mentioned above, the ‘third wave’ cognitive-behavioural interventions are built on shared common features, aiming at changing the way people relate to themselves and their internal experiences, promoting awareness, acceptance and a non-judgmental attitude (Neff & Dahm, 2015; Neff & Tirsch, 2013). Most mindfulness and acceptance-based interventions present overlapping treatment techniques, such as awareness and acceptance strategies, cognitive distancing and values clarity promotion to foster motivation for behavioural change (Herbert & Forman, 2012). Mindfulness is considered a unique metacognitive skill for the development of cognitive defusion, acceptance and self-compassion. In fact, fostering mindfulness abilities is nuclear in both ACT and compassion-based interventions (Hayes et al., 2012a; Neff & Tirsch, 2013).

Mindfulness is considered one core component of self-compassion (Neff, 2003a). Still, self-compassion also includes the notion of common humanity and self-kindness, which are not necessarily part of mindfulness (Bishop et al., 2004), although they may frequently co-exist. Baer (2010) argues that self-compassion is crucial when exploring the benefits of mindfulness. Both concepts were drawn from the Buddhist tradition (Neff & Dahm, 2015), which considers them as the two wings of a bird that are needed to fly (Kraus & Sears, 2009). Both have been consistently linked to well-being (Keng, Smoski, & Robins, 2011; MacBeth & Gumley, 2012). Nevertheless, while mindfulness relates to how we relate to our internal experiences, self-compassion is a way of relating to the person who is experiencing suffering (Germer, 2009). Mindfulness and self-compassion mutually enhance each other. Mindfulness is essential to assure that compassion does

not become a new form of pain resistance, whereas compassion offers the emotional safeness to promote openness to that pain (Neff & Dahm, 2015).

It has been suggested that interventions aiming to promote well-being could benefit from developing mindfulness and self-compassion skills (Keng et al., 2012; Neff & Dahm 2015). It could be useful for people to learn mindfulness skills before self-compassion, given that mindfulness is essential for compassion development and both enhance people's ability to be at their best and heal (Kabat-Zinn, 1990; Neff & Dahm, 2015; The Dalai Lama, 2001). Recent research on weight management suggests that combining mindfulness and loving-kindness interventions showed better results than mindfulness alone (e.g., Mantzios & Wilson, 2015). These results point out the importance of including self-compassion when targeting eating behaviours and weight loss.

On the other hand, compassion meditation and loving-kindness meditation are often combined together in many Buddhist traditions and psychological studies (e.g., Kabat-Zinn, 1990, Lutz, Greischer, Perlman, & Davidson, 2009). In fact, compassion training (e.g., Loving-kindness, Compassion Focused Therapy) can be effective when combined with several cognitive-behavioural treatment strategies (Gilbert, 2010; Hofmann et al., 2011).

Moreover, given the growing evidence linking self-compassion to well-being, interest on the role of self-compassion in psychotherapy has been rising within the ACT community. Nonetheless, self-compassion is still not considered as a formal component of the ACT model (Neff & Tirch, 2013). Hayes (2008) argued that the only value inherent to the ACT model for psychological flexibility is compassion and that self-compassion is rooted in all of the six ACT processes. It has been argued that Neff's (2003a) conceptualization of self-compassion and the ACT model considerably overlap (Hayes et al., 2012a). One study (Yadavaia, Hayes, & Vilardaga, 2014) found that a six-hour workshop of ACT was able to increase self-compassion and that psychological flexibility significantly mediated changes in self-compassion and psychopathological symptoms. Another study (Vowles, Witkiewitz, Sowden, & Ashworth, 2014) found that self-compassion was a key mediator of changes after an ACT intervention for chronic pain. Taken together, these findings suggest that self-compassion might be an under-recognized mechanism of change in ACT interventions.

Although it has been stated that all self-compassion components are inbuilt within the psychological flexibility model, some authors (Luoma & Platt, 2015; Neff & Tirch, 2013) have been arguing for the usefulness of directly promoting self-compassion training in most ACT interventions. In fact, this seems particularly relevant for interventions that aim to improve the ability to maintain health-related behaviours and reduce shame, self-criticism and stigma.

Despite the growing interest and evidence suggesting the importance of integrating self-compassion into ACT and mindfulness-based interventions (Neff & Dahm, 2015; Neff & Tirsch, 2013), research on interventions that incorporate these different yet related approaches is still scant. One small pilot study found preliminary support for the efficacy of integrating ACT and CFT to increase self-compassion and diminish HIV-related stigma in five men with HIV (Skinta, Lezama, Wells, & Dilley, 2015). Although these results are encouraging, larger and more rigorous studies are needed to support the integration of ACT and self-compassion (Luoma & Platt, 2015).

More recently, in Portugal, BEfree intervention was developed (Pinto-Gouveia et al., 2017). This intervention was created from the clinical expertise of several researchers from the Cognitive and Behavioural Research Centre (CINEICC) in the area of eating disorders. BEfree is a psychological group intervention for women with binge eating and obesity that integrates psychoeducation, mindfulness, self-compassion and value-based committed action. The main idea was to develop an effective intervention specifically to target binge eating symptoms. The non-randomized controlled trial included thirty-one women with binge eating disorder. At the end of the intervention, none of the participants met criteria for binge eating disorder (Pinto-Gouveia et al., 2017). Results also revealed significant improvements in eating psychopathological symptoms, shame and self-criticism levels and quality-of-life that were maintained up to six months follow-up (Pinto-Gouveia et al., 2016). Furthermore, changes in binge eating and eating psychopathology from baseline to post-intervention were mediated by decreased levels of shame, self-criticism, body-image cognitive fusion and psychological inflexibility and increased self-compassion skills (Pinto-Gouveia et al., 2016).

1.10. SUMMARY

Nowadays, most humans living in developed countries live in an obesogenic environment, where food is easily and readily available without the need for much energy expenditure. Thus, this current environment poses significant evolutionary challenges, given that our brains did not evolve to restrain us from eating and our bodies are built to maximise energy conservation and guaranty survival. In fact, in this environment, people face a double edge sword, as they are constantly being prompted to consume highly tasty foods and, at the same time, maintain the thin body image that is socially valued. It seems unreasonable to look at the increasing overweight and obesity rates without putting things in context, and that context is an obesogenic one.

Still, obesity is a major risk factor for several health problems and may significantly impair ones' physical and mental health. Thus, medical advice for those with overweight and obesity is

to lose weight, since losing five to ten percent of the initial weight brings significant health benefits. Nonetheless, the majority of the individuals are unable to maintain the weight loss at long-term even after bariatric surgery, regaining or surpassing their initial weight.

In contrast, the weight stigma and discrimination towards people with overweight and obesity are widespread and sometimes even disseminated as an obesity prevention strategy. However, research is consistently emphasising the damaging role of weight stigma in the lives of those with obesity. It is frequent for people with overweight and obesity to internalise these stigmatisation messages and present weight self-stigma, which in turn relates to poorer outcomes. Nevertheless, few studies have explored the psychological mechanisms that underlie the association between weight self-stigma and unhealthy eating patterns and quality-of-life. Moreover, self-disgust has also been an understudied emotional schema. In fact, and although the existent studies suggest its importance in physical appearance, eating disorders and depression, no studies have explored the role of self-disgust in people with overweight and obesity. Still, individuals with overweight and obesity might be particularly vulnerable to internalise the disgust responses towards their bodies and themselves, as self-disgust is inseparable from the social context and that being overweight or obese are opposites of the socially valued body image.

Recently, the ‘third wave’ contextual behavioural approaches have been gaining empirical support in several contexts and distinct medical and psychological conditions. These approaches focus on changing the way people relate to their internal events and on promoting a valued and meaningful life. This may be particularly useful in the context of weight management, weight loss and obesity, given that the maintenance of healthy behaviours relies on the development of the ability to be aware, open and tolerate unpleasant internal experiences (e.g., thoughts, emotions and urges). Additionally, self-compassion has been linked to well-being, intrinsic motivation and the capacity to endure in healthy behaviours, even when facing failures and setbacks. However, when people with overweight and obesity experience relapses, they tend to be highly ashamed and criticise themselves, rather than being able to show kindness and support and motivate themselves to persist in the healthy behaviours.

Overall, three main factors led us to explore how these approaches could be integrated into a new intervention for women with overweight and obesity struggling with their weight. Firstly, the evidence suggesting the importance of acceptance, cognitive defusion, distress tolerance, values and committed actions, mindfulness and self-compassion skills to maintain healthy behaviours in the current obesogenic environment (Forman et al., 2015; Lillis et al., 2015); Secondly the promising results of the existent studies that combined these approaches (Pinto-

Gouveia et al., 2017; Skinta et al., 2015). Lastly, the fact that this research field is still largely unexplored.

All these factors led to the development of the Kg-Free intervention that integrates mindfulness, ACT and self-compassion components. Kg-Free aims at tackling weight self-stigma and unhealthy eating behaviours (emotional and uncontrolled eating) and promote quality-of-life in women with overweight and obesity without binge eating.

CHAPTER II |

RESEARCH AIMS AND METHODOLOGY

2. RESEARCH AIMS AND METHODOLOGY

This chapter summarises the general and specific aims of this research project, as well as the methodological procedures used. It seeks to enhance the existent link between all studies presented in Chapter III. Furthermore, an overview of the Kg-Free intervention is presented. Lastly, we provide an overview of the methodology, samples' characteristics and measures used throughout the eight empirical studies.

2.1. GENERAL AND SPECIFIC AIMS

The current thesis encloses three main objectives that can be subdivided into several specific goals. Overall, this work aimed to:

1. Explore the psychological mechanisms that underlie the link between weight self-stigma and unhealthy eating patterns and quality-of-life in people with overweight and obesity enrolled in nutritional treatment for weight loss;
2. Develop and test the efficacy of a new and integrated group-intervention (Kg-Free) based on acceptance, mindfulness and compassion for women with overweight and obesity struggling to lose weight;
3. Unveil the role of self-disgust in eating and depressive psychopathological symptoms.

1. Weight self-stigma, eating behaviours and poorer quality-of-life

Weight stigma is widespread and has been consistently associated with negative outcomes for those living with overweight and obesity (e.g., Durso et al., 2012a; Puhl & Heuer, 2010; Sutin & Terracciano, 2013). This stigmatisation messages may be internalised reflecting weight self-stigma (e.g., Lillis et al., 2010). Literature has been highlighting that weight self-stigma play an important role in unhealthy eating behaviours and poorer quality-of-life both in community and clinical samples (e.g., Durso & Latner, 2008; Durso et al., 2012a; Hilbert et al., 2013; Lillis et al., 2010; Pearl et al., 2014). Nonetheless, the psychological mechanisms involved are still scarcely explored. Thus, the first goal of the current work is to study the psychological processes that mediate the relationship between weight self-stigma and unhealthy eating patterns and quality-of-life in women with overweight and obesity seeking nutritional treatment for weight loss.

To conduct those studies, first we needed to translate and validate to the Portuguese population two key self-reported measures: the Acceptance and Action Questionnaire for Weight-Related Difficulties (AAQW; Lillis & Hayes, 2008) and the Weight Self-Stigma Questionnaire (WSSQ; Lillis et al., 2010). Therefore, the first contribution of the present work was to provide useful and validated self-reported measures that could be clinically useful for health professionals treating people with overweight and obesity.

More specifically, the **study I** aimed to contribute to the further development of the AAQW. In fact, the authors (Lillis & Hayes, 2008) from the original AAQW version had already suggested that the instrument factor structure needed to be studied further. Thus, in this first study, we conducted a confirmatory factor analysis (CFA) based on the existent proposed factor structures (Weineland et al., 2012; Cardoso, Palmeira, Cunha, & Pinto-Gouveia, 2016) and tested the instrument psychometric properties. The measurement invariance across groups was also tested through a multi-group analysis using two independent samples, one community sample and a sample of women with overweight and obesity enrolled in nutritional treatment. In addition, another sample of women with overweight and obesity enrolled in Kg-Free was used to assess the instrument's temporal stability and sensitivity to change.

Similarly, one of the main goals of **study II** was to confirm the factor structure of the Portuguese version of the WSSQ and explore its psychometric properties. For this purpose, two different samples of women with overweight and obesity were used. Additionally, this study also aimed at exploring whether weight-related experiential avoidance played a significant mediator role on the relationship between BMI, the two dimensions of weight self-stigma and unhealthy eating patterns (emotional and uncontrolled eating)

Study III focused on testing the mediator role of weight-related experiential avoidance on the relationship between the two dimensions of weight self-stigma and diminished obesity-related quality-of-life while controlling for BMI. Literature has been pointing out significant differences between people with obesity with and without binge eating (e.g., Baiano et al., 2014; Bulik et al., 2002; Durso et al., 2012; Herbozo et al., 2015). In effect, binge eaters tend to present fewer adaptive emotional regulation strategies (Gianini et al., 2013; Leehr et al., 2015). Given the substantial amount of evidence suggesting that binge eaters may be a distinct and specific group within obesity, we were interested in exploring whether the mediator model was invariant across women with and without binge-eating. For this purpose, the sample was divided into two separate groups based on the proposed cut-off scores of the Binge Eating Scale (Duarte, Pinto-Gouveia, & Ferreira, 2015).

Finally, literature emphasises the detrimental role of self-criticism in disordered eating (e.g., Duarte et al., 2014; Dunkley & Grilo, 2007), but relatively unexplored in people with overweight and obesity. With **study IV** we aimed to explore differences in weight self-stigma, self-criticism and self-reassurance strategies in women with overweight and obesity with and without a diagnosis of Binge Eating Disorder. We hypothesised that women with BED would present higher weight self-stigma and self-criticism tendencies are fewer abilities to reassure the self when facing struggles than those without BED. Moreover, another goal was to test whether self-criticism and self-reassurance tendencies could mediate the relationship between weight self-stigma and binge eating symptoms.

Taken together, these studies contribute to clarify the psychological mechanisms that underlie the link between weight self-stigma, unhealthy eating and diminished quality-of-life in people with overweight and obesity seeking treatment for weight loss.

2. Bringing acceptance and compassion into obesity interventions

Obesity is a complex chronic disease that poses enormous treatment challenges. Interventions focus on promoting weight loss and adherence to eating and physical exercise patterns. Although this seems crucial, there is evidence suggesting the detrimental effects that excessive focus on weight loss may have on the well-being of people with overweight and obesity (Bacon et al., 2002; Tylka et al., 2014). While promoting weight loss seems inescapable, the importance of fostering health and well-being and changing the way people with overweight and obesity relate to their eating and weight issues has also been highlighted (e.g., Hilbert et al., 2013; Tylka et al., 2014). Additionally, literature emphasises the need for interventions to target weight-related experiential avoidance patterns, shame feelings, self-criticism and self-stigma in order to promote healthy behaviours and quality-of-life in people with overweight and obesity trying to manage their weight (e.g., Duarte et al., 2017; Gilbert et al., 2014; Lillis et al., 2010, 2011).

Mindfulness, ACT and compassion-based interventions have been gaining empirical support in promoting well-being and quality-of-life in several chronic medical and psychological conditions (Graham et al., 2016; Hofmann et al., 2010; Leaviss & Uttley, 2015), including weight, body image issues and obesity (Forman et al., 2015; O'Reilly et al., 2014; Kelly & Carter, 2015). More recently interest has emerged in integrating (self)compassion into ACT and mindfulness-based interventions (Neff & Dahm, 2015; Neff & Tirsch, 2013), given that they share key elements, intending to promote an accepting stance towards people's internal experiences, well-being and motivation to pursue a more vital and meaningful life. In addition, it has been stated that most

ACT protocols could benefit from directly targeting self-compassion (Luoma & Platt, 2015; Neff & Tirsch, 2013) and there is evidence that self-compassion may be a stronger predictor of psychological well-being than mindfulness alone (Neff & Dahm, 2015). In fact, this may be particularly relevant for addressing shame, self-criticism, and stigma (Luoma & Platt, 2015). Nonetheless, few studies tested the efficacy of interventions that integrate ACT, mindfulness and compassion-based components (Pinto-Gouveia et al., 2017; Skinta et al., 2015) and none was developed specifically to tackle weight self-stigma and unhealthy eating behaviours in women with overweight and obesity without BED.

This led to the main goal of the present thesis, the development of the Kg-Free intervention - a 12-session psychological group intervention based on mindfulness, ACT and compassion-based approaches. **Study V** is a randomised controlled trial that tests the efficacy of the Kg-Free intervention with adult women with overweight and obesity without BED struggling with their weight. We hypothesised that, when compared to treatment as usual, participants enrolled in Kg-Free would develop a more open and acceptance attitude towards themselves and their unwanted internal experiences, which would improve their well-being and health-related-quality-of-life. Furthermore, we hypothesised that the intervention would reduce weight experiential avoidance, weight self-stigma, shame and self-criticism patterns increasing participants abilities to stick to healthier eating and physical exercise behaviours even when dealing with difficulties, which in turn may influence their weight, waist circumference and total cholesterol levels.

Next, **study VI** aimed to explore whether the changes observed after the Kg-Free intervention were maintained at three months follow-up. Another goal was to explore the psychological mechanisms of change from pre-to-post-intervention in health and weight and eating-related outcomes. Exploring the mechanisms responsible for changes is crucial, as it helps to clarify the role of the distinct processes inbuilt in the intervention. Also, gathering knowledge on the mechanisms that mediate treatment changes allows to enhance interventions effectiveness and has been less studied (McCracken & Gutiérrez-Martínez, 2011; Murphy, Cooper, Hollon, & Fairburn, 2009). Finally, we proposed a serial mediation model to test whether changes on quality-of-life from pre-to-post intervention were mediated by decrease weight self-stigma and whether these changes were mediated by diminished weight-related experiential avoidance.

3. The link between self-disgust and eating and depressive symptoms

The last two studies that comprise this thesis focus on self-disgust. As mentioned in Chapter I, self-disgust arises from the internalisation of the adaptive disgust response. Self-disgust

encloses an enduring feeling of aversion and repugnance and may be particularly pathogenic when directed at relatively stable aspects of the self (Gilbert et al., 2015, Overton et al., 2008; Powell et al., 2015).

Despite the fact that research on self-disgust is still very recent, the existent studies highlight self-disgust as a key feature of depression (Overton et al., 2008; Powell et al., 2013; 2015). Additionally, high self-disgust levels (particularly related to body image) have been found in people with eating disorders (Espeset et al., 2012; Ille et al., 2014) and have been linked with eating disorders maintenance (Fox & Power, 2009). Still, as far as we know self-disgust is unexplored in people with overweight and obesity. Nonetheless, given that self-disgust is intrinsically linked to the social context and presenting an overweight or obese body-image is the opposite of the socially valued body-image, people within this group may be especially prone to develop self-disgust feelings.

In **Study VII** we explore the relationships between self-disgust, self-compassion and eating psychopathological symptoms in a sample of people with overweight and obesity seeking nutritional treatment. We expect that self-disgust will be negatively related to self-compassion abilities and positively related to eating psychopathological symptoms. Given that the existent literature has been pointing gender differences regarding self-compassion and eating psychopathological symptoms (Buchanan et al., 2013; Yarnell et al., 2015), gender differences were also explored. Lastly, we also examined whether self-compassion played a mediator role on the association between self-disgust and eating psychopathological symptoms while controlling for BMI and gender.

The last study presented, **Study VIII**, adds to the previous study by exploring the relationships between self-disgust, self-criticism and self-reassurance, depressive and eating psychopathological symptoms in two distinct samples – a dieter and a non-dieter sample. Moreover, differences between these two groups were also highlighted. Another goal was to examine the mediator role of self-criticism and self-reassurance on the relationship between self-disgust and depressive and eating psychopathological symptoms while controlling for BMI and gender. Finally, we also tested the invariance of the mediation model across both groups.

2.2. THE DEVELOPMENT OF KG-FREE INTERVENTION

Kg-free is a manualized acceptance, mindfulness & compassion-based group intervention for women with overweight and obesity struggling with their weight. The intervention comprises ten weekly group sessions plus two fortnightly booster sessions of 2h30 hours each, run in small

groups (from 10 to 12 participants). Kg-Free was designed to integrate distinct yet related components that have been showing promising results. The intervention was based upon pre-existent ACT, Mindfulness and compassion-based protocols for people with eating and weight issues (e.g., Forman et al., 2013; Goss, 2011; Kristeller & Wolever, 2011; Lillis et al., 2009; Tapper et al., 2009).

Kg-free aims specifically to tackle weight self-stigma and unhealthy eating behaviours and foster quality-of-life by targeting weight-related experiential avoidance and self-criticism patterns. It intends to develop emotion regulation skills based on acceptance, mindfulness and self-compassion towards eating and weight difficulties to increase participant's well-being and quality-of-life.

The intervention was designed to be delivered by two clinical psychologists with previous training in Acceptance and Commitment Therapy, Mindfulness and Compassion-based approaches. Several materials were developed including a therapist's manual (Attachment I), a participant's manual (Attachment II) and several audio mindfulness and compassion-based exercises that were recorded and made available to the participants.

The therapist manual includes a detailed description of each session, as well as, the translated and adapted scripts from all the exercises used in the sessions. In the participant's manual, we included an overview of each session content, additional information and examples. This manual also comprises the exercise and self-monitoring sheets for participants to use during the intervention. The audio exercises were made available for participants in a CD format or MP3 format, depending on participants' preference. Each audio starts with the name of the exercise and when appropriated a brief introduction was also recorded. For example, specific instructions concerning the use of imagination were included before the "safe place" exercise. The following mindfulness exercises were included: "Mindfulness of the Breath", "Mindfulness of physical sensations", "Mindfulness of emotional balance", "Mindfulness of a difficult emotion" and "Leaves on a stream". Moreover, several compassion-based exercises were also included namely: "Soothing breathing rhythm", "Safe place", "Imagining the compassionate self", "You at your best" "Creating a compassionate friend" and "Loving-kindness meditation". Exercises are firstly practised in the sessions, and then participants are invited to practice between sessions daily.

All Kg-Free sessions present the same basic structure except session one that is an introductory session. The remaining sessions all start with thirty minutes of shared experience (not mandatory). This moment was included to foster group support, provide a safe place for participants to share their stories and struggles and allow participants to help one another. After the shared experience moment, all sessions include a brief mindfulness exercise (e.g., eating a

raisin exercise, mindfulness of breathing, mindfulness of physical sensations). After the exercise, participants are prompted to share their experiences. Then, the session's main content is delivered through debates, metaphors and experiential exercises. Given that the intervention intended to change participants' way of relating to food and their eating patterns, we included an eating mindfulness practice (e.g., mindful eating or mindful eating awareness exercise) at the end of all sessions. Specifically, these practices were translated and adapted from M-BEAT (Kristeller & Wolever, 2011). The sessions end with the establishment of the practices for the week.

Although the detailed description of all Kg-Free sessions is displayed in the therapist manual (Attachment I), in the following paragraphs, we provide a brief summary of each session main goals and exercises. Furthermore, as mindfulness is an overarching metacognitive skill key for the development of cognitive defusion, acceptance and self-compassion, mindfulness was directly promoted in all Kg-Free sessions.

The first session is an introductory session. The session starts with a welcome statement and presentations, including the therapists. A group dynamic, where everyone is prompted to state their name, age and other information about themselves, as well as their expectations was used. The intervention goals and structure of the sessions is presented, followed by the establishment of the group rules. Previous weight loss attempts are discussed, and participants are asked to reflect on how their weight is influencing their lives. To promote creative hopelessness, we integrate the previous weight loss attempts in light of the man in the hole metaphor. Lastly, mindfulness is introduced using the eating a raisin exercise, as an opposite to automatic pilot functioning and a way of fully living in the present moment.

Sessions 2 and 3 are psychoeducation sessions regarding eating, weight and emotions. Psychoeducation was delivered through an evolutionary perspective to decrease participants' shame feelings and self-criticism patterns. More specifically, in session 2 we look at obesity and difficulties in weight management in the light of the current Western societies. In this session participants have the opportunity to understand the gap between how the brain works ("see food, eat food") and the world we live in (where food is easy available at all times). Also, we explore the multiple functions of food and the problem with diets. Then, general guidelines for a healthy lifestyle are presented (e.g., eating regularly, at least thirty minutes of daily physical exercise). Finally, participants do a mindful eating exercise with bread (which is frequently seen as a forbidden food). This allows them to experience how eating mindful is different from the way they usually eat and it allows them to choose consciously the amount they want to eat.

Session 3 focus on exploring how the human brain has evolved (old brain vs. new brain) and its advantages and disadvantages. Through an evolutionary perspective, we want for participants

to acknowledge that it is not our fault, as we do not choose how our brains evolved and how our bodies work. In this sense “*we are all in the same boat*”, and we all just do the best we can to deal with life. Also, we explore the three emotional regulation systems and the function of different emotions (e.g., Gilbert, 2010).

Session 4 is a values-based session that aims to promote values clarification and enhance motivation towards healthy valued actions through several experiential exercises (e.g., attending your funeral exercise; goal, value life dimensions and goals, barriers and action worksheet). The passenger on the bus metaphor is introduced in this session, but it is revisited in all subsequent sessions to identify the unwanted passengers in participants’ buses and to demonstrate the strategies used to control them.

Next, sessions 5, 6 and 7 are dedicated to foster acceptance of unwanted internal experiences, cognitive defusion and distress tolerance skills that are essential for the development of a more flexible and accepting relationship with one’s weight, food and eating. Session 5 specifically exposes how language is a double-edged sword and may lead to human suffering. Control attempts are discussed as the problem and not the solution using metaphors and experiential exercises (e.g., the polygraph metaphor and the butterfly exercise) and acceptance is introduced as an alternative. Lastly, we introduce cognitive defusion to allow participants’ to look at their thoughts as thoughts and not facts (e.g., labelling your thoughts exercise). Session 6 aims to reinforce acceptance and willingness of unwanted internal experiences and distress tolerance skills. This session includes the taking a mind for a walk exercise, the eyes on exercise and an urge surfing exercise. In session 7, we introduce the mind as an evaluating machine and help participants to distinguish between descriptions and evaluations, particularly towards their bodies using the defusion in front of a mirror exercise. In addition, participants practice two important mindfulness exercises focused on a difficult emotion and thoughts.

Shame and self-criticism are addressed in depth in session 8. This session aims essentially to explore the role of shame and self-criticism and present compassion as a distinct way of self-to-self-relating and a powerful motivation system focused on positive affect and one’s well-being, rather than on one’s failures and inadequacies. Main metaphors and exercises used in the session are the two teacher metaphor, soothing breathing rhythm (mindfulness of a difficult emotion exercise) and safe place (leaves on the stream exercise).

Sessions 9 and 10 exclusively focus on developing compassion for self. First, we explore why we need compassion, its importance and possible obstacles. Then participants explore through experiential exercises different ways of practising compassion for self (e.g., loving-kindness meditation, compassion for self, compassionate friend and compassion letter writing).

Lastly, session 11 and 12 are booster sessions and occur fortnightly. Both sessions aim to reinforce the skills learned throughout the intervention. While session 11 focus on fostering acceptance of what cannot be changed and help participants change what can be changed, session 12 focus on helping participants to stick to commitment actions, cope with relapse and develop a personalised action plan to maintain changes in the long-term. At the end of the last session participants and therapists are encouraged to stand up and state a commitment they would like to continue working on after the intervention.

2.3. GENERAL METHODOLOGY

In the following section, we present a general overview of the methodology and statistical procedures used in the studies presented in Chapter III. The specific methodology and description of the instruments used are provided in each study in chapter III.

2.3.1 Research Design

The majority of the studies from this thesis followed a cross-sectional design (Studies I to IV, VII and VIII). Although cross-sectional designs do not allow to assume causality, these methods are still valid to unveil the associations found between the variables tested (Hayes, 2013; Mueller & Hancock, 2008).

Study V was a randomised controlled trial, parallel group study, to test the effectiveness of the Kg-Free intervention. Participants were randomly assigned to one of two conditions: the experimental condition, that consistent in the Kg-Free intervention; and the control condition that consisted in the Treatment as Usual (TAU). Both groups were assessed through a structured interview and provided self-report measures at baseline and at the end of the Kg-Free intervention or the equivalent period for the control group. After the post-treatment assessment, participants from the control group were given the opportunity to complete the Kg-Free intervention.

Study VI presents a longitudinal design with three distinct assessment moments that includes all participants that completed the Kg-Free intervention (n = 53).

2.3.2. Participants

Data collection occurred from April 2013 to July 2016. The majority of the samples comprised individuals with overweight and obesity seeking nutritional treatment for weight loss.

These samples were collected in six Portuguese public and private clinics, namely: Coimbra's University Hospital Centre (CHUC, at endocrinology and internal medicine services); Figueira da Foz District Hospital (HDFF), Figueira da Foz and Eiras primary care centres, Guimarães Private Hospital and Nutribalance. Additionally, several nutritionists contributed to the sample recruitment in their private practices. In addition, in studies I and VIII, two community samples collected at Coimbra's citizen Bureau were used.

Table 2 displays an overview of the samples used in each study. A more detailed description of each sample can be found in each empirical study. The majority of the studies were conducted in samples of women with overweight and obesity seeking nutritional treatment for weight loss (Studies I to VI). The first and last studies (studies I and VIII) also included community samples. Studies I and II also included the sample from the Kg-Free studies (Studies V and VI) to test the instruments temporal stability and sensitivity to change. Study IV included two samples of women with overweight and obesity seeking treatment, one sample with BED and another sample without BED (enrolled in Kg-Free). Studies V and VI comprise the sample recruited for the Kg-Free intervention. Study VII includes a sample of individuals from both genders with overweight and obesity seeking nutritional treatment for weight loss. Finally, study VIII was conducted in two samples with both genders, a community sample of non-dieters and a sample of dieters enrolled in nutritional treatment for weight loss.

Table 2
Overview of the samples used in all empirical studies.

	Empirical Studies							
	I	II	III	IV	V	VI	VII	VIII
Women's from general community	✓							
Women with overweight and obesity enrolled in nutritional treatment for weight loss	✓	✓	✓					
Women with overweight and obesity without BED enrolled in Kg-Free	✓	✓		✓	✓	✓		
Women with overweight and obesity with BED				✓				
Men and women with overweight and obesity enrolled in nutritional treatment for weight loss							✓	✓
Men and women from the general community (non-dieters)								✓

2.3.3 Ethics and General Procedures

Before data collection all studies were approved, whether by the ethic committee or by the institution's clinical boards were the samples were collected. The Kg-Free intervention study received ethical approval from CHUC (CHUC-020-13). Also, the randomised controlled trial (Study V) was registered at clinicaltrials.gov with the identifier code: NCT02850796.

Participants from all studies were required to sign a consent form to take part in the study. The consent form included the general study aims, as well as information regarding the voluntary and confidentiality nature of the data provided. All participants were aware that they could abandon the study at any time, without any consequence.

Specifically for studies V and VI, a unique numerical code was assign to each participant to guaranty confidentiality and match responses from all assessment moments. Only Lara Palmeira had access to participants' research codes. Participants from the randomised controlled trial also provided blood test samples to examine the lipid profile (glycemia, total cholesterol; HDL and LDL cholesterol and triglycerides). These samples were collected and analysed by the clinical analysis laboratory from Coimbra's University Pharmacy Department. The laboratory only had access to participants' unique research code. Furthermore, the results of the blood tests from all assessments were provided to the participants. All costs were supported by Lara Palmeira's PhD grant from Portuguese Science and Technology Foundation (FCT).

2.3.4. Measures

Globally the measures used in the studies presented in this thesis were self-reported. Although a more detailed description of the instruments is provided in each study, a brief overview of the measures used in each empirical study is presented in Table 3. In addition to the self-reported measures, protocols from studies I to IV, VII and VIII included a set of questions regarding the sociodemographic variables (age, gender, weight, height, marital status and socio-economic status). In most studies, BMI was calculated using self-reported weight and height, except studies IV, V, and VI were participants were weighted with their street clothes (without shoes) using a body composition analyser (Tanita TBF-300) accurate to 0.1kg.

Table 3

Self-report measures used in the empirical studies that comprise this thesis.

	Empirical Studies							
	I	II	III	IV	V	VI	VII	VIII
Acceptance and Action Questionnaire for Weight-Related Difficulties (AAQW) ¹	✓							
Acceptance and Action Questionnaire for Weight-Related Difficulties - Revised (AAQW-R) ²		✓	✓		✓	✓		
Acceptance and Action Questionnaire (AAQ-II) ³	✓							
Weight Self-Stigma Scale (WSSQ) ⁴		✓	✓	✓	✓	✓		
Obesity Related Well-Being Questionnaire (Orwell-97) ⁵		✓	✓		✓	✓		
General Health Questionnaire (GHQ-28) ⁶					✓			
Subjective Happiness Scale (SHS) ⁷	✓	✓						
Eating Disorder Examination Questionnaire (EDE-Q) ⁸	✓						✓	✓
Binge Eating Scale (BES) ⁹	✓	✓	✓	✓	✓			
Three Factor Eating Questionnaire-18R (TFEQ-18) ¹⁰		✓						
Three Factor Eating Questionnaire-21R (TFEQ-R21) ¹¹					✓	✓		
Other as Shamer Scale – Brief (OAS-Brief) ¹²	✓							
Other as Shamer Scale (OAS) ¹³						✓		
Forms of Self-Criticizing/ attacking and Self-Reassuring Scale (FSCRS) ¹⁴				✓	✓			✓
Self-Compassion Scale (SCS) ¹⁵					✓	✓	✓	
Five Facet Mindfulness Questionnaire - 15 (FFMQ-15) ¹⁶					✓	✓		
Multidimensional Self-disgust Scale ¹⁷							✓	✓
Depression Anxiety and Stress Scales (DASS-21) ¹⁸								✓

¹ Lillis & Hayes, 2008; ² Palmeira, Cunha, Pinto-Gouveia, Carvalho, & Lillis, 2016; ³ Bond et al., 2011; ⁴ Lillis et al., 2010; ⁵ Mannucci et al., 1999; ⁶ Goldberg & Hillier, 1979; ⁷ Lyubomirsky & Lepper, 1999; ⁸ Fairburn & Beglin, 1994; ⁹ Gormally et al., 1982; ¹⁰ Karlsson, Persson, Sjöström, & Sullivan, 2000; ¹¹ Cappelleri et al., 2009; ¹² Matos, Pinto-Gouveia, & Duarte, 2016; ¹³ Goss, Gilbert, & Allan, 1994; ¹⁴ Gilbert et al., 2004; ¹⁵ Neff, 2003a; ¹⁶ Baer et al., 2006; ¹⁷ Carreiras, 2014; ¹⁸ Lovibond & Lovibond, 1995.

Overall the self-report instruments assess weight self-stigma, self-disgust, shame, unhealthy eating behaviours, quality-of-life, different emotional regulation processes and psychopathological symptoms. Given that there no validated measures to assess weight self-stigma (WSSQ) and weight-related experiential avoidance (AAQW) in people with overweight and obesity, the first two studies contributed to the existent dearth in the literature by aiming to translate and explore the psychometric properties of the Portuguese version of these two instruments (studies I and II).

In study IV, the diagnosis of Binge Eating Disorder was established using the Portuguese version of the Eating Disorder Examination- Interview (EDE-I, Ferreira, Pinto-Gouveia, & Duarte, in preparation) conducted by experienced clinical psychologists from CINEICC. All participants were weighed using the Tanita TBF-300 body analyser.

Additionally, the studies regarding the Kg-Free intervention (studies V and VI) involved distinct procedures. After signing the consent form, participants were invited to an initial eligibility assessment. This assessment included an initial interview where participants' sociodemographic data was obtained, as well as information regarding previous weight history and number and type of previous dietary attempts. During this brief initial interview participants also reported if they were currently doing any physical exercise, how many times a week and the type of exercise they were doing. Moreover, the Portuguese version of the SCID-I interview (translated by A. Maia, 2006) was used to exclude the existence of severe psychiatric conditions, namely: depressive episode, Bipolar disorder and substance abuse. In addition, the existence of Borderline Personality Disorder and Binge Eating Disorder was also assessed using the Portuguese version of the SCID-II (Pinto-Gouveia, Matos, Rijo, Castilho, & Salvador, 1999) and EDE-Interview (Ferreira, Pinto-Gouveia, & Duarte, in preparation) respectively. The existence of severe psychiatric conditions was established as exclusion criteria because the intervention was not designed for people with severe psychopathology. When needed participants presenting any of the conditions mentioned above were referred to individual psychological treatment.

At all assessments (baseline, post-intervention, 3 and 6-months follow-up) participants were weighed, had their blood pressure and waist circumference measured, provided blood samples and were assessed using EDE-Interview and completed a set of self-reported questionnaires. Finally, participants that completed the Kg-Free intervention also responded to a brief questionnaire regarding the intervention at post-intervention, 3 and 6-months follow-up. This questionnaire aimed to evaluate Kg-Free overall acceptability, as well as to understand what intervention components participants found to be most useful. We assessed the amount of weekly

practice using a scale ranging from 0 = never to 7 = every day. Finally, an open question allowed participants to express their opinions and suggestions regarding the intervention.

2.3.5. Statistical Analyses

In the following section, we offer an overview of the statistical analysis used in the empirical studies. The specific details concerning those statistical analyses can be found in the methods section of the studies.

Overall, data analysis was conducted using PASW (Predictive Analytics Software) Statistics (SPSS Inc, Chicago, IL, USA). AMOS (Analysis of Moment Structures; AMOS Development Corporation, Crawfordville, FL, USA) software was used to conduct the confirmatory factor analysis on study I and all the path analysis models using the Maximum Likelihood (ML) estimation method.

In study II, MPlus (Muthén & Muthén, 2007) software was chosen to conduct the confirmatory analyses on the WSSQ, given that the data were not multivariate normally distributed. This prevented us from using the Maximum Likelihood (ML) estimator usually employed in AMOS software. Thus, the weighted least square parameter (WLSMV) estimation method was chosen, as it is the one recommended for multivariate no normal data and ordinal variables (Flora & Curran, 2004; Muthén, du Toit, & Spisic, 1997), based on simulation studies (Hsu, 2009). Also, R software (R Core Team, 2013) was also used in this study to compute WSSQ ordinal Cronbach's alpha and Mardia's multivariate skewness and kurtosis test (Mardia, 1970).

The significance level was set at .05 for all statistical procedures. All studies include descriptive statistics to describe samples' characteristics and the study's measures. Pearson correlation coefficients were also computed in the majority of the studies to examine the magnitude of the associations between study's variables. Scales' internal consistency were assessed using Cronbach's alpha (except the WSSQ on study II). Composite reliability and average variance extracted (AVE) were also estimated in studies I and II as additional measures of instruments internal reliability (Hair, Anderson, Tatham, & Black, 1998).

Student's t tests for independent or paired samples were used to compare means among two variables, and effect sizes were estimated using Cohen's d (Field, 2013).

To examine the model fit of the confirmatory factor analyses and path analyses models several goodness-of-fit indices and recommended cut-points were used, namely: Chi-Square (χ^2), Normed Chi-Square ($\chi^2/d.f.$), Comparative Fit Index ($CFI \geq .90$, acceptable, and $\geq .95$, desirable;

Hu & Bentler, 1998), Tucker-Lewis Index (TLI $\geq .90$, acceptable, and $\geq .95$, desirable; Hu & Bentler, 1998), Goodness of Fit Index (GFI $\geq .90$, good, and $\geq .95$, desirable; Jöreskog & Sörbom, 1996), Root Mean Square Error of Approximation (RMSEA $\leq .05$, good fit; good fit; $\leq .08$, acceptable fit; $\geq .10$, poor fit; Kline, 2005) with a 95% confidence interval.

Path analysis was used to test mediation studies, as it allows the simultaneous examination of structural relationships, as well as the examination of direct and indirect paths (Kline, 2005). The bootstrap procedure with 2000 resamples and 95% bias-corrected confidence interval was used, with the effect being statistically significant at $p < .05$ if the interval between the lower and the upper bound does not include zero (Kline, 2005). To test model invariance across groups, multi-group analysis were performed using AMOS software. Structural model invariance was examined through the chi-square difference test and the critical ratios for differences among all parameter estimates (Byrne, 2010).

In study V, between-group differences at post-treatment were conducted using ANCOVAs with baseline as covariate and condition as a fixed factor and effect sized were reported. Furthermore, to test within-group differences from baseline to post-treatment, paired samples t-tests were performed for each group separately. To reduce type I errors Bonferroni correction for multiple comparisons was calculated. In study VI, Repeated Measures Analysis of Variance (ANOVA) were performed to test differences between pre-treatment, post-treatment and 3-month follow-up assessments. Finally, MEMORE (Mediation and Moderation Analysis for Repeated measures designs; Montoya & Hayes, 2016) macro for SPSS was used to test within-subjects' mediation effects. MEMORE allows to estimate total, direct, and indirect effects of the independent variable (X) on the dependent variable (Y) through one or more mediators (M) simultaneously or in sequence in two-condition or two occasions within-subjects design (Montoya & Hayes, 2016).

CHAPTER III |

EMPIRICAL STUDIES

EMPIRICAL STUDY I |

New developments in the assessment of weight-related psychological
inflexibility (AAQW-Revised)

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New developments in the assessment of weight-related psychological inflexibility (AAQW-Revised)

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ABSTRACT

Experiential avoidance, defined as attempts to control or change unwanted internal experiences when doing so causes harm, has been consistently associated with physical and mental health problems and has been traditionally measured using the Acceptance and Action Questionnaire. Several studies have highlighted the importance of developing content-specific measures to better capture relevant processes for specific populations. One such measure is the Acceptance and Action Questionnaire for Weight-Related Difficulties (AAQ-W), which measures experiential avoidance of unwanted weight related thoughts, feelings and actions. The AAQW factor structure still requires further examination.

The present study aims to contribute to the further development of the AAQW by conducting a confirmatory factor analysis (CFA) based on the existent factor structures and testing the measurement invariance across groups, through a multi-group analysis. Three distinct samples were used: the CFA used 215 women from the general population with BMI < 25 (sample 1); 210 overweight or obese treatment seeking (sample 2); AAQW's temporal stability and sensitivity to change was assessed using a sample of 58 overweight and obese women enrolled in Kg-Free (sample 3). Results supported a revised and shorter version of the AAQW (10 items) that we call AAQW-R (revised) with a three-factor structure (food as control, weight as barrier to living, weight-stigma) that showed a good fit to the data. Also, the measurement invariance across groups was confirmed. Finally, AAQW-R proved to be a reliable, stable measure and sensitive to clinical changes. Overall, this study offers new advances in the assessment of weight-related experiential avoidance, proposing a revised version of the AAQW. Moreover, it provides evidence for the usefulness of the AAQW-R both in general and clinical populations.

KEYWORDS: weight-related experiential avoidance; confirmatory factor analysis; overweight and obesity; multi-group analysis;

INTRODUCTION

Obesity has been considered one of the most serious worldwide health problems, with increasing prevalence despite the availability of weight loss treatments (Fassino et al., 2002; WHO, 2011). There has been an increasing interest in literature regarding the psychological factors associated with poorer weight loss outcomes (e.g., Avenell et al., 2004; Byrne, Cooper, & Fairburn, 2003; Elfhag & Rössner, 2004). Individuals who are more likely to regain weight after a weight loss program have shown a tendency to report lower self-esteem, higher emotional eating, impulsivity and rigid control of eating and avoidance-based motivations for losing weight (e.g. to avoid being criticized by others or by the self; Avenell et al., 2004; Byrne et al., 2003; Fassino et al., 2002; Ogden, 2000). These characteristics can be conceptualized as a pattern of experiential avoidance regarding weight-related internal negative experiences (Byrne et al., 2003; Lillis, Hayes, Bunting, & Masuda, 2009; Kayman, Bruvold, & Stern, 1990).

Acceptance and Commitment Therapy (ACT; Hayes, Wilson, & Strosahl, 1999) defines experiential avoidance as the unwillingness to be in contact with unwanted difficult internal experiences (e.g., thoughts, emotions, physical sensations, urges) and attempts to control, suppress or avoid them. It has been proposed that eating behavior difficulties can be conceptualized in part as ineffective attempts to regulate internal experiences perceived as negative and unwanted (Baer, Fischer, & Huss, 2006; Merwin et al., 2011).

The literature has consistently shown that experiential avoidance is associated with overall psychopathological problems, diminished quality of life (e.g., Bond et al., 2011; Pinto-Gouveia, Gregório, Dinis, & Xavier, 2012) and functioning related to chronic medical conditions (Gifford et al., 2004; Gregg, Callaghan, Hayes, & Glenn-Lawson, 2007; Tapper, et al., 2009). The primary measure used to assess experiential avoidance is the Acceptance and Action Questionnaire (AAQ-II; Bond et al., 2011). However given that the AAQ-II was developed with a general mental health focus, recent studies have found that using a content specific measure of experiential avoidance can be more powerful, particularly in chronic health domains such as diabetes (Gregg et al., 2007), irritable bowel syndrome (Ferreira, Eugenicos Morris, Gillanders, 2013), and epilepsy (Lundgren, Dahl, & Hayes 2008).

The AAQW (*Acceptance and Action Questionnaire for Weight-Related Difficulties*; Lillis & Hayes, 2008) represents the first attempt at measuring experiential avoidance in relation to difficulties with eating, weight, and physical activity. Although the original version of the AAQW showed acceptable psychometric properties and temporal reliability, it was validated on a small sample size ($n = 84$) that did not allow for a full exploration of the factor structure using multiple groups. Indeed the authors stated that the factorial structure of AAQW still needed further analysis. The original study suggested a unifactorial structure (Lillis & Hayes, 2008), however a

more recent study attempted to validate the AAQW for use with bariatric surgery patients and suggested that a five factor structure might be appropriate in that context (Weineland, Lillis, & Dahl, 2012). However, three of the identified factors presented low internal consistencies (ranging between .44 to .67) and only 20 items of the original 22 were retained in the factor structure found.

More recently the psychometric properties of the Portuguese version of the AAQ-W was tested in a sample of 249 women with overweight and obesity seeking nutritional treatment. Results from the exploratory factor analysis did not entirely support the factor structure presented by Weineland et al. (2012). Instead, a three factor structure emerged (factor 1 - *food as control*; factor 2 – *emotional avoidance* and factor 3 - *weight-stigma*) explaining 50.94% of the AAQW total variance. From the original 22 items, only 15 items were retained in the final Portuguese version. The measure revealed good internal consistency ($\alpha=.81$) and convergent and divergent validity (Cardoso, 2014).

Studies using the original 22-item version of the AAQW have found that weight-related experiential avoidance is associated with general psychopathology, body dissatisfaction, disordered eating attitudes and behaviors, binge eating symptoms and diminished quality of life (Cardoso, 2014; Lillis & Hayes, 2008; Lillis et al., 2009; Lillis, Hayes, & Levin, 2011; Weineland et al., 2012). Furthermore, Lillis et al. (2009) found that weight-related experiential avoidance mediated the impact of a 1-day ACT workshop on weight, weight self-stigma, psychopathological symptoms and health-related quality of life.

The primary aim of the current study is to perform confirmatory factor analysis of two possible factor structures (five-factor and three-factor) in a large sample of adult women. In addition, it explores the psychometric properties and construct validity of the AAQW. A multi-group factor analysis was also performed in order to test the measurement invariance of the AAQW in two different groups (women from general population and women with overweight and obesity seeking weight management treatment). Finally, a third sample composed of overweight and obese women enrolled in a 12 session compassionate mindfulness & acceptance group training (Kg-Free) was used to assess AAQW temporal stability and sensitivity to clinical change.

METHODS

Participants

Sample 1 - Participants were 215 Portuguese women from the general population with BMI < 25. Mean age was 29.55 ($SD = 9.52$), with a mean years of education of 14.09 ($SD = 2.57$). Mean BMI was 21.49 ($SD = 1.73$). Concerning marital status, 67.9% of the sample was single and 21.9% married. The majority (46.7%) had a medium to high socio-economic status.

Sample 2 - This sample is comprised of 210 Portuguese women with overweight or obesity seeking nutritional treatment from both private and public health institutions in the district of Coimbra, Portugal. Mean BMI was 31.14 (SD = 5.31), with a mean age of 40.14 (SD = 12.19) and a mean of 10.90 (SD = 3.81) years of education. The majority presented low to medium socio-economic status (65.7%) and, regarding marital status, 42% were single and 24.6% were married.

Sample 3 - Sample 3 is comprised of an additional 58 overweight or obese treatment seeking Portuguese women without binge eating disorder who were randomly assigned to one of two treatment conditions as part of a larger intervention trial: Kg-Free intervention (n = 28) or treatment as usual (TAU; n = 30). The Kg-Free intervention was developed to target weight stigma, shame and self-criticism and promote emotion regulation skills based on acceptance, mindfulness and self-compassion. At baseline and at the end of the intervention (3^{1/2} months) participants were assessed. At baseline, the sample reported a mean BMI of 33.92 (SD = 5.22), a mean age of 42.67 (SD = 8.81) and a mean of 15.69 (SD = 3.80) years of education. Concerning marital status, 60.3% of the sample was married, 17.2% was single, and 13.8% was divorced. The majority (65.5%) came from a low to medium socio-economic status.

A summary of each sample as well as a description of the statistical procedures used with each sample are described in Table 1.

Table 1

Samples description.

	Participants	Mean BMI (SD)	Statistical procedure
Sample 1 (n = 215)	Women from general population (not overweight)	21.49 (1.73)	Multi- Group analysis and independent t-tests
Sample 2 (n = 210)	Overweight or obese women treatment seeking	31.14 (5.31)	Multi- Group analysis and independent t-tests
Combination of Sample 1 and Sample 2 (n = 425)	Women from general population (not overweight) + Overweight or obese women treatment seeking	26.39 (6.31)	Confirmatory Factor Analysis, internal reliability, validity analyses
Sample 3 N = 58 (Kg-Free intervention n= 28; TAU n= 30)	Overweight or obese women enrolled in Kg-Free	33.92 (5.22)	Temporal stability (only TAU group) and sensitivity to change

Note: Sample 2 and Sample 3 are independent samples.

Measures

Demographic Data was obtained from participants self-report, including current height and weight. BMI (Wt/Ht^2) was calculated.

Acceptance and Action Questionnaire for Weight-Related Difficulties (AAQW; Lillis & Hayes, 2008) is a weight focused version of the original AAQ comprising 22 items that specifically assesses experiential avoidance in relation to weight-specific thoughts, feelings, and bodily sensations. Items are rated on a 7-point scale (1 = “never true” or “not at all believable” and 7 = “always true” or “completely believable”). Higher scores reflect more weight-related experiential avoidance. The original version of the AAQ-W showed good internal consistency ($\alpha = .86$) and test-retest reliability (Lillis & Hayes, 2008).

Acceptance and Action Questionnaire (AAQ-II; Bond, et al. 2011; Portuguese version by Pinto-Gouveia et al., 2012) is a widely used, 7-item questionnaire that assesses psychological inflexibility on a seven point scale. Higher scores indicate higher levels of psychological inflexibility (Bond et al. 2011). Both the original and Portuguese versions presented good psychometric properties (Bond et al. 2011; Pinto-Gouveia et al., 2012). In this study, the AAQ-II had a very good internal consistency of .92.

Other as Shamer Scale - Brief (OAS-2; Matos, Pinto-Gouveia, Gilbert, Duarte, & Figueiredo, 2015) is an 8-item questionnaire used to measure external shame, rated on a 5-point scale. Higher scores reflect higher levels of external shame (Matos et al., 2015). The scale showed an adequate internal consistency ($\alpha = .85$), temporal stability and convergent and divergent validity (Matos et al., 2015). In the current study the internal consistency of OAS was very good .93.

Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994; Portuguese version by Machado et al., 2014). The EDE-Q is a 36-item self-report measure that assesses disordered eating attitudes and behaviors. Although EDE-Q has four subscales, in the current study only the global score was calculated. EDE-Q has consistently shown to be a reliable measure of eating psychopathology (Fairburn, 2008). In this study the internal consistency of the EDE-Q was very good .92.

Binge Eating Scale (BES; Gormally, Black, Daston, & Rardin, 1982; Duarte, Pinto-Gouveia, & Ferreira, 2013) is a 16-item self-report measure assessing binge eating symptoms. For each item participants are asked to choose which sentence best describes their experience. Higher scores reflect higher severity of binge eating symptoms (from 0 to 46) and scores above 17 indicate the presence of binge eating symptoms (Duarte, Pinto-Gouveia, & Ferreira, 2015). Both the original and the Portuguese versions have shown good internal consistency, similar to the one found in this study ($\alpha = .89$).

Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999; Portuguese version by Pais-Ribeiro, 2012) contains 4 items rated on a 7-point scale. Two items ask participants to rate themselves through absolute and peer-related ratings and the other two ask participants to indicate the extent to which a given description describes them. The instrument has consistently shown good psychometric properties, with Cronbach alpha ranging from .79 to .94 (Lyubomirsky & Lepper, 1999). The Portuguese version also showed adequate internal consistency ($\alpha = .76$; Pais-Ribeiro, 2012). In this study Cronbach alpha was .79.

Procedures

The current study was approved by the institutions where the samples were collected. The general population sample (sample 1) is a convenience sample from Coimbra, Portugal. This sample was collected in Coimbra's Citizen's Bureau from January to February 2014. Each participant was invited to participate by a member of the research team, who assured the voluntary and confidential nature of the data. Participants were given informed consent and the research goals were clarified.

Separately from sample 1, participants from the clinical sample (sample 2) were invited by a member of the research team to take part in the study on the day of their ongoing nutritional appointment at the hospital or private clinic. This sample was collected from October 2013 and June 2014.

Finally, sample 3 was recruited in Coimbra's University Hospital (CHUC) at the endocrinology and internal medicine services. Participants were referred to the research team by the endocrinologist or resident, and then invited by a member of the research team to participate in the intervention study (Kg-Free). The sample, as well as all assessment moments occurred between May 2014 and September 2015.

Participants in all three samples were informed about the voluntary and confidential nature of their collaboration as well as the study's goals and gave their informed consent by a member of the research team. After they gave their consent, participants took approximately 20 min to complete the self-report measures.

Data analysis

Preliminary data analyses (Skewness and Kurtosis; Multicollinearity; Mahalanobis distance statistic for outlier analysis) were executed to examine the adequacy of the data. The AAQW psychometric properties were performed using IBM SPSS Statistics and the confirmatory factor analysis with AMOS Software.

Confirmatory Factorial Analysis (CFA) was conducted on the combined sample 1 and 2 to test and compare the two existent factor structures of the AAQW (the original version with 5 factors and the Portuguese version comprising 3 factors). The Maximum Likelihood (ML) estimation method was used as it is one of the most frequently used and suggested to be robust and appropriate for our goals (Brown, 2006; Iacobucci, 2010; Kline, 2005; Schermelleh-Engel, Moosbrugger, & Müller, 2003). Several goodness-of-fit indices and recommended cut-off points were used to evaluate the model fit (Brown, 2006; Kline, 2005): *Chi-Square* (χ^2), *Normed Chi-Square* ($\chi^2/\text{d.f.}$), *Comparative Fit Index* (CFI $\geq .90$, acceptable, and $\geq .95$, desirable; Hu & Bentler, 1998), *Tucker-Lewis Index* (TLI $\geq .90$, acceptable, and $\geq .95$, desirable; Hu & Bentler, 1998), *Goodness of Fit Index* (GFI $\geq .90$, good, and $\geq .95$, desirable; Jöreskog & Sörbom, 1996), *Root Mean Square Error of Approximation* (RMSEA $\leq .05$, good fit; $\leq .08$, acceptable fit; $\geq .10$, poor fit; Brown, 2006; Kline, 2005) using a 90% confidence interval. In order to compare the two factor structures (original *versus* Portuguese structure) the chi-square difference test was used, with statistically significant difference ($X^2 0.95$) indicating better models. Moreover, Akaike Information Criterion (AIC) and Expected Cross-Validation Index (ECVI) were analyzed to compare alternative models (Schermelleh-Engel et al., 2003). Lower values on AIC and ECVI are considered indicators of superior models (Arbuckle, 2008).

Item standardized factor loadings (λ) and individual reliability (R^2) were examined as indicators of local adjustment. It has been stated that when $\lambda \geq .50$ the model has factorial validity and when $R^2 \geq .25$ items show individual reliability (Hair, Anderson, Tatham, & Black, 1998).

To examine AAQ-W reliability, *Cronbach's alphas* (cut-off of .70 is considered suitable; Field, 2013) and the item-total correlations were used to assess scale's internal consistency (Tabachnick & Fidell, 2007). Also, *Composite Reliability* and variance extracted measure (VEM should be $\geq .50$) were estimated. Composite reliability measures internal reliability of each construct and indicates the degree to which the individual indicators are all consistent with their common latent construct (values $\geq .70$ indicate acceptable reliability; Hair et al., 1998).

Convergent and divergent validities were assessed through Pearson correlation coefficients (Cohen, Cohen, West, & Aiken, 2003). We expected high correlations with general experiential avoidance (AAQ-II) and measures of eating pathology (BES, EDE-Q), moderate correlations with BMI, and lower (but still significant) correlations with subjective happiness (SHS) and external shame (OAS).

A *multi-group confirmatory factor analysis* was performed in order to assess structural invariance of the AAQW across different samples. To do so, two separate samples were used: sample 1 (composed by woman from general population with BMI < 25) and sample 2

(overweight or obese women seeking nutritional treatment). The invariance of the structural model for both groups was tested through the chi-square difference test (Byrne, 2010).

To examine differences in AAQW across two distinct groups (sample 1 and sample 2) we conducted *Independent sample t tests* and calculated *Cohen's d effect sizes* (e.g., Field, 2013). Cohen's guidelines were used to interpret effect size magnitude (1988 cited in Tabachnick & Fidell, 2007).

Temporal stability, as known as *test-retest reliability*, was performed in TAU group from Kg-free (Sample 3) by comparing results from the baseline assessment and the assessment after a three-month period, using Pearson product-moment correlations and *t-tests* for paired samples. Sample 3 was used to measure AAQW's *sensitivity to change* through an analysis of covariance on 3-month follow-up scores with the baseline score as a covariate.

RESULTS

Preliminary Data Analyses

Violations of normality were not found, as data Skewness and Kurtosis values were in acceptable ranges ($SK < |3|$ and $Ku < |8-10|$). Multicollinearity was not problematic as all variables presented VIF values < 5 (Kline, 2005). Additionally, the Mahalanobis distance statistic (D^2) was calculated to examine the existence of multivariate outliers. Despite the fact that three cases did present values that indicate the presence of outliers, we decided to maintain them. This decision was based on the suggestion that data are more likely to be representative of the population when outliers are included (Kline, 2005; Tabachnick & Fidell, 2007).

Confirmatory Factor Analyses (combined samples 1 & 2)

First, the model with the Weineland et al. (2012) five-factor structured was tested (model 1). This model presented a poor fit to the data (see Table 2). We then tested the three factor structure from the Portuguese exploratory factor analysis (model 2). Results showed an adequate fit for the model. Additionally, when the two models were compared, model 2 was statistically superior to model 1 (chi-square difference test: $\chi^2_{dif} = 378.118 > \chi^2_{0.95; (109)} = 134.370$) and presented lower values of comparisons indexes (AIC and EVCI; cf. Table 2) indicating a better fit to the data.

Nevertheless, some items from model 2 did not reach the recommended cut-off points for item factor loadings and Squared Multiple Correlations, namely items: 14 ($\lambda = .16$ and $R^2 = .03$), 18 ($\lambda = .30$ and $R^2 = .09$) and 5 ($\lambda = .42$ and $R^2 = .18$) and were excluded. Additionally, items 3 and

4 also presented local adjustment values just below the cut-off points ($\lambda = .24$ and $R^2 = .49$ for both items), had item-total correlation below .30 and did not contribute to the scale and subscale's internal consistency. In addition, both items failed to evidence theoretical consistency with their underlying factor. Thus, we decided to exclude them, based on both statistical and theoretical justification. The model was then respecified without those five items and the model showed a very good fit to the data (see Table 2, model 3), with the exception of the Chi-square value that remained statistically significant. Nevertheless, Chi-square is very sensitive to sample size and tends to be significant with large samples (Schermele-Engel et al., 2003).

Table 2

Goodness-of-fit statistics for comparative models of the AAQW (N = 425).

Models	Chi-square	Df	X ² /df	CFI	TLI	GFI	RMSEA	AIC	ECVI
							(95% C.I.; p)		
Model 1							0.075***		
(5 factors, 20 items)	545.552***	160	3.410	0.848	0.820	0.885	(0.069 to 0.082)	645.552	1.523
Model 2							0.073**		
(3 factors, 15 items)	167.434***	51	3.283	0.940	0.923	0.932	(0.061 to 0.086)	245.434	.579
Model 3							0.066		
(3 factors, 10 items)	90.242***	32	2.820	0.966	0.952	0.957	(0.050 to 0.082; p = .052)	136.242	.321
Model 4							0.066		
(2 nd order factor, 10 items)	90.242***	32	2.820	0.966	0.952	0.957	(0.050 to 0.082; p = .052)	136.242	.321

Note. df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; GFI = Goodness of Fit Index; RMSEA = Root Mean Error of Approximation; C.I. = Confidence Interval; AIC = Akaike Information Criterion; ECVI = Expected Cross-Validation Index.

** $p < .01$; *** $p < .001$;

Finally, we also tested a second-order CFA (see Figure 1). This decision was based on the fact that the three factors were highly correlated with each other and with the scale's global score (e.g., Chen, Sousa, & West, 2005). In addition, the original publication of the AAQW (Lillis & Hayes, 2008) argued that the data supported a unified factor solution representing weight-related

experiential avoidance. This change did not modify the model fit nor items factor loading and squared multiple correlations.

The final factor structure includes an underlying second-order factor. This factor is composed of the three sub factors that assess different aspects of weight-related experiential avoidance. The identified sub factors are: Factor 1 – *food as control*, which reflects the tendency to use food as a coping mechanism to deal with negative emotions. Factor 2 – *weight as barrier to living* includes items that assess the tendency to move away from a valued life due to one’s weight or body shape; Factor 3 – *weight-stigma* contains items that assess experiences of internalized stigma related to one’s weight.

The final, 10-item version of the measure is referred to as the AAQW-R (revised) for the remainder of the manuscript.

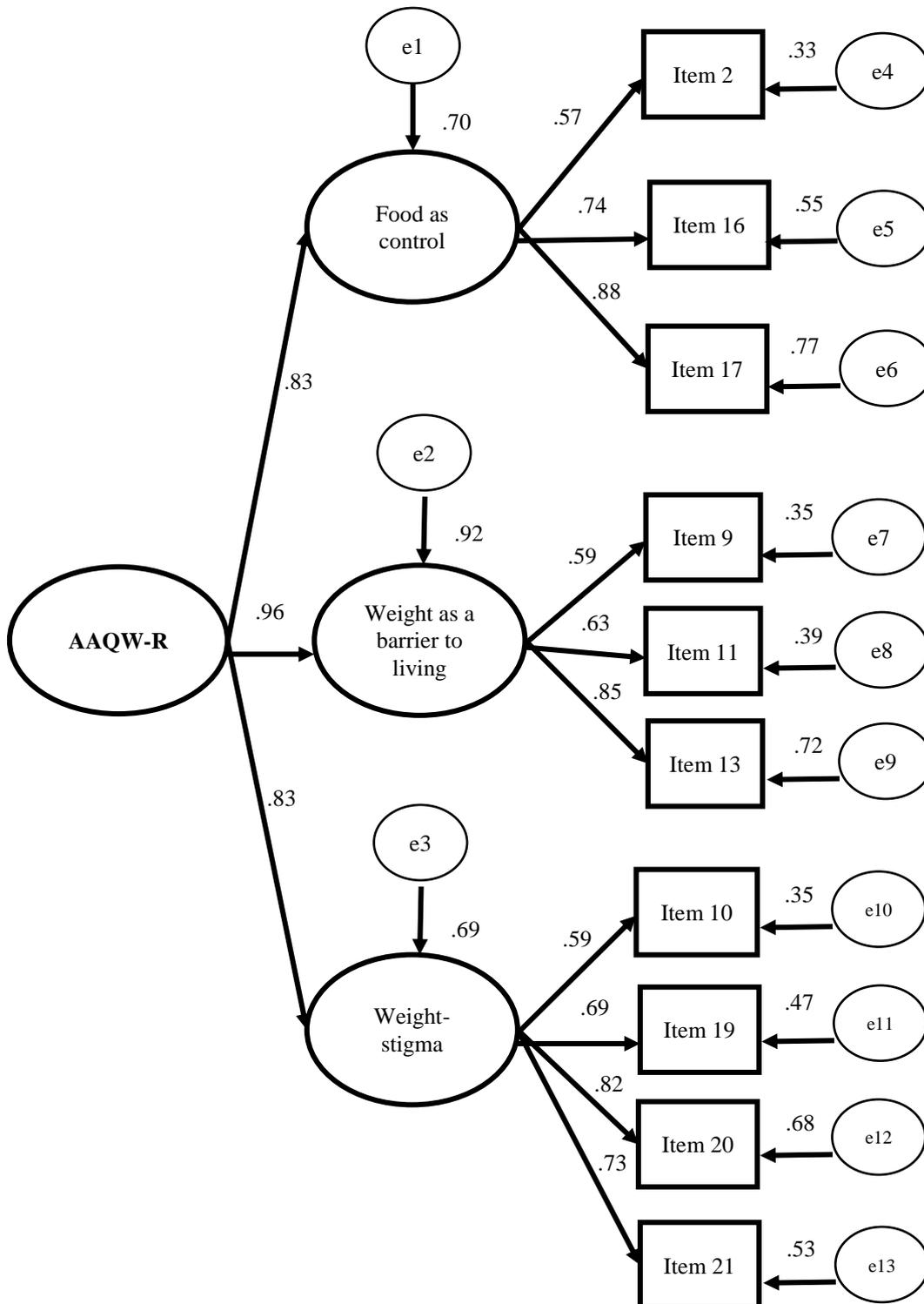


Figure 1. Confirmatory Factor Analysis of the three-factor of the AAQW ($N = 425$). Standardized coefficients are shown; all paths are statistically significant ($p < .001$).

Descriptive Statistics and Reliability Analysis

Table 3 presents the means, standard deviations, corrected item total correlation, Cronbach's alpha if item deleted and Cronbach's alpha for the total score and all subscales.

Table 3

Means (M), standard deviations (SD), corrected item-total correlations, Cronbach's alpha and Cronbach's alpha if item deleted for Acceptance and Action Questionnaire for Weight-Related Difficulties-Revised (AAQW-R) and its dimensions (N = 425).

Items	M	SD	Corrected item-total r	Cronbach's alpha
AAQW-R_ food as control				.77
2. When I have negative feelings, I use food to make myself feel better	2.86	1.73	.51	.73
16. My eating urges control me	2.84	1.83	.62	.71
17. I need to get rid of my eating urges to eat better	3.49	2.15	.70	.65
AAQW-R_ weight as barrier to living				.73
9. I need to feel better about how I look in order to live the life I want to	4.41	2.01	.50	.65
11. If I'm overweight, I can't live the life I want to	3.63	2.11	.56	.65
13. If I gain weight, that means I have failed	3.60	2.15	.60	.57
AAQW-R_ weight-stigma				.79
10. Other people make it hard for me to accept myself	2.28	1.67	.52	.78
19. If I eat something bad, the whole day is a waste	2.49	1.79	.54	.77
20. I should be ashamed of my body	2.19	1.73	.72	.68
21. I need to avoid social situations where people might judge me	2.25	1.75	.63	.73
AAQW-R Total				.88

The AAQW-R total score and the three subscales presented good internal reliability, with a Cronbach's alphas ranging from of .73 to .88. All items presented item-total correlations above .30 and contributed for the measure's internal consistency.

Moreover, the AAQW-R showed good composite reliability (.95 to AAQW-R's total score, .73 to AAQW-R_{food as control}, .82 for AAQW-R_{weight as barrier to living} and .90 to AAQW-R_{weight-stigma} dimensions). Finally, all dimensions presented adequate variance extracted measure (VEM), specifically: .67 AAQW-R_{food as control}, .61 to AAQW-R_{weight as barrier to living} and .63 to AAQW-R_{weight-stigma}. According to these results, it seems that the latent constructs are reflected in the items that comprise them.

Construct validity

Table 4 presents the means, standard deviations and Pearson's correlation coefficients for all variables in study. AAQW-R_{total} showed positive and moderate to high correlations with the BES and the EDE-Q, moderate positive associations with BMI, AAQ-II, and the OAS, and negative and low to moderate correlations with subjective happiness.

Multi-group analysis

A multi-group analysis was also conducted to test the measurement invariance of the AAQW-R across two samples, one from the general population (sample 1) and a clinical sample (sample 2) comprised of women with overweight and obesity seeking nutritional treatment (Meredith, 1993). Measurement invariance is suggested when measurement properties are structurally equivalent in different groups (Meredith, 1993; Schmitt & Kuljanin, 2008). The multiple-group CFA invariance was verified by comparing the unconstrained model (i.e., with free structural parameter coefficients) and the constrained model (i.e., where the parameters are constrained equally across groups; Byrne, 2010). The model presented a very good fit to the data for both groups: GFI= 0.95; CFI = 0.97; TLI = 0.96; RMSEA = 0.040, $p[\text{rmsea} \leq .05] = 0.903$, I.C. 90%]0.026; 0.053[. Additionally, results confirm the invariance of measurement across groups for measurement weights (i.e., equal factor loadings) ($\chi^2_{\text{dif}(7)} = 9.603$, $p = .212 < \chi^2_{0.95;(7)} = 14.067$).

Table 4

Means (M), Standard Deviations (SD) and Intercorrelation scores on self-report measures (N =425).

Measures	M	SD	1	2	3	4	5	6	7	8	9
1. BMI	26.39	6.31	-								
2. AAQW-R_Total	30.04	13.16	.51***	-							
3. AAQW-R_food as control	9.20	4.74	.40***	.85***	-						
4. AAQW-R_weight as barrier to living	11.64	5.06	.42***	.87***	.62***	-					
5. AAQW-R_weight-stigma	9.20	5.45	.49***	.87***	.59***	.62***	-				
6. AAQ-II	19.99	9.33	.06	.45***	.39***	.33***	.45***	-			
7. OAS	5.36	5.54	.18***	.47***	.37***	.31***	.53***	.59***	-		
8. BES	25.56	7.27	.44***	.65***	.63***	.46***	.59***	.33***	.40***	-	
9. EDE-Q Total	1.37	1.14	.54***	.70***	.54***	.60***	.65***	.40***	.34***	.67***	-
10. SHS	4.94	1.05	.07	-.37***	-.28***	-.28***	-.39***	-.53***	-.44***	-.20**	-.27***

Note. BMI = Body Mass Index; AAQW-R = Acceptance and Action Questionnaire for Weight-Related Difficulties- Revised; AAQ-II = Acceptance and Action Questionnaire; OAS = Others as Shamer Scale; BES = Binge Eating Scale; EDE-Q = Eating Disorder Examination Questionnaire; SHS = Subjective happiness scale

*** p < .001; ** p < .01.

Group differences

Independent *t* tests were performed to explore differences in AAQW-R total score and its three factors regarding participant's with distinct BMI comparing participants from sample 1 (women from general population, BMI < 25) and sample 2 (women seeking nutritional treatment, BMI > 25). Table 5 shows means, standard deviations, *t*-test differences and Cohen's *d* for AAQW-R total score and all its dimensions. Results showed that the overweight and obese group (BMI > 25) presented significantly higher levels of weight-related experiential avoidance patterns than women from the general population. The differences reflect a large effect (Table 5).

Table 5

Means (M), standard deviations (SD), t-test differences and Cohen's d for effect size by group for AAQW-R dimensions (N = 425).

	Overweight and Obese (<i>n</i> = 210)		Not Overweight (<i>n</i> = 215)		<i>t</i> (<i>df</i>)	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
AAQW-R-Total	35.75	13.65	24.47	9.75	9.790	<.001	0.95
AAQW-R_food as control	10.90	4.94	7.52	3.87	7.847	<.001	0.76
AAQW-R_weight as barrier to living	13.56	5.05	9.76	4.32	8.320	<.001	0.81
AAQW-R_weight-stigma	11.29	6.06	7.19	3.82	8.333	<.001	0.81

Temporal stability

Test-retest reliability, also referred to as temporal stability, is a measure of how reliable a scale is across two different time points. AAQW-R temporal stability was examined using the 30 participants from sample 3 who were allocated to TAU condition. Participants completed two assessments within a three month period. Results revealed a highly significant positive correlation between the first and second assessment of the AAQW-R_{total score} (*r* = .80), AAQW-R_{food as control} (*r* = .81), AAQW-R_{weight as barrier to living} (*r* = .74) and AAQW-R_{weight-stigma} subscales (*r* = .78). Additionally, the *t*-tests (paired samples) analyses showed no significant differences between the two assessments for AAQW-R_{total score} (*t*(29) = -0.395, *p* = .696), AAQW-R_{food as control} (*t*(29) = -0.137, *p* = .137), AAQW-R_{weight as barrier to living} (*t*(29) = 0.340, *p* = .736) and AAQW-R_{weight-stigma} subscales (*t*(29) = 0.000, *p* = 1.000).

Sensitivity to change

In order to examine the AAQW-R's sensitivity to clinical change we compared pre and post treatment scores after 12 sessions of a mindfulness and acceptance-based intervention for overweight and obese woman program using sample 3 (N= 58). Analysis of covariances (using baseline score as covariate) showed that, at post treatment, the experimental group reported significantly lower levels of overall weight-related experiential avoidance ($F(1,56) = 10.052, p = .002$, partial $\eta^2 = .16$ – large effects), AAQW-R_{food as control} dimension ($F(1,56) = 12.791, p = .001$, partial $\eta^2 = .19$ – large effects), AAQW-R_{weight as barrier to living} dimension ($F(1,56) = 7.643, p = .008$, partial $\eta^2 = .12$ – intermediate effects). However, results for AAQW-R_{weight-stigma} did not reach a statistically significant result ($F(1,56) = 3.055, p = .086$).

DISCUSSION

Obesity is a significant public health problem and innovative treatment targets, such as experiential avoidance, are needed to drive technological evolution. Researchers have articulated the importance of developing content specific measures of experiential avoidance that are able to account for changes in important psychological processes that relate to treatment change (Lillis & Hayes, 2008; Sandoz, Wilson, Merwin, & Kellum, 2013). The AAQW is a widely used measure of experiential avoidance related to one's weight (Lillis & Hayes, 2008; Weineland et al., 2012) with a factor structure that required further development. The current study tested and compared the model fit of the two proposed factor structures in a mixed sample (women from the general population and women with overweight and obesity seeking nutritional treatment).

The confirmatory factor analysis of a proposed five-factor structure showed a poor fit to the data. On the other hand, the three-factor structure derived from the Portuguese exploratory factor analysis (Cardoso, 2014) presented an adequate model fit and was superior when compared to the five-factor model. However, several items did not meet statistical and theoretical justification for inclusion and were eliminated. Additionally, the revised scale was tested as a second order, unified factor, which was shown to be statistically equivalent to the three-factor solution and may provide a more parsimonious interpretation of the data (Chen et al., 2005) while also being consistent with the original analysis of the AAQW (Lillis & Hayes, 2008).

The final revised version of the AAQW-R comprises 10 items (from the original 22 item AAQW) distributed in three-factors: AAQW-R_{food as control} (items 2, 16 and 17); AAQW-R_{weight as barrier to living} (items 9, 11 and 13) and AAQW-R_{weight-stigma} (items 10, 19, 20 and 21). We suggest that this revised and shortened version be referred to as the AAQW-Revised (AAQW-R). The analyses presented in this manuscript support using the AAQW-R primarily as a unifactor measure of weight-related experiential avoidance. Additionally, when clinically or theoretically useful, it can

also be used as a three-subfactor measure that can provide separate scores for food as control, weight as barrier to living, and weight-related stigma.

Results also support that the AAQW-R is a reliable measure, which is in line with the results found in previous studies (Cardoso, 2014; Lillis & Hayes, 2008; Weineland et al., 2012). Also, the three factors obtained adequate internal consistency, good composite reliability values, and adequate variance extracted measure, which seem to provide evidence for the AAQW-R reliability.

The current study is the first to confirm the measurement invariance of AAQW-R across two groups: women from the general population and women with overweight and obesity seeking nutritional treatment. These results suggest that the structure of the AAQW-R is consistent when assessing weight related experiential avoidance patterns across different BMI groups. In addition, participants who are overweight or obese ($BMI < 25$) presented significantly higher levels of *weight-related* experiential avoidance patterns when compared to women within a normative BMI range ($BMI > 25$), suggesting that the AAQW-R is sensitive to varying levels of weight-related experiential avoidance among groups of participants in varying BMI ranges.

Concerning the relationships between AAQW-R and other measures, results corroborate previous research (Cardoso, 2014; Lillis & Hayes, 2008; Weineland et al., 2012) and generally fit our predicted pattern. As expected, the AAQW-R was found to be highly positively associated with eating pathology, moderately associated with BMI, and less strongly associated with subjective happiness, a construct that would be considered only weakly related to weight-related experiential avoidance. The correlation with external shame was slightly higher than expected, and the correlation with general experiential avoidance was slightly lower than expected, with both being squarely in the moderate range. In retrospect, the correlation with shame seems logical, given that the AAQW-R contains a stigma sub factor; a variable that is highly correlated with shame. The moderate correlation with general experiential avoidance is likely a positive indication that the AAQW-R is tapping into a related, but distinct domain, and is thus a welcome departure from our prediction. Overall, however, the general pattern was consistent with expectation and the AAQW-R seemed to display good convergent and divergent construct validity in the current study.

Test-retest reliability results supported the temporal stability of AAQW-R total as well as its three factors, which corresponds with the results found by Weineland et al. (2012) in a four-week period. The AAQW-R appears to show adequate temporal stability.

Finally, one of our main goals was to test whether AAQW-R was able to account for therapeutic changes after a 12-session mindfulness and acceptance-based group intervention for overweight and obese women. According to covariance analysis, the AAQW-R and its subscales

(except for the *weight stigma* subscale) proved to be highly sensitive to clinical change, showing medium to large effects in a sample of 58 female participants.

This study has limitations that need to be taken into consideration when interpreting the results. First, the sample was comprised solely of adult women, which prevents from generalizing these results to adolescents females and males with overweight and obesity. Moreover, all data were collected via self-report, which can be biased.

Summary

Taken together, the current study offers new advances in the assessment of weight-related experiential avoidance. This study presents a revised, more rigorously tested version of AAQW, called the AAQW-Revised (AAQW-R), comprised of 10 of the original 22 AAQW items, containing three subfactors (food as control, weight as barrier to living and weight-stigma) and representing a global second-order factor, weight-related experiential avoidance. AAQW-R seems to be an improved, short, reliable, stable, and easy to use instrument to assess weight-related experiential avoidance, which has been consistently linked to negative health-related outcomes. In addition, the AAQW-R appears to have clinical utility, particularly for women with overweight and obesity.

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EMPIRICAL STUDY II |

The weight of weight self-stigma in unhealthy eating behaviors:
The mediator role of weight-related experiential avoidance

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Manuscript under revision

The weight of weight self-stigma in unhealthy eating behaviors: The mediator role of weight-related experiential avoidance

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ABSTRACT

Weight stigma plays a damaging role in the life of the individuals with overweight and obesity who may internalise the widespread stigmatisation messages. Weight self-stigma is defined as personal experiences of shame, negative self-evaluations as well as perceived discrimination. It has been found to be related to experiential avoidance patterns and poorer outcomes. The current study aims to conduct a confirmatory factor analysis (CFA) on the Weight Self-Stigma Questionnaire (WSSQ) and explore its psychometric properties. Furthermore, the mediator role of weight-related experiential avoidance on the relationship between weight self-stigma and unhealthy eating behaviours was analysed. Concerning the CFA, the sample comprised 331 women with overweight and obesity seeking nutritional treatment. A second independent sample of 58 overweight and obese women was used to assess WSSQ's temporal validity and internal responsiveness. Results supported the WSSQ two-factor structure and good psychometric properties and responsiveness to change. Also, evidence was found for the mediator role of weight-related experiential avoidance on the relationship between BMI, weight self-stigma and unhealthy eating patterns in women with overweight and obesity. Overall, the current study showed that WSSQ is a reliable measure and highlights the important role of weight self-stigma and weight-related experiential avoidance in women with overweight and obesity.

KEYWORDS: Weight self-stigma; confirmatory factor analysis; obesity; eating behaviors; weight-related experiential avoidance

INTRODUCTION

Weight-related stigmatisation is widespread and its intensity tends to increase over time (Andreyeva, Puhl, & Brownell, 2008). Stigma can be conceptualised as a multidimensional concept that includes both an external and an internal dimension (Lillis, Luoma, Levin, & Hayes, 2010; Link & Phelan, 2001). The external dimension (enacted stigma) reflects the experience of being discriminated against in social situations such as relationships, employment or assistance (Link & Phelan, 2001). On the other hand, internalised stigma, or self-stigma, reflects personal experiences of shame, negative self-evaluations as well as perceived discrimination (Lillis et al., 2010). Self-devaluation involves negative thoughts and emotions about being overweight, whereas fear of enacted stigma relates to the self-perception of belonging to a stigmatised group (Lillis, Luoma, Levin, & Hayes, 2010; Link & Phelan, 2001).

Weight-related stigmatization has been considered a major obstacle to the efficacy of weight loss interventions and found to be related to experiential avoidance patterns, diminished treatment compliance, avoiding seeking medical care and may actually lead to weight gain (Lillis et al., 2010; Nolan & Eshleman, 2016; Puhl & Heuer, 2009). In addition, research has been highlighting the link between weight stigmatisation experiences and unhealthy eating behaviours (e.g., binge-eating, skipping meals, uncontrolled eating) (Nolan & Eshleman, 2016; Vartanian & Porter, 2016 for a review). Also, there is some evidence suggesting that weight loss itself may not diminish weight-related stigma (Latner, Ebner, & O'Brien, 2012). These findings led several researchers to argue that interventions should not focus only on weight loss but mainly on improving quality-of-life, targeting the reduction of weight-related stigma (Carels et al., 2014; Hilbert, Braehler, Haeuser, & Zenger, 2013; Lillis et al., 2010; Tylka et al., 2014).

Moreover, it has been suggested that weight stigmatisation can become internalised and lead to the development and maintenance of weight self-stigma (Durso & Latner, 2008; Lillis et al., 2010; O'Brien et al., 2016; Ratcliffe & Ellison, 2015). In turn, internalised weight stigma has been proposed as an important risk factor for unhealthy eating behaviours (O'Brien et al., 2016; Vartanian & Porter, 2016). Overall, several studies found that internalized weight stigma was associated with higher levels of weight concerns, binge-eating symptoms, overall experiential avoidance patterns, psychopathological symptoms and poorer quality-of-life in adult weight loss seeking samples (Farhangi, Emam-Alizadeh, Hamed, & Jahangiry, 2016; Hilbert et al., 2013; Latner, Durso, & Mond, 2013; Pearl, White, & Grilo, 2014). Furthermore, Puhl, Moss-Racusin and Schwartz (2007) found that when exposed to stigmatising experiences, people who presented higher internalised negative weight stereotypes showed a higher tendency to binge eat and were

less likely to diet. Moreover, Pearl and collaborators (2014) concluded that weight bias internalisation is prevalent among those who binge eat.

To assess internalised stigma, Durso and Latner (2008) developed the Weight Bias Internalization Scale (WBIS). However, the WBIS only measures stigma unidimensionally, which led Lillis and collaborators (2010) to develop the Weight Self-Stigma Questionnaire (WSSQ), as a way of measuring different (yet related) weight-stigma dimensions: fear of enacted stigma and weight self-devaluation. In the original study, the scale presented good psychometric properties and sensitivity to change. Moreover, evidence for the multidimensional nature of the weight self-stigma was found, as fear of enacted stigma was strongly related to poorer quality-of-life, whereas self-devaluation was associated with psychopathological symptoms, namely: anxiety and depressive symptoms, as well as disinhibit eating (Lillis et al., 2010). Additionally, weight self-stigma has been pointed out as an important predictor of body image dissatisfaction, binge-eating and diminished physical and psychological health (Durso et al., 2012; Latner et al., 2013).

Nevertheless, the relationship between internalized weight stigma and unhealthy eating behaviors still requires further research (O'Brien et al., 2016; Vartanian & Porter, 2016), as the emotional regulation processes involved are still largely unknown. Weight-related experiential avoidance is likely to play a role on this relationship, as it has been associated with eating and weight difficulties and diminished quality-of-life (Lillis & Hayes, 2008; Palmeira, Cunha, Pinto-Gouveia, Carvalho, & Lillis, 2016a). It reflects the tendency to control, suppress or avoid eating and weight-related unwanted internal experiences (e.g., thoughts, emotions, physical sensations) (Lillis & Hayes, 2008). Lillis, Levin and Hayes (2011) found that weight self-stigma and general experiential avoidance partially mediated the relationship between body mass index and health-related quality-of-life. More recently, a study with college women showed that body-image flexibility, body-shame and self-compassion mediated the negative relationship between weight self-stigma and intuitive eating (Webb & Hardin, 2016). Additionally, weight-related experiential avoidance has been found to mediate the relationship between weight self-stigma and obesity-related quality-of-life, especially for women with binge-eating symptoms (Palmeira, Cunha, & Pinto-Gouveia, 2016b).

The current study was aimed to: 1) assess the internal structure, internal consistency, convergent and discriminant validity of the WSSQ in a sample of Portuguese women with overweight and obesity seeking weight-loss treatment (sample 1); 2) assess the test-retest reliability and responsiveness to change of the WSSQ in a second sample of women with overweight and obesity enrolled in a clinical trial (sample 2); 3) explore differences in weight self-stigma regarding participants' binge-eating symptoms severity, given the evidence that suggests that binge-eaters seem to be a distinct group within those with obesity [24]; 4) test the

mediational role of weight-related experiential avoidance on the relationship between BMI, weight self-stigma (both self-devaluation and fear of enacted stigma) and unhealthy eating behaviors.

METHODS

Participants

Sample 1 - Participants were 331 overweight and obese women enrolled in nutritional weight loss treatment at several private and public health institutions in the district of Coimbra, Portugal. Sample's mean age was 44.11 ($SD = 10.90$), with a mean of 12.06 ($SD = 4.06$) years of education. Concerning marital status 47.1% of the sample was married and 28.7% was single. Participants' BMI ranged from 26 to 48 ($M = 32.11$; $SD = 4.60$).

Sample 2 – Participants were 58 women with overweight or obesity enrolled in nutritional treatment at Coimbra's University Hospital Centre (CHUC) that were randomly assigned to one of two conditions as part of a larger intervention trial: Kg-Free intervention ($n = 28$) or treatment as usual (TAU; $n = 30$). Only participants that completed both baseline and post-intervention assessments were used (79.5%). Kg-Free is a 12 session (2h30 hours each) acceptance, mindfulness & compassion-based group training for overweight and obese women without binge-eating disorder. It was designed to tackle weight self-stigma and unhealthy eating behaviours and promote participant's quality-of-life, by promoting acceptance, mindfulness and self-compassion skills [authors]. TAU involved only the standard nutritional support, which does not involve any psychological intervention. Sample's mean age was 42.55 ($SD = 8.77$), with a mean of 15.59 ($SD = 3.19$) years of education. Concerning marital status 69% of the sample was married, and 17.2% was single. Participants' BMI mean at baseline was 33.85 ($SD = 5.20$). In average, after intervention participants in Kg-free lost 1.44kg, whereas those in TAU gained 0.49kg.

Procedures

Before data collection, the study was approved by the ethics committee of all institutions involved. WSSQ was translated into Portuguese by two members of the research team. The initial Portuguese version was back-translated by a psychologist research assistant that was unfamiliar with the original English version. The back-translated version was identical to the original WSSQ (Hambleton, Merenda, & Spielberger, 2005).

Participants were invited to participate on the day of their nutritional appointment by a member of the research team. Before completing the self-report measures, participants were informed about the voluntary and confidential nature of their collaboration as well as the study's

goals. Written informed consent was obtained from all participants. The questionnaires took approximately 20 minutes to be completed.

Measures

Demographic Data. Participants gave information regarding age and educational level. Also, in sample 1, participants' current height and weight were self-reported, and then BMI (Wt/Ht^2) was calculated. Participants from sample 2 were weighed with their street clothes (without shoes) using a Body Composition Analyzer (Tanita TBF-300) accurate to 0.1kg.

Weight self-stigma Questionnaire (WSSQ; Lillis et al., 2010) is a 12 item self-report measure designed to assess stigma of being overweight or obese in a multidimensional way. Participants rate items on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Higher scores reflect higher weight self-stigma. The original version presented good internal consistency ($\alpha = .88$ for the total scale, .81 and .87 for the self-devaluation and fear of enacted stigma subscales), convergent and divergent validity and test-retest reliability (Lillis et al., 2010).

Three Factor Eating Questionnaire-18R (TEFQ-18R; Karlsson, Persson, Sjöström, & Sullivan, 2000; Palmeira, Garcia, Pinto-Gouveia, & Cunha, 2016) measures three types of eating behaviours: cognitive restraint, uncontrolled eating and emotional eating. The first seventeen items are rated on a 4-point scale (1= "completely true" and 4= "completely false". Item 18 is answered through an 8-point scale (1= "I eat everything I want and when I want" and 8= "I constantly confine my food intake") (Karlsson et al., 2000). Higher scores indicate higher tendency to engage in those eating behaviours. All three subscales showed adequate internal consistencies ($\alpha = .76$ for cognitive restraint, $\alpha = .85$ for emotional eating and $\alpha = .83$ for uncontrolled eating), discriminant and convergent validity (Karlsson et al., 2000). In this study the internal consistency was $\alpha = .69$ for cognitive restraint, $\alpha = .83$ for emotional eating and $\alpha = .89$ for uncontrolled eating.

Binge-eating Scale (BES; Gormally, Black, Daston, & Rardin, 1982; Duarte, Pinto-Gouveia, & Ferreira, 2015) is a 16 item self-report questionnaire that measures binge eating symptoms. For each item, participants choose which of the given statements best describes their experience. The scale's total score ranges from 0 to 46 and scores higher than 17 indicate the presence of binge-eating symptoms (Duarte et al., 2015). In the original study, the scale presented good internal consistency, similar to the one found in the Portuguese version ($\alpha = .88$). In this study, the internal consistency was very good ($\alpha = .94$).

Acceptance and Action Questionnaire for Weight-Related Difficulties- Revised (AAQW-R) (Palmeira et al., 2016a) is a revised and shortened version of the original AAQW with ten items. AAQW targets experiential avoidance patterns related to one's weight-related thoughts, feelings,

and physical sensations. All items are rated on a 7-point scale (1 = “never true” or “not at all believable” and 7 = “always true” or “completely believable”). Higher scores reflect more experiential avoidance [19]. Results from the confirmatory factor analysis revealed that AAQW-Revised has a good fit to the data, good internal reliability ($\alpha = .88$), temporal stability and sensitivity to change (Palmeira et al., 2016a). In this study the internal consistency was good ($\alpha = .80$).

Obesity Related Well-Being Questionnaire (Orwell-97; Mannucci et al., 1999; Silva, Pais-Ribeiro, & Cardoso, 2008) is an 18 items self-report scale that assesses obesity-related quality-of-life (QoL). Participants rate on a four-point scale (0 = “not at all” to 3 = “much”) the frequency and severity of symptoms (occurrence subscale) as well as its importance regarding limitations in one’s life (importance subscale). Higher values indicate diminished QoL. Both the original and Portuguese versions of Orwell-97 revealed good internal consistencies ($\alpha = .83$ and $\alpha = .85$ respectively). In the current study, the Orwell-97 internal consistency was $\alpha = .87$.

Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999; Pais-Ribeiro, 2012) comprises four items rated on a 7-point scale. The first two items ask participants to rate themselves through absolute and peer-related ratings. The last two items ask participants to rate to what extent the description given describes them. Internal consistency for the original was tested in fourteen different samples and ranged from .79 to .94 (Lyubomirsky & Lepper, 1999). The Portuguese version (Pais-Ribeiro, 2012) showed an adequate internal consistency ($\alpha = .76$). In this study, the internal consistency for the SHS was $\alpha = .74$.

Data analysis

Preliminary data analyses were executed to examine the adequacy of the data using IBM SPSS Statistics 20 and R software. Univariate and multivariate Skewness and Kurtosis values were verified to ensure that there was not a severe bias to normal distribution. Variance inflation factor (VIF) values were examined to detect the presence of multicollinearity and Mahalanobis distance statistic (D^2) to examine the presence of multivariate outliers.

Confirmatory Factorial Analysis (CFA) was performed, using MPlus software, to test the two-factor structure of the WSSQ. A robust weighted least square parameter (WLMSV) estimation was chosen over other estimation methods (Flora & Curran, 2004). This WLMSV estimator has been recommended for multivariate no normal data and ordinal variables (Muthén, du Toit, & Spisic, 1997), based on simulation studies (Hsu, 2009). To evaluate the model fit several goodness-of-fit indices and recommended cut-points were used: *Chi-Square* (χ^2), *Comparative Fit Index* – CFI, *Tucker-Lewis Index* – TLI (Hu & Bentler, 1998), *Root Mean Square Error of Approximation* ($RMSEA \leq .08$, acceptable fit; $\geq .10$ poor fit) with 95% confidence

interval (Kline, 2005) and *Weighted Root-mean-square Residual* ($WRMR \leq 1$) (Yu, 2002). Concerning local adjustment, all items' should present standardized factor loadings higher than .50 ($\lambda \geq .50$ indicating the model's factorial validity) and individual reliability ($R^2 \geq .25$ suggesting item's individual reliability) (Hair, Anderson, Tatham, & Black, 1998). For model comparison (original *versus* simplified model) the CFI difference test was performed, with a positive difference in CFI indicating fit improvement (Dimitrov, 2010).

Ordinal Cronbach's alpha was used to assess WSSQ internal consistency. Also, *Composite Reliability* ($\geq .70$ indicate acceptable reliability) was estimated, which measures the internal reliability of each construct and provides information regarding the degree to which the individual indicators are all consistent with their common latent construct. Additionally, reliability was also measured through the average variance extracted (AVE) which should be $\geq .50$ (Hair et al., 1998). *Independent sample t tests* and *Cohen's d effect sizes* were calculated to explore differences in WSSQ regarding binge-eating symptoms. Cohen's guidelines (cited in Tabachnick & Fidell, 2007) were used to interpret effect sizes. *Convergent and divergent validities* were assessed through *Pearson correlation coefficients*. Correlations between .30 and .50 are considered low, between .50 and .70 moderate and above .70 high (Cohen, Cohen, West, & Aiken, 2003). Similar to the results found in the original version (Lillis et al., 2010) we expect that WSSQ and both subscales present positive correlation with BMI, all TFEQ dimensions, weight-related experiential avoidance (AAQW) and decreased quality-of-life (Orwell-97). Furthermore, we expect WSSQ to show a positive association with BES and a negative correlation with subjective happiness (SHS).

Sample 2 was only used to determine WSSQ test-retest reliability and responsiveness to change. *Test-retest reliability* was examined (only with participants allocated to TAU) by comparing results from the baseline assessment and the assessment after a three-month period using the intraclass correlation coefficient (ICC) and t-tests for paired samples. To evaluate WSSQ internal responsiveness standardized response mean (SRM) with 95% confidence intervals were calculated with MedCal software. Internal responsiveness refers to the measure's sensitivity to changes over a period of time within groups. The SRM effect size is frequently used and independent of sample size. It reflects the ratio between the observed mean change and the variability (the standard deviation) of that change score within the same group (Husted, Cook, Farewell, & Gladman, 2000). We used Cohen's guidelines to interpret effect sizes.

Finally, a path analysis was performed to test the mediator effect of weight-related experiential avoidance (AAQW) on the relationship between BMI and weight self-stigma (both self-devaluation and fear of enacted stigma; WSSQ) and unhealthy eating behaviours (emotional and uncontrolled eating; TFEQ). Path analysis was chosen as it allows the simultaneous

examination of structural relationships, as well as the examination of direct and indirect paths (Kline, 2005). To test the mediation effects a bootstrap procedure (2000 resamples) with 95% bias-corrected confidence interval was performed. The effect is considered statistically significant ($p < .05$) if zero is not included in the interval between the lower and the upper bound (Kline, 2005).

RESULTS

Preliminary Data Analyses

Univariate skewness and kurtosis values did not show a serious bias to normal distribution ($SK < |3|$ and $Ku < |8-10|$). Nonetheless, Mardia's multivariate skewness and kurtosis test (Mardia, 1970) revealed that the WSSQ did not present multivariate normality. Thus, the CFA was conducted using the WLMSV estimator (Muthén et al., 1997) and there was no multicollinearity, as all variables presented VIF values < 5 (Kline, 2005). Mahalanobis distance statistic (D^2) was used to analyse multivariate outliers. No extreme values were detected and the outliers were maintained, as it has been argued that data are more likely to be representative of the population when outliers are included (Hu & Bentler, 1998).

There were no missing data for the WSSQ's CFA and psychometric properties analyses. However, some participants ($n = 49$) incorrectly answered or left blank one or more questionnaires and were not used for correlational and path model analyses.

Confirmatory Factor Analysis

Following the original exploratory factor analysis, a two-factor structure of WSSQ was tested. The initial model (Model 1) presented a poor fit to the data (see Table 1). The analysis of the modification indices suggested that some items should be correlated to improve model fit. When items content was analysed it made theoretical sense to perform the modifications suggested. Therefore, three correlations were introduced in the model, namely the correlation between errors of items 2 and 3, 8 and 12, and 1 and 6. Another CFA was performed to this simplified model (Figure 1), which presented a good model fit to the data (see Table 1, model 2). Although this final model presented a lower Chi-square value, it remained statistically significant. Nevertheless, the Chi-square is very sensitive to sample size and tends to produce significant results with large samples (Schermelleh-Engel, Moosbrugger, & Müller, 2003). Additionally, when the two models were compared, model 2 was statistically superior to model 1 ($\Delta CFI = 0.035$) (Dimitrov, 2010). Moreover, as the correlation between the two WSSQ dimensions was

high ($r = .78$), a unifactorial solution of WSSQ was also tested through a CFA. Results showed a poor fit to the data (see Table 1, unifactorial model) supporting the two-factor structure.

Table 1

Goodness-of-fit statistics for comparative models of the WSSQ using WLSMV estimator (N = 331).

Models	Chi-square	Df	CFI	TLI	RMSEA	WRMR
					(95% C.I.)	
Model 1 (initial model)	381.238***	53	0.949	0.937	0.137*** (0.124 to 0.150)	1.533
Model 2 (final model)	151.592***	50	0.984	0.979	0.078** (0.064 to 0.093)	0.875
Model 3 (unifactorial model)	759.562***	54	0.891	0.866	0.199*** (0.186 to 0.211)	2.229

Note. *** $p < .001$; ** $p < .01$. df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Error of Approximation; C.I. = Confidence Interval; WRMR = Weighted Root Mean Square Residual

Regarding local adjustment, all standardised factor loadings were statistically significant ($p \leq .001$) ranging from .55 (item 1) to .93 (item 10) and Squared Multiple Correlations ranged from .30 (item 1) to .87 (item 10).

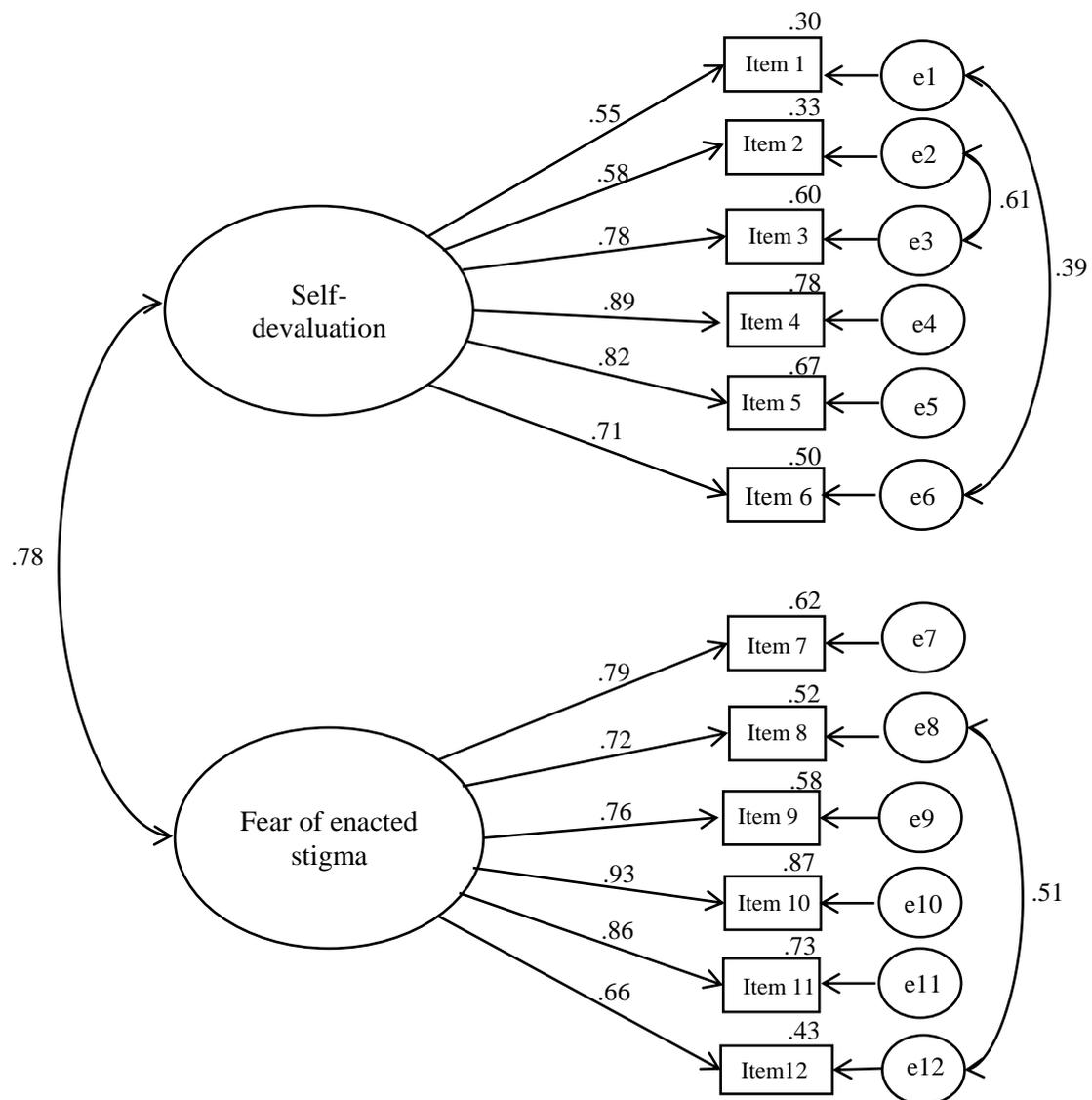


Figure 1. Confirmatory Factor Analysis of the two-factor of the WSSQ for women with overweight and obesity ($N = 331$). Standardised coefficients are shown; all paths are statistically significant ($p < .001$).

Descriptive Statistics and Reliability Analysis

Means, standard deviations, corrected item-total correlation, ordinal Cronbach's alpha if item deleted and ordinal Cronbach's alpha for WSSQ total score and both dimensions are displayed in Table 2. The total score and the two subscales presented good internal reliability, with $\alpha = .92$ for $WSSQ_{total}$, $.88$ for $WSSQ_{self-devaluation}$ and $.90$ for $WSSQ_{fear\ of\ enacted\ stigma}$. As can be seen in Table 2, item-total correlations were above .30, ranging from .55 (item 1) to .85 (item 10) and all items contributed for the instrument's internal consistency.

Additionally, WSSQ revealed good composite reliability ($.97$ for $WSSQ_{total}$, $.87$ for $WSSQ_{self-devaluation}$ and $.95$ for $WSSQ_{fear\ of\ enacted\ stigma}$). Lastly, both dimensions presented an adequate variance extracted measure (AVE), namely: $.66$ for $WSSQ_{self-devaluation}$ and $.74$ for

WSSQ_{fear of enacted stigma}, suggesting that the individual indicators are representative of the latent construct.

Table 2

Means (M), standard deviations (SD), corrected item-total correlations, ordinal Cronbach's alpha and ordinal Cronbach's alpha if item deleted for Weight Self-Stigma Questionnaire (WSSQ) and its dimensions (N = 331).

Items	M	SD	Corrected item-total r	Cronbach's alpha
WSSQ_self-devaluation				.88
1. I'll always go back to being overweight	2.42	1.23	.55	.87
2. I caused my weight problems	2.42	1.23	.60	.86
3. I feel guilty because of my weight problems	3.22	1.23	.77	.84
4. I became overweight because I'm a weak person	3.53	1.22	.79	.85
5. I would never have any problems with weight if I were stronger	3.59	1.25	.74	.85
6. I don't have enough self-control to maintain a healthy weight	2.96	1.23	.68	.85
WSSQ_fear of enacted stigma				.90
7. I feel insecure about others' opinions of me	2.63	1.21	.75	.89
8. People discriminate against me because I've had weight problems	1.99	1.05	.70	.88
9. It's difficult for people who haven't had weight problems to relate to me	2.79	1.25	.69	.89
10. Others will think I lack self-control because of my weight problems	2.53	1.21	.85	.87
11. People think that I am to blame for my weight problems	2.73	1.30	.79	.88
12. Others are ashamed to be around me because of my weight	1.83	1.02	.63	.90
WSSQ total				.92

Descriptive data for Binge-eating symptoms

Independent *t* tests were performed to explore differences in WSSQ total and both dimensions regarding participant's binge-eating symptoms (Table 3). Sample 1 was divided into two independent groups based on binge-eating symptoms assessed through the BES. A cut point of 17 was used, as it indicates the presence of binge-eating (Duarte et al., 2015). As expected, binge-eaters presented higher levels of weight stigma than non binge-eaters in WSSQ total ($t_{(324)} = 9.329, p < .001$; Cohen's $d = 1.05$) and both dimensions (WSSQ_{self-devaluation} $t_{(324)} = 7.977, p < .001$; Cohen's $d = 0.90$; WSSQ_{fear of enacted stigma} $t_{(324)} = 8.609, p < .001$; Cohen's $d = 0.97$), with differences reflecting very large effects.

Table 3

Means (M), standard deviations (SD), t-test differences and Cohen's d for effect size by group (based on BES scores) for WSSQ (N = 331)

	BES < 17 (n = 196)		BES ≥ 17 (n = 135)		<i>t</i> (<i>df</i>)	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
WSSQ-Total	28.92	8.75	38.46	9.48	9.329 (324)	<.001	1.05
WSSQ Self-devaluated	16.32	5.10	20.95	5.17	7.977 (324)	<.001	0.90
WSSQ fear of enacted stigma	12.59	4.72	17.51	5.52	8.609 (324)	<.001	0.97

Convergent and divergent validity

Table 4 displays Pearson's correlation coefficients for all study's variables. WSSQ total score and both subscales presented positive and moderate associations with Orwell-97, AAQW, BES and emotional and uncontrolled eating (TFEQ). BMI had positive but low associations with WSSQ_{total} and WSSQ_{fear of enacted stigma} and not significantly related to WSSQ_{self-devaluation}. Cognitive restraint was not significantly associated with WSSQ_{fear of enacted stigma} and presented low correlations with WSSQ_{self-devaluation} and WSSQ_{total}. Finally, all WSSQ dimensions were negatively and moderately correlated with subjective happiness.

Table 4

Means (M), Standard Deviations (SD) and Intercorrelation scores between all study's variables (N = 282)

Measures	M	SD	1	2	3	4	5	6	7	8	9	10
1. BMI	32.11	4.60	-									
2. WSSQ_Total	32.66	10.18	.21***	-								
3. WSSQ_self-devaluation	18.15	5.62	.12	.91***	-							
4. WSSQ_fear of enacted stigma	14.51	5.60	.29***	.91***	.66***	-						
5. Orwell-97	43.31	14.23	.15*	.64***	.50***	.66***	-					
6. AAQW	85.00	17.61	.24***	.65***	.61***	.56***	.57***	-				
7. BES	14.97	11.29	.28***	.61***	.54***	.58***	.53***	.46***	-			
8. TFEQ_cognitive restraint	16.91	3.34	-.02	-.17**	-.21***	-.09	.02	-.14*	-.22***	-		
9. TFEQ_uncontrolled eating	20.84	6.23	.08	.52***	.51***	.44***	.39***	.51***	.57***	-.31***	-	
10. TFEQ_emotional eating	7.75	2.77	.16***	.58***	.56***	.58***	.50***	.28***	.53***	-.21***	.67***	-
11. SHS	4.33	1.03	-.10	-.35***	-.28***	-.36***	-.28***	-.19**	-.41***	.13*	-.32***	-.26***

Note. * $p < .050$. ** $p < .010$. *** $p < .001$. BMI = Body Mass Index; WSSQ = Weight Self-Stigma Questionnaire; Orwell-97 = Obesity Related Well-Being Questionnaire; AAQW = Acceptance and Action Questionnaire for Weight-Related Difficulties; BES = Binge-eating Scale; TFEQ = Three Factor Eating Questionnaire; SHS = Subjective happiness scale

Temporal stability

WSSQ temporal stability was analysed with participants from sample 2 allocated to TAU condition (n=30). Participants were assessed at baseline and 3-months later. Results revealed a high intraclass correlation coefficient (ICC) between the first and second assessments: WSSQ_{total} (ICC = 0.95; CI = [0.89-0.97]), WSSQ_{self-devaluation} (ICC = 0.95; CI = [0.89-0.97]), and WSSQ_{fear of enacted stigma} (ICC = 0.91; CI = [0.81-0.95]). Furthermore, results from the *paired samples t-tests* showed no significant differences between the two assessments: WSSQ_{total} ($t_{(29)} = 0.98, p = .336$), WSSQ_{self-devaluation} ($t_{(29)} = 0.33, p = .741$) and WSSQ_{fear of enacted stigma} ($t_{(29)} = 1.14, p = .262$).

Internal responsiveness

WSSQ's internal responsiveness was assessed within a 3-months period. Participants were evaluated at baseline and at the end of a 12 session's acceptance, mindfulness and compassion-based intervention for women with overweight and obesity. Results showed an effect size of SRM = -.84 with 95% CI = [-1.27; -.42] for WSSQ_{total} reflecting a large effect size. Moreover, WSSQ_{self-devaluation} had an effect size of SRM = -.78 with 95% CI = [-1.12; -.37] and WSSQ_{fear of enacted stigma} presented an effect size of SRM = -.60 with 95% CI = [-1.01; -.13]. According to Cohen's guidelines SRM results for both WSSQ dimensions reflect moderate effect sizes.

Path analysis

The path analysis aimed to test the mediator effect of weight-related experiential avoidance on the relationship between BMI, self-weight stigma (both self-devaluation and fear of enacted stigma) and emotional and uncontrolled eating. Initially, the hypothesised model was tested through a fully saturated model with 27 parameters. As fully saturated models have a perfect model fit, model fit indices were neither examined nor reported. Three path coefficients were not statistically significant and were progressively removed: the direct effect of BMI → uncontrolled eating ($b = -0.040; p = .581$); BMI → emotional eating ($b = 0.027; p = .299$); WSSQ_{fear of enacted stigma} → uncontrolled eating ($b = 0.113; p = .161$).

From the examination of the unstandardized solution of the final model the path between WSSQ_{fear of enacted stigma} → emotional eating revealed to be non-significant ($\beta = 0.117$) based on the bootstrap 95% CI (-.002; .124; $p = .061$) and was removed from the final model. All the remaining individual path coefficients were statistically significant. The final model (Figure 2) presented a very good model fit: $\chi^2(1, N = 284) = 7.522, p = .111$; $\chi^2/d.f. = 1.881$; GFI = 0.991; CFI = 0.994; TLI = 0.979; RMSEA = 0.058, [CI = 0.000; 0.117]; $p = .363$).

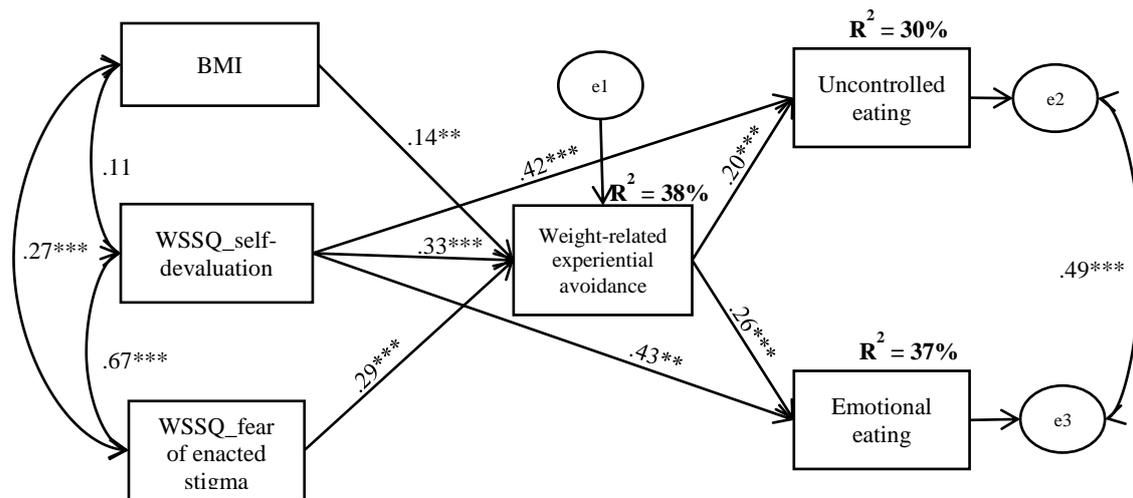


Figure 2. Final Path Model ($N = 282$).

Note. ** $p < .01$; *** $p < .001$; Standardized path coefficients among variables are presented. All path coefficients are significant.

Mediation Analysis

Concerning the analysis of total, direct and indirect effects, positive and statistically significant indirect effects were found between BMI and emotional ($\beta = 0.036$; based on 95% CI: 0.012; 0.080, $p = .004$) and uncontrolled eating ($\beta = 0.028$; based on 95% CI: 0.009; 0.063, $p = .004$) through AAQW. The same pattern was found for the indirect effects found between WSSQ_{fear of enacted stigma} and emotional ($\beta = 0.076$; based on 95% CI: 0.035; 0.136, $p < .001$) and uncontrolled eating ($\beta = 0.058$; based on 95% CI: 0.020; 0.120, $p = .001$) through AAQW. Concerning WSSQ_{self-devaluation}, both direct and indirect effects on emotional and uncontrolled eating were found. The direct effect between WSSQ_{self-devaluation} and emotional eating was $\beta = 0.432$ based on 95% CI (0.172; 0.286, $p = .001$) and the indirect effect through AAQW was $\beta = 0.086$ based on 95% CI (0.023; 0.077, $p < .001$). Also the direct effect between WSSQ_{self-devaluation} and uncontrolled eating was $\beta = 0.417$ based on 95% CI (0.299; 0.532, $p = .001$) and the indirect effect through AAQW was $\beta = 0.067$ based on 95% CI (0.032; 0.145, $p < .001$). The total effect represents the sum of the standardized direct effect with the standardized indirect effect. The total effect of WSSQ_{self-devaluation} on emotional eating was $\beta = 0.518$ based on 95% CI (0.421; 0.597, $p = .001$) and the total effect of WSSQ_{self-devaluation} on uncontrolled eating was $\beta = 0.484$ based on 95% CI (0.380; 0.576, $p = .001$).

Overall, the model accounted for 38% of weight-related experiential avoidance, 37% of emotional eating and 30% of uncontrolled eating patterns variances.

DISCUSSION

Literature has highlighted the negative effect of weight-related stigmatisation on the lives of people with overweight and obesity (Nolan & Eshleman, 2016; Puhl & Heuer, 2009; Vartanian & Porter, 2016). Moreover, these weight biased messages can become internalised, which may be considered a risk factor for poorer outcomes (Lillis et al., 2010; O'Brien et al., 2016; Vartanian & Porter, 2016).

The present study aimed to perform a confirmatory factor analysis (CFA) of the two-factor structure of the Weight Self-Stigma Questionnaire in a sample of Portuguese women with overweight and obesity and explore its psychometric properties, test-retest reliability and responsiveness to change. Results from the CFA supported the two-factor structure. Three correlations between very similar items were added to the initial model to improve model fit. The final model showed a good fit to the data and significant improvements when compared to the initial one. As expected, the two WSSQ factors were highly correlated, which led us to test a unifactorial solution. This unifactorial solution presented a poor fit to the data, supporting the WSSQ multidimensionality. All items revealed a good local adjustment.

Similar to the original and German versions (Hain, Langer, Hunnemeyer, Rudofsky, Zech, & Wild, 2015; Lillis et al., 2010), the Portuguese version of the WSSQ presented high internal consistency and good composite reliability. Both WSSQ'S subscales revealed adequate average variance extracted which suggests that the individual indicators are truly representative of the latent construct. Moreover, test-retest reliability analyses demonstrated that the WSSQ is a stable measure within a 3-month period. Additionally, the WSSQ and its dimensions revealed to be sensitive to change.

Overall, this study demonstrates that WSSQ is a reliable and useful tool in clinical settings, as it captures weight self-stigma multidimensionally and presents good psychometric properties, temporal reliability and internal responsiveness.

Moreover, participants with higher levels of binge-eating symptoms presented higher levels of weight self-stigma than participants with lower levels of binge-eating symptoms. Differences on internalised weight stigma between binge-eaters and a community sample had already been found (Durso et al., 2012). Our study adds to previous research by showing that, within overweight and obese women, those who tend to binge-eat, also present more internalised weight stigma. In fact, weight bias internalisation seems prevalent among individuals with binge eating disorder (Pearl et al., 2014). This finding is relevant especially as binge eating is considered to pose psychosocial impairments that go beyond the experience of being obese. In fact, binge eating seems to require a differentiated intervention (Leehr et al., 2015), in which tackling weight self-stigma might be a relevant therapeutic target.

Regarding the association between BMI and weight self-stigma, significant but low correlations were found for WSSQ total score and fear of enacted stigma subscale. This is consistent with previous studies that found moderate associations between weight self-stigma and BMI (Lillis et al., 2010) and that BMI >50 was associated with a dramatic increase in weight self-stigma levels (Hain et al., 2015). Additionally, and consistent with previous research (Farhangi et al., 2016; Hilbert et al., 2013; Lillis et al., 2010; Latner et al., 2013; Pearl et al., 2014), weight self-stigma was associated with several negative outcomes, namely: diminished obesity-related quality-of-life, unhealthy eating behaviors (including binge-eating) and weight-related experiential avoidance. Inversely, weight self-stigma was negatively associated with subjective happiness. Both WSSQ subscales presented similar patterns of association except the pattern found for cognitive restraint. Indeed, the tendency to restrict food intake was only negatively related to self-devaluation and WSSQ global score but not with fear of enacted stigma.

Finally, results from the path analysis suggest that the tendency to control or avoid unwanted weight-related thoughts and emotions plays a mediator role on the relationship between BMI, weight self-stigma (both self-devaluation and fear of enacted stigma) and unhealthy eating behaviours in women with overweight and obesity. The model tested accounted for 38% of weight-related experiential avoidance, 37% of emotional eating and 30% of uncontrolled eating behaviours variances. This result is consistent with results from Webb and Hardin study (2016) that found that affect regulation strategies (body-image shame and flexibility and self-compassion) mediated the negative impact of internalised weight stigma on adaptive eating behaviours.

In our model, the relationship between fear of enacted stigma and unhealthy eating behaviours (both emotional and uncontrolled eating) was fully mediated by experiential avoidance patterns towards unwanted internal experiences regarding one's weight. This suggests that one's current weight and fear of being discriminated may be associated with unhealthy eating behaviours when one is not willing to accept their weight-related unwanted internal experiences. Interestingly, the tendency to have self-devaluation thoughts and feelings regarding one's weight presented both a direct and indirect relation with unhealthy eating behaviours. In other words, it seems that when women with overweight and obesity internalise negative weight stigma messages, they present a greater tendency to eat in response to environmental cues and negative emotional states. Moreover, at least partially, weight-related experiential avoidance seems to play a role in this relationship.

These findings highlight the pervasive role of weight self-stigma (particularly the self-devaluation dimension) and weigh-related experiential avoidance on the tendency to engage in unhealthy eating behaviours.

Nevertheless, our research encloses some limitations. This study's cross-sectional design prevents causality assumptions and calls for the necessity of future studies to test these assumptions through longitudinal studies. The samples comprised only adult women, which does not allow the generalisation of the findings to overweight and obese male or adolescent populations. Moreover, we relied only on self-reported measures, which can limit the results found. Also, it was not possible to collect information concerning either current or past somatic or psychological comorbidities (e.g., eating and personality disorders), which may be important aspect to take into account when analysing the relationships found. Finally, the model tested may be limited as it is possible that other factors may contribute to unhealthy eating behaviours.

In conclusion, the current paper offers relevant clinical contributions for professionals working with people with overweight and obesity by highlighting the pervasive role of weight self-stigma and weight-related experiential avoidance on unhealthy eating behaviours. This is important as it seems that internalised weight stigma arises from the widespread weight stigmatisation messages that exist even among health professionals treating obesity (Puhl & Heuer, 2009). Thus, health professionals need to be aware of the negative role that weight stigma plays and evaluate whether their patients are particularly vulnerable to internalise those messages. Especially, as those who present more weight self-stigma and fear being discriminated tend to present poorer outcomes. Furthermore, interventions that aim to promote behavioural change and weight loss should tackle weight self-stigma and experiential avoidance patterns, as well as to promote greater awareness and foster an acceptance, kind and non-judgmental stance towards one's external and internal experiences. This seems particularly important when working with people with binge-eating, who tend to show poorer outcomes and emotional regulation strategies to deal with difficult experiences.

Compliance with ethical standards

Funding

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Conflict of Interest

On behalf of all authors, the corresponding author declared that there is no conflict of interest.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all participants included in the study.

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EMPIRICAL STUDY III |

The role of weight self-stigma on the quality of life of women with
overweight and obesity: A multi-group comparison between binge eaters
and non-binge eaters

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**The role of weight self-stigma on the quality of life of women with overweight and obesity:
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ABSTRACT

Weight self-stigma is conceptualized as a multidimensional concept involving experiences of shame, self-devaluation and the perception of being discriminated against in social situations due to one's weight. It has been associated with experiential avoidance, unhealthy eating behaviours, binge eating and diminish quality-of-life (QoL). The current study aims to explore the mediation effect of weight-related experiential avoidance on the relationship between weight self-stigma and obesity-related QoL in women with and without binge eating (BE).

The sample comprised 282 women with overweight or obesity, from which 100 presented BE symptoms. Sample's mean age was 44.24 ($SD = 11.30$), with a mean BMI of 31.40 ($SD = 4.53$). Participants completed a set of self-reported measures regarding BE symptoms, weight self-stigma, weight-related experiential avoidance and QoL.

Results from path analysis supported the mediation of weight-related experiential avoidance on the relationship between weight self-stigma and QoL, even when controlling for BMI. The model accounted 58% of QoL variance. Furthermore, the multi-group analysis revealed that the model was not invariant for both groups. The analysis of the critical ratios showed that the path from weight-related experiential avoidance to QoL was stronger for the BE group. Also the model only explained 39% of QoL for the group without BE and 65% of QoL for the BE group.

This study highlights the pervasive role of weigh self-stigma, particularly fear of being discriminated and weight-related experiential avoidance on obesity-related quality-of-life, especially for those women with BE. Additionally, it supports that interventions should focus not only in weight loss but also in improving individual's QoL, promoting the development of adaptive emotional regulation strategies.

KEYWORDS: Weight self-stigma; Obesity; Weight-related experiential avoidance; Obesity-related Quality-of-life; Multi-group analysis

INTRODUCTION

Weight-related discrimination has been considered inescapable because it is not easily concealed from others' eyes (Andreyeva, Puhl, & Brownell, 2008; Crocker, Cornwell, & Major, 1993). This is especially important for women with overweight or obesity who are more prone to be discriminated against than overweight or obese men (Puhl, Andreyeva, & Brownell, 2008).

Weight-related stigmatization tends to invade all life domains of individuals with obesity, exacerbating disparities and affecting their physical and psychological health outcomes (Crocker et al., 1993; Kolotkin, Meter, & Williams, 2001; Puhl & Brownell, 2001; Puhl & Heuer, 2010). Research has been consistently demonstrating that weight discrimination is associated with eating disordered attitudes and behaviors (Durso, Latner, & Hayashi, 2012; Puhl & Latner, 2007), avoidance of physical activity (e.g., Faith, Leone, Ayers, Heo, & Pietrobelli, 2002), psychopathological symptoms (e.g., Ashmore, Friedman, Reichmenn, & Musante, 2007; Puhl & Heuer, 2009), poorer health care, reduced treatment compliance, medical care avoidance (Dovidio & Fiske, 2012; Lillis, Hayes, Bunting, & Masuda, 2009; Puhl & Heuer, 2010) and may lead to weight gain (Sutin & Terracciano, 2013). Weight stigma may even hold a negative impact on the efficacy of weight loss treatments (Carels, et al., 2009; Puhl & Heuer, 2009).

Additionally, these negative weight stigmatization messages can become internalized, reflecting weight self-stigma (Durso & Latner, 2008; Lillis, Luoma, Levin, & Hayes, 2010). Weight self-stigma can be considered a multidimensional construct involving negative emotions and beliefs about being overweight or obese and fear of enacted stigma (i.e. perception of being discriminated against and that one belongs to a stigmatized group; Lillis et al., 2010; Link & Phelan, 2001; Bos, Pryor, & Reeder, 2013). In fact, some evidence suggests that the self-devaluation dimension is more associated with psychopathology and unhealthy eating behaviors, while fear of enacted stigma is closely linked to diminished quality-of-life. Overall, internalized weight stigma was found to be closely related to the unwillingness to stay in contact with, and attempts to control unwanted weight-related internal experiences (Lillis et al., 2010; Palmeira, Cunha, & Pinto-Gouveia, 2016). In turn, research has been unveiling the pervasive role of experiential avoidance patterns in dealing with eating and weight difficulties (Forman et al., 2007; Lillis & Hayes, 2008; Lillis, Hayes, & Levin, 2011; Weineland, Lillis, & Dahl, 2012).

Overall, research has been highlighting internalized weight stigma as a major predictor of poorer outcomes such as: binge eating symptoms, body image dissatisfaction and diminished quality-of-life (Durso & Latner, 2008; Durso, Latner, & Hayashi, 2012; Hilbert, Braehler, Haeuser, & Zenger, 2013; Latner, Durso, & Mond, 2013; Lillis et al., 2010; Pearl, White, & Grilo, 2014). More specifically, weight self-stigma has been found to play an important role on the

relationship between BMI quality-of-life of individuals with overweight or obesity (Latner, Barile, Durso, & O'Brien, 2014; Lillis, et al., 2011).

These findings seem to be particularly relevant as weight loss is hard to maintain (e.g., Dansinger, Tatsioni, Wong, Chung, & Balk, 2007; Wadden, Butryn, & Byrne, 2004) and may not necessarily diminish weight-related stigma (Fardouly & Vartanian, 2012; Latner, Ebner, & O'Brien, 2012). Thus, recently researchers have been highlighting the importance of shifting the way individuals cope with their weight and weight-related experiences (including weight stigma) in order to increase their health-related quality-of-life (e.g., Blaine, Rodman, & Newman, 2007; Durso, Latner, White, et al., 2012; Hilbert, et al., 2013; Latner, et al., 2014; Lillis et al., 2010; Puhl & Bronwell, 2001; Puhl & Heuer, 2009; Tylka et al., 2014).

Among those who struggle with overweight or obesity, the ones that also present binge eating symptoms tend to have poorer outcomes (e.g., Bulik, Sullivan, & Kendler, 2002; Elfhag & Rossner, 2005). In fact, differences between individuals with and without binge eating have been consistently substantiated in the literature. Even when compared with overweight or obese individuals, those with binge eating (BE) symptoms reveal higher levels of eating psychopathology, body dissatisfaction, greater medical and psychiatric morbidity (e.g., Bulik et al., 2002; Durso, Latner, White, et al., 2012; Herbozo, Schaefer, & Thompson, 2015; Linde et al., 2004; Wilfley, Wilson, & Agras, 2003) and more maladaptive emotional regulation strategies (e.g., Gianini, White, & Masheb, 2013). In addition, recent evidence argues for the central role of experiential avoidance patterns in BE symptoms, as experiential avoidance was found to predict BE episodes (Lillis et al., 2011) and to play a mediating role in the relationship between negative affect and BE (Kingston, Clarke, & Remington, 2010).

Overall the presence of BE poses crucial psychosocial impairments and reduces individuals' quality-of-life beyond the experience of being obese (De Zwaan, et al., 2002). In fact, literature has been consistently showing that BE patients present poorer health-related quality-of-life (HRQoL), which includes physical and mental functioning and well-being, even when compared with patients with obesity without BE (see Baiano et al., 2014 for a meta-analysis; Kolotkin et al., 2004; Mannucci et al., 1999; Rieger, Wilfley, Stein, Marino, & Crow, 2005; Vancampfort et al. 2014; De Zwaan et al., 2002).

The fact that individuals with and without BE tend to present significant differences, led several researchers to argue that individuals with BE should be considered a distinct group from those with obesity without BE and to recommend differentiated treatments (e.g., Leehr et al., 2015). Despite the aforementioned differences, it is still unclear whether weight-related experiential avoidance patterns would mediate the relationship between weight self-stigma and obesity-related quality-of-life, and if it plays a similar role in individuals with and without BE.

The first aim of the present paper was to test the mediating effect of the tendency to control, suppress or avoid weight-related unwanted internal experiences on the relationship between weight self-stigma (both self-devaluation and fear of enacted stigma dimensions) and obesity-related quality-of-life, while controlling for BMI in a sample of women with overweight or obesity seeking help for weight loss. Secondly, the sample was divided into two groups: one including the women without BE and another with the women with BE symptoms. Then, the differences between the two groups regarding BMI, weight self-stigma, weight-related experiential avoidance patterns and obesity-related quality-of-life were explored. Lastly, and given the differences pointed out in the literature regarding individuals with and without binge eating, a multiple-group comparison was conducted to test for the model's invariance.

METHODS

Participants

Participants were 282 women with overweight or obesity seeking nutritional treatment in the district of Coimbra, Portugal. The Binge Eating Scale's (BES) cut point was used to split the sample into two groups. According to Duarte, Pinto-Gouveia and Ferreira (2015) BES scores above 17 reflect the existence of significant binge eating symptoms. The total sample was divided in two subsamples: one comprised by the women without binge eating symptoms ($n = 182$) and another group with the women with binge eating symptoms ($n = 100$). This criteria was adopted since research has highlighted that individuals with binge eating seem to represent a distinct group from those with overweight or obesity without binge eating and because binge eating seems to play a prevailing effect on individual's quality-of-life that goes beyond their weight.

Sample's BMI ranged from 25.1 to 48 ($M = 31.40$; $SD = 4.53$). Participants' mean age was 44.24 ($SD = 11.30$), with a mean of 11.54 ($SD = 3.92$) years of education. Concerning marital status 51.8% of the participants were married and 22.7% was single. The majority came from low to medium socio-economic status, 84.1% in the non-binge-eating group and 81% in the binge-eating group.

Procedures

The study was approved by all institutions involved before the data collection took place. Participants were invited to participate on the day of their nutritional appointment by a member of the research team. Firstly, the research member informed about the voluntary and confidential nature of the collaboration as well as the general study's goals. After participants signed their informed consent, they completed the self-reported measures in a separate room. When this was

not possible questionnaires were filled out in the waiting room but apart from other people to assure confidentiality. The questionnaires took approximately 20 minutes to be completed.

Measures

Demographic Data. Participants were asked about their age, educational level, current height and weight (participants were asked to report the weight of their previous appointment). Then BMI (Wt/Ht^2) was calculated.

Binge Eating Scale (BES; Gormally, Black, Daston, & Rardin, 1982; Duarte et al., 2015) is a self-report questionnaire used to measure binge eating symptoms. For each of the 16 items participants are asked to choose which of the given statements best describes their experience. The scale's total score range from 0 to 46 with higher scores reflecting higher severity of binge eating symptoms. Research has pointed out that BES scores above 17 reflect the presence of binge eating symptoms (Duarte et al., 2015). Both the original and Portuguese versions showed high internal consistency ($\alpha = .88$). In this study BES internal consistency was high ($\alpha = .94$)

Weight self-stigma Questionnaire (WSSQ; Lillis et al., 2010; Palmeira, Cunha, & Pinto-Gouveia, 2016) is a 12 items self-report measure designed specifically to assess weight self-stigma in overweight and obese individuals. It comprises two subscales: self-devaluation (negative thoughts and emotions about being overweight) and fear of enacted stigma (involves the perception of being discriminated, as well as, the identification to a stigmatized group). Items are rated in a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), with higher scores reflecting the presence of more weight self-stigma. WSSQ original version showed good psychometric properties, with an internal consistency of .88 for the total scale, .81 for self-devaluation subscale and .87 for fear of enacted stigma subscale (Lillis et al., 2010). The Portuguese version of WSSQ also presented good psychometric properties (Palmeira et al., 2016). In the present study the WSSQ revealed high internal consistency ($WSSQ_{total} \alpha = .91$; $WSSQ_{self-devaluation} \alpha = .84$; and $WSSQ_{fear\ of\ enacted\ stigma} \alpha = .88$),

Acceptance and Action Questionnaire for Weight-Related Difficulties-Revised (AAQW-R; Palmeira, Cunha, Pinto-Gouveia, Carvalho, & Lillis, 2016) is a short version of the original AAQW, that was developed to measure the tendency to avoid, control or suppress unwanted internal experiences related to one's weight. Participants are asked to rate all items in a 7-point scale (1 = "never true" or "not at all believable" and 7 = "always true" or "completely believable"), with higher scores reflecting more experiential avoidance (Lillis & Hayes, 2008). The revised version of AAQW resulted from a confirmatory factor analysis performed with a large sample ($N = 425$) where 10 items were retained. The model presented a very good model

fit to the data and the scale revealed high internal consistency ($\alpha = .88$), convergent and divergent validities, temporal stability and sensitivity to clinical change (Palmeira et al., 2016). In the present study only the AAQW-R global score was used. In the present study the AAQW-R showed good internal consistency ($\alpha = .81$).

Obesity Related Well-Being Questionnaire (Orwell-97; Mannucci, et al., 1999; Silva, Pais-Ribeiro, & Cardoso, 2008) assesses obesity-related quality-of-life (QoL), through 18 items, in three different areas: physical symptoms, discomfort and the impact on one's family, social relationships and functional functions. Participants rate the frequency and severity of symptoms (occurrence subscale) as well as its importance regarding limitations in one's life (importance subscale) in a four point scale (0 = "not at all" to 3 = "much"). Higher scores indicate diminished QoL. Both the original and the Portuguese version revealed good internal consistency ($\alpha = .83$ and $\alpha = .85$ respectively). In the present study Orwell-97's Cronbach alpha was .87.

Data analysis

All data analyses were performed using IBM SPSS Statistics 20 and AMOS software. Firstly, preliminary data analyses were performed to explore data adequacy. Secondly, Pearson correlation coefficients were conducted in order to verify the association between WSSQ total score and both subscales (self-devaluation and fear of enacted stigma) and BMI, weight-related experiential avoidance and obesity-related quality-of-life (Cohen, Cohen, West, & Aiken, 2003).

Likewise, independent sample *t* tests and Cohen's *d* effect size were calculated to examine differences between both groups in all study's variables (Field, 2013). According with Cohen's guidelines (1988 cited in Tabachnick & Fidell, 2007) Cohen's *d* between 0.2 and 0.4 represent small effects; between 0.5 and 0.7 medium effects and above 0.8 large effects.

Path analysis was used to explore the mediator role of weight-related experiential avoidance (AAQW-R) on the relationship between weight self-stigma (both self-devaluation and fear of enacted stigma; WSSQ) and obesity-related quality-of-life (ORWELL-97), while controlling for BMI. Path analysis allows the simultaneous examination of structural relationships, as well as the examination of direct and indirect paths (e.g., Schumacker & Lomax, 2004). We chose the Maximum Likelihood method as it allows for the estimation of all model path coefficients and to compute fit statistics. Also, to assess overall model fit a number of goodness-of-fit measures and recommended cut-points were used (Kline, 2005): Chi-Square (χ^2), Normed Chi-Square ($\chi^2/d.f.$), Comparative Fit Index (CFI ≥ 0.90 , acceptable, and ≥ 0.95 , desirable; Hu & Bentler, 1998), Tucker-Lewis Index (TLI ≥ 0.90 , acceptable, and ≥ 0.95 , desirable; Hu & Bentler, 1998), Goodness of Fit Index (GFI ≥ 0.90 , good, and ≥ 0.95 , desirable; Jöreskog & Sörbom, 1996), Root Mean Square Error of Approximation (RMSEA ≤ 0.05 , good fit; ≤ 0.08 , acceptable fit; Kline,

2005) with a 95% confidence interval. The mediation effects were analyzed using a bootstrap procedure (2000 resamples) with 95% bias-corrected confidence interval. It is considered that if zero is not included on the interval between the lower and the upper bound the effect is statistically significant at $p < 0.05$ (Kline, 2005).

Furthermore, a multiple-group comparison was performed to test whether the model structure was invariant for both groups. The invariance of the structural model for both groups was tested through the chi-square difference test and the critical ratios for differences among all parameter estimates. Significant differences between groups exist when critical ratio values are larger than 1.96 (Byrne, 2010).

RESULTS

Preliminary Data Analyses

No severe bias to normal distribution were found, as all variables presented acceptable values of skewness and kurtosis ($SK < |3|$ and $Ku < |8-10|$) and $VIF < 5$ (Kline, 2005), which excludes the existence of multicollinearity. Also, from the analysis of multivariate outliers using Mahalanobis distance statistic (D^2), some cases indicated the presence of outliers. Nevertheless, extreme values were not detected which lead us to decide to maintain the outliers. This procedure has been considered to make the data more likely to be representative of the population under study (Kline, 2005; Tabachnick & Fidell, 2007).

Correlation analysis

Pearson's correlation coefficients for all variables in study are presented in Table 1. As can be seen, BMI showed low associations with all self-reported variables in study. $WSSQ_{total}$, as well as both subscales presented moderate and positive associations with ORWELL, AAQW-R and BES, with the exception of the relation between $WSSQ_{fear\ of\ enacted\ stigma}$ with ORWELL that can be considered high. Finally, AAQW-R was positively and moderately correlated with both ORWELL and BES.

Table 1

Pearson moment correlation on all variables for the total sample (N =282).

Measures	1	2	3	4	5	6	7
1. BMI	-						
2. WSSQ _Total	.22***	-					
3. WSSQ self-devaluation	.12*	.91***	-				
4. WSSQ fear of enacted stigma	.27***	.92***	.67***	-			
5. ORWELL-97	.22***	.69***	.55***	.71***	-		
6. AAQW-R	.25***	.61***	.55***	.56***	.62***	-	
7. BES	.26***	.62***	.54***	.58***	.54***	.49***	-

Note. * $p < 0.05$; *** $p < 0.001$; BMI = Body Mass Index; WSSQ = Weight Self-Stigma Questionnaire; ORWELL-97 = Obesity Related Well-Being Questionnaire; AAQW-R = Acceptance and Action Questionnaire for Weight-Related Difficulties- Revised; BES = Binge Eating –Scale

Differences between groups

Independent t tests were conducted to explore group differences in all variables in study. Means, standard deviations, t -test differences and Cohen's d for all variables in each group (with and without binge-eating) are displayed on Table 2. Results show that the binge eating group had a significantly higher BMI and higher levels of weight self-stigma and diminished QoL when compared with women with without binge eating symptoms. All differences reflect very large effects, with the exception of BMI differences that represent a small effect (Table 2).

Table 2

Means (*M*), standard deviations (*SD*), *t*-test differences and Cohen's *d* effect size by group based on Binge eating scores (*BES*) for all variables (*N* = 282).

	BES < 17		BES ≥ 17		<i>t</i> (<i>df</i>)	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
	(<i>n</i> = 182)		(<i>n</i> = 100)				
BMI	30.74	4.56	32.59	4.25	-3.344 (280)	<.001	0.42
BES	6.97	4.58	26.32	8.41	-21.336 (280)	<.001	3.12
WSSQ-Total	28.09	8.37	37.21	9.75	-8.243 (280)	<.001	1.03
WSSQ Self-devaluated	15.79	4.85	20.05	5.09	-6.935 (280)	<.001	0.86
WSSQ fear of enacted stigma	12.30	4.52	17.16	5.73	-7.322 (280)	<.001	0.98
AAQW-R	32.23	10.73	42.31	11.19	-5.884 (280)	<.001	0.93
ORWELL-97	38.78	12.00	51.56	14.31	-7.581 (280)	<.001	0.99

Note. BMI = Body Mass Index; BES = Binge Eating –Scale; WSSQ = Weight Self-Stigma Questionnaire; AAQW-R = Acceptance and Action Questionnaire for Weight-Related Difficulties- Revised; ORWELL-97 = Obesity Related Well-Being Questionnaire.

Path analysis

To test the mediator effect of weight-related experiential avoidance on the relationship between weight self-stigma and obesity-related quality-of-life, controlling for the effect of BMI, a path analysis was performed. The initial model was tested through a fully saturated model with 15 parameters. Model fit indices were neither examined nor reported as fully saturated models always have a perfect model fit. The analysis of the path coefficients from the first (fully saturated) model revealed that two path coefficients were not statistically significant and were progressively removed. First we removed the direct path from BMI → QoL (*t* statistics = -0.002; *p* = .982 and then the direct path from WSSQ_{self-devaluation} → QoL (*t* statistics = 0.104; *p* = .447). The model was then respecified with all the remaining individual path coefficients being statistically significant. The final model can be seen in Figure 1. Overall the model presented an excellent model fit to the data: $\chi^2(2, N = 282) = 0.516, p = 0.772; \chi^2/d.f. = 0.258; GFI = 0.999; CFI = 1.000; RMSEA = 0.000, [CI = 0.000; 0.078]; p = .877$).

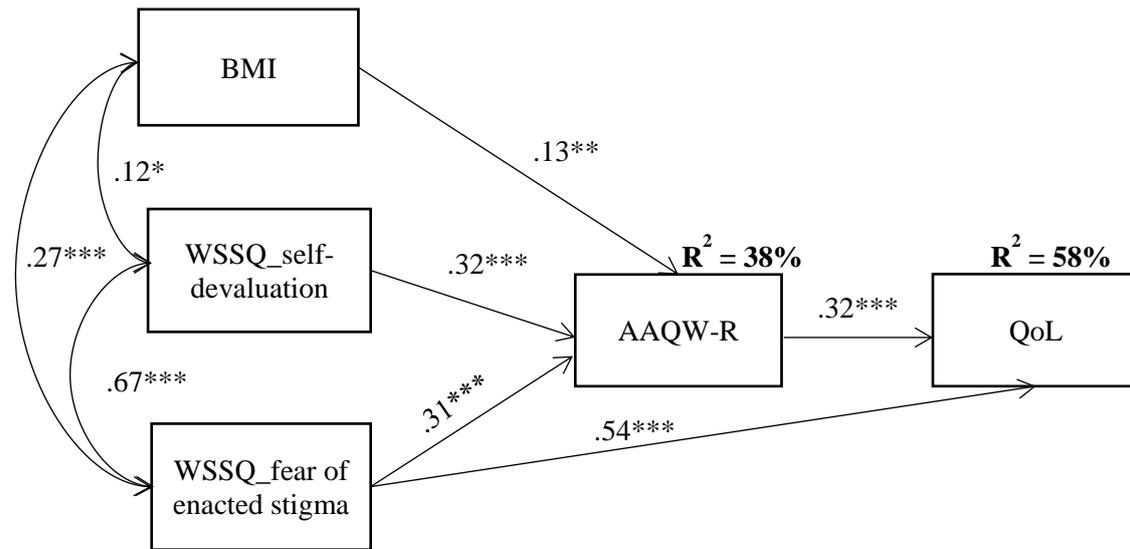


Figure 1. Final Path Model ($N = 282$).

Note. * $p < .05$; ** $p < .01$; *** $p < .001$; Standardized path coefficients among variables are presented. All path coefficients are statistically significant.

Mediation Analysis

The analysis of the total, direct and indirect effects showed that the direct effect of $WSSQ_{\text{fear}}$ of enacted stigma on QoL was $\beta = 0.536$ based on 95% CI: (0.439; 0.622, $p = .001$). Also, AAQW-R presented a significant direct effect on QoL ($\beta = 0.315$; based on 95% CI: 0.277; 0.409, $p = .001$). Moreover, three positive and statistically significant indirect effects on QoL through AAQW-R were found, namely between: BMI and QoL ($\beta = 0.041$; based on 95% CI: 0.004; 0.028, $p = .028$); $WSSQ_{\text{self-devaluation}}$ and QoL ($\beta = 0.101$; based on 95% CI: 0.056; 0.157, $p = .001$); and $WSSQ_{\text{fear}}$ of enacted stigma and QoL ($\beta = 0.099$; based on 95% CI: 0.050; 0.157, $p = .001$). Finally, the total effect of $WSSQ_{\text{fear}}$ of enacted stigma on QoL was $\beta = 0.635$ based on 95% CI (0.550; 0.710, $p = .001$), representing the sum of the standardized direct effect with the standardized indirect effect. Overall, the final model (Figure 1) accounted for 38% of weight-related experiential avoidance and 58% of obesity-related quality-of-life.

Multi-group analysis

A multi-group analysis was used to verify if there were differences in the final model between the two groups (women with and without binge eating). The tested model presented a very good fit to the data for both groups: $\chi^2(4) = 6.148$, $p = 0.188$; $\chi^2/\text{d.f.} = 1.537$; CFI = 0.995; TLI = 0.975; RMSEA = 0.044, [CI = 0.000; 0.108]; $p = .480$.

The multi-group analysis allows to test whether the path coefficients are equal or invariant between groups. The unconstrained model (i.e., with free structural parameter coefficients) and the constrained model (i.e., where the parameters are constrained equal across groups) were compared (Byrne, 2010). Results from the Chi-square difference test revealed that the model was not invariant for the two groups ($\chi^2 \text{ dif}(5) = 7.198, p = .206$). Moreover, in the group without binge eating the model accounted for 30% of AAQW-R and 39% of women's obesity-related QoL (Figure 2). On the other hand, for the group with binge eating the model explained 33% of the AAQW-R and 65% of women's obesity-related QoL (Figure 3).

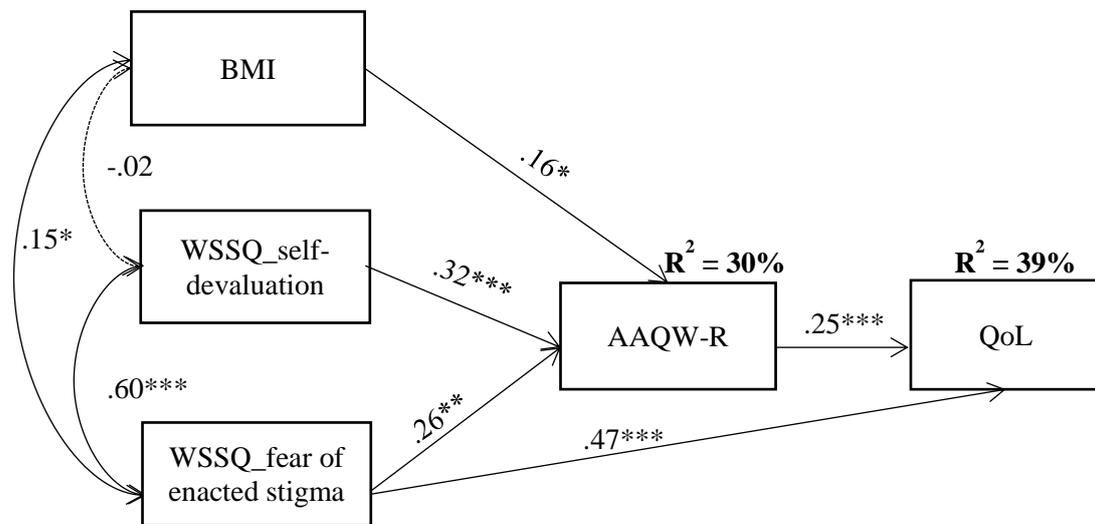


Figure 2. Path Model for the group without Binge Eating ($n = 182$).

Note. * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$; Standardized path coefficients among variables are presented. Dotted lines represent non-significant path coefficients.

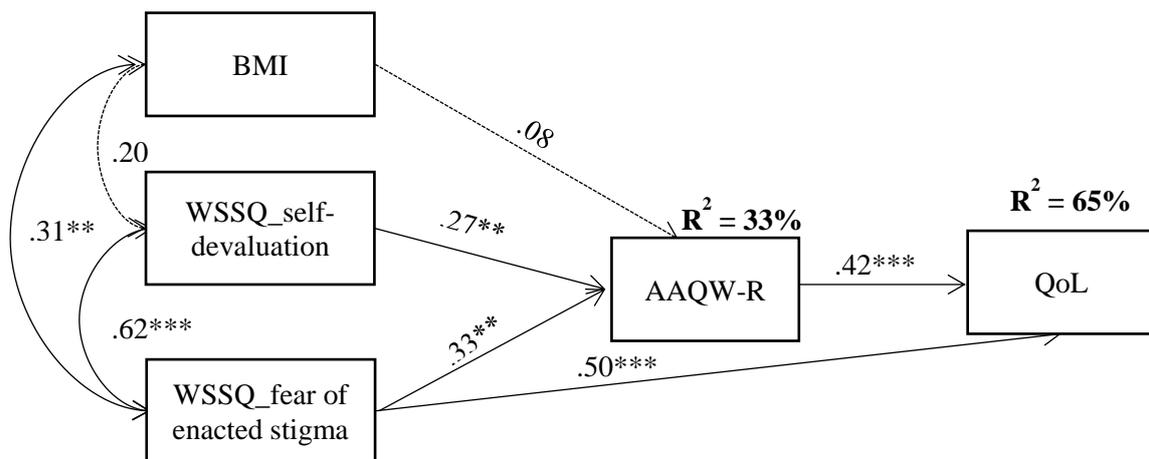


Figure 3. Path Model for the group with Binge Eating ($n = 100$).

Note. * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$; Standardized path coefficients among variables are presented. Dotted lines represent non-significant path coefficients.

Finally, the critical ratio differences were calculated to test for differences between both groups among all parameter estimates. Results showed that only the parameters coefficients in the path between AAQW-R and QoL had a statistically significant difference ($Z = 2.257, p < .05$). For the group without binge eating the standardized regression weight was $\beta = 0.277, p < .001$ whereas for the group with binge eating was $\beta = 0.537, p < .001$. This suggests that the relationship between AAQW-R and QoL seems to be stronger in the group with binge eating than in the group without binge eating.

DISCUSSION

The negative consequences of the widespread weight-related stigmatization are well known and can lead to the development of weight self-stigma (e.g., Puhl & Heuer, 2009; Puhl & Latner, 2007; Sutin & Terracciano, 2013), which has been related to poorer health-related outcomes (Durso & Latner, 2008; Lillis et al., 2010). Moreover, literature emphasizes differences between individuals with and without binge eating (e.g., Bulik et al., 2002; Elfhag & Rossner, 2005; Herbozo et al., 2015; Wilfley et al., 2003). The current study contributes to the understanding of these differences by testing the mediator role of weight-related experiential avoidance on the relationship between self-weight-stigma (both self-devaluation and fear of enacted stigma) and obesity-related quality-of life (while controlling for BMI). Furthermore, the model was tested in two groups of women with overweight or obesity, one group with binge-eating symptoms and another without binge-eating symptomatology.

As expected, weight-self-stigma showed moderate and positive associations with weight-related experiential avoidance, binge-eating symptomatology and poorer obesity-related quality-of-life. Similarly, individuals with internalized weight stigma had already been found to present unhealthy eating patterns, shame, experiential avoidance patterns related to their own weight and reduced health-related quality-of-life (e.g., Durso, Latner et al., 2012; Latner, et al., 2013; Lillis et al., 2010).

On the other hand, BMI was only weakly related with all the study's variables. Interestingly, evidence on BMI in relation to weight self-stigma and weight-related experiential avoidance has been somewhat inconsistent. While some studies found positive and moderate associations (Lillis et al., 2009, 2010, 2011), others failed to find significant correlations (e.g., Weineland et al., 2012). On the other hand, BMI has been found to be related to lower physical functioning (QoL dimension), but not with psychosocial status and social adjustment (e.g., Mannucci et al., 1999).

Furthermore, results from our independent *t*-tests are in line with previous research that consistently points to differences in overweight or obese individuals with and without binge-eating (e.g., Durso, Latner, White et al., 2012; Herbozo et al., 2015; Vancampfort et al., 2014). In

fact, in our sample, women with binge eating showed higher BMI and significantly more internalized weight-stigma and weight-related experiential avoidance patterns and poorer quality-of-life, than women without binge-eating. Previous research had already established that among those struggling with overweight and obesity those with BE symptoms tend to present higher BMI, weight self-stigma (Durso, Latner, White et al., 2012) and reduced physical and psychological quality-of-life (Kolotkin et al., 2004; Mannucci et al., 1999; De Zwaan et al., 2002). However, as far as we know, no study had yet explored differences between these two groups concerning experiential avoidance patterns. Thus, our results add to previous knowledge by suggesting that women with BE symptoms tend to use more avoidance, control or suppression strategies to deal with their unwanted weight-related thoughts and emotions, even when compared to overweight or obese women without binge-eating. In fact, binge-eating episodes have been considered as attempts to control, suppress or avoid difficult and unwanted internal experiences (e.g., Gianini et al., 2013; Lillis et al., 2011). Also, these results seem to corroborate the emotional regulation model of binge-eating that proposes that binge-eaters have additional emotional regulation difficulties and may be considered a distinctive neurobiological phenotype within obesity (Leehr et al., 2015).

Moreover, our study contributes to the existent literature by finding a mediator effect of the tendency to use avoidance and inflexible strategies to deal with weight-related unwanted thoughts and emotions on the relationship between weight self-stigma (both self-devaluation thoughts and fear of discriminated against due to one's weight) and quality-of-life in women with overweight or obesity seeking nutritional treatment, even when controlling for BMI. Overall, our model explained 38% of weight-related experiential avoidance and 58% of obesity-related quality-of-life.

In addition, results from the mediational analysis revealed that the relationship between weight self-stigma (self-devaluation) on quality-of-life was fully mediated by the tendency to control or avoid weight-related undesirable thoughts and emotions. Therefore, it seems that the internalized negative weight stigma messages are related to poorer quality-of-life, when women become trapped in avoidance and inflexible strategies to deal with their weight-related unwanted internal experiences.

Remarkably, fear of enacted stigma presented both a direct and indirect effect (through weight-related experiential avoidance) on obesity-related quality-of-life. The direct effect was the largest, suggesting the important impact that being afraid of being discriminated against in social situations due to one's own weight holds on one's quality-of-life. Although less dominant, and partial, this relationship is also mediated by the tendency to escape, avoid or control their weight-related thoughts and feelings.

Particularly interesting in this study was the fact that our model was not invariant across groups. This finding adds to previous knowledge highlighting the crucial role that weight-related self-stigma and weight-related experiential avoidance play on quality-of-life, especially for women with BE. Previously, Lillis et al. (2011) suggested that binge eating behaviors may arise, at least partially, from the use of food as a disrupted attempt to regulate negative emotions. Our findings seem to support this assumption, corroborating the emotional regulation model that advocates that individuals with binge-eating have poorer emotional regulation strategies, even when compared with other individuals without binge-eating. In turn, these disturbed emotional regulation strategies (such as experiential avoidance) have been consistently linked to poorer outcomes (e.g., Leehr et al., 2015; Gianini et al., 2013).

Taken together, these findings emphasize the negative role of weight self-stigma, particularly fear of being discriminated by others in social situations and weight-related experiential avoidance on obesity-related quality-of-life. Moreover, even when controlling for BMI, the presence of binge-eating symptoms seems to be accompanied by higher levels of weight self-stigma and experiential avoidance strategies and reduced quality-of-life. This seems to support the awareness that BE impairs individuals' lives beyond their weight.

The present study has some limitations. The first relies on the cross-sectional nature of the data used, which prevents assumptions of causality. Clearly, these results need to be replicated using longitudinal designs, in order to properly confirm the results found. Furthermore, the assessment of binge-eating symptoms relied on BES scores. Ideally, other methods (e.g., structured interview) should be used to confirm binge-eating severity. However, a recent study (Duarte et al., 2015) found that BES scores above 17 are indicative of significant binge eating symptomatology. Likewise, the sample is comprised only of adult women, which compromises data generalization to overweight and obese male or adolescent populations. Also, it is known that self-reported measures can introduce bias, which may influence results. Finally, our model can be considered limited as other variables (e.g., unhealthy eating patterns, self-criticism, self-disgust) may contribute to decrease obesity-related quality-of-life. Nonetheless, we specifically intended to explore the role of internalized stigma and weight-related experiential avoidance patterns on obesity-related quality-of-life.

To sum up, the present study makes a relevant contribution for professionals working with adult populations seeking to lose weight, by highlighting the role of weight self-stigma and weight-related experiential avoidance tendencies on quality-of-life, especially for those with binge-eating symptoms. Furthermore, it provides empirical support for the need to have differentiated interventions when treating individuals trying to lose weight, as those with binge-eating seem to pose distinct clinical challenges. Overall, interventions should target individual's

weight self-stigma and experiential avoidance patterns, by cultivating a more accepting and compassionate way of dealing with those unwanted weight-related thoughts and emotions, in order to improve their quality-of-life.

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EMPIRICAL STUDY IV |

Finding the link between internalized weight-stigma and binge eating behaviors in Portuguese adult women with overweight and obesity:
The mediator role of self-criticism and self-reassurance

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Finding the link between internalized weight-stigma and binge eating behaviors in Portuguese adult women with overweight and obesity: The mediator role of self-criticism and self-reassurance

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ABSTRACT

Literature has emphasized the negative role of internalized self-stigma in unhealthy eating behaviors in individuals with overweight and obesity. Still, less is known about the psychological processes that mediate this relationship. Self-criticism and the inability to reassure the self are considered to play crucial roles on eating behaviors. This study aims to: 1) explore the associations between BMI, weight self-stigma, self-criticism, self-reassurance and binge-eating; 2) explore differences in weight self-stigma and self-criticism tendencies between women with and without Binge Eating Disorder (BED); 3) test the mediator effect of self-criticism and self-reassurance on the relationship between weight self-stigma and binge-eating severity. Participants were 125 Portuguese adult women with overweight and obesity (MBMI= 34.44; SD =5.51). Participants were weighted and completed a set of self-report measures. BED was assessed through a clinical structured interview. Results showed that women with BED display higher levels of weight self-stigma and self-criticism and lower tendencies to be self-reassuring, than women without BED. Additionally, the mediation model tested indicated that the effect of weight self-stigma on binge eating severity was in part partially mediated by a self-to-self-relationship that is critical, harsh and punitive and by a decreased ability to be reassuring when facing setbacks. Overall, the model accounted for 45% of binge eating symptoms severity. These findings may inform clinical practice with clients who present high levels of weight self-stigma. Results suggest the relevance of targeting self-criticism and promoting a self-to-self relationship that is caring and reassuring, as a way of diminishing binge eating behaviors.

KEYWORDS: Weight self-stigma; Obesity; Binge-eating; self-criticism and self-reassurance; Path analysis

HIGHLIGHTS

- Weight self-stigma was positively correlated with self-criticism and binge eating.
- Weight self-stigma was negatively associated with self-reassurance.
- Significant differences between women with and without BED were found.
- Self-criticism and self-reassurance are relevant processes in binge eating symptoms.
- Clinical interventions should focus on the development of self-compassion skills.

INTRODUCTION

Weight stigma refers to discriminatory attitudes towards people with overweight and obesity, and has a negative impact on the life of individuals with overweight and obesity (e.g. Puhl & Heuer, 2010). Even in the absence of perceived discrimination, the perception of being a target of stigma is related to poorer health (e.g., Ratner, Halim, & Amodio, 2013). Moreover, weight stigma is associated with disordered eating behaviors (O'Brien et al., 2016; Vartanian & Porter, 2016), particularly binge eating (Ashmore, Friedman, Reichmann, & Musante, 2008; Lillis, Hayes, & Levin, 2011). Additionally, this weight bias discrimination tends to be internalized by individuals with overweight and obesity reflecting negative self-evaluations of one's weight and physical appearance and perceived discrimination (Durso & Latner, 2008; Lillis, Luoma, Levin, & Hayes, 2010). In turn, this is linked with negative health outcomes not exclusively attributed to obesity itself (Latner, Durso, & Mond, 2013). Weight self-stigma is correlated with psychological distress and disordered eating (e.g. Durso et al., 2012; Pearl & Puhl, 2014; Schvey & White, 2015) and affects the quality-of-life of individuals with overweight and obesity (Farhangi, Emam-Alizadeh, Hamed, & Jahangiry, 2016; Latner, Barile, Durso, & O'Brien, 2014; Palmeira, Pinto-Gouveia, & Cunha, 2016a).

Empirical evidence suggests that individuals who internalize weight-based stereotypes are prone to engage in binge eating (Puhl, Moss-Racusin, & Schwartz, 2007). In fact, eating is a common way for individuals with overweight and obesity to cope with weight-related discrimination and stigmatization experiences (Puhl & Brownell, 2006). Additionally, individuals with overweight and obesity with binge eating present poorer health outcomes and quality-of-life than those without binge eating (see Baiano et al., 2014 for a meta-analysis). Specifically, individuals with overweight and obesity who binge eat have higher levels of eating psychopathology, greater medical and psychiatric morbidity (e.g. Bulik, Sullivan, & Kendler, 2002; Herbozo, Schaefer, & Thompson, 2015), and present more ineffective strategies of emotional regulation (e.g. Gianini, White, & Masheb, 2013).

As a result of weight self-stigma, individuals may engage in critical and punitive internal dialogues towards the self, i.e., self-criticism (Gilbert, Clarke, Hempel, Miles, & Irons, 2004; Gilbert & Irons, 2005). Self-criticism has been conceptualized as a harsh and punitive way of self-to-self relating, particularly in the face of setbacks or when things go wrong (Gilbert et al., 2004). Although it may be rooted in a desire to self-improve and self-correct, this strategy usually backfires, given that self-criticism focuses on and emphasizes one's flaws and feelings of inferiority (Gilbert et al., 2004; Gilbert & Irons, 2005). Unintentionally, this may lead to increased negative affect, which is a well-known predictor of binge eating episodes (Gianini et al., 2013). On the other hand, the more toxic and harsh form of self-criticism involves feelings of aversion

and contempt towards the self (Gilbert et al., 2004; Gilbert & Irons, 2005). This desire to persecute and punish the self and has been consistently related to more severe forms of psychological suffering (e.g., Castilho, Pinto-Gouveia & Duarte, 2015). A recent study showed that harsh self-criticism mediates the relationship between body-image shame and binge eating in a sample of 329 non-overweight women (general population and college students) (Duarte, Pinto-Gouveia, & Ferreira, 2014). In fact, although a few studies have shed some light on how self-criticism and binge eating are related, little is known about the impact of self-criticism, specifically in individuals with overweight and obesity. A study conducted in a sample of patients with eating disorders found that self-criticism predicted depressive symptoms and shape and weight over-evaluation (Dunkley & Grilo, 2007). Another study, in a sample of 170 patients with binge eating disorder, found that self-criticism was an important mediator between emotional abuse and body dissatisfaction and depression (Dunkley, Masheb, & Grilo, 2010). Nevertheless, although the role of self-criticism in eating disorders has been growingly unveiled (Goss & Allan, 2014), little is known about its contribution to the impact of weight self-stigma in binge eating symptoms in people with obesity and overweight.

In contrast to self-criticism, being self-kind, self-compassionate and able to reassure the self when things go wrong seem to be crucial psychological processes that protect against disordered eating (see Braun, Park, & Gorin, 2016, for a review). Some evidence suggests that self-compassion negatively predicts eating disorders symptoms (Geller, Srikameswaran, & Zelichowska, 2015; Kelly, Vimalakanthan, & Carter, 2014; Taylor, Daiss, & Krietsch, 2015). Nevertheless, it is noteworthy that these studies were conducted in samples from the general population or college students, and not individuals with overweight or obesity.

Compassion-based approaches to eating disorders have been recently developed (Goss & Allen, 2014) and seem to be effective in reducing binge eating (Kelly & Carter, 2015). These approaches specifically aim to promote the development of a self-to-self- relationship characterized by a kind, caring and supportive attitude, instead of being critical, punitive and harsh towards oneself (Gilbert et al., 2014; Neff, 2003). In fact, some evidence points out that when people with overweight and obesity experience setbacks, they tend to become self-critical and have difficulty in being self-compassionate. In turn, this is linked with struggles in maintaining healthy behaviors (e.g., Gilbert et al., 2014). Thus, this calls for the importance of exploring the role of self-reassurance in binge eating in patients with overweight and obesity. Additionally, studies about how self-compassion relates to weight self-stigma and binge eating are still scant, with only one study showing that self-compassion mediated the impact of weight self-stigma on mental and physical health outcomes (Hilbert, Braehler, Schmidt, Löwe, Häuser, & Zenger, 2015).

The current study has three aims: 1) to study the associations between weight self-stigma, self-criticism, self-reassurance and binge-eating in a sample of women with overweight or obesity with and without Binge Eating Disorder (BED). We expect positive and moderate to strong correlations between weight self-stigma, hated and inadequate-self and binge eating symptoms. Conversely, moderate to strong negative associations are expected between the above mentioned variables and reassured-self; 2) to explore differences between binge-eaters and non-binge-eaters in weight self-stigma, self-criticism and self-reassurance. We expect that women with BED present higher levels of weight self-stigma and self-criticism and lower self-reassuring abilities than those without BED. The third goal was to test whether self-criticism and self-reassurance mediate the relationship between weight self-stigma and binge eating symptoms.

METHODS

Participants

From the 134 Portuguese women with overweight or obesity seeking nutritional treatment in Coimbra invited to participate, nine declined. A sample of 125 participants were interviewed by experienced clinical psychologists using the Portuguese versions of Eating Disorder Examination Interview (Ferreira, Pinto-Gouveia, & Duarte, in preparation) and the appendix H from Structured Clinical Interview for DSM-IV TR (SCID; translated by Maia, 2006) to determine the existence of Binge Eating Disorder. BED diagnosis was established following the criteria from DSM-V. According to DSM-V, 54 participants (43.2%) presented BED and 73 participants did not. Participants' mean age was 41.14 ($SD = 8.72$), with an average of 14.96 ($SD = 3.15$) years of education. Sample's average Body Mass Index (BMI) was 34.44 ($SD = 5.51$). Concerning marital status, 62.4% were married and 20.8% were single. The majority came from low to medium socio-economic status (87.21%).

Procedures

Prior to data collection, the current study was approved by the ethics committee of Coimbra's University Hospital (CHUC) and by the scientific committee of the Psychology Faculty of University of Coimbra, Portugal. Participants were invited to participate by a research team member on the day of their nutritional appointment. Participants were informed about the voluntary and confidential nature of the collaboration, as well as the main study's goals. After signing a written informed consent, participants were screened for BED individually and

completed the self-report measures. The questionnaires took approximately 20 min to be completed.

Measures

Demographic Data. Participants' age, years of education and current height were self-reported.

BMI. Participants were weighted with their clothes (without shoes) using the same Body Composition Analyzer (Tanita TBF-300) accurate to 0.1 kg.

Weight self-stigma Questionnaire (WSSQ; Lillis et al., 2010; Palmeira, Cunha, & Pinto-Gouveia, 2016b) includes 12 items that assess weight self-stigma in people with overweight and obesity. It measures negative thoughts and emotions about being overweight and fear of enacted stigma. Participants are asked to rate each item in a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree). Higher scores indicate higher levels of weight self-stigma. Both the original ($\alpha = .88$) and Portuguese ($\alpha = .85$) versions presented good psychometric properties (Lillis et al., 2010; Palmeira et al., 2016b).

Forms of Self-Criticizing/Attacking & Self-Reassuring Scale (FSCRS; Gilbert et al., 2004; Castilho et al., 2015) is 22-item self-report measure with three subscales: inadequate-self (focused on personal inadequacies and feelings of inferiority, “*There is a part of me that feels I am not good enough*”), hated-self (focused on condemning and attacking the self; “*I have a sense of disgust with myself*”) and reassured-self (focused on being warm and in comforting the self; “*I am gentle and supportive with myself*”). It measures the tendency to criticize or reassure the self when facing failures or errors. Items are rated on a 5-point scale (0 = “Not at all like me” to 4 = “Extremely like me”). Both the original and Portuguese versions revealed good internal consistencies in clinical and non-clinical samples ranging from .83 to .91 (Castilho et al., 2015; Gilbert et al., 2004).

Binge Eating Scale (BES; Gormally et al., 1982; Duarte et al., 2015) consist of 16 items. Participants are asked to choose which of the given statements best describes their experience concerning binge-eating symptoms. Scale's scores range from 0 to 46, with higher scores reflecting higher severity of binge eating symptoms. Both the original and Portuguese versions showed high internal consistency ($\alpha = .88$).

Table 1 displays the internal consistency for all variables in study.

Table 1

Pearson moment correlation on all variables for the total sample (N = 125).

Measures	<i>M</i>	<i>SD</i>	α	1	2	3	4	5	6
1. BMI	34.44	5.51	-	-					
2. Binge eating	21.06	9.67	.89	.04	-				
3. Weight self-stigma	41.50	9.37	.91	.04	.62***	-			
4. Hated self	5.19	3.54	.65	.16	.49***	.50***	-		
5. Inadequate self	19.06	7.35	.87	-.03	.42***	.60***	.68***	-	
6. Reassured self	16.79	6.64	.89	-.12	-.52***	-.55***	-.52***	-.42***	-

Note. *** $p < 0.001$; BMI = Body Mass Index.

Data analysis

Data analyses were performed using IBM SPSS Statistics 20 and AMOS software. Preliminary data analyses were performed to explore the adequacy of the data. Pearson correlation coefficients were conducted to examine the associations between BMI, WSSQ, hated, inadequate and reassured-self and BES (Cohen, Cohen, West, & Aiken, 2003). To explore differences between binge eaters and non-binge eaters in all variables, independent sample *t* tests and Cohen's *d* effect size were calculated (Field, 2013). Cohen's cutoff values were followed: Cohen's *d* between 0.2 and 0.4 - small effects; between 0.5 and 0.7 - medium effects and above 0.8 - large effects (1988 cited in Tabachnick & Fidell, 2007). Finally, to test whether self-criticism and self-reassurance mediated the relationship between weight self-stigma (WSSQ) and binge eating symptomatology (BES), while controlling for BMI, a path analysis was used. Path analysis allows the simultaneous examination of structural relationships, as well as the examination of direct and indirect paths (e.g., Schumacker & Lomax, 2004). The Maximum Likelihood method was chosen because it allows for the estimation of all model path coefficients and to compute fit statistics. To assess the model fit we relied on several goodness-of-fit measures and recommended cut-points (Kline, 2005): Chi-Square (χ^2), Normed Chi-Square ($\chi^2/d.f.$), Comparative Fit Index ($CFI \geq 0.95$, desirable; Hu & Bentler, 1998), Tucker-Lewis Index ($TLI \geq 0.95$, desirable; Hu & Bentler, 1998), Goodness of Fit Index ($GFI \geq 0.95$, desirable; Jöreskog & Sörbom, 1996), Root Mean Square Error of Approximation ($RMSEA \leq 0.05$, good fit; Kline, 2005) with a 95% confidence interval. The bootstrap with 2000 resamples and 95% bias-corrected confidence interval was used to analyze the mediational effects. The effect is considered statistically significant at $p < .05$ if the interval between the lower and the upper bound does not include zero (Kline, 2005).

RESULTS

Preliminary Data Analyses

All variables presented acceptable values of skewness and kurtosis ($SK < |3|$ and $Ku < |8 - 10|$) which indicate no severe bias to normal distribution. Multicollinearity was not found ($VIF < 5$; Kline, 2005). Also, the analysis of multivariate outliers using Mahalanobis distance statistic (D^2) did not detect the presence of any outlier. There were no missing data.

Correlation analysis

Table 1 displays the means, standard deviations and Pearson's correlation coefficients for all variables in study. As can be seen, BMI was not significantly related to any variable. WSSQ showed moderate and positive associations with hated-self, inadequate-self and BES. In turn, reassured-self revealed negative and moderate associations with WSSQ, BES, hated and inadequate-self.

Differences between binge eaters and non-binge eaters

Table 2 depicts the means, standard deviations, *t*-test differences and Cohen's *d* for all variables for the two groups (with and without BED). Results reveal that binge eaters presented significantly higher levels of binge eating symptoms, weight self-stigma, hated and inadequate self, and lower levels of reassured-self when compared with non-binge eaters. Differences regarding binge eating symptoms, and weight self-stigma reflect very large effects, whereas differences in hated, inadequate and reassured-self reflect small effect sizes (Table 2). Additionally, no statistically significant differences were found regarding BMI.

Table 2

Means (*M*), standard deviations (*SD*), *t*-test differences and Cohen's *d* effect size for all variables in both groups (*N* = 125).

	With BED		Without BED		<i>t</i> (<i>df</i>)	<i>p</i>	Cohen's <i>d</i>
	(<i>n</i> = 54)		(<i>n</i> = 71)				
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
BMI	34.70	5.95	34.24	5.19	0.455 (123)	.650	0.08
Binge eating	28.42	7.34	15.45	7.14	9.943 (123)	<.001	1.80
Weight self-stigma	46.06	7.52	38.02	6.93	5.227 (123)	<.001	0.94
Hated self	6.11	3.65	4.50	3.32	2.555 (123)	.012	0.46
Inadequate self	20.98	7.52	17.63	6.93	2.564 (123)	.012	0.46
Reassured self	13.74	6.51	19.07	5.80	-4.806 (123)	<.001	0.47

Note. BMI = Body Mass Index;

Path analysis

A path analysis was conducted to test the mediator effect of self-criticism (both hated and inadequate-self dimensions) and self-reassurance on the relationship between weight self-stigma and binge eating symptoms severity, while controlling BMI. The initial model was tested through a fully saturated model with 20 parameters. Model fit indices were not reported as fully saturated models have a perfect model fit. The analysis of the path coefficients from the fully saturated model revealed four non-significant direct paths, namely: the path from BMI → BES (*t* statistics = - 0.072; *p* = .550); BMI → inadequate-self (*t* statistics = - 0.062; *p* = .515); inadequate-self → BES (*t* statistics = - 0.097; *p* = .459); BMI → reassured-self (*t* statistics = - 0.137; *p* = .122) and were progressively removed. The final model (Figure 1) included all the remaining statistically significant path coefficients. The model presented an excellent model fit: $\chi^2(4, N = 125) = 3.699$, *p* = 0.448; $\chi^2/d.f. = 0.925$; GFI = 0.990; CFI = 1.000; TLI = 1.000; RMSEA = 0.000, [CI = 0.000; 0.131]; *p* = .596.

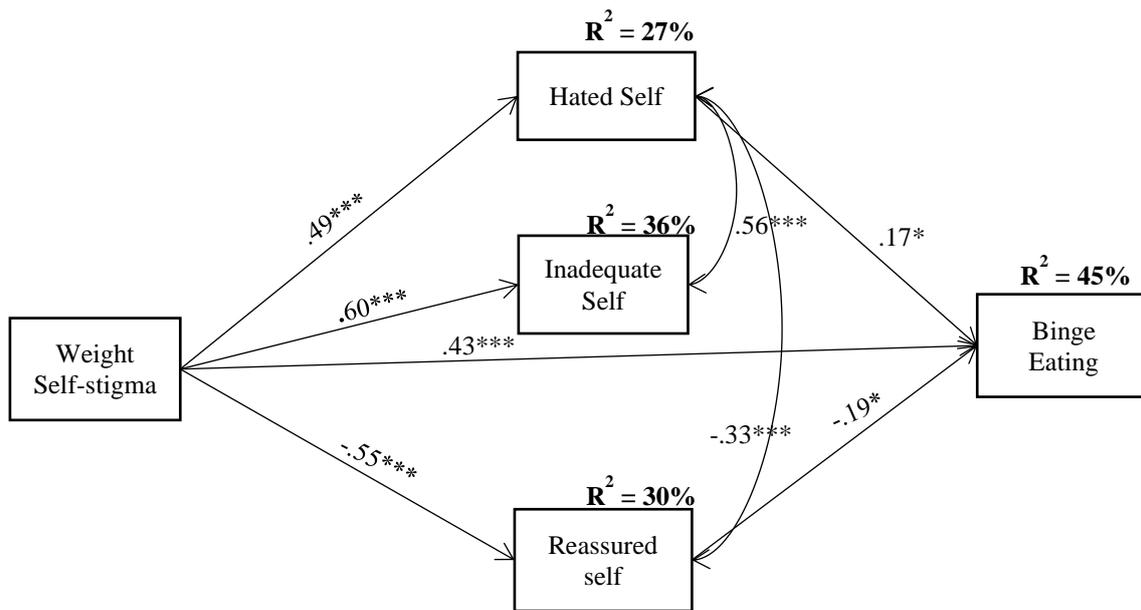


Figure 1. Final Path Model (N = 125).

Note. * $p < .05$; *** $p < .001$; only significant standardized path coefficients among variables are presented.

Mediation analysis

Bootstrap with 2000 resamples and 95% bias-corrected confidence interval was used to analyze the total, direct and indirect effects. Results revealed that weight self-stigma showed both direct and indirect effects on BES. The direct effect of WSSQ on BES was $\beta = 0.433$ based on 95% CI: (0.267; 0.579, $p = .001$) and the indirect effect was $\beta = 0.188$ based on 95% CI: (0.086; 0.314, $p = .001$). This indirect effect occurred through hated-self ($b = 0.493 \times 0.173 = 0.085$) and reassured-self ($b = -0.552 \times -0.187 = -0.103$). Moreover, hated-self ($\beta = 0.173$; based on 95% CI: .005; .330, $p = .043$) and reassured-self ($\beta = -0.187$; based on 95% CI: -0.377; -0.007, $p = .039$) also presented significant direct effects on BES. The total effect of WSSQ on BES was $\beta = 0.621$ based on 95% CI (0.512; 0.719, $p = .001$), that represent the sum of the standardized direct effect with the standardized indirect effect. Finally, BMI had a significant direct effect on hated-self ($\beta = 0.142$; based on 95% CI: 0.016; 0.268, $p = .026$) and an indirect effect on BES (through hated-self) of $\beta = 0.025$ based on 95% CI (0.001; 0.075, $p = .032$). The final model (Figure 1) accounted for 27% of the variance of hated-self, 30% of reassured-self, 36% of inadequate-self and 45% of binge eating symptoms.

DISCUSSION

Recently, studies have emphasized the damaging impact of internalized weight-stigma in healthy eating behaviors of individuals with overweight and obesity (Ashmore et al., 2008; Pearl & Puhl, 2014; Schvey & White, 2015). Nonetheless, the psychological processes through which this relationship is operated on are still underexplored. The current study contributes to the existing literature by testing the mediator role of self-criticism and self-reassurance on the relationship between weight self-stigma and binge eating symptoms.

In line with previous studies (e.g., Ashmore et al., 2008; Durso et al., 2012), results from correlation analyses showed that weight self-stigma was positively and significantly associated with binge eating symptoms. As expected, participants with higher levels of weight self-stigma revealed higher self-criticism and less self-reassurance. To best of our knowledge, this is the first study to explore these results, although they corroborate that weight-stigma internalization is related to poor health outcomes (e.g., Ratner et al., 2013). Moreover, these results also seem to align with other studies that found that high self-criticism and low levels of self-compassion are associated with disordered eating behaviors (e.g., Duarte et al., 2014; Dunkley & Grilo, 2007, Dunkley et al., 2010). Interestingly, BMI was not significantly associated with any variable in study, which may have resulted from the reduced BMI variability from our sample. However, these results are consistent with studies that found that the negative impact of weight self-stigma on disordered eating goes beyond the impact of weight itself (Latner et al., 2013).

In addition, we sought to explore differences between women with and without BED. Contrarily to previous findings (e.g., Palmeira et al., 2016a), no difference across groups were found regarding BMI. Nonetheless, Palmeira et al. (2016a) asserted the presence of binge eating using BES scores, while the current study conducted a structured clinical assessment. Women with BED showed significantly higher levels of weight self-stigma and self-criticism and lower levels of self-reassurance, than women without binge-eating. This is consistent with previous findings that suggest that individuals with BED present poorer health outcomes when compared to those without BED (e.g., Bulik et al., 2002; Durso et al., 2012). Our study adds to the existent literature by showing that women with BED, when compared to women without BED, tend to adopt a more critical attitude towards the self and have lower abilities to reassure the self when facing setbacks or failures.

The major contribution of this study was to explore whether self-criticism and self-reassurance mediated the influence of weight self-stigma on binge eating symptoms, while controlling for BMI. Results suggest that the effect of weight self-stigma on binge eating symptoms partially occurs through a harsh and attacking attitude towards the self (hated-self) and

through a decreased ability in reassuring the self when things go wrong. Interestingly, the less toxic and harsh form of self-criticism (inadequate-self) did not mediate this relationship. It seems that women who internalize stigmatizing weight messages tend to develop a self-to-self relationship that is characterized by a harsh and punitive attitude, as well as the inability to reassure the self when facing setbacks. In turn, this way of dealing with difficulties and failures seems to be related to higher severity of binge eating symptoms.

Still, it is noteworthy that results also revealed a direct effect of weight self-stigma on binge eating symptoms. This stresses the importance of weight stigma internalization on women's tendency to engage in binge eating. Another possibility is that other unexplored processes might contribute to this relationship. In fact, research has shown that weight-related experiential avoidance is an important process on the relationship between weight self-stigma and quality-of-life (e.g., Lillis et al., 2011; Palmeira et al., 2016a). Finally, BMI also had an indirect effect on binge-eating symptoms, through its effect on hated-self. It seems that presenting a higher BMI is indirectly linked to more binge-eating symptoms due to one's tendency to attack and condemn oneself when facing setbacks.

This study has some limitations: 1) its cross-sectional design, prevents us from inferring causality. Future studies should consider replicating our findings following a longitudinal design; 2) the sample used comprised only adult women, which does not allow to generalize the results for other genders or age groups. In fact, being BED the most common eating disorder in men it would be worth examining the existence of gender differences on the relationship between weight self-stigma and binge eating; 3) results concerning the hated-self dimension should be interpreted with caution given its low internal consistency; 4) the model tested is limited, as other processes (e.g., decentering abilities, rumination) may be involved in the relationship between weight self-stigma and binge eating symptoms. Still, our goal was to explore the role of self-criticism and self-reassurance in this relationship. Future studies should explore our findings using a multi-group approach (which our sample size did not allow) to test differences between individuals with and without BED.

Nevertheless, the current study has significant strengths: a) our study comprised a specific clinical sample of women with overweight and obesity, rather than a community sample; b) BMI and BED were not self-reported, but assessed through a body composition analyzer and a clinical structured interview, respectively; c) this is the first study to explore the role of weight self-stigma and self-criticism on binge-eating symptoms.

In conclusion, our findings provide evidence that may be useful for clinicians working with women with overweight and obesity, particularly those with BED. Specifically, it suggests that therapists should consider weight self-stigma and the more toxic form of self-criticism (hated-

self) as important aspects to tackle in therapy in order to reduce binge eating symptoms. One way to address these aspects is through the development of self-compassion, using a compassionate-based approach such as Compassion Focused Therapy (CFT). In fact, CFT was specifically developed to provide a de-shaming setting, to decrease patients' shame feelings and self-criticism, and to help them develop a warmer and more caring self-to-self relationship, particularly when facing difficulties or failure (e.g., Goss & Allan, 2014). In this context, being compassionate towards oneself seems to provide intrinsic motivation and the ability to maintain healthy behaviors even when setbacks occur (e.g., Neff, Rude, & Kirkpatrick, 2007).

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Contributors

Authors Lara Palmeira, Marina Cunha and José Pinto-Gouveia designed the study and wrote the protocol. Authors Lara Palmeira and Sérgio A. Carvalho conducted literature searches, provided summaries of previous research studies, conducted the statistical analysis and wrote the manuscript. Authors Marina Cunha and José Pinto-Gouveia supervised all stages of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of Interest

The authors declare no conflicts of interest.

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EMPIRICAL STUDY V |

Exploring the efficacy of an acceptance, mindfulness & compassionate-
based group intervention for women struggling with their weight
(Kg-Free): A randomized controlled trial

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Exploring the efficacy of an acceptance, mindfulness & compassionate-based group intervention for women struggling with their weight (Kg-Free):

A randomized controlled trial

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ABSTRACT

This randomized-controlled trial aims to test the efficacy of a group intervention (Kg-Free) for women with overweight or obesity based on mindfulness, ACT and compassion approaches. The intervention aimed to reduce weight self-stigma and unhealthy eating patterns and increase quality-of-life (QoL). Seventy-three women, aged between 18-55 years old, with BMI ≥ 25 without binge-eating seeking weight loss treatment were randomly assigned to intervention or control groups. Kg-Free comprises 10 weekly group sessions plus 2 booster fortnightly sessions, of 2h30 hours each. The control group maintained Treatment as Usual (TAU). Data was collected at baseline and at the end of the Kg-Free intervention. Overall, participants enrolled in Kg-Free found the intervention to be very important and helpful when dealing with their weight-related unwanted internal experiences. Moreover, when compared with TAU, the Kg-Free group revealed a significant increased health-related QoL and physical exercise and a reduction of weight self-stigma, unhealthy eating behaviors, BMI, self-criticism, weight-related experiential avoidance and psychopathological symptoms at post-treatment. Results for self-compassion showed a trend towards significance, whereas no significant between-groups differences were found for mindfulness. Taken together, evidence was found for Kg-Free efficacy in reducing weight-related negative experiences and promoting healthy behaviors, psychological functioning, and QoL.

KEYWORDS: Overweight and Obesity; Weight-self-stigma; Obesity-related Quality-of-life; RCT; Kg-Free Intervention.

INTRODUCTION

One of the most serious worldwide health problems is obesity, especially as it is associated with several health problems (e.g., diabetes, hypertension, high cholesterol, heart and liver disease, sleep apnea, osteoarthritis, depression and anxiety disorders) and diminished quality-of-life (e.g., Franz et al., 2007). Obesity treatments typically include dietary restriction and physical activity prescriptions, usually producing significant short-term weight losses (e.g., Lasikiewicz, Myrissa, Hoyland, & Lawton, 2014). However, the majority of the individuals regain their initial weight within 5-years (Wilson & Brownell, 2002). A growing body of empirical data suggests that not only diet-focused interventions may be ineffective and counterproductive, but may also pose significant unwanted harmful effects such as increased body dissatisfaction, disordered eating behaviors (e.g., chronic dieting, overeating), shame and self-criticism, and have a damaging impact on individuals' health and well-being (e.g., Bacon et al., 2002; Tylka et al., 2014).

Literature has been emphasizing the role of shame and self-criticism as important transdiagnostic processes involved in several psychological and health-related medical conditions, including eating psychopathology and obesity (Gilbert et al., 2014; Kelly & Carter, 2013). Additionally, the impact of weight stigma may reach almost every life domain of people with overweight and obesity. Weight stigma may be internalized reflecting personal experiences of shame, negative self-evaluations as well as perceived discrimination, that have been related to medical noncompliance, avoiding seeking medical care and has been considered a major predictor of poorer outcomes (Latner, Durso, & Mond, 2013; Lillis, Luoma, Levin, & Hayes, 2010; Palmeira, Pinto-Gouveia, & Cunha, 2016a). Thus, it seems that focusing only on weight loss is not sufficient to promote health and well-being of those living with a chronic illness such as obesity. Therefore, targeting the psychological processes that are linked to weight gain is crucial to help people to develop a healthier and more accepting relationship with their eating, weight, and weight-related experiences in order to increase quality-of-life (Hilbert, Braehler, Haeuser, & Zenger, 2013; Tapper et al., 2009; Tylka et al., 2014). Research has shown that health-focused interventions promote healthy eating behaviors and physical activity, improve health, (including the reduction of well-known risk factors such as elevated blood pressure, cholesterol and glucose), even without significant weight changes (e.g., Blaine, Rodman, & Newman, 2007; Tylka et al., 2014).

In fact, several psychological factors associated with weight regain (e.g., avoidance-based motivations, emotional eating, impulsivity and rigid control of eating) might reflect weight-related experiential avoidance patterns, which in turn have been related to poorer outcomes and

diminished quality-of-life (Lillis, Hayes, Bunting, & Masuda, 2009; Palmeira et al., 2016a). Weight-related experiential avoidance relates to being unwilling to stay in contact with difficult, weight and eating-related internal experiences (such as craving for food, fatigue, weight self-stigma) and attempts to avoid, control or change them (Lillis et al., 2009). Acceptance and Commitment Therapy (ACT; Hayes, Strosahl, & Wilson, 2012) specifically aims to reduce experiential avoidance patterns by increasing willingness and acceptance towards one's unwanted internal experiences. ACT fosters cognitive defusion (i.e., the ability to recognize thoughts as simply products of the mind and not necessarily the truth) and distress tolerance skills in order to promote committed actions driven by one's core life values.

Furthermore, the development of mindfulness skills is key for all ACT processes (Hayes et al., 2012). Mindfulness involves present moment experiences awareness with an open, accepting and non-judgmental attitude. Particularly regarding food and eating, the practice of mindfulness enhances awareness and clarity of emotional and sensory cues (e.g. hunger and satiety) and the ability to make healthier choices (Kristeller & Wolever, 2011). It may also help to create a more positive and accepting relationship with food, which in turn could lead to weight changes (O'Reilly, Cook, Spruijt-Metz, & Black, 2014).

Efficacy studies showed that ACT interventions can be effective to reduce weight self-stigma, disinhibit and emotional eating, psychological distress, weight loss and increase physical activity and health-related QoL (Forman et al., 2013; Lillis et al., 2009; Niemeier, Leahey, Reed, Brown, & Wing, 2012; Tapper et al., 2009). In addition, a recent literature review (O'Reilly et al., 2014) concluded that mindfulness-based interventions can be effective in reducing binge eating, emotional and external eating, food cravings, body image concerns and showed promising results for weight management.

Concomitantly, there is an increasing interest in developing self-compassion to promote wellbeing and decrease shame and self-criticism patterns (e.g., Gilbert, 2010). Self-compassion involves cultivating a kind, accepting and reassuring relationship with oneself, especially during challenging times (Gilbert, 2010; Neff & Dahm, 2015). It includes the sensitivity to one's suffering and a desire to prevent or alleviate it (Goetz, Keltner, & Simon-Thomas, 2010). Mindfulness is one of the key components of self-compassion, as one needs to be aware, open and able not to become overidentified with one's own suffering in order to be self-compassionate (Neff & Dahm, 2015). However, the concept of self-compassion goes beyond mindfulness as it involves an attitude of support and kindness towards oneself, instead of being critical and disparaging, as well as the recognition that suffering is an inherent part of the human condition. Individuals may need to learn mindfulness skills before practicing loving-kindness or other

compassion exercises, given that mindfulness is required for compassion and that both skills mutually enhance one another (Hofmann, Grossman, & Hinton, 2011; Kabat-Zinn, 1990; Neff & Dahm, 2015).

Research shows that self-compassion is associated with decreased body dissatisfaction and increased global mental health (Albertson, Neff, & Dill-Shackleford, 2015) and may buffer the relationship between weight self-stigma and health of individuals with overweight and obesity (Hilbert et al., 2015). Nevertheless, results from a qualitative study (Gilbert et al., 2014) suggest that people struggling with their weight find it hard (if not impossible) to be self-compassionate when dealing with relapses. In fact, when facing setbacks, many dieters tend to see themselves as failures, feeling shame and becoming self-critical rather than self-reassuring, which hinders the maintenance of healthy lifestyles and eating habits (Adams & Leary, 2007; Gilbert et al., 2014). Thus, developing self-compassion skills with people struggling with their weight and eating seems particularly relevant (Gilbert et al., 2014). Additionally, self-compassion has been linked to perceived self-efficacy and intrinsic motivation (e.g., Neff, Rude, & Kirkpatrick, 2007), less fear of failure and a higher tendency to try again when facing failures (Neely, Schallert, Mohammed, Roberts, & Chen, 2009).

It seems that all the above-mentioned skills (acceptance, cognitive defusion, distress tolerance, values and committed actions, mindfulness and self-compassion) may be key to maintain healthy behaviors in the current obesogenic environment where food is abundant and easily accessible and where sedentary lifestyles are common (Forman et al., 2015; Lillis et al., 2015).

ACT, mindfulness, and compassion-based interventions share a common ground, as they focus on promoting a more aware, kind, accepting and non-judgmental relationship with a person's experiences and oneself (Neff & Dahm, 2015; Neff & Tirsch, 2013). ACT and self-compassion both emphasize that mindfulness is crucial to develop cognitive defusion, acceptance and self-compassion abilities (Hayes et al., 2012; Neff & Tirsch, 2013). Moreover, compassion training (e.g., loving-kindness, Compassion Focused Therapy - CFT) may be combined with several cognitive-behavioral therapeutic techniques (Gilbert, 2010; Hofmann et al., 2011). Furthermore, some authors (Luoma & Platt, 2015; Neff & Tirsch, 2013) argue that most ACT protocols may benefit from explicitly targeting self-compassion, as it improves the ability to stick to health-related behaviors and decreases weight-stigma, shame, and self-criticism.

Although growing interest in integrating self-compassion in ACT and mindfulness-based interventions exists (Neff & Dahm, 2015; Neff & Tirsch, 2013), research on how these different yet related approaches might be integrated into comprehensive interventions is still scant. So far,

only one pilot study found promising results integrating ACT and CFT to increase self-compassion and diminish HIV-related stigma (Skinta, Lezama, Wells, & Dilley, 2015). Thus, we developed a 12-session group intervention (Kg-Free) for women with overweight and obesity that integrates mindfulness, ACT and self-compassion components.

This randomized controlled trial main goal was to test the efficacy of Kg-Free with women with overweight and obesity without binge eating. Kg-Free specifically aims at promoting quality-of-life and reducing weight self-stigma and unhealthy eating behaviors (emotional and uncontrolled eating) by targeting weight-related experiential avoidance and self-criticism. Our hypothesis is that after Kg-Free, participants will be more open, accepting and compassionate towards themselves and their unwanted internal experiences (especially those related to eating and weight), which will increase their well-being and quality-of-life. If a change occurs at this level, it is likely that participants will be increasingly able to engage in healthier behaviors even in the face of difficulties, which may influence their weight and obesity-related biochemical risk factors (e.g., cholesterol).

METHODS

Participants and procedures

Previously to data collection, ethical approval was obtained from all institutions involved. Participants were adult women, aged between 18 and 55 years old, with overweight and obesity ($BMI \geq 25$) without binge eating, enrolled in nutritional treatment for weight loss in primary care units and Hospitals from Coimbra's district, Portugal. Participants were recruited directly at the medical care units in the day of their appointment by a clinical psychologist (member of the research team), using an existent spare room. A brief overview of the treatment program was presented and participants were individually informed about the voluntary and confidential nature of the data.

Power analysis was calculated a priori using G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007) for ANCOVA analysis. Results indicated that a sample size of 26 per group ($N = 52$) was needed, using a significance level of .05 and a power of 80% to detect significant fixed effects, main effects, and interaction effects, with a large effect size ($f = 0.40$). Overall, 108 women were invited to take part in the study and six declined. Those who accepted to take part in the study signed a written informed consent. Only then, participants were screened for eligibility. Exclusion criteria included: a) Binge Eating Disorder assessed through EDE interview; b) Severe psychiatric problems (severe depressive episode, substance abuse, Bipolar disorder and

Borderline Personality Disorder) assessed through SCID-I and SCID-II; c) medical conditions that affect weight; d) medication that can cause significant weight or appetite changes. From the 102 that accepted to participate, 16 did not meet inclusion criteria. Figure 1 displays the flow of participants throughout the study in detail. To guarantee confidentiality a numerical unique code was assigned to each participant. Only one of the researchers (L.P.) had access to the participant's research code.

Study design

This is a randomized controlled trial, parallel group study conducted in Portugal from September 2014 to June 2016. After baseline assessment, 73 participants were randomly assigned to an experimental or to control conditions by a member of the research team, using a computer-based random allocation.

Participants in the experimental group received Kg-Free while maintaining their Treatment As Usual (TAU), which includes medical and nutritional appointments. At the same time, the control group maintained only TAU, at their local medical care units. The medical appointment in TAU includes a physical examination and addressing comorbidities. In nutritional appointments individuals are weighed, receive tailored dietary recommendations (according to one's needs and food preferences) and physical activity prescriptions (at least 3 times per week of moderate to high intensity physical exercise is usually recommended). Difficulties regarding weight loss plans are also addressed in both appointments. TAU does not include any psychological intervention. Data collection was carried out by clinical psychologists (blinded to participants' treatment condition). From the initial 36 participants allocated to Kg-Free, four failed to attend any session, one became severely depressed between the baseline assessment and program's first session, one was submitted to bariatric surgery and three dropped out after the first sessions. These nine participants were excluded from further analysis because it was not possible to obtain any data at post-treatment assessment. From the initial 37 participants allocated to TAU, one moved to another city, one was submitted to bariatric surgery and three more were scheduled but did not attend the second assessment. These five participants were also excluded from analysis. After the post-intervention assessment, participants in the TAU group were given the possibility to receive the intervention.

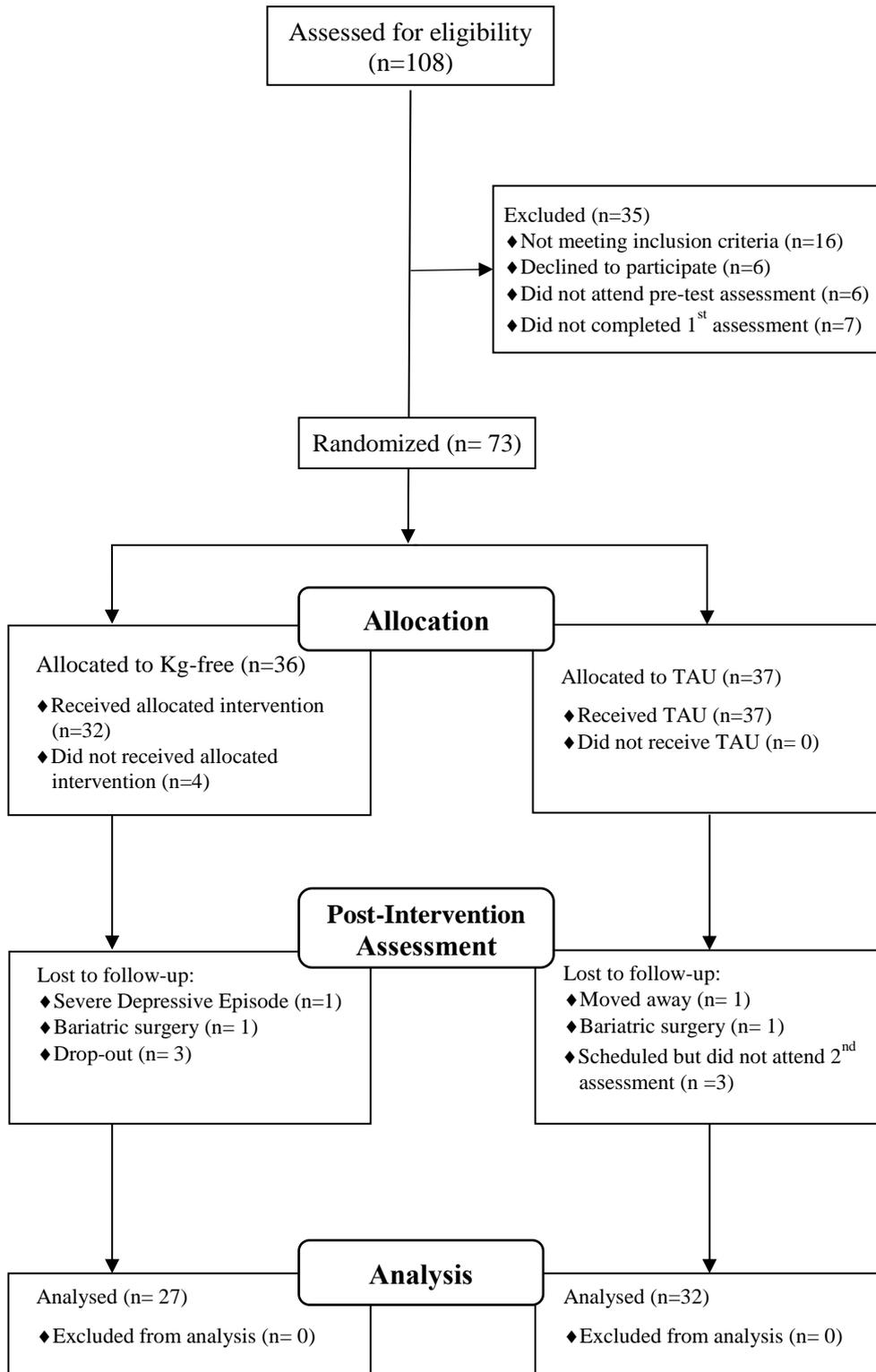


Figure 1. Flow of participants throughout the randomized controlled trial.

Table 1 displays baseline demographic characteristics across intervention and control groups after randomization.

Table 1

Socio-Demographic Sample Characteristics by Group at baseline.

	Kg-Free (n=36)		TAU (n=37)	
	M	SD	M	SD
Age	41.97	8.79	42.73	8.36
Years of education	14.94	3.03	15.35	3.45
BMI	34.82	5.26	33.65	4.83
	N	%	N	%
Marital status				
Single	7	19.8	4	10.8
Married	26	72.2	27	73
Divorced	3	8.3	6	16.2
Socioeconomic status				
Low	8	22.2	4	10.8
Medium	22	61.1	31	83.8
High	6	16.7	2	5.4
Number of previous diet attempts				
None	3	8.3	5	13.5
Less than 5	19	52.8	20	54.1
From 5 to 10	9	25	10	27
More than 10	5	13.9	2	5.4

Note. Kg-Free = treatment group; TAU = control group

Kg-Free intervention

Kg-free is a manualized group intervention based on mindfulness, ACT and compassion-based approaches for women with overweight and obesity developed by the three authors. It comprises 10 weekly group sessions plus 2 booster fortnightly sessions (3^{1/2}months) 2h30 hours

each, run in small groups (from 10 to 12 participants). The intervention was designed to reduce weight self-stigma and unhealthy eating behaviors and promote quality-of-life by targeting weight-related experiential avoidance and self-criticism. A clinical psychologist with previous training in contextual-behavioural therapies and one clinical psychology master student delivered the sessions for all groups.

The intervention was designed to integrate distinct yet related components that have showing promising results with people that are have weight and eating difficulties (e.g., Goss, 2011; Kristeller & Wolever, 2011; Forman et al., 2013; Lillis et al., 2009; Tapper et al., 2009). Table 2 displays a session-by-session overview of Kg-Free intervention. Kg-free included the following main components: a) psychoeducation regarding eating, weight and emotions using an evolutionary approach to decrease shame and self-criticism (Gilbert, 2010; Goss, 2011); b) values and committed actions towards a healthier life were promoted to enhance motivation; c) acceptance of unwanted internal experiences, cognitive defusion and distress tolerance skills were used to diminish experiential avoidance patterns and promote a more accepting and flexible relationship with one's eating and weight; d) mindfulness was promoted in all sessions to cultivate present moment awareness, as well as a nonjudgmental attitude towards one's experiences, particularly concerning eating; and e) self-compassion was included to tackle weight self-stigma and self-criticism patterns, to enhance individual's motivation to kindly take care of themselves and to explicitly promote well-being and positive affect.

Experiential exercises and key concepts from ACT were adapted from pre-existent ACT books (Hayes & Smith, 2005) and manuals for eating and weight issues (Forman et al., 2013; Lillis et al., 2009). The mindfulness exercises scripts used were adapted from Teasdale, Williams, and Segal (2014). Particularly, the mindfulness eating practices (mindful eating and mindful eating awareness) included in all sessions were adapted from MB-EAT (Kristeller & Wolever, 2011). Finally, the self-compassion component included a loving-kindness meditation (Salzberg, 1995), as well as several self-compassion exercises (adapted from CFT; Gilbert, 2010; Goss, 2011), given that both are frequently combined in many Buddhist practices and psychological studies (Kabat-Zinn, 1990).

Table 2

Overview of Kg-Free intervention session-by-session.

Sessions	Aims	Key Metaphors and Exercises
1. Introduction	Participants' presentations, Programs' structure and methodology; Promote creative hopelessness; Introducing mindful eating.	Group dynamics; Man in the hole metaphor; Eating a raisin meditation
2. Psychoeducation I	Promote mindfulness skills; Understanding our relationship with food; The multiple functions of food; Deshaming and diminishing self-criticism. Develop mindful eating.	Mindfulness of breathing; Videos and discussion about your relationship with food; Mindful eating exercise
3. Psychoeducation II	Understand the role of different emotions in our lives; Deshaming and diminish self-criticism. Enhance awareness of hunger and satiety cues.	Mindful looking at your hand; Videos and discussion; Exploring emotional regulation systems; Mindfulness eating awareness
4. Values and committed action	Promote mindfulness skills; Promote values clarification; Enhance motivation towards healthy valued actions; Creating obtainable goals towards a healthier life.	Mindfulness of breathing; Passengers on the bus metaphor; Attending your own funeral exercise; Goals, barriers and actions worksheet
5. Acceptance and defusion	Promote mindfulness skills; Understanding why language lead to suffering; Control as the problem; Introduce the importance of acceptance; Thoughts are not facts.	Mindfulness of physical sensations; Debate language as a double-edged sword; Clipboard exercise; Defusion exercises (e.g., Labeling your thoughts)
6. Willingness and distress tolerance	Promote mindfulness skills; Promote acceptance and willingness of unwanted internal experiences; Enhance distress tolerance;	Mindfulness of the present moment; Taking the mind for a walk exercise; Eyes On exercise; Urge surfing
7. Descriptions vs evaluations	Promote mindfulness skills; The mind as an evaluating machine; Distinguish between descriptions and evaluations towards your bodies; Promote acceptance of unwanted internal experiences;	Mindfulness of physical sensations; Defusion in front of a mirror; Leaves on a stream; Mindfulness of a difficult experience
8. Shame and self-criticism	Promote mindfulness skills; The role of shame and self-criticism; Self-compassion as an antidote for shame and self-criticism;	Mindful eating exercise; Role play; Two-teachers metaphor; Soothing rhythm breathing and safe place exercises
9. Self-compassion	Promote mindfulness skills; Understand what is compassion; Why do we need compassion?; Cultivate loving-kindness and compassion for self;	Mindfulness of the present moment; Loving-Kindness meditation; Compassionate friend exercise
10. Self-compassion	Promote mindfulness skills; Explore obstacles for self-compassion; Cultivate compassion for self.	Mindfulness of physical sensations; Compassionate-self exercise; Compassionate letter writing
11. Booster session I	Change what you can and accept what you cannot change; Foster acceptance of unwanted internal experiences; Smashing patterns and building flexible actions	Mindfulness of breathing; Mindfulness of a difficult emotion
12. Booster session II	Sticking to committed actions; Coping with relapses; Develop a personalized action plan.	Mindful walking; Mountain path metaphor; Willingness and action plan worksheet

All sessions shared the same basic structure, starting with 30 minutes of shared experience, followed by a five-minute mindfulness practice (e.g., eating a raisin meditation, mindfulness of breathing, physical sensations). The session content was delivered, followed by a mindful eating practice to train the ability to pay attention to food and eating physical sensations. Finally, the session content was briefly revised and practices for the week were established (e.g., audio mindfulness and self-compassion practices). Participants received a manual that included the targeted constructs, examples, and exercise sheets. Audio files were provided to ensure the practice of mindfulness and compassion exercises between sessions.

Measures

Participants were assessed at baseline and after the *terminus* of the intervention program (or the equivalent period for the control group).

Demographic Data. In the initial screening interview, participants were asked about their age, educational level, and previous weight history.

Qualitative Data. After the intervention, participants allocated to Kg-Free intervention completed a brief self-reported questionnaire designed to assess program's acceptability.

Main outcome measures

The intervention targeted specifically two main areas of outcomes: health-related (including quality-of-life and weight self-stigma) and eating-related (emotional and uncontrolled eating) outcomes.

Weight self-stigma Questionnaire (WSSQ; Lillis et al., 2010; Palmeira, Cunha, & Pinto-Gouveia, 2017) was designed to assess weight self-stigma in people with overweight and obesity. The 12 items are rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree), with higher scores reflecting the presence of more weight self-stigma. WSSQ original version showed good psychometric properties ($\alpha = .88$), similar to the ones found in the Portuguese version (Palmeira et al., 2017). In the present study only WSSQ total score was used and revealed high internal consistency ($\alpha = .90$).

Obesity Related Well-Being Questionnaire (ORWELL-97; Mannucci et al., 1999; Silva, Pais-Ribeiro, & Cardoso, 2008) is an 18-items measure that assesses obesity-related quality-of-life (QoL). Participants are asked to rate all items on a four-point scale (0 = "not at all" to 3 = "much"), with higher scores indicating diminished QoL. Orwell-97 has revealed good internal

consistencies both the original and the Portuguese version ($\alpha = .83$ and $\alpha = .85$ respectively). In this study, ORWELL-97's Cronbach alpha was .91.

Three Factor Eating Questionnaire-21R (TFEQ-R21; Cappelleri et al., 2009; Duarte, 2015) measures three types of eating behaviors: cognitive restraint, uncontrolled eating, and emotional eating. Twenty items are rated on a 4-point scale (1= "completely true" to 4= "completely false"). Item 21 is answered through an 8-point scale (1= "I eat everything I want and when I want" and 8= "I constantly confine my food intake"). Higher scores indicate higher tendency to engage in those eating behaviors. In this study, only emotional and uncontrolled eating dimensions were used and presented good internal consistency ($\alpha = .86$ for uncontrolled eating; and $\alpha = .94$ for emotional eating).

Secondary outcome measures

BMI. All participants were weighted with their street clothes (without shoes) using the same Body Composition Analyzer (Tanita TBF-300) accurate to 0.1kg.

Waist circumference was measured, by the same researcher, using a tape measure at the umbilicus.

Total Cholesterol. Participants consented and provided blood samples. The samples were collected and analysed by the clinical analysis laboratory from the Pharmacy department¹. Confidentiality was assured hence only the research code for each participant was provided to the laboratory.

General health Questionnaire (GHQ-28; Goldberg & Hillier, 1979; Pais-Ribeiro & Antunes, 2003) measures current mental health and screen for non-specific psychiatric morbidity. It assesses four main areas: somatic symptoms, anxiety, depression, and social dysfunction. Items are rated on a 4-point scale (0 = better than usual to 3 = worse than usual). GHQ has been shown to be valid in screening for psychiatric problems in both clinical and general populations. In this study, GHQ internal consistency was .91.

Physical exercise. Participants were asked three different questions: 1) Do you currently do physical exercise? (Yes responses were considered if participants engage in physical exercise for more than 30min at a time); 2) What kind of exercise do you do?; 3) How frequently do you do physical exercise? (Responses ranged from 0 = "less than once a week" to 4 = "6/7 days a week")

¹ All costs were supported by the first author's PhD. grant.

Process measures

Acceptance and Action Questionnaire for Weight-Related Difficulties-Revised (AAQW-R; Palmeira, Cunha, Pinto-Gouveia, Carvalho, & Lillis, 2016b) is a 10 items version of the original AAQW, that measures the tendency to avoid, control or suppress unwanted internal experiences related to one's weight. Participants are asked to rate all items on a 7-point scale (1 = "never true" or "not at all believable" and 7 = "always true" or "completely believable"), with higher scores reflecting more experiential avoidance. In this study AAQW-R showed good internal consistency ($\alpha = .87$).

Forms of Self-Criticizing/Attacking & Self-Reassuring Scale (FSCRS; Gilbert, Clark, Hempel, Miles, & Irons, 2004; Castilho, Pinto-Gouveia, & Duarte, 2015a) assesses the tendency to criticize or reassure the self when things go wrong. It comprises three subscales: inadequate, hated and reassured self. The 22 items are rated on a 5-point scale (0 = "Not at all like me" to 4 = "Extremely like me"). The FSCRS presented good internal consistencies in clinical and non-clinical samples ranging from .83 to .91 (Gilbert et al., 2004). In this study, only inadequate and hated-self dimensions were used and presented adequate internal consistencies ($\alpha = .79$ for inadequate-self, $\alpha = .64$ for hated-self).

Self-Compassion Scale (SCS; Neff, 2003; Castilho, Pinto-Gouveia, & Duarte, 2015b) is a 26 items questionnaire assessing compassion for self. The instrument comprises six subscales that measure three self-compassion components (self-kindness/self-judgment; common humanity/isolation and mindfulness/ over-identification). Items are rated on a 5 point Likert scale (1 = almost never; to 5 = almost always). In the original study, SCS showed good internal consistency ($\alpha = .92$; Neff, 2003), similar to the one found in the current study ($\alpha = .91$).

Five Facet Mindfulness Questionnaire - 15 (FFMQ-15, Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Gregório, Pinto-Gouveia, Palmeira, & Carvalho, in preparation) is a shorter version of the original FFMQ with 15 items that measures the dispositional mindfulness characteristics. Participants rate how mindful they feel in daily life on a 5-points Likert scale (1 = "never or very rarely true" to 5 "very often or always true"). In the present study only FFMQ-15 global score was used and it showed low but still acceptable internal consistency ($\alpha = .52$).

Data analysis

All data analyses were performed using SPSS Statistics 20 and alpha level was set at .05. *Independent sample t tests* were used in order to compare intervention and control groups at baseline. To test between-group differences at post-treatment ANCOVAs with baseline as covariate and condition as a fixed factor were performed. The effect sizes were calculated using d_{corr} as it allows testing the effect size controlling for unequal sample sizes and baseline differences (Morris, 2008). According to Cohen's guidelines (1988 cited in Tabachnick & Fidell, 2007), Cohen's d between 0.2 and 0.4 represent small effects; between 0.5 and 0.7 medium effects and above 0.8 large effects. Independent samples t -tests and ANCOVA assumptions were verified through skewness and kurtosis. Also, ANCOVA's assumption of homogeneity of variance assumption (Levene's test of the homogeneity) and homogeneity of regression slopes was also tested.

Finally, to explore within-group differences from pre to post-treatment, *paired samples t-tests* were performed for each group separately. Bonferroni correction for multiple comparisons was calculated in order to reduce type I errors ($\alpha = .05/14$). Effect sizes were calculated using Cohen's d .

RESULTS

Kg-Free feasibility and acceptability

Overall, the intervention had high attendance rate. From the 27 participants that completed the Kg-free intervention, 24 attended the majority of the 12 sessions ($M = 10.89 \pm 1.12$). Intervention acceptability was assessed at post-treatment on a 5-point rating scale (from 1 = "not at all" to 5 "extremely"). Participants rated the program as very important ($M = 4.37 \pm 0.49$) and helpful ($M = 4.00 \pm 0.39$). Likewise, participants found the intervention to have a significant impact on their quality-of-life ($M = 3.96 \pm 0.76$) and to be very important to help them deal with difficult thoughts ($M = 4.11 \pm 0.58$), emotions ($M = 3.89 \pm 0.70$) and urges ($M = 3.89 \pm 0.51$). Lastly, sessions that promoted acceptance and defusion (63%) and self-compassion (52%) were considered the most useful.

Baseline differences

Baseline differences between groups were explored for all outcome measures. At baseline the intervention group revealed higher levels of weight-related experiential avoidance ($t_{(71)} = -$

2.251, $p = .027$, Cohen' $d = 0.53$) and self-criticism (inadequate-self: $t_{(71)} = -2.307$, $p = .024$, Cohen' $d = 0.54$; hated-self: $t_{(71)} = -2.438$, $p = .017$, Cohen' $d = 0.57$). Moreover they reported diminished obesity-related quality-of-life ($t_{(17)} = -2.138$, $p = .036$, Cohen' $d = 0.50$), and fewer abilities be compassionate towards themselves ($t_{(57)} = 2.216$, $p = .030$, Cohen' $d = 0.52$) in comparison with TAU group. All differences represent medium effect sizes. No differences at the onset of the study were found for all other study's variables. We also compared the characteristics of those who dropped with those who remained in the study at baseline. Only one significant difference was found. When compared to those who remained in the study, those who drop-out presented less years of education ($t_{(71)} = -2.482$, $p = .015$, Cohen's $d = 0.74$ – medium effect size).

Intention to treat analysis

Initially, an intention to treat analysis was conducted. Missing data were replaced by calculating the mean change from previous observations in the group and adding or subtracting this value from the existent previous observation. Table 3 displays the results found for the intention to treat analysis. Results showed that weight self-stigma, diminished quality-of-life, emotional and uncontrolled eating decreased in both groups. Physical activity frequency and self-compassion increased in the Kg-Free group compared to a decrease in the control group (see Table 3). Conversely, changes in BMI, waist circumference and cholesterol were relatively minor. Psychological distress and hated-self decreased in the intervention group compared to an increase in the TAU group. Both groups also showed a reduction in weight-related experiential avoidance and inadequate-self and an increase in mindfulness abilities. ANCOVA analyses with the condition as a fixed factor and baseline scores as covariate were executed (Table 3). Levene's test of the homogeneity were non-significant for all study's variables indicating that group variances were equal. Likewise, the homogeneity of regression slopes was also non-significant for all variables, which means that the relationship between the outcome and the covariate is the same in both groups. Results showed that the intervention has significant effects for almost all variables, with small to medium effect sizes. The significant effect for BMI was very low, with a non-significant effect size (Cohen's $d = 0.09$). Lastly, no significant effects of the intervention were found for waist circumference, total cholesterol, mindfulness and self-compassion skills.

Intervention efficacy analyses

As in the intention to treat analysis, ANCOVA assumptions were satisfied. Thus, ANCOVA with baseline scores as covariate and condition as a fixed factor were performed in order to test between-group differences at post-treatment. As can be seen in Table 3, when compared with the control group, participants in Kg-Free group presented a significant decrease in weight self-stigma, emotional and uncontrolled eating and increased quality-of-life. All effect sizes reflect medium effects.

Regarding secondary outcomes, those allocated to Kg-Free revealed a significant decrease in BMI, less psychological distress and increased physical exercise frequency. At post-intervention, the intervention group presented was practicing physical exercise 4 or 5 times a week, whereas on average the TAU group practiced once a week. Moreover, no significant between groups' differences were found regarding waist circumference and cholesterol. Likewise, significant between-group differences were found for process variables with participants from the Kg-Free group presenting lower levels weight-related experiential avoidance, inadequate-self, and hated-self. These results reflect medium to large effect sizes. Results for self-compassion were on the edge of statistical significance, reflecting a medium effect size. No between-groups difference at post-intervention was found for mindfulness abilities.

Finally, and given that the intervention was delivered in groups, additional ANCOVA analyses controlling for group allocation were performed to explore between groups differences in all outcomes. Results resembled the ones found above, with no differences between the intervention groups being found.

Table 3

Mean change score (and SDs) for all outcome and process variables by group. Analysis of Covariance and effect size for the intention to treat and intervention efficacy analyses.

	Intention to treat				Intervention efficacy						
	Kg-Free (n=36)		TAU (n=37)		Kg-Free (n=27)		TAU (n=32)				
	M (SD)	M (SD)	F	p	d	M (SD)	M (SD)	F	p	d	
Main outcomes											
Weight self-stigma	-5.27 (6.83)	-0.19 (4.13)	11.294	.001	0.58	-6.96 (7.14)	-0.19 (.81)	14.790	<.001	0.74	
Quality-of-life	-8.47 (12.31)	-0.56 (10.18)	5.110	.027	0.50	-11.11 (13.23)	-0.56 (10.97)	5.346	.024	0.68	
Emotional eating	-0.32 (.54)	-0.02 (.36)	8.003	.006	0.44	-0.41 (.60)	-0.05 (.35)	6.837	.011	0.52	
Uncontrolled eating	-0.28 (.37)	-0.05 (.28)	10.245	.002	0.46	-0.35 (.41)	-0.06 (.30)	9.801	.003	0.61	
Secondary outcomes											
BMI	-0.54 (.92)	-0.07 (.76)	5.506	.022	0.09	-0.69 (.95)	-0.33 (.81)	8.323	.006	0.13	
Waist Circumference	-1.56 (3.73)	-0.70 (4.26)	0.894	.348	0.08	-1.74 (4.28)	-0.67 (4.58)	0.824	.368	0.09	
Total Cholesterol	-12.07 (21.37)	-11.56 (24.96)	0.250	.619	0.29	-12.76 (19.47)	-11.57 (25.53)	.598	.531	0.28	
Physical Exercise	+1.06 (1.71)	-0.62 (1.91)	24.534	<.001	1.11	+1.52 (1.74)	-0.56 (1.95)	31.609	<.001	2.00	
GHQ	-6.29 (10.56)	+2.58 (10.37)	11.790	.001	0.85	-9.00 (10.91)	+2.31 (10.90)	16.718	<.001	1.18	
Process measures											
AAQW-R	-7.96 (9.99)	-0.46 (4.67)	8.127	.006	0.61	-10.56 (10.32)	-0.19 (8.08)	9.884	.003	0.96	
Mindfulness	+3.44 (6.39)	+0.84 (4.45)	2.042	.158	0.48	+4.35 (7.23)	+0.84 (4.80)	1.722	0.195	0.70	
Inadequate self	-3.97 (5.76)	-0.02 (5.01)	6.151	.016	0.63	-5.30 (6.11)	+0.03 (5.41)	6.194	0.016	0.94	
Hated self	-1.94 (2.59)	+0.16 (2.45)	7.744	.007	0.62	-2.63 (2.66)	+0.16 (2.65)	9.467	0.003	0.87	
Self-compassion	+0.22 (.47)	-0.03 (.33)	3.458	.067	0.38	+0.38 (.50)	-0.03 (.36)	3.774	0.052	0.71	

Note. Kg-Free = treatment group; TAU = control group; BMI = Body Mass Index; GHQ = General Health Questionnaire; AAQW-R = Acceptance and Action Questionnaires for Weight-Related Difficulties-Revised.

Post-hoc analyses

As participants from the intervention group lost more weight than those in the control group, a supplementary set of ANCOVA were conducted for the study's main outcomes (weight self-stigma, unhealthy eating behaviors, and quality-of-life), using baseline scores and BMI at post-intervention as covariates. This allowed testing whether reductions in BMI accounted for changes in intervention's main outcomes. Results showed that the effect due to condition increased slightly for all outcomes, this suggests that the impact of the intervention was direct and not due to changes in weight. At post-intervention participants from Kg-free group presented decreased levels of weight self-stigma ($F(1, 57) = 16.943, p \leq .001, \eta_p^2 = 0.24$ – large effect), emotional ($F(1, 57) = 8.151, p = .006, \eta_p^2 = 0.13$ – medium effect) and uncontrolled eating ($F(1, 57) = 11.348, p = .001, \eta_p^2 = 0.17$ – large effect) and increased quality-of-life ($F(1, 57) = 6.487, p = .014, \eta_p^2 = 0.11$ – medium effect).

Within-group t-tests of changes

To explore significant changes within each group, paired samples t-tests were also performed, comparing baseline to post-treatment scores for each group. Table 4 presents the means, standard deviations from baseline and post-treatment assessments, paired samples t-tests and within-group effect sizes for both groups. Using Bonferroni correction for multiple corrections significant results were considered when $p \leq .004$. As can be seen in Table 4, in the Kg-Free group, significant differences were found from baseline to post-treatment. At post-treatment, the Kg-Free group presented significantly lower BMI and an important increase in physical activity frequency. Although effect size for BMI was rather small, the effect size for physical activity frequency large. In addition, results from the self-reported measures showed the same pattern (Table 4), with differences representing moderate to large effect sizes. Results also showed that there was a significant improvement in self-compassion in the Kg-Free group. Given the Bonferroni correction, differences from baseline to post-intervention in the Kg-free group concerning waist circumference, cholesterol levels, and mindfulness abilities remained non-significant. Finally, no statistically significant differences were found for the TAU group (Table 4).

Table 4

Means, standard deviations, within-group t-test of changes from pre to post-treatment and Cohen's d for effect size for each group.

	Kg-Free Group (n = 27)					TAU Group (n = 32)								
	Pre-treatment		Post-treatment		t	P	d	Pre-treatment		Post-treatment				
	M (SD)	M (SD)	M (SD)	M (SD)				M (SD)	M (SD)	t	p	d		
Main outcomes														
Weight self-stigma	40.81 (6.71)	33.85 (7.72)	5.068	<.001	0.96	35.84 (5.97)	35.66 (10.54)	0.232	.813	0.02				
Quality-of-life	62.70 (14.31)	51.59 (13.02)	4.364	<.001	0.81	51.63 (16.32)	51.06 (17.30)	0.290	.774	0.03				
Emotional Eating	2.88 (0.66)	2.48 (0.52)	3.551	.001	0.67	2.67 (0.77)	2.62 (0.70)	0.854	.400	0.07				
Uncontrolled Eating	2.26 (0.44)	1.91 (0.38)	4.523	<.001	0.85	2.14 (0.57)	2.08 (0.51)	1.180	.276	0.11				
Secondary outcomes														
BMI	34.76 (5.44)	34.07 (5.68)	3.732	.001	0.12	33.40 (5.03)	33.37 (5.07)	0.232	.818	0.01				
Waist Circumference	106.26 (12.52)	104.51 (12.89)	2.115	.044	0.14	105.84 (11.38)	105.17 (10.40)	0.829	.413	0.06				
Total Cholesterol ^a	203.48 (28.96)	186.14 (22.84)	3.004	.007	0.67	208.26 (41.06)	196.70 (38.45)	2.173	.041	0.29				
Physical Exercise	1.26 (1.61)	2.78 (0.16)	-4.534	<.001	1.33	1.31 (1.86)	.75 (1.39)	1.632	.113	0.34				
GHQ	26.00 (10.31)	17.00 (9.43)	4.287	<.001	0.91	22.78 (10.86)	25.09 (9.09)	-1.200	.239	0.23				
Process measures														
AAQW-R	46.26 (11.10)	35.70 (10.17)	5.317	<.001	0.99	38.00 (10.66)	37.81 (11.17)	0.131	.896	0.02				
Mindfulness	44.59 (4.74)	48.96 (7.11)	-3.064	.005	0.72	48.16 (5.19)	49.00 (5.84)	-0.994	.328	0.15				
Inadequate self	19.93 (5.25)	14.63 (5.46)	4.506	<.001	0.99	15.53 (5.97)	15.71 (7.36)	0.033	.974	0.03				
Hated self	5.74 (2.84)	3.11 (3.11)	5.132	<.001	0.88	3.65 (3.30)	3.77 (3.45)	-0.339	.737	0.04				
Self-compassion	2.80 (0.47)	3.16 (0.37)	-3.699	.001	0.81	3.21 (0.61)	3.18 (0.46)	0.514	.611	0.06				

Note: ^an = 22 for Kg-Free group and n = 23 for TAU group; BMI = Body Mass Index; GHQ = General Health Questionnaire; AAQW-R = Acceptance and Action Questionnaires for Weight-Related Difficulties-Revised.

DISCUSSION

The present study main goal was to test the efficacy of Kg-Free – an acceptance, mindfulness and compassion-based group intervention for women with overweight and obesity. As far as we know, this is the first study to test the efficacy of an intervention that integrates ACT, mindfulness, and self-compassion components to reduce weight self-stigma and unhealthy eating patterns and improve health-related quality-of-life. The intervention specifically targeted weight-related experiential avoidance and self-criticism, two important psychological processes associated with poorer outcomes and diminished quality-of-life (Gilbert et al., 2014; Latner et al., 2013; Lillis et al., 2009).

Overall, participants enrolled in Kg-Free found the intervention to be very important and helpful when dealing with unwanted internal experiences (thoughts, emotions and urges). Cognitive defusion, urge surfing, mindfulness and compassion skills were rated as the most useful, which supports the importance of integrating component from different but complementary perspectives.

Results highlighted several differences between groups at post-intervention. When compared with the TAU group, the Kg-Free group revealed a significant increase in health-related quality-of-life and psychical exercise frequency (from 1 to 4/5 times a week) and lower levels of weight self-stigma, unhealthy eating patterns, and psychopathological symptoms. Moreover, participants from Kg-Free group also revealed decreased levels of self-criticism and weight-related experiential avoidance. All differences represented medium to very large effect sizes. These findings support the efficacy of the Kg-Free intervention on the targeted health and eating-related main outcomes and psychological processes. This is relevant given the detrimental role of weight self-stigma, weight-related experiential avoidance and self-criticism patterns have on the health and well-being of people living with obesity (e.g., Gilbert et al., 2014; Latner et al., 2013; Lillis et al., 2010). It seems that the intervention helped participants to develop a more accepting relationship with their weight and eating-related internal experiences and to decrease the tendency to be harsh and critic with oneself, particularly when facing mistakes and failures. This might have led to decrease their weight self-stigma and helped participants to engage and maintain healthy behaviors, which in turn, may have an impact on their BMI and cholesterol levels.

Furthermore, at post-treatment, participants from Kg-Free had a significant decrease in BMI, when compared with TAU. Nevertheless, the effect size was small. In fact, participants in Kg-Free lost 1.15kg more than participants allocated to TAU at post-treatment. This result is in line with findings from previous acceptance and mindfulness-based interventions (O'Reilly et al.,

2014; Tapper et al., 2009). Although between-groups differences for waist circumference was non-significant, participants from Kg-Free intervention showed a decrease, whereas the TAU group did not. Likewise, there was no difference between groups in total cholesterol, with both groups showing improvements at post-intervention. Remarkably, total Cholesterol values were at optimal levels (< 200 mg/dl) for both groups at post-treatment. These findings are similar to the ones from Bacon et al. (2002) that compared a diet and non-diet program and found that both improved individuals' metabolic fitness.

Results for self-compassion failed to reach statistical significance, when comparing changes in both groups from baseline to post-treatment. However, within-groups results suggested that participants in Kg-Free did show improved self-compassion skills at post-treatment. In fact, self-compassion was only explicitly promoted in the program last sessions, which gave participants less time to practice. It is possible that the development of self-compassion requires more time and practice. Another explanation may rely on the instrument used to assess self-compassion. It is possible that SCS did not capture (at least completely) what was promoted in the intervention. Nevertheless, at the time no other validated measure of self-compassion was available.

On the other hand, there were no between-group differences regarding mindfulness, which was not expected. At least partially, this result may be due to the difficulty in assessing mindfulness through self-report questionnaires in individuals without meditation experience (Baer et al., 2006). Also, the FFMQ version used had internal consistency problems. Moreover, and although mindfulness was promoted in all session, between sessions the majority of the participants practiced less than three times a week, which may also explain the results found.

Additionally, post-hoc analyses highlighted that changes in our main outcomes (weight self-stigma, emotional and uncontrolled eating and quality-of-life) did not depended on whether participants lost weight at post-treatment or not. This is particularly relevant as weight loss is hard to achieve and maintain. In addition, it supports the importance of delivering an intervention aimed at reducing weight self-stigma and unhealthy eating behaviors and improving people's quality-of-life regardless of the amount of weight lost.

Within-group changes from baseline to post-intervention assessment further supported the results found, with the Kg-Free revealing significant improvement in almost all outcomes (with the exception of waist circumference, cholesterol levels, and mindfulness). The effect sizes were mostly large, with the exception of emotional eating and BMI that presented moderate and small effect sizes, respectively. In contrast, no significant changes occurred in the TAU group.

Despite the encouraging findings, this study encloses some limitations that should be taken into consideration and addressed in future studies. Firstly, the sample comprised only adult women seeking nutritional treatment, which does not allow to generalize the results for men or adolescents' samples. Secondly, the control group remained with TAU, which did not include any psychological intervention. Thus, we can only state that adding Kg-Free to TAU seems to be useful for women struggling with weight and eating issues. Future studies with larger samples are needed to replicate these findings and test the efficacy of Kg-Free in comparison to other psychological interventions. Thirdly, despite randomization, our groups were not equal at baseline in all outcome variables. Thus, we cannot assure with absolute certainty that the improvements observed in the Kg-Free group derived solely from the intervention. Moreover, given that participants were not blind to their group allocation and that Kg-Free was a group intervention, at least partially, the group support might have played a role on the changes we observed.

Nevertheless, this is still an ongoing research that includes two follow-up assessments. The next step will be to analyze the clinical changes maintenance at 3- and 6-months follow-up and explore the mechanisms responsible for those changes.

Overall, this study provides an important contribution to psychological interventions with people struggling with their weight. It is one of the first studies that integrates different but yet related approaches (based on ACT, mindfulness, and compassion) to tackle weight self-stigma and promote healthy behaviors and quality-of-life in women living with overweight and obesity. It also reinforces the importance of promoting well-being and quality-of-life and not only weight loss. Finally, Kg-Free revealed itself as an effective and feasible intervention in reducing weight self-stigma and increasing health-related indicators in women struggling with their eating and weight.

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Intervention manual

Information regarding the Kg-Free intervention can be found at: <http://www.uc.pt/en/fpce/research/CINEICC/interventionprograms>. The program includes a therapist and a participant manual written in Portuguese. Manuals are available upon request

through the first author email. Moreover, to have access to the intervention session-by-session overview in English please contact the first author by email.

Trial register

This trial was registered at clinicaltrials.gov with the Identifier code: NCT02850796 following data collection and analysis.

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EMPIRICAL STUDY VI |

Processes of change in quality-of-life, weight self-stigma, BMI and emotional eating after an acceptance, mindfulness and compassion-based group intervention (Kg-Free) for women with overweight and obesity

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Processes of change in quality-of-life, weight self-stigma, BMI and emotional eating after an acceptance, mindfulness and compassion-based group intervention (Kg-Free) for women with overweight and obesity

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ABSTRACT

This study examined the effectiveness of Kg-Free: an acceptance, mindfulness and compassion-based group intervention for women with overweight and obesity at post-treatment and 3-month follow-up and explored the psychological processes that underlie changes in quality-of-life, weight self-stigma, BMI and emotional eating at post-treatment. Overall, 53 women completed Kg-Free. At post-treatment and 3-months follow-up, participants reported increased quality-of-life, mindfulness and self-compassion abilities and decreased weight self-stigma, emotional eating, shame, weight-related experiential avoidance, self-criticism and BMI. Shame and self-criticism reductions were important mediators of changes in health-related outcomes, whereas weight-related experiential avoidance, mindfulness and self-compassion mediated changes in weight and eating-related outcomes.

KEYWORDS: Overweight and obesity; Quality-of-life; Weight self-stigma; Kg-Free intervention; Within-group mediation analysis

INTRODUCTION

The literature suggests that traditional weight-loss treatments (that include dietary restriction and physical activity) tend to present poorer weight loss results at long-term and do not necessarily improve psychological health nor diminish weight-stigma (Lasikiewicz, Myrissa, Hoyland, & Lawton, 2014; Latner, Ebnetter, & O'Biren, 2012; Wilson & Brownell, 2002). These diet-focused interventions may also yield unwanted consequences, namely: increased body dissatisfaction, eating disordered behaviours (e.g., chronic dieting, overeating), shame and self-criticism (e.g., Bacon et al., 2002; Tylka et al., 2014). Moreover, the psychological processes (such as experiential avoidance, shame, self-criticism and weight self-stigma), known to impact negatively on health and quality-of-life are rarely targeted (Duarte, Pinto-Gouveia, & Ferreira, 2014; Latner, Durso, & Mond, 2013; Lillis, Hayes, Bunting, & Masuda, 2009; Lillis, Luoma, Levin, & Hayes, 2010; Luoma & Platt, 2015).

Clearly, there is still room for improvement, especially in enhancing the quality-of-life of people dealing with chronic problems such as obesity. By fostering acceptance, distress tolerance, present moment awareness and the development of a kind and caring attitude towards the self, the third wave cognitive-behavioural therapies (such as Acceptance and Commitment Therapy - ACT, Mindfulness and Compassion Focused Therapy - CFT) seem to be particularly useful in chronic conditions (e.g., Graham, Gouick, Krahé, & Gillanders, 2016 for a review), such as obesity and weight issues (Forman, Butryn, Manasse, & Bradley, 2015; Gilbert, Stubbs, Gale, Gilbert, Dunk, & Thomson, 2014; O'Reilly, Cook, Spruijt-Metz, & Black, 2014). Furthermore, in societies where food is easily available and where sedentary lifestyles are common, promoting willingness, acceptance and distress tolerance of internal unwanted experiences seems to be crucial for weight management (Forman et al., 2015; Forman & Butryn, 2015; Lillis et al., 2015). In addition, eating is intrinsically an automatic behaviour not only related to the fulfilment of basic bio physiological needs (suppress hunger), but also with important social and emotional regulation functions (Goss, 2011). Learning to be fully aware of the present moment in an open, accepting and non-judgmental way is required as it enhances the ability to recognize internal cues (e.g. hunger and satiety) and helps to make healthier choices (e.g., Forman & Butryn, 2015; Kristeller & Wolever, 2011).

Overall, acceptance and mindfulness-based interventions seem to be effective in reducing weight self-stigma, unhealthy eating patterns (e.g., disinhibit and emotional eating, food cravings), body image concerns and psychological distress, while increasing physical activity and health-related quality-of-life and even promoting weight loss (Forman et al., 2013; Lillis et al., 2009; Niemeier, Leahey, Reed, Brown, & Wing, 2012; O' Reilly et al., 2014). In fact, not only these interventions promote healthier behaviours and well-being, they also promote the

development of a more flexible and accepting relationship with one's eating, food and weight, which seems fundamental in weight loss (Forman, et al., 2013; 2015; Lillis et al., 2015; O'Reilly et al., 2014).

Although less studied, there is evidence that integrating self-compassion can bring an important contribution for people with obesity (Gilbert et al., 2014; Hilbert, Braehler, Schmidt, Löwe, Häuser, & Zenger, 2015). Recently, a study with 1158 individuals with overweight and obesity found that self-compassion mediated the relationship between weight self-stigma and global health (Hilbert et al., 2015). Additionally, people trying to lose weight frequently feel inferior, flawed or a failure, become very self-critical and have difficulty to experience self-compassion (Adams & Leary, 2007; Gilbert et al., 2014). In fact, shame and self-criticism have been consistently linked to disordered eating, body dissatisfaction, and difficulties in maintaining healthy behaviours (Duarte et al., 2014; Gilbert et al., 2014; Pila, Sabiston, Brunet, Castonguay, & O'Loughlin, 2015). Contrarily, self-compassion – the ability to have a caring, accepting and comforting relationship with the self – is proving to be effective in decreasing shame and self-criticism and in improving psychological well-being (Brian, Leary, & Drabkin, 2014; Gilbert, 2010; MacBeth & Gumley, 2012; Neff, 2003), particularly for people struggling with eating and weight (Adams & Leary, 2007; Gilbert et al., 2014; Goss & Allan, 2014).

Given the fact that contextual-behavioural approaches share several common features (e.g. promote awareness and acceptance), despite targeting different yet related skills, growing interest has been raised in integrating them (e.g., Luoma & Platt, 2015; Pinto-Gouveia et al., 2016). However, integrating CFT and ACT has only been attempted in a small pilot study with people living with HIV, showing promising results (Skinta, Lezama, Wells, & Dilley, 2015). Following this line, Kg-Free - an acceptance, mindfulness and compassion-based group intervention for women struggling with eating and weight - was developed. The intervention aimed to decrease weight self-stigma and unhealthy eating behaviours and promote quality-of-life (Palmeira, Pinto-Gouveia, & Cunha, submitted-b). Results from the randomized controlled trial comparing Kg-Free with treatment as usual (TAU) supported Kg-Free efficacy in reducing weight self-stigma, weight-related experiential avoidance and self-criticism, while increasing healthy behaviours and quality-of-life (Palmeira et al., submitted-b). However, this previous study did not explore follow-up results nor the mechanisms that underlie the changes found. Still, gathering knowledge on the processes that mediate treatment-induced changes is of crucial importance in order to make interventions more effective and is usually less explored (McCracken & Martinez, 2011; Murphy, Cooper, Hollon, & Fairburn, 2009). Particularly, several trials using ACT have found that reductions in experiential avoidance represent an important mediator of changes in binge-eating and weight loss (Lillis, Hayes, & Levin, 2011; Niemeier et al., 2012;

Pinto-Gouveia et al., 2016). Also, mindfulness and self-compassion seem to have specific and independent contributions as mediators of changes in ACT and mindfulness-based interventions (e.g., Forman, Butryn, Hoffman, & Herbert, 2009).

Although evidence for the efficacy of Kg-Free at post-treatment has been found, the current study aimed to explore if these changes were maintained at 3-month post-intervention. Furthermore, we also aimed to explore the mechanisms of change for quality-of-life, weight self-stigma, emotional eating and BMI at post-treatment. We hypothesized that the changes that occurred after Kg-Free intervention were mediated by decreased weight-related experiential avoidance, shame and self-judgment tendencies, and increased abilities to be open, accepting and compassionate towards oneself. Lastly, and given the damaging effect of weight-related experiential avoidance and weight self-stigma on quality-of-life (e.g., Palmeira, Pinto-Gouveia, & Cunha, 2016b), a serial mediation model was created to explore if the impact of the intervention on participants' quality-of-life was mediated by changes in weight-related experiential avoidance and weight self-stigma.

METHODS

Participants

The sample comprised women, aged between 18 and 55 years old, with overweight or obesity ($BMI \geq 25$) enrolled in nutritional treatment for weight loss in primary care units and Hospitals from Coimbra's district, Portugal. All participants were screened for eligibility by experienced clinical psychologists. Exclusion criteria: a) presence of Binge Eating Disorder assessed through Eating Disorders Examination interview; b) Severe psychiatric conditions (severe depressive episode, substance abuse, Bipolar disorder and Borderline Personality Disorder) assessed through SCID-I and SCID-II; c) medical conditions that affect weight; d) medication associated with significant weight or appetite changes.

From the initial 60 participants enrolled in Kg-Free, seven dropped-out after the first group sessions and did not complete any of the post-treatment assessments. From the 53 completers, at 3-month follow-up assessment, one participant was pregnant and another was admitted to the hospital due to illness. Thus, no data from the 3-month follow-up assessment was available for these two participants. At baseline, participants had a mean age of 42.55 ($SD = 9.05$), with a mean of 15.60 ($SD = 3.21$) years of education. Mean BMI was 34.09 ($SD = 5.30$). The majority of the participants were married (69.8%), 18.9% were single and 11.3% divorced. The majority (84.9%) came from low to medium socio-economic status.

Kg-Free intervention

The intervention included 10 weekly sessions plus 2 booster fortnightly sessions (2h30 hours each). It was designed upon pre-existing ACT and mindfulness-based protocols for people with eating and weight issues (e.g., Forman et al., 2013; Kristeller & Wolever, 2011; Lillis et al., 2009), plus a self-compassion component (Gilbert, 2010; Goss, 2011). A more detailed overview of the intervention can be found elsewhere (Palmeira et al., submitted-b). Overall, the intervention included several components: 1) Psychoeducation regarding eating and emotions through an evolutionary approach was introduced, in order to diminish shame and self-criticism (sessions 2 and 3); 2) Mindfulness was promoted in all sessions to enhance present moment awareness; 3) Values clarification and committed action were promoted to enhance motivation towards healthy behaviours (session 4); 4) Acceptance and defusion skills were promoted to reduce experiential avoidance and enhance distress tolerance particularly regarding weight and eating-related experiences (sessions 5 to 7); 5) Self-compassion was introduced as an antidote for shame and self-criticism (session 8) and explicitly developed through experiential exercises in sessions 9 and 10 (e.g. loving-kindness, self-compassion exercises). All sessions started with 30 minutes of shared experience, followed by a five-minute mindfulness practice. Then the session content was delivered, followed by an eating mindfulness practice and the establishment of the practices for the week (e.g., mindfulness or self-compassion exercises).

Procedures

Ethical approval was obtained from all institutions enrolled in the study. Participants were invited to take part in the study directly at the medical care units on their appointment day. All participants received information regarding the voluntary and confidential nature of the study, as well as a brief overview of the intervention. Likewise, all participants signed an informed consent. To guarantee confidentiality a unique and numerical code was assigned to each participant. Baseline assessment occurred one week before Kg-Free intervention, post-treatment assessment was obtained within the two weeks' post-intervention, and follow-up assessment occurred 3 months after the end of the intervention. All assessments were conducted by psychologists blinded to participants' condition.

Measures

Demographic Data were gathered in the initial screening interview. Participants were asked about their age, years of education, marital and socio-economic status.

Main outcome measures

BMI. Participants were weighted with their street clothes (without shoes) using a Body Composition Analyser (Tanita TBF-300) accurate to 0.1kg.

Weight self-stigma Questionnaire (WSSQ; Lillis et al., 2010; Palmeira, Cunha, & Pinto-Gouveia, submitted-a) is a 12 items self-report measure that assesses internalized weight-stigma in people with overweight and obesity. Items are rated in a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Higher scores reflect higher levels of weight self-stigma. Both the original and Portuguese versions revealed good psychometric properties ($\alpha = .88$) (Lillis et al., 2010). In this study, WSSQ presented high internal consistency at baseline ($\alpha = .89$), post-treatment ($\alpha = .88$) and 3-month follow-up ($\alpha = .86$) assessments.

Obesity Related Well-Being Questionnaire (ORWELL-97; Mannucci et al., 1999; Silva, Pais-Ribeiro, & Cardoso, 2008) measures decreased obesity-related quality-of-life. All 18 items are rated assessing symptoms frequency and severity (occurrence subscale) and importance regarding limitations in one's life (importance subscale) using a four-point scale (0 = "not at all" to 3 = "much"). Both the original and Portuguese versions presented good internal consistency ($\alpha = .83$ and $\alpha = .85$ respectively). In this study ORWELL presented high internal consistency ($\alpha = .92$ at baseline; $\alpha = .91$ at post-treatment; and $\alpha = .90$ at 3-month follow-up).

Three Factor Eating Questionnaire-21R (TFEQ-R21; Cappelleri et al., 2009; Duarte, 2016) assesses unhealthy eating behaviours: cognitive restraint, uncontrolled eating and emotional eating in a 4-point scale (1= "completely true" to 4= "completely false"). Higher scores indicate higher tendency to engage in those behaviours. The TFEQ-21 has proved to have good internal consistency ($\alpha = .76$ for cognitive restraint, $.85$ emotional eating and $.83$ for uncontrolled eating), discriminant and convergent validity (Cappelleri et al., 2009). In this study, only emotional eating dimension was used and it presented very good internal consistency in all assessments ($\alpha = .93$ at baseline and $\alpha = .87$ at both post-treatment and 3-month follow-up).

Mediator processes

Acceptance and Action Questionnaire for Weight-Related Difficulties-Revised (AAQW-R; Palmeira, Cunha, Pinto-Gouveia, Carvalho, & Lillis 2016a) includes 10 items of the AAQW. It measures weight-related experiential avoidance, i.e., the tendency to avoid, control or suppress unwanted internal experiences related to one's weight and eating. Items are rated in a 7-point scale (1 = "never true" or "not at all believable" and 7 = "always true" or "completely

believable”), with higher scores reflecting higher levels of weight-related experiential avoidance. In the original study, the AAQW-R proved to be a reliable measure (Palmeira et al., 2016a). In this study, AAQW-R showed good internal consistency of $\alpha = .88$ at baseline and post-treatment and $\alpha = .84$ at 3-month follow-up assessment.

Other as Shamer Scale (OAS; Goss, Gilbert & Allan, 1994; Matos, Pinto-Gouveia, & Duarte, 2016) assesses external shame. The 18 items are rated on a 5-point Likert scale (from 0 = “never” to 4 = “almost always”). Higher scores indicate more external shame. OAS consistently showed very good internal consistencies in clinical and non-clinical samples ($\alpha = .96$ and $.92$, respectively; Goss et al., 1994). In the current study OAS internal consistency was very good in all assessments ($\alpha = .93$ at baseline, $\alpha = .91$ at post-treatment and $\alpha = .92$ at 3-month follow-up).

Self-Compassion Scale (SCS; Neff, 2003; Castilho, Pinto-Gouveia, & Duarte, 2015) includes 26 items and it can be divided into a positive and a negative dimension. The positive dimension – *self-compassion* (includes self-kindness, common humanity and mindfulness subscales) measures the tendency to show a caring and supportive attitude towards the self. The negative dimension – *self-judgment* (includes self-judgment, isolation and over-identification subscales) assesses the tendency to be harsh and critical towards oneself when facing setbacks. All items are rated in a 5 point Likert scale (1 = almost never; to 5 = almost always). SCS has showed very good internal consistency ($\alpha = .91$ for self-compassion and $\alpha = .89$ for self-judgment; Castilho et al., 2015). Similar internal consistency values were found in this study for all assessments (self-compassion: $\alpha = .85$ at baseline and post-treatment and $\alpha = .89$ at 3-month follow-up; self-judgment: $\alpha = .91$ at baseline and post-treatment and $\alpha = .93$ at 3-month follow-up).

Five Facet Mindfulness Questionnaire - 15 (FFMQ-15; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Gregório, Pinto-Gouveia, Palmeira, & Carvalho, in preparation) measures the dispositional mindfulness characteristics in daily life. FFMQ-15 is a reduced version of the original FFMQ that comprises 15 items rated in a 5-point Likert scale (1 = “never or very rarely true” to 5 “very often or always true”). In this study, only FFMQ-15 global score was used and it presented an acceptable Cronbach alpha at baseline ($\alpha = .62$) and good at post-treatment ($\alpha = .82$) and 3-month follow-up ($\alpha = .80$) assessments.

Data analysis

All data analyses were performed using SPSS Statistics 20. Power analysis was calculated for Repeated Measures Analysis of Variance (ANOVA) at post-hoc for $N = 51$. Using a significance level of .05, with 3 different measurement moments and an effect size of $f = 0.25$, the power analysis was 98%. Repeated Measures ANOVA was performed to test differences between pre-treatment, post-treatment and 3-month follow-up assessments. Whenever sphericity assumption was violated, the Greenhouse–Geisser correction was used to produce a valid F-ratio (Field, 2013). Effect sizes were calculated using partial eta square (η^2) and were interpreted as follows: partial η^2 values of 0.01 small, 0.06 medium and 0.14 large effect sizes (Tabachnick & Fidell, 2007). Post-Hoc analyses using Bonferroni adjustment for multiple comparisons were used to explore pairwise differences (pre-to-post treatment; pre-to-3 month and post-to-3 month follow up).

To explore whether changes in shame, weight-related experiential avoidance, self-judgment, mindfulness and self-compassion mediated the impact of the Kg-Free intervention on participants' health-related (quality-of-life and weight self-stigma) and weight and eating-related outcomes (emotional eating and BMI), MEMORE (Mediation and Moderation analysis for Repeated measures designs) was used (Montoya & Hayes, 2016). MEMORE is a new SPSS macro that allows to estimate total, direct, and indirect effects of independent variable (X) on dependent variable (Y) through one or more mediators (M) simultaneously or in sequence in two-condition or two-occasion within-subjects design. MEMORE's approach was carefully chosen as it conceptualizes mediation analysis as a path analytic framework and not a set of discrete hypothesis tests. As such, it reduces the number of tests needed to test indirect effects, which reduces the changes of inferential errors. MEMORE computes the difference between the two mediator measurements and the difference between the two dependent variable measurements (see Montoya & Hayes, 2016 for a more detailed description). In this study, all participants experienced the same intervention (Kg-Free), hypothesized mediators and main outcomes were measured at baseline and post-intervention. Therefore, the independent variable 'X' is the passage of time that corresponds to the intervention period. Moreover, MEMORE also produces 95% confidence intervals for indirect effect(s) using bootstrapping resampling. The effect is considered statistically significant ($p < .05$) if zero is not included on the interval between the lower and the upper bound of the confidence interval (Montoya & Hayes, 2016).

Finally, a serial mediation model was conducted to test if changes from baseline to post-treatment on participants' quality-of-life were mediated by changes occurred in weight-related experiential avoidance and weight self-stigma (see Figure 1 for a representative path diagram).

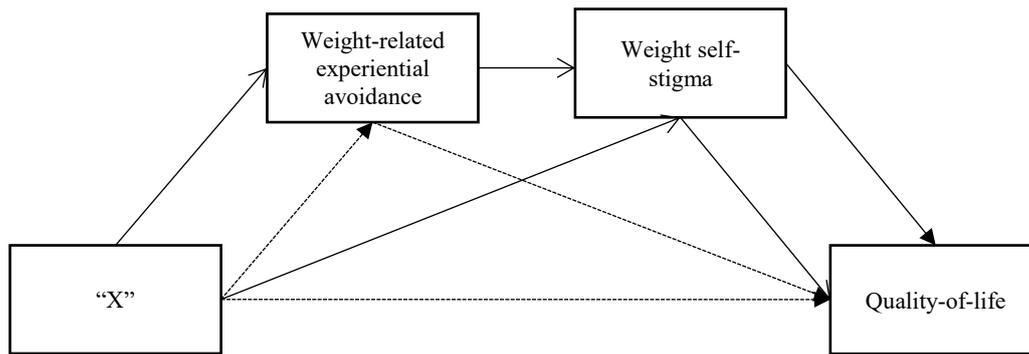


Figure 1. Path diagram for the serial mediation model tested. Significant paths are displayed with black lines and non-significant paths are showed with dotted lines.

RESULTS

Repeated measures ANOVA

Repeated Measures ANOVAs were performed to test differences in all study's variables from baseline to post-treatment and 3-month follow-up. At post-treatment, participants presented increased quality-of-life, mindfulness and self-compassion abilities and decreased BMI, weight self-stigma, emotional eating, weight-related experiential avoidance, shame and self-judgment levels (Table 1). All differences reflected large effect sizes. Furthermore, post-hoc pairwise comparisons indicated that changes from baseline to post-treatment were maintained at 3-month follow-up. Furthermore, no significant differences were found between post-intervention and 3-month follow-up, except for emotional eating where significant differences were found between all assessments.

Kg-Free mechanisms of change

In order to explore the mechanisms of change on Kg-Free main outcomes, two-condition within-subjects' mediation analyses were performed using MEMORE. Changes from baseline to post-treatment in weight-related experiential avoidance, shame, self-judgment, self-compassion and mindfulness were hypothesized as possible mediators of changes in two main areas: 1) health-related outcomes that included weight self-stigma and quality-of-life; 2) weight and eating-related outcomes that encloses emotional eating and BMI. Changes in all outcomes were assessed from baseline to post-treatment. Table 2 displays the results found for the indirect effects of the intervention on changes in all outcome variables through the hypothesized mediators. As we were interested in exploring the unique and specific contribution of each mediator process, all analyses were performed separately.

Table 1

Means and SDs of the Outcome Measures at Baseline (M0), Post-treatment (M1), 3-month follow-up (M2) and Repeated Measures Analysis of Variance (N = 51) with Bonferroni Adjustment for pairwise comparisons.

Outcome measures	Baseline		Post-intervention		3-month follow-up		F	p	Partial η^2	Pairwise Comparisons				
	M (SD)	M (SD)	M (SD)	M (SD)	M0-M1	p				M0-M2	p	M1-M2	p	
ORWELL-97 ^a	56.43 (17.13)	49.12 (14.84)	46.88 (14.68)	46.88 (14.68)	15.886	<.001	0.25	7.31 (1.94)	.001	9.55 (2.10)	<.001	2.25 (1.11)	.147	
WSSQ	38.47 (9.03)	33.04 (8.22)	33.63 (9.1)	33.63 (9.1)	15.644	<.001	0.25	5.43 (1.14)	.001	4.84 (1.11)	.001	-0.59 (.93)	1.000	
BMI ^a	33.84 (5.47)	33.25 (5.36)	33.39 (5.45)	33.39 (5.45)	10.091	.001	0.18	0.59 (.14)	.000	0.46 (.17)	.033	-0.14 (.09)	.441	
TFEQ_Emotional eating ^b	2.81 (.69)	2.42 (.51)	2.24 (.53)	2.24 (.53)	28.326	<.001	0.37	0.38 (.08)	.001	0.56 (.09)	.001	0.18 (.05)	.006	
AAQW-R	42.04 (12.00)	32.80 (10.28)	30.78 (9.42)	30.78 (9.42)	37.496	<.001	0.44	9.25 (1.44)	.001	11.27 (1.53)	.001	2.02 (1.17)	.271	
OAS	23.71 (11.45)	18.57 (9.44)	17.16 (9.25)	17.16 (9.25)	11.557	<.001	0.19	5.14 (1.45)	.003	6.55 (1.48)	<.001	1.41 (1.36)	.920	
Self-compassion	8.35 (1.54)	9.14 (1.66)	9.17 (1.69)	9.17 (1.69)	6.345	.003	0.12	-0.80 (.25)	.006	-0.82 (.28)	.014	-0.02 (.27)	1.000	
Self-judgment	8.50 (2.14)	7.62 (1.82)	7.63 (2.28)	7.63 (2.28)	8.217	.001	0.15	0.87 (.24)	.002	0.87 (.25)	.003	-0.01 (.25)	1.000	
FFMQ ^a	47.02 (6.06)	50.28 (7.14)	50.57 (7.22)	50.57 (7.22)	9.196	.001	0.17	-3.26 (1.05)	.007	-3.55 (1.02)	.003	-0.30 (.70)	1.000	

Note: ^a = Greenhouse-Geisser correction; ORWELL-97 = Obesity-related Quality-of-life; WSSQ = Weight Self-Stigma Questionnaire; BMI = Body Mass Index; TFEQ = Three Factor Eating Questionnaire; AAQW-R = Acceptance and Action Questionnaire for Weight-Related Difficulties-Revised; OAS = Others as Shamer Scale; FFMQ = Five Facet Mindfulness Questionnaire.

Table 2

Independent Mediation analysis for Repeated measures using MEMORE macro for SPSS for changes on Health and eating-related outcomes (N = 53)

Mediation Analysis						
Outcome: Quality-of-life	Model Summary		Indirect effect		Bootstrapping 95% CI	
Mediators	ΔR^2	F	B	SE	Lower	Upper
AAQW-R	.16	4.611*	-4.80	2.12	-9.045	-0.837
OAS	.43	17.710***	-3.80	1.48	-7.068	-1.244
FFMQ	.14	3.956*	-2.07	1.21	-4.863	-0.240
Self-judgment	.27	8.800***	-3.39	1.41	-6.644	-1.150
Self-compassion	.03	0.827	-1.15	.77	-2.990	0.103
Outcome: Weight self-stigma						
AAQW-R	.17	5.180**	-3.00	1.11	-5.261	-0.900
OAS	.27	8.969***	-1.96	0.78	-3.719	-0.699
FFMQ	.25	7.731***	-1.53	0.70	-3.187	-0.447
Self-judgment	.21	6.577**	-1.80	0.71	-3.441	-0.613
Self-compassion	.07	1.181*	-0.96	0.58	-2.279	-0.008
Outcome: Emotional Eating						
AAQW-R	.14	4.090**	-0.16	0.10	-.370	-0.069
OAS	.05	1.276	-0.06	0.05	-.168	0.024
FFMQ	.11	2.818*	-0.09	0.05	-.194	-0.013
Self-judgment	.06	1.486	-0.03	0.03	-.101	0.032
Self-compassion	.11	3.083*	-0.09	0.05	-.209	-0.006
Outcome: BMI						
AAQW-R	.12	3.120*	-.31	.13	-0.561	-0.046
OAS	.00	0.066	-0.02	0.06	-0.138	0.090
FFMQ	.01	0.249	-0.01	0.09	-0.208	0.168
Self-judgment	.04	0.873	-0.06	0.07	-0.213	0.083
Self-compassion	.03	0.672	-0.01	0.06	-0.106	0.149

Note: *** $p \leq .001$; ** $p \leq .01$; * $p \leq .05$; AAQW-R = Acceptance and Action Questionnaire for Weight-Related Difficulties-Revised; OAS = Others as Shamer Scale; FFMQ = Five facet Mindfulness Questionnaire

Health related-outcomes

Concerning quality-of-life, results showed that all hypothesized mediators (except for self-compassion) mediated the changes from baseline to post-treatment. Results showed that participants scored less in ORWELL at post-treatment relative to baseline, through the process of the intervention's effect on reducing weight-related experiential avoidance, shame and self-judgment. Furthermore, another indirect effect of the intervention on *participants' quality-of-life occurred through* the development of mindfulness abilities from baseline to post-treatment. In addition, results showed that all hypothesized mediators had a significant indirect effect on the impact of the intervention on changes in weight self-stigma from baseline to post-treatment. In fact, participants presented diminished weight self-stigma at post-treatment through the process of the intervention's influence on weight-related experiential avoidance, shame, self-criticism, mindfulness and self-compassion abilities.

Weight and Eating-related outcomes

Concerning BMI, only weight-related experiential avoidance mediated the effect of the intervention (Table 2). This result indicates that the reduction in BMI at post-treatment occurred through the process of the intervention's influence on weight-related experiential avoidance from baseline to post-intervention. Finally, concerning changes in emotional eating results indicated that changes in weight-related experiential avoidance, mindfulness and self-compassion mediated the effects of the intervention on emotional eating changes from baseline to post-treatment.

Serial Mediation analysis

Given that research has been stressing the negative role of weight-related experiential avoidance and weight self-stigma on quality-of-life (e.g., Lillis et al., 2011; Palmeira et al., 2016b), we explored whether the impact of the intervention on participants' quality-of-life (ORWELL) from baseline to post-treatment would be mediated by the reduction of weight self-stigma (WSSQ) and if these changes were mediated by decreased weight-related experiential avoidance (AAQW-R), through a serial mediation model (Figure 1). Thus, three indirect effects were explored: 1) "X" → AAQW-R → ORWELL (B = -1.32, BootSE = 1.43, 95% CI [-4.067 to 1.628]); 2) "X" → WSSQ → ORWELL (B = -2.91, BootSE = 1.42, 95% CI [-5.736 to -0.080]); and 3) "X" → AAQW-R → WSSQ → ORWELL (B = -3.52, BootSE = 1.53, 95% CI [-6.993 to -0.982]), as well as a total indirect effect (B = -7.75, SE = 2.17, 95% CI [-12.036 to -3.498]). Also, the total effect (including direct and indirect effects) was significant ($t_{(51)} = -3.953$, $p = <.001$; B = -7.31, SE = 1.85, 95% CI [-11.019 to -3.596]), whereas the direct effect of "X" on

ORWELL was non-significant ($t_{(47)} = -1.851, p = .913; B = 0.44, SE = 1.85, 95\% CI [-3.284 \text{ to } 4.166]$). The model was significant ($F_{(4,47)} = 14.035, p < .001$) and accounted for 54.4% of changes in ORWELL's from baseline to post-treatment.

DISCUSSION

Although acceptance and mindfulness-based approaches seem to be effective in promoting quality-of-life for people with obesity (e.g., Forman et al., 2013; 2015; Lillis et al., 2009; O'Reilly et al., 2014), a growing interest exists in integrating compassion (Luoma & Platt, 2015). Results from this study provided further evidence for Kg-Free effectiveness, with changes from baseline to post-intervention being sustained at 3-month follow-up. Participants showed diminished external shame, self-judgment, weight-related experiential avoidance, weight self-stigma, emotional eating and BMI, and increased quality-of-life, mindfulness and self-compassion abilities at post-intervention and at 3 month follow-up. The effect sizes were large except for self-compassion that was medium. Although weight loss was not directly promoted in Kg-free, at post-treatment participants showed a significant, albeit small, weight loss. This was sustained at 3-month follow-up and is consistent with previous studies using acceptance and mindfulness-based interventions (O'Reilly et al., 2014; Tapper, Shaw, Ilsley, Hill, Bond, & Moore, 2009).

These findings support previous research that emphasises the importance of developing acceptance, mindfulness and compassion-based skills, in people living with overweight and obesity (Forman et al., 2015; O'Reilly et al., 2014; Gilbert et al., 2014), focused in improving health-related behaviours and quality-of-life, even without significant weight changes (e.g., Tylka et al., 2014). They also add to the existent knowledge by revealing the effectiveness of integrating components from different yet related approaches in people with overweight and obesity in order to promote quality-of-life and tackle weight self-stigma.

Given that Kg-Free integrated different components, it is paramount to explore whether all the processes mediated the changes found in the intervention's main outcomes. This will provide a much needed information to further develop process-focused and parsimonious interventions. Overall, results revealed that the increased quality-of-life and reductions in weight self-stigma at post-treatment were mediated by decreased levels of weight-related experiential avoidance, shame and self-judgment patterns and increased mindfulness skills. Nevertheless, self-compassion did not mediate changes in participants' quality-of-life. One possible explanation relies on the time needed to develop a self-companionate mind frame. Because self-compassion was only explicitly promoted in the intervention's last sessions, participants had less time to practice. It might be that for people with an underdeveloped soothing system, more time for

practicing self-compassionate exercises is required. On the other hand, a deshaming and non-judgmental attitude was promoted throughout the intervention. Thus, it makes sense that at the end of the intervention participants felt less shame and were less critical towards themselves but they might not be able to recognize themselves or even feel more self-compassionate. Thus, more studies are needed to fully understand the specific role of self-compassion.

Unveiling the mechanism of change in weight self-stigma is a particularly relevant finding, as weight stigma is considered a major obstacle to interventions (e.g., Lillis et al., 2009). As far as we know, our study is the first to reveal that other mechanisms, besides weight-related experiential avoidance, play a significant role in mediating the impact of the intervention on weight self-stigma.

In fact, and although the importance of shame and self-criticism in eating psychopathology has already been established (Duarte et al., 2014; Goss, 2011; Pila et al., 2015), our findings add to the existent knowledge by emphasising the negative role of shame and self-judgment as two important processes related to weight self-stigma and diminished quality-of-life in women with overweight and obesity. Moreover, our results also stress the importance of developing a more open, aware and tolerant relationship with oneself in order to promote well-being and increase the quality-of life of people with overweight and obesity. This is in line with empirical evidence that highlights the effectiveness of acceptance and mindfulness-based interventions in promoting quality-of-life (e.g., Forman et al., 2013, 2015; O'Rilley et al., 2014). In addition, by showing that self-compassion plays a mediator role on weight self-stigma, our results stress the importance of promoting a warm and caring relationship with oneself in this population (e.g., Gilbert et al., 2014; Hilbert et al., 2015). It seems that by explicitly promoting self-compassion, the intervention helped participants to access their soothing system and to deactivate the threat system, which is linked to shame feelings and self-critic patterns (e.g. Gilbert, 2010; Goss, 2011).

Concerning weight and eating-related outcomes, weight-related experiential avoidance was particularly important as it mediated changes in participants' BMI and emotional eating. These findings mirror the results found after a 1-day ACT workshop for weight loss (Lillis et al., 2009; 2011). This emphasizes the need to help people to become more flexible, tolerant and accepting towards their weight and eating-related experiences in order to maintain healthy eating patterns and even lose weight. This allows individuals to be more aware and disentangle themselves from their unwanted thoughts and emotions and create willingness to just look and be with them, while maintaining healthy behaviours. These skills are thought to be very helpful in the current environment where we are constantly being prompted to eat or to be sedentary (e.g., Forman et al., 2015).

Another relevant finding was the fact that the development of mindfulness and self-compassion abilities stand out (together with weight-related experiential avoidance) as important mediators of changes in emotional eating. It seems that promoting a more aware, non-judgmental and compassionate way to relate to one's experiences, particularly those related to eating, weight and physical exercise, was crucial to help participants recognize their internal cues (e.g. hunger and satiety) and to find other ways to soothe themselves without using food as a mechanism to regulate difficult emotional states. Particularly, mindfulness has been proposed to be important to decrease emotional eating and binge eating as it enhances awareness of internal and external cues and helps to make healthier choices (e.g., Kristeller & Wolever, 2011). Furthermore, self-compassion seems to be essential to diminish emotional eating, as it is closely associated with shame and self-criticism (e.g., Duarte et al., 2014, Pinto-Gouveia et al., 2016). Moreover, there is some evidence that individuals with overweight and obesity struggle to be compassionate towards themselves (Gilbert et al., 2014).

Taken together, our findings highlight the importance of promoting acceptance, mindfulness and self-compassion abilities in order to decrease shame, self-criticism and internalized stigma and promote the quality-of-life of individuals living with overweight and obesity. Additionally, targeting weight-related experiential avoidance and the development of mindfulness and self-compassion abilities was crucial to reduce participants' emotional eating levels and weight.

Finally, the serial mediational model tested revealed that the improvement in participants' quality-of-life at post-treatment was fully mediated by the impact of the intervention on weight self-stigma, which in part was due to increased weight-related psychological flexibility. The model accounted for 54.4% of changes in participants' quality-of-life. This result broadens the existent evidence (Lillis et al., 2010; 2011; Palmeira et al., 2016b) by pointing out the need to target experiential avoidance patterns and weight self-stigma to promote the quality-of-life of people living with overweight and obesity.

Despite the stimulating and relevant findings, this study encloses some limitations. Firstly, the reduced sample size may compromise findings generalization. Clearly more studies with larger and heterogeneous samples (men, adolescents) are needed to corroborate the results found. Also, because there was no control group, it is not possible to unequivocally assure that treatment effects are only due to the intervention. However, the large effects found, as well as the evidence for the mediational role of the psychological processes supports the assumption that changes were likely to result from the intervention. Also, results from the previous RCT supported Kg-Free effectiveness even when compared with TAU (Palmeira et al., 2016a). Lastly, results using FFMQ-15 should be viewed with caution, especially considering its low reliability at baseline. In

fact, researchers (e.g., Baer et al, 2006) already stressed the difficulties in assessing mindfulness, especially in non-meditators.

To sum up, our findings supported the effectiveness of Kg-Free in reducing weight-self-stigma, emotional eating, BMI and increasing quality-of life in women with overweight and obesity after a 3-month follow-up. More importantly, this study unveils the psychological processes that underlie the health and eating-related outcomes. Results support and highlight the clinical relevance of promoting acceptance, mindfulness and self-compassion abilities to tackle shame, self-criticism in order to diminish emotional eating, BMI and weight self-stigma and promote quality-of-life.

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Declaration of Conflicting Interests

The authors declare that they have no conflicts of interest.

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EMPIRICAL STUDY VII |

The role of self-disgust in eating psychopathology
in overweight and obesity:
Can self-compassion be useful?

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ABSTRACT

This study explores the relationship between self-disgust and eating psychopathology and whether self-compassion plays a mediator role on this relationship. Participants were 203 adults, from both genders, with overweight and obesity ($M_{\text{BMI}} = 31.17$, $SD = 5.43$). Women reported higher levels of self-disgust and eating psychopathology and lower levels of self-compassion than men. Path analysis' results suggested that the effect of self-disgust on eating psychopathology occurred partially through one's inability to be self-compassionate. Results highlight the damaging role of self-disgust on eating psychopathology and the importance of developing a more compassionate attitude towards the self to promote healthy eating behaviors.

KEYWORDS: Self-disgust; Self-compassion; Overweight and Obesity; Eating psychopathology; path analysis

INTRODUCTION

Evolutionarily, disgust refers to feelings of revulsion (Rozin, Lowery, Imada, & Haidt., 1999) and is an aversive response rooted in the threat-protection system that signals possible contamination or attacks, aiming to avoid diseases and protect us from ingesting harmful or poisoned substances (Gilbert, 2015; Oaten, Stevenson, & Case, 2009). It motivates avoidance-based responses, such as moving away, getting rid of or eradicating what is dangerous or disgusting (Rozin et al., 1999). Nevertheless, disgust evolved to be a multifaceted and heterogeneous emotional construct shaped through sociocultural learning, that can be prompted by different stimuli (Power & Dalglish, 2008; Rozin et al., 1999), including: social deviance and immoral behavior, interpersonal relationships (being disgusted by other's behaviors or presentations) and self-judgements (regarding one's body, emotions, thoughts, behaviors or even the self) (Chapman & Anderson, 2012; Ille, Schögggl, Kapfhammer, Arendasya, Sommera, & Schienlea, 2014; Gilbert, 2015; Overton, Markland, Taggart, Bagshaw, & Simpson, 2008) and lead to distinct responses. Although the disgust response serves an important and adaptive function in the external world, feelings of disgust may be generalized and directed towards the self when some aspects are seen as toxic, repugnant and dangerous (Gilbert, 2015; Overton et al., 2008; Power & Dalglish, 2008).

Self-disgust or self-loathing is considered to arise from the self-directed generalization of the basic disgust response and relates to feelings of aversion, deep grief or even repugnance towards the one's self, reflecting a noxious, harsh and embodied feeling state (Roberts & Goldenberg, 2007). It is considered a stable and dysfunctional psychological phenomenon that encloses two interrelated domains of the self (physical and behavioral) and that is intrinsically dependent on one's social environment (Powell, Simpson, & Overton, 2013). Even though self-disgust origins are yet to be fully understood, it is likely that it arises from social learning experiences such as: disgust-related criticism, internalization of other's disgust reactions and negative social comparisons, where the individuals learn what attributes others consider physically or socially repulsive (Powell, Simpson, & Overton, 2015). Moreover, self-disgust is intrinsically linked to other threaten-based emotions, such as anger, fear, and shame that when directed towards one's self may be extremely pathogenic (Gilbert, 2015; Powell et al., 2015). It is unclear whether self-disgust represents a severe form of shame or whether shame and self-disgust are variants of the disgust response (Roberts & Goldenberg, 2007). Nevertheless, several authors have been claiming that self-disgust reflects an important and distinct construct that deserves more empirical attention (Roberts & Goldenberg, 2007; Powell et al., 2015).

According to Gilbert (2005), individuals use identical psychological mechanisms to deal with both external and internal attacks and threats. Although disgust tends to elicit the urge to get

rid of, avoid or reject what is considered disgusting, this can be particularly difficult when the stimuli that elicit the disgust feeling is a part (or the whole) self (Espeset, Gulliksen, Nordbø, Skårderud, & Holte, 2012). Nonetheless, individuals can still engage in avoidance behaviors, such as avoiding touching or looking at themselves or being looked by others, masking the disgusting aspects of themselves or even trying to distract themselves from the object of disgust (Espeset et al., 2012; Powell et al., 2013). These avoidance-based strategies tend to yield paradoxical effects and contribute to increase or maintain the disgust response (Powell et al., 2015). Given that self-disgust is particularly enduring and that avoidance-based strategies seem to produce unwanted effects, individuals with self-disgust may become somehow trapped with the desire to get rid of those parts considered disgusting (Powell et al., 2013).

Until now, research on self-disgust is still scant and its relationship with psychopathology needs to be further explored. Nonetheless, recently, in a longitudinal study, self-disgust has been found to be involved in the genesis of depressive experience, as an important predictor of depressive symptoms (Powell et al., 2013). Self-disgust has also been related to unhealthy eating behaviors (e.g. restrictive eating, purging, and vomiting) body dissatisfaction, urge to lose weight, being often directed at undesirable and unattractive body features (Espeset et al., 2012; Powell, Overton, & Simpson, 2014; Shanmugarajah, Gaiind, Clarke, & Butler, 2012). Moreover, evidence suggests that individuals with eating disorders may use unhealthy eating behaviors to avoid or regulate negative affect and difficult emotions, such as shame, anger, sadness (Espeset et al., 2012; Fox, Grange & Power, 2015; Power & Dalglish, 2008). In a study comparing patients with different psychological problems and healthy controls, Ille et al. (2014) found that those with psychological problems showed higher levels of self-disgust. Among those with mental problems, those with borderline personality and eating disorders presented the highest self-disgust levels. Furthermore, evidence suggests that self-disgust plays a crucial role in eating disorders maintenance, eliciting food, eating and body-related stimuli avoidance in women (Espeset et al., 2012; Fox & Power, 2009). However, as far as we know the role of self-disgust in individuals with overweight and obesity has never been studied. Nevertheless, unveiling the role of self-disgust in this population may be especially important given that, in modern society, physical appearance (particularly for women) has become a major source of social acceptance (Gilbert, Price, & Allan, 1995) and is something that cannot be easily hidden from others. Thus, presenting a body that is different than the one that is socially valued and that others may view as disgusting can be threatening and become internalized, leading to feelings of shame and self-disgust. In turn, this increases one's vulnerability to engage in disordered eating patterns (Fox et al., 2015). Gilbert (2015) proposes that self-disgust encloses the desire to avoid the object of disgust, in order to become an acceptable and valued self within the social context.

On the other hand, research has been consistently highlighting the importance of developing self-compassion, i.e., having a warm, kind and accepting relationship with one's self as a protective emotional regulation process in mental health and well-being (MacBeth & Gumley, 2012; Neff, 2003). However, individuals that struggle with eating and weight problems seem to present difficulties in being self-compassionate towards themselves, especially when facing setbacks or failures (Adams & Leary, 2007; Gilbert, Stubbs, Gale, Gilbert, Dunk, & Thomson, 2014).

Evidence suggest that self-compassion may be linked to eating pathology in multiple ways (Braun, Park, & Gorin, 2016). Self-compassion has been found to mediate the relationship between BMI, shame, body dissatisfaction and body image-related unfavorable social comparisons and eating psychopathological symptoms and quality-of-life in females from clinical and non-clinical samples (e.g., Duarte, Ferreira, Trindade, & Pnto-Gouveia, 2015; Ferreira, Pinto-Gouveia, & Duarte, 2013). A German large study (N = 1158), with individuals with overweight and obesity, found that self-compassion mediated the relationship between weight self-stigma and global health (Hilbert, Braehler, Schmidt, Löwe, Häuser, & Zenger, 2015). Taken together these studies emphasize self-compassion abilities as key resources for the adoption of healthy behaviours.

This study aims to explore the associations between self-disgust, self-compassion and eating psychopathological symptoms in individuals with overweight and obesity. We expect that self-disgust would be positively related to eating psychopathology and negatively related to self-compassion. Gender differences concerning all study's variables were also explored since literature has been highlighting that women are more prone to present eating psychopathology than men (e.g., Buchanan, Bluestein, Nappa, Woods, & Depatie, 2013). Lastly, this study also investigated whether the ability to be self-compassionate mediated the relationship between self-disgust feelings and eating psychopathological symptoms in individuals with overweight and obesity, while controlling gender and BMI.

METHODS

Participants

The sample comprised 203 individuals (50.2% males and 49.8% females) with overweight and obesity ($M_{BMI} = 31.17$; $SD_{BMI} = 5.43$) seeking nutritional treatment for weight loss in several public and private health care units in Portugal. Inclusion criteria were: being an adult (age > 18 years old) and having a BMI ≥ 25 Kg/m². Participants presented a mean age of 40.08 ($SD = 11.74$), with a mean of 12.67 ($SD = 3.74$) years of education. No gender differences were found

for age, $t_{(201)} = -1.228$, $p = .221$, years of education, $t_{(201)} = 1.463$, $p = .145$ and BMI $t_{(201)} = -.451$, $p = .653$.

Concerning marital status 55.1% of the participants were married or living together, 36% were single, 8.4% were divorced and 0.5% were widowed. The majority (68.5%) came from low to medium socio-economic status.

Procedures

Before data collection ethical approval was obtained from all institutions that participated in the study. Participants were invited to the study by their own nutritionist on the day of their nutritional appointment. In the first page of the protocol, the study's goals, as well as the voluntary and confidential nature of the data, was stated. Participants were required to sign an informed consent before completing the self-reported questionnaires. The study's protocol took approximately 15 minutes to be completed.

Measures

Demographic Data. Participants reported their age, educational level, current height and weight. Participants were asked to report the weight of their current or previous nutritional appointment. Then BMI (Wt/Ht^2) was calculated.

Multidimensional Self-Disgust Scale (MSDS; Carreiras, 2014) is a self-report measure with 33 items that assesses self-disgust concerning physical, behavioral and functioning aspects. It encloses four subscales: defensive activation (physiological component; “*I have the feeling my body contracts*”), cognitive-emotional (cognitive and emotional component; “*I hate/despise that part of me*”), avoidance (behavioral component; “*I disguise/ dissimulate those aspects of me that I disgust*”) and exclusion (behaviors used to eliminate and exclude disgusting characteristics of the self; “*I feel like cutting, burning, or excluding that part of myself*”). Participants rate the frequency they experience each item on a 5 point Likert scale (0 - never and 4 - always). In the original study, conducted in a Portuguese sample, all subscales showed good internal consistency ($\alpha = .95$ for defensive activation; $\alpha = .97$ for cognitive-emotional subscale; $\alpha = .77$ for exclusion and $\alpha = .84$ for avoidance), good convergent and divergent validities (Carreiras, 2014). For the present study, only the cognitive-emotional subscale was used to assess participant's disgust thoughts and feelings towards the self.

Self-Compassion Scale (SCS; Neff, 2003; Castilho, Pinto-Gouveia, & Duarte, 2015) is a 26 items self-report measure that assesses the tendency to be compassionate toward the self when

facing setbacks. The SCS encloses six subscales that measure three components of self-compassion (self-kindness vs self-judgment, common humanity vs isolation and mindfulness vs over-identification) All items are rated on a 5 point Likert scale (1 = almost never; to 5 = almost always). The total score reflects the mean of all items, with higher values indicating more self-compassion. Both the original ($\alpha = .92$) and the Portuguese version ($\alpha = .94$) showed very good internal consistency (Neff, 2003; Castilho et al., 2015).

Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994; Machado, Martins, Vaz, Conceição, Pinto-Basto, & Gonçalves, 2014) is a well-known 36-item self-report instrument that measures eating psychopathological symptoms using a 6 point rating scale. EDE-Q has been consistently considered a reliable measure of eating psychopathology (Fairburn, 2008). The Portuguese version also presented very good internal consistency ($\alpha = .94$; Machado et al., 2014). In this study, we only used the EDE-Q global score as we were interested in capturing eating psychopathological symptoms severity.

Data analysis

IBM SPSS Statistics 20 and AMOS software were used to perform all data analysis. Gender variable was dummy coded as 0 = female and 1 = male. Preliminary data analyses were executed to explore the adequacy of the data. *Pearson correlation coefficients* were calculated to explore the associations between BMI, self-disgust (cognitive-emotional subscale), self-compassion and eating psychopathological symptoms. Then *independent t-tests* were performed to explore gender differences in all study's variables (Field, 2013). Effect sizes were calculated with Cohen's *d*. Following Cohen's guidelines (1988 cited in Tabachnick & Fidell, 2007) values < 0.4 = small effects; from 0.5 to 0.7 medium effects and > 0.8 large effect sizes.

Finally, to explore the mediator effect of self-compassion on the relationship between self-disgust and eating psychopathological symptoms, while controlling for BMI and gender, a *path analysis* was used. Path analysis allows the simultaneous examination of structural relationships, as well as the examination of direct and indirect paths (e.g., Schumacker & Lomax, 2004). Maximum Likelihood method was used since it allows for the estimation of all path coefficients and computes fit statistics. Model fit was assessed using several goodness-of-fit measures and recommended cut-points: Chi-Square (χ^2), Normed Chi-Square ($\chi^2/d.f.$), Comparative Fit Index (CFI ≥ 0.95 , desirable; Hu & Bentler, 1998), Goodness of Fit Index (GFI ≥ 0.95 , desirable; Jöreskog & Sörbom, 1996), Root Mean Square Error of Approximation (RMSEA ≤ 0.08 , acceptable fit; Kline, 2005) with a 95% confidence interval. The mediation effect was examined using bootstrap (2000 resamples) with 95% bias-corrected confidence interval. The effect is

statistically significant at $p < .05$ if zero is not included in the interval between the lower and the upper bound (Kline, 2005).

RESULTS

Preliminary Data Analyses

All variables showed acceptable skewness and kurtosis values below the recommend cut-points ($SK < |3|$ and $Ku < |8-10|$). Also, multicollinearity was not identified as all variables had $VIF < 5$. Finally, Mahalanobis distance statistic (D^2) did not detect the presence of any outliers (Kline, 2005).

Correlation analysis

Pearson's correlation analyses are displayed in Table 1. Results reveal that gender and BMI were not significantly correlated. Gender also showed negative and low associations with self-disgust and EDE-Q and a low and positive correlation with self-compassion. BMI showed positive and low associations with self-disgust and EDE-Q. BMI was not significantly related to self-compassion. Self-disgust was negatively and moderately related to self-compassion and positively and moderately associated with EDE-Q. Lastly, self-compassion was negatively and moderately correlated with EDE-Q.

Table 1

Means (M), standard deviations (SD), Alpha coefficients and Pearson moment correlation for all study's variables (N = 203)

Measures	M	SD	α	1	2	3	4
1. Gender	-	-	-	-			
2. BMI	31.17	5.43	-	.03	-		
3. Self-disgust	8.04	7.44	.94	-.18**	.27***	-	
4. Self-compassion	3.25	0.60	.92	-.28***	-.11	-.59***	-
5. EDE-Q	1.77	1.25	.94	.21**	.37***	.65***	-.48***

Note. ** $p < .01$; *** $p < .001$; BMI = Body Mass Index; EDE-Q = Eating Disorder Examination Questionnaire.

Gender differences

To explore differences regarding BMI, self-disgust, self-compassion and eating psychopathological symptoms between females and males, independent samples *t*-test were performed. Means, standard deviations, *t*-test differences and Cohen's *d* for all variables for each gender are displayed in Table 2. As can be seen, significant differences were found for all study's variables, except for BMI ($t(201) = -0.451, p = .653; d = 0.06$). Overall, females reported higher levels of self-disgust ($t(201) = 2.625, p = .009; d = 0.37$) and eating psychopathological symptoms ($t(201) = 4.116, p \leq .001; d = .58$). On the contrary, men presented higher levels of self-compassion abilities ($t(201) = -3.076, p = .002; d = 0.43$). All differences represent small effect sizes, with the exception for eating psychopathological symptoms, where the effect size was medium.

Table 2

Means (M), standard deviations (SD), t-test differences by gender for all variables and Cohen's d effect size (N = 203)

	Female (<i>n</i> = 101)		Male (<i>n</i> = 102)		<i>t</i> (<i>df</i>)	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
BMI	31.00	5.42	31.34	5.46	-.451 (201)	.653	0.06
Self-disgust	9.40	8.40	6.70	6.56	2.625 (201)	.009	0.37
Self-compassion	3.12	0.61	3.38	0.56	-3.076 (201)	.002	0.43
EDE-Q	2.12	1.23	1.42	1.19	4.116 (201)	<.001	0.58

Note. BMI = Body Mass Index; EDE-Q = Eating Disorder Examination Questionnaire.

Path analysis

Path analysis was conducted in order to test the mediational role of self-compassion on the relationship between self-disgust and eating psychopathological symptoms, while controlling for the effect of BMI and gender. The model tested contained 15 parameters. As fully saturated models always have a perfect model fit, model fit indices were neither examined nor reported. All path coefficients were statistically significant with the exception of the direct path from BMI → self-compassion ($b = 0.005$; $SE = 0.006$; $Z = 0.718$; $p = .473$) and the direct path from gender → self-compassion ($b = 0.129$; $SE = 0.068$; $Z = 1.888$; $p = .059$) that were non-significant and were progressively removed. The final model (Figure 1) presented a very good model fit: $\chi^2(2) = 4.049$, $p = .473$; $\chi^2/d.f. = 2.025$; $CFI = 0.992$; $GFI = 0.992$; $RMSEA = 0.071$, $[CI = 0.000; 0.172]$; $p = .266$.

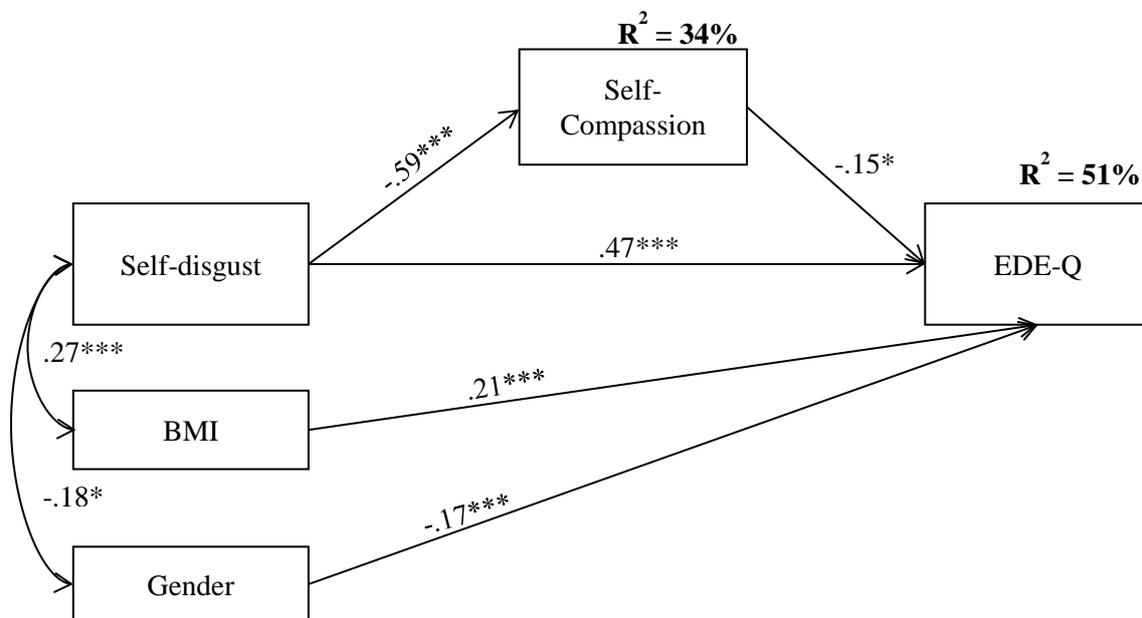


Figure 1. Graphic representation of the Mediation Model ($N = 203$).

Note. $**p \leq .01$; $***p \leq .001$; Standardized path coefficients are presented.

Self-disgust was significantly correlated with both BMI ($r = .27$, $p \leq .001$) and gender ($r = -.18$, $p = .011$). Concerning the mediation analysis, results showed that self-disgust had a significant direct ($\beta = 0.465$ based on 95% CI: 0.326; 0.590, $p = .001$) and an indirect effect on EDE-Q through self-compassion ($\beta = 0.085$ based on 95% CI: 0.007; 0.159, $p = .033$). The total effect (that represent the sum of the standardized direct and indirect effects) of self-disgust on EDE-Q was $\beta = 0.551$ based on 95% CI (0.438; 0.640, $p = .001$). Moreover, there was a significant direct effect of self-disgust on self-compassion ($\beta = -0.586$, based on 95% CI: -0.666; -0.498, $p =$

.001); 2) and a significant direct effect of self-compassion on EDE-Q ($\beta = -0.146$, based on 95% CI: $-0.272; -0.012$, $p = .033$); Also, BMI ($\beta = 0.237$, based on 95% CI: $0.113; 0.338$, $p = .001$) and gender ($\beta = -0.172$, based on 95% CI: $-0.267; -0.068$, $p = .001$) both presented significant direct effects on EDE-Q. The final model accounted for 34% of self-compassion and 51% of EDE-Q.

DISCUSSION

Self-disgust has been described as an enduring feeling of aversion, deep grief or repugnance towards some parts of the self (e.g. physical, psychological or behavioral), that stimulates avoidance-based responses (Roberts & Goldenberg, 2007). Especially when directed at relatively stable attributes of the self (e.g. body weight), self-disgust seem to be particularly maladaptive and associated with disordered eating (Espeset et al., 2012; Fox & Power, 2009). However, research on self-disgust is still in its early stages. As far as we know this is the first study that explored self-disgust in a sample of individuals with overweight and obesity seeking treatment for weight loss.

Results revealed that self-disgust was positively and moderately associated with eating psychopathological symptoms, whereas BMI only revealed positive but low associations with self-disgust and eating psychopathological symptoms. This result mirrors the results found in previous studies with non-clinical and eating disorders samples that showed that self-disgust was related to restrictive eating, purging, body dissatisfaction and urge to lose weight (Espeset et al., 2012; Powell et al., 2013). Contrarily, and as expected, the ability to have a warm and caring relationship with oneself was negatively associated with self-disgust and eating psychopathological symptoms and was not significantly related to BMI.

Consistent with previous findings, women presented higher levels of self-disgust and eating psychopathological symptoms and fewer self-compassion abilities than men. All gender differences reflected small effects, with the exception of the medium effect size found for eating psychopathological symptoms. In fact, literature points out suggest that women are more self-critic and have fewer self-compassion skills than men (Neff, 2003; Yarnell, Stafford, Neff, Reilly, Knox, & Mullarkey, 2015) and are more vulnerable to eating psychopathology (Buchanan et al., 2013). Likewise, although less studied, women present higher levels of self-disgust than men (e.g, Ille et al., 2014). These findings suggest that women are more prone to develop a negative and harmful internal relationship and may require differentiated interventions.

In addition, the present study highlights the role of self-disgust on eating psychopathological symptoms in people living with overweight and obesity. It seems that individuals that experience more self-disgust-related thoughts and emotions present more eating psychopathological

symptoms. This is in line with the existent studies with patients with Anorexia and Bulimia Nervosa that suggest that self-disgust is closely linked with body-image dissatisfaction, avoidance, tendency to restrict food intake and purging behaviors (Espeset et al., 2012; Powell et al., 2014). Furthermore, these findings give empirical support to Gilbert's (2015) idea that trying to avoid or get rid of what is considered disgusting enfold the wish to become accepted and valued in the eyes of others. Given the fact that one's weight and physical appearance is easily judged by others and that, especially for women, physical appearance is a crucial element for social acceptance, being considered overweight may present a threat to one's social acceptance and status (Gilbert et al., 1995; Simpson, Hillman, Crawford, & Overton, 2010). In fact, Gilbert (2015) argued that if the self, or parts of the self, are seen as disgusting by others (e.g., weight or physical appearance), this view can become built in the self-system. Thus, self-disgust feelings may lead people to increase their weight control strategies and become more preoccupied with their weight, eating and body image as a way to be accepted and valued in their social context.

Consistent with previous research (Buchanan et al., 2013; Ferreira, Palmeira, & Trindade, 2014), having a higher BMI and being female (although weakly) were directly related to higher levels of eating psychopathological symptoms. The fact that in our male sample the EDE-Q mean score was below the cut-off for eating psychopathology, may also account for the results found.

Moreover, in our model, the relationship between self-disgust and eating psychopathological symptoms was partially mediated by individual's inability to adopt a compassionate attitude towards themselves. Overall, the model tested accounted for 34% of self-compassion and 51% of eating psychopathological symptoms. This result points out that the effect of feeling disgust towards the self on disordered eating symptomatology seems to occur partially through the difficulty in accepting and having a warm and kind attitude towards oneself and one's imperfections. This is noteworthy as once acquired, self-disgust is considered hard to unlearn and that avoidance-based strategies tend to be ineffective (Powell, et al., 2015).

To sum up, this study highlights the harmful role of self-disgust on eating psychopathological symptoms in people living with overweight and obesity. It also points out that being self-compassionate when facing failures or errors can be a useful resource in self-disgust and eating psychopathology. Still, research on self-disgust is recent and more studies are needed to better understand its origins and impact on the lives of people living with overweight and obesity. Future studies could continue to explore the impact of self-disgust particularly on binge eating and quality-of-life.

The present study encloses some limitations. This is a cross-sectional study, which precludes conclusions regarding causality. Clearly, longitudinal studies are needed to determine the directionality of the associations found. Likewise, we relied on participants self-reports (including

height and weight), which may be biased and influenced the results. Additionally, we were unable to assess participant's medical and psychiatric history or the existence of eating disorders. Future studies should also take these aspects into account as they may influence the results found. Finally, the model tested is limited as it is likely that other variables (e.g., body dissatisfaction, self-criticism) and other emotional regulation processes (e.g., decentering, experiential avoidance, cognitive fusion) may be involved in the relationship between self-disgust and eating psychopathological symptoms. However, we intentionally restrained this model to specifically explore the role of self-disgust and self-compassion abilities.

In conclusion, this study offers new insights for future research on self-disgust and stresses the importance of assessing and targeting self-disgust – an often neglected emotion – in adults (especially women) with overweight and obesity seeking treatment. Furthermore, our findings suggest the importance of fostering self-compassion skills, so individuals may develop a more detached and accepting relationship with their internal experiences, instead of being judgmental and becoming overidentified with them. In turn, this may help to decrease their eating psychopathological symptoms.

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Declaration of Conflicting Interests

The authors declare that they have no conflicts of interest.

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EMPIRICAL STUDY VIII |

Self-disgust as a pathway to depressive and eating-disordered symptoms
in dieters and non-dieters:
The mediator role of self-criticism and self-reassurance

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Submitted manuscript

Self-disgust as a pathway to depressive and eating-disordered symptoms in dieters and non-dieters: The mediator role of self-criticism and self-reassurance

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ABSTRACT

Current research emphasizes the association between self-disgust and psychological suffering, particularly its role on depression and weight and eating issues. Furthermore, self-disgust seems to be closely related to other defensive emotions and self-criticism patterns. This study main goals were to test whether self-criticism and self-reassurance mediated the relationship between self-disgust and depressive and eating psychopathological symptoms (EDE-Q) and to explore differences between dieters and non-dieters.

The study encloses two distinct samples (N = 448): a non-dieter community sample (n= 284; sample 1) and a dieter sample enrolled in nutritional treatment for weight loss (n= 164; sample 2) that completed a set of self-reported measures. As expected, self-disgust was closely related to self-criticism, depressive and EDE-Q symptoms and negatively related to self-reassurance. Moreover, differences between dieters and non-dieters were found for all variables, except for self-reassurance. Overall, results from path analysis showed that, even when controlling BMI and gender, the relationship between self-disgust and depressive and EDE-Q symptoms was partially mediated by self-criticism and difficulties in reassuring the self. The model accounted 55% of depressive symptoms and 41% of EDE-Q variance. Finally, the model tested was not invariant across groups. In fact, the path between self-disgust and hated-self was stronger for the dieter group. Also, the path between self-reassurance and depressive symptoms was only significant for the dieter group. The model explained 48% of depressive and 27% of EDE-Q symptoms for the non-dieters group and 61% of depressive and 47% of EDE-Q symptoms for the dieters group.

KEYWORDS: Self-disgust; self-criticism; dieters and non-dieters; depression; eating psychopathology; Multi-group analysis

KEY PRACTITIONER MESSAGES

- Self-disgust was moderately related to self-criticism and psychopathological symptoms
- Significant differences between dieters and non-dieters were found, with dieters reporting higher levels of self-criticism and symptoms than non-dieters
- Self-criticism mediated the association of self-disgust and psychopathological symptoms
- The model was not invariant across dieters and non-dieters
- Findings point the importance of developing a warm and nurturing internal relationship.

INTRODUCTION

Recently, several authors argued for the importance of self-disgust as a unique construct that deserves more empirical attention (e.g., Roberts & Goldenberg, 2007; Simpson, Hillman, Crawford, & Overton, 2010). Self-disgust is considered to arise from the internalization of the human basic and adaptive disgust response (Powell, Simpson, & Overton, 2013; 2015). Anchored within the threat-protection system, the disgust response originally existed as an adaptive mechanism to avoid disease, stimulating avoidance or rejection (Gilbert, 2015; Rozin, Haidt & McCauley, 1999). However, as disgust is intrinsically related to the sociocultural environment, the disgust response may be generalized and elicited by distinct stimuli (e.g., certain animals, immoral behaviors, physical appearance, features of the self; (Ille et al, 2014; Overton, Markland, Taggart, Bagshaw, & Simpson, 2008; Roberts & Goldenberg, 2007), signaling what is considered aversive and unacceptable in one's social context (Gilbert, 2015; Power & Dalgleish, 2008). Physical attributes regarded as socially unattractive are often perceived as disgusting (e.g., Park, Van Leeuwen, & Stephen, 2012), and self-disgust related to physical attributes seems to be more enduring than self-disgust related to one's behaviors (Powell et al., 2013).

Self-disgust relates to an enduring feeling of aversion, revulsion or deep grief about features of the self (physical or behavioral) that are viewed as toxic and repulsive, involving a noxious and embodied feeling state (Gilbert, 2015; Roberts & Goldenberg, 2007; Powell et al., 2015). It is a multidimensional construct that includes physiological, behavioral and cognitive-emotional components (Carreiras, 2014; Rozin, Haidt, & McCauley, 2008). When the object of disgust is an attribute of the self that is considered persistent or difficult to change (e.g., one's weight, specific thoughts, emotions or behaviors or even the whole self), self-disgust is considered to be maladaptive (Powell et al., 2013, 2015). Disgust towards the self tends to elicit avoidance strategies (e.g., avoiding looking at one's body; engaging in distraction techniques) similar to those prompted by disgust towards external stimuli (Powell et al., 2013). These avoidance-based strategies may maintain the self-disgust response (Espset, Gulliksen, Nordbo, Skarderud, & Holte, 2012; Powell, Overton, & Simpson, 2014).

Current research on self-disgust has been highlighting its negative role in psychopathology, particularly in depression, physical appearance, eating and interpersonal problems (Espeset et al., 2012; Ille et al, 2014; Powell et al., 2014).

Powell et al. (2013) in a longitudinal study concluded that self-disgust reflects a stable affective orientation that can predict depressive symptoms over a 12-month period. Thus, self-disgust may be considered a fundamental aspect of the experience of being depressed (mediating the relationship between dysfunctional cognitions and depressive symptoms) and it seems more

than merely an epiphenomenon of depression symptomatology (Overton et al., 2008; Powell et al., 2013, 2015)

Ille et al. (2014) reported that among those with mental health problems, individuals with borderline personality and eating disorders were the ones that presented the highest self-disgust levels. Espeset et al. (2012) in a qualitative study with women with eating disorders revealed that the experience of feeling disgusted with oneself was linked to body dissatisfaction, desire to lose weight, unhealthy eating behaviors (such as, restrictive eating and purging) and the tendency to avoid food, body awareness and social interactions where the body could be exposed to others. Thus, certain eating behaviors seem to function as a way to avoid or regulating self-disgust (Espeset et al., 2012; Fox & Power, 2009; Olatunji, Cox, & Kim, 2015).

Self-disgust has been considered part of a threat-protection system, and is closely related to, but distinct from, other defensive emotions, such as anger, fear, sadness and shame (Powell et al., 2015; Rozin et al., 1999). According to Gilbert (2015) these threat-based emotions may be exceptionally pathogenic when directed at one's self. Moreover, self-disgust seems to involve some type of harsh relationship with oneself (Gilbert, Clarke, Hempel, Miles, & Irons, 2004). Self-disgust differs from self-criticism due to the level emotionality associated with it and its explicit focus on aversion (Powell et al., 2013; Whelton & Greenberg, 2005). Powell et al. (2014) found that simply not liking certain features of the self is necessary, but not sufficient, to experience self-disgust. Gilbert et al. (2004) argues that individuals may be self-critical and not have self-disgust feelings.

Self-criticism has been described as a defensive strategy within the threat-protection system, which main goal is to correct and improve the self in order to protect from external or internal social threats (Gilbert, 2010; Gilbert & Procter, 2006). Gilbert et al. (2004) argue that when facing errors or failures individuals may adopt different strategies to deal with themselves, namely one can be self-critic or instead self-reassuring. Moreover, Gilbert distinguishes two types of self-criticism: one focused on one's inadequacies and inferiority aiming at correcting the self from errors and failures (inadequate self) and another one focused on condemning, blaming and attacking the self (hated-self). Hated-self is characterized by self-hatred, anger and contempt (Ekman & Cordaro, 2011; Power & Dalgleish, 2008). It constitutes the harsher and more pathological form of self-to-self relating and has been consistently associated with severe psychological suffering (e.g., Castilho, Pinto-Gouveia, & Duarte, 2015; Gilbert et al., 2010), namely depressive symptoms (Dunkley, Zuroff, & Blankstein, 2003; Gilbert et al., 2004) and binge-eating (e.g., Duarte, Pinto-Gouveia, & Ferreira, 2014; Dunkley & Grilo, 2007). Feeling disgusted towards oneself and self-hatred are likely to co-occur and are closely related (Carreiras,

2014; Gilbert et al., 2004). Contrarily, self-reassurance refers to the capacity to develop positive feelings for the self in relation to one's failures and to see the self and others as a source of support, comfort and help in times of difficulty (Gilbert et al., 2004). In fact, the ability to be warm and comfort oneself even when facing difficulties or error has been associated with positive mental health (Gilbert et al., 2004; MacBeth & Gumley, 2012).

The current literature highlights the detrimental role that self-disgust and self-criticism play in psychological suffering, particularly in depression and eating disorders (Gilbert et al., 2004; Olatunji et al., 2015; Powell et al., 2013). However, the mediational processes involved in the relationship between the existence of feelings of aversion towards the self and depressive and eating psychopathology are still largely unexplored. In this sense, it is possible that the existence of a self-to-self relationship that is harsh, punitive and critic, rather than warm and supportive, may function as important mediators. These relationships have not been explored for people who present overweight or obesity, whose physical appearance is very different from the socially valued one, or for those who are deliberately trying to change their size and shape by dieting.

Therefore, this study has four main goals. Firstly, to explore the associations between BMI, gender, self-disgust, self-criticism, self-reassurance, depressive and eating psychopathological symptoms. Secondly, to explore these differences between dieters and non-dieters. Thirdly, to test the mediator role of self-criticism (both inadequate and hated-self) and self-reassurance on the relationship between self-disgust and depressive and eating psychopathological symptoms, while controlling for BMI and gender. These demographic variables were controlling hence research has been suggesting that women and individuals with higher BMIs tend to present higher levels of self-disgust (Ille et al., 2014), self-criticism (DeVore, 2013) and eating psychopathological symptoms (Buchanan et al., 2013). Finally, to explore whether the mediator role of self-criticism and self-reassurance was equivalent for dieters and non-dieter groups.

METHODS

Participants

Overall, 448 Portuguese adults participated in this cross-sectional study, comprising two samples. Sample 1 (community sample) - was comprised by 284 non-dieter adults from both genders (70.4% women and 29.6% men) from the general community via Coimbra citizen's bureau. Inclusion criteria included being an adult and not currently on any weight loss diet. Participants presented a mean age of 32.85 ($SD = 11.51$) and a mean of 14 years of education (SD

= 3.19). BMI mean was 24.49 ($SD = 3.32$). The majority were single (57.4%) and 36.9% were married. The majority came from low to medium socio-economic status (57%).

Sample 2 (clinical sample) – included 164 adults from both genders (61.6% women and 38.4% men) currently seeking nutritional treatment for weight loss in public and private care units in Portugal. They were invited to participate on the day of their nutritional appointment by their nutritionist. Sample mean BMI was 30.88 ($SD = 7.12$). Participants' mean age was 37.30 ($SD = 11.90$), with a mean of 12.95 ($SD = 3.71$) years of education. Concerning marital status 48.8% of the participants were married and 41.7% were single. The majority (66.8%) came from low to medium socio-economic status.

Procedures

Before data collection the study was approved by all institutions involved. All participants were informed about the voluntary and confidential nature of the collaboration as well as the general study's goals. Participants were required to give written informed consent before completing the self-reported measures. These took approximately 20 minutes to complete.

Measures

Demographic Data. All participants reported their age, educational level, current height and weight. In the clinical sample, participants were asked to report their weight of their current or previous appointment. Then BMI (Wt/Ht^2) was calculated.

Multidimensional Self-Disgust Scale (MSDS; Carreiras, 2014) is a 33-items self-report instrument that measures the frequency individuals experience disgust regarding different aspects of the self: cognitive, emotional, physiological and behavioral. This MSDS includes four subscales: defensive activation (physiological component, “*I have the feeling my body contracts*”), cognitive-emotional (cognitive and emotional component, “*I feel a deep grief regarding those aspects of myself*”), avoidance (behavioral component, “*I disguise/dissimulate those aspects of me that I disgust*”) and exclusion (behaviors used to eliminate and exclude disgusting characteristics of the self, “*I feel like cutting, burning or excluding that part of myself*”). All items are rated on a 5-point scale (0 - never and 4 - always). The original study was performed using a large sample ($N = 604$) and all subscales showed good internal consistency ($\alpha = .95$ for defensive activation; $\alpha = .97$ for cognitive-emotional subscale; $\alpha = .77$ for exclusion and $\alpha = .84$

for avoidance; Carreiras, 2014). In this study the global score was used to assess participant's experiences of disgust towards the self ($\alpha = .96$).

Forms of Self-Criticizing/Attacking & Self-Reassuring Scale (FSCRS; Gilbert et al., 2004; Castilho et al., 2015) is a self-report instrument that assesses the tendency to criticize or reassure the self when facing difficulties or errors, comprising three subscales: inadequate-self, hated-self and reassured-self. Participants rate the 22 items on a 5-point scale (0 = "Not at all like me" to 4 = "Extremely like me"). In the original version the FSCRS presented good internal consistencies ranging from .83 to .91 in clinical and non-clinical samples (Gilbert et al., 2004). In this study all subscales showed good internal consistencies ($\alpha = .85$ for inadequate-self, $\alpha = .74$ for hated-self and $\alpha = .87$ for reassured-self).

Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994; Machado et al., 2014). EDE-Q is a well-known 36-item self-report questionnaire that measures eating psychopathological symptoms. EDE-Q comprises four subscales, namely: restraint, eating concern, shape concern and weight concern. For the present study we only used EDE-Q global score as we were interested in assessing a global measure of eating psychopathological symptoms. EDE-Q has shown to be a reliable measure of eating psychopathology (Fairburn & Beglin, 1994). In this study the internal consistencies were $\alpha = .94$ for EDE-Q total score, $\alpha = .91$ for shape concern, $\alpha = .79$ for weight concern and $\alpha = .78$ for both restraint and eating concern subscales.

Depression, Anxiety and Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995; Pais-Ribeiro, Honrado, & Leal, 2004) is a 21-item self-report measure that comprises three subscales: depression, anxiety and stress. Participants rate all items using a 4-point scale (1 = It was not at all applied to me; 4 = Most of the times were applied to me), with higher scores reflecting greater negative emotional states. Both the original (.81 for depression and stress dimensions and .83 for anxiety; Lovibond & Lovibond, 1995) and Portuguese version revealed good internal consistency (.74 for anxiety, .85 for depression and .81 for stress dimensions; Pais Ribeiro et al., 2004). For this study only the depression subscale was used and it resented a very good internal consistency ($\alpha = .91$).

Data analysis

All data analyses were conducted using IBM SPSS Statistics 20 and AMOS software. Preliminary data analyses were executed to explore the adequacy of the data. *Pearson correlation coefficients* were calculated to explore the associations between BMI, gender, self-disgust, inadequate, hated and reassured self, depressive symptoms and EDE-Q subscales eating psychopathological symptoms in the total sample (combining samples 1 and 2). *Independent sample t tests* were performed to examine differences between non-dieters (sample 1) and dieters

(sample 2) for all variables. Cohen's *d* effect size was also analyzed to explore the magnitude of the differences found. According with Cohen's guidelines (1988 cited in Tabachnick & Fidell, 2007) Cohen's *d* between .2 and .4 represent small effects; between .5 and .7 medium effects and above .8 large effects.

To explore the mediator role of self-criticism (both hated and inadequate self) and self-reassurance (FCSRS) on the relationship between self-disgust (MSDS) and depressive symptoms (DASS-21) and eating psychopathological symptoms (EDE-Q), while controlling for BMI and gender, a *Path analysis* was performed using both samples (sample 1 and 2). Path analysis allows the simultaneous examination of structural relationships, as well as the examination of direct and indirect paths. The Maximum Likelihood method was chosen as it allows for the estimation of all model path coefficients and to compute fit statistics. Also, to assess overall model fit a number of goodness-of-fit measures and recommended cut-points were used (Kline, 2005): Chi-Square (χ^2), Normed Chi-Square ($\chi^2/d.f.$), Comparative Fit Index (CFI ≥ 0.90 , acceptable, and ≥ 0.95 , desirable; Hu & Bentler, 1998), Tucker-Lewis Index (TLI ≥ 0.90 , acceptable, and ≥ 0.95 , desirable; Hu & Bentler, 1998), Goodness of Fit Index (GFI ≥ 0.90 , good, and ≥ 0.95 , desirable; Jöreskog & Sörbom, 1996), Root Mean Square Error of Approximation (RMSEA ≤ 0.05 , good fit; ≤ 0.08 , acceptable fit; Kline, 2005) with a 95% confidence interval. The bootstrap procedure (2000 resamples) with 95% bias-corrected confidence interval was used to analyze the mediation effects. The effect is statistically significant at $p < .05$ if zero is not included on the interval between the lower and the upper bound (Kline, 2005). Finally, a multiple-group analysis was executed to test whether the model structure was invariant for both groups. This was performed through the chi-square difference test and the critical ratios for differences among all parameter estimates. Differences between groups are significant if critical ratio value is larger than 1.96 (Byrne, 2010).

RESULTS

Preliminary data analyses

All variables presented acceptable skewness and kurtosis values ($SK < |3|$ and $Ku < |8-10|$) and multicollinearity was not identified ($VIF < 5$; Kline, 2005). Mahalanobis distance statistic (D^2) indicated the presence of outliers, but extreme values were not detected. Thus, we decided to maintain the outliers, as it has been argued that this procedure makes the data more likely to be representative of the population being studied (Kline, 2005; Tabachnick & Fidell, 2007).

Correlation analysis

Pearson's correlation coefficients were computed with the total sample (combining samples 1 and 2) for all variables, these can be found in Table 1. BMI showed positive associations with all self-reported variables in study, except with reassured-self, where no significant correlation was found. Self-disgust was positively and strongly related to self-criticism, depressive and eating psychopathological symptoms. Self-disgust presented a negative and low association with reassured-self. Self-criticism (both inadequate and hated-self) showed positive and moderate to strong associations with DASS-21 and EDE-Q. Conversely, reassured-self was negatively and moderately related to self-criticism, DASS-21 and EDE-Q. Finally, depressive symptoms were positively and moderately correlated with EDE-Q.

Table 1

Pearson moment correlation for all study's variables (N =448)

Measures	1	2	3	4	5	6	7
1. Gender	-						
2. BMI	.27***	-					
3. Self-disgust	-.11*	.20***	-				
4. Inadequate Self	-.06	.14**	.64***	-			
5. Hated Self	.04	.24***	.68***	.65***	-		
6. Reassured Self	.03	-.08	-.35***	-.33***	-.44***	-	
7. Depressive symptoms	-.06	.19***	.70***	.58***	.63***	-.38***	-
8. EDE-Q	-.19**	.31***	.56***	.47***	.38***	-.26***	.45***

Note. ** $p < .01$; *** $p < .001$; BMI = Body Mass Index; EDE-Q = Eating Disorder Examination Questionnaire.

Differences between groups

Independent t tests were conducted to explore differences in all study's variables between non-dieters (sample 1) and dieters (sample 2). Means, standard deviations, t -test differences and Cohen's d for all variables can be found in Table 2. Results revealed significant group differences. As expected, the dieter group reported higher BMI's than the non-dieter group. The dieter group also reported significantly higher levels of self-disgust, self-criticism (both inadequate and hated-self), depressive symptoms and eating psychopathological symptoms than the community non-

dieter sample. All differences reflect small effect sizes, with the exception of BMI and EDE-Q total and restraint subscale differences that represent large effect sizes (Table 2). There was no statistically significant difference regarding reassured-self between groups.

In the dieter group gender differences were found with men presenting higher BMI than women ($t_{(162)} = -3.294, p = .001; d = 0.52$) and lower levels of global eating psychopathological symptoms ($t_{(282)} = 3.567, p = .001; d = 0.56$), restraint ($t_{(282)} = 2.263, p = .024; d = 0.36$), eating ($t_{(282)} = 2.120, p = .037; d = 0.33$), shape ($t_{(282)} = 3.449, p = .001; d = 0.54$) and weight concerns ($t_{(282)} = 3.954, p = <.001; d = 0.62$), than men. In the non-dieting group there were significant differences between men and women. Women presented higher levels of self-disgust ($t_{(282)} = 2.454, p = .011; d = 0.33$), depressive ($t_{(282)} = 2.019, p = .044; d = 0.27$) and global eating psychopathological symptoms ($t_{(282)} = 5.579, p = <.001; d = 0.76$), restraint ($t_{(282)} = 2.852, p = .002; d = 0.39$), eating ($t_{(282)} = 4.108, p = <.001; d = 0.56$), shape ($t_{(282)} = 4.677, p = <.001; d = 0.64$) and weight concerns ($t_{(282)} = 5.380, p = <.001; d = .73$), whereas men presented higher BMI ($t_{(282)} = -5.676, p = <.001; d = 0.77$). All effect sizes were small to moderate.

Table 2

Means (M), standard deviations (SD), t-test differences and Cohen's d effect size by group for all variables (N = 448)

	Non-dieters (n = 284)		Dieters (n = 164)		t(df)	p	Cohen's d
	M	SD	M	SD			
BMI	24.49	3.32	30.89	7.12	-10.834 (446)	<.001	1.06
Self-disgust	19.18	17.74	28.33	25.15	-4.108 (446)	<.001	0.40
Inadequate Self	14.19	6.46	16.40	8.21	-2.966 (446)	.003	0.29
Hated Self	2.72	2.93	4.34	4.60	-4.061(446)	<.001	0.40
Reassured Self	20.98	5.89	19.98	6.78	1.566 (446)	.118	0.15
Depressive symptoms	3.46	4.00	4.98	5.59	-3.057 (446)	.002	0.30
EDE-Q Total	1.11	1.01	2.12	1.17	-9.262 (446)	<.001	0.91
EDE-Q Restraint	0.95	1.09	1.87	1.31	-8.017(446)	<.001	0.78
EDE-Q Eating concern	0.57	0.84	1.23	1.25	-6.658(446)	<.001	0.65
EDE-Q Weight concern	1.62	1.44	2.56	1.72	-6.189(446)	<.001	0.61
EDE-Q Shape concern	1.55	1.26	2.40	1.47	-6.463(446)	<.001	0.63

Note. ** $p <.01$; *** $p <.001$; BMI = Body Mass Index; EDE-Q = Eating Disorder Examination Questionnaire.

Path analysis

To test the mediator effect of self-criticism and self-reassurance on the relationship between self-disgust and depressive and eating psychopathological symptoms, a path analysis was performed combining both samples. BMI was controlled given that it was not possible to match the BMI from both samples. Gender was also controlled due to the significant gender differences. The initial model was tested through a model with 30 parameters. The analysis of the path coefficients from the initial model allowed us to verify that four path coefficients were not statistically significant. These non-significant path coefficients were progressively removed: 1) the direct path from gender \rightarrow depressive symptoms ($b = -0.140$; $p = .674$); 2) the direct path from BMI \rightarrow depressive symptoms ($b = 0.026$; $p = .317$); 3) the direct path from reassured-self \rightarrow EDE-Q ($b = -0.013$; $p = .082$); and 4) the direct path from hated-self \rightarrow EDE-Q ($b = -0.033$; $p = .052$). The model was then respecified with all the remaining individual path coefficients being statistically significant. The final model presented an excellent model fit: $\chi^2(10, N = 448) = 26.165$, $p = .004$; $\chi^2/d.f. = .2.617$; GFI = 0.99; CFI = 0.99; TLI = 0.97; RMSEA = 0.060, [CI = 0.032; 0.089]; $p = .245$).

Mediation Analysis

Results showed that self-disgust presented direct and indirect effects (through self-criticism and self-reassurance) both on depressive symptoms and EDE-Q. Concerning EDE-Q the direct effect of self-disgust was $\beta = 0.355$ based on 95% CI: 0.267; 0.441, $p = .001$, whereas the indirect effect through inadequate-self was $\beta = 0.123$, based on 95% CI: 0.072; 0.178, $p = .001$. The total effect (sum of the standardized direct and indirect effect) of self-disgust on EDE-Q was $\beta = 0.478$ based on 95% CI: 0.403; 0.543, $p = .001$.

In relation to depressive symptoms, self-disgust also revealed a significant direct effect ($\beta = 0.448$, based on 95% CI: 0.364; 0.533, $p = .001$), as well as, a significant indirect effect ($\beta = 0.254$; based on 95% CI: 0.190; 0.324, $p = .001$). This indirect effect occurred through hated-self ($b = 0.684 \times 0.208 = 0.142$), inadequate-self ($b = 0.641 \times 0.123 = 0.078$) and reassured-self ($b = -0.353 \times -0.092 = -0.032$). The total effect of self-disgust on depressive symptoms was $\beta = 0.702$ based on 95% CI: 0.648; 0.749, $p = .001$. The final model accounted for 41% of inadequate-self, 47% of hated-self, 12% of reassured-self, 55% of depressive symptoms and 41% of EDE-Q.

Multi-group analysis

A multi-group analysis was used to verify whether the path coefficients from the final model are equal or invariant across groups (dieters and non-dieters). The tested model presented a very good fit to the data for both groups: $\chi^2(20) = 38.207$, $p = .008$; $\chi^2/\text{d.f.} = 1.910$; CFI = 0.99; TLI = 0.96; RMSEA = 0.045, [CI = 0.022; 0.067]; $p = .614$.

The unconstrained model (i.e., with free structural parameter coefficients) and the constrained model (i.e., where the parameters are constrained equal across groups) were compared (Byrne, 2010). Results from the Chi-square difference test revealed that the model was not invariant for the two groups ($\chi^2 \text{ dif}(11) = 31.228$, $p = .001$). In fact, in the non-dieters group the model accounted for 31% of inadequate-self, 28% of hated-self, 6% of reassured-self, 48% of depressive symptoms and 27% of EDE-Q (Figure 1), whereas in the dieters group the model explained 50% of inadequate-self, 61% of hated-self, 21% of reassured-self, 61% of depressive symptoms and 47% of EDE-Q (Figure 2).

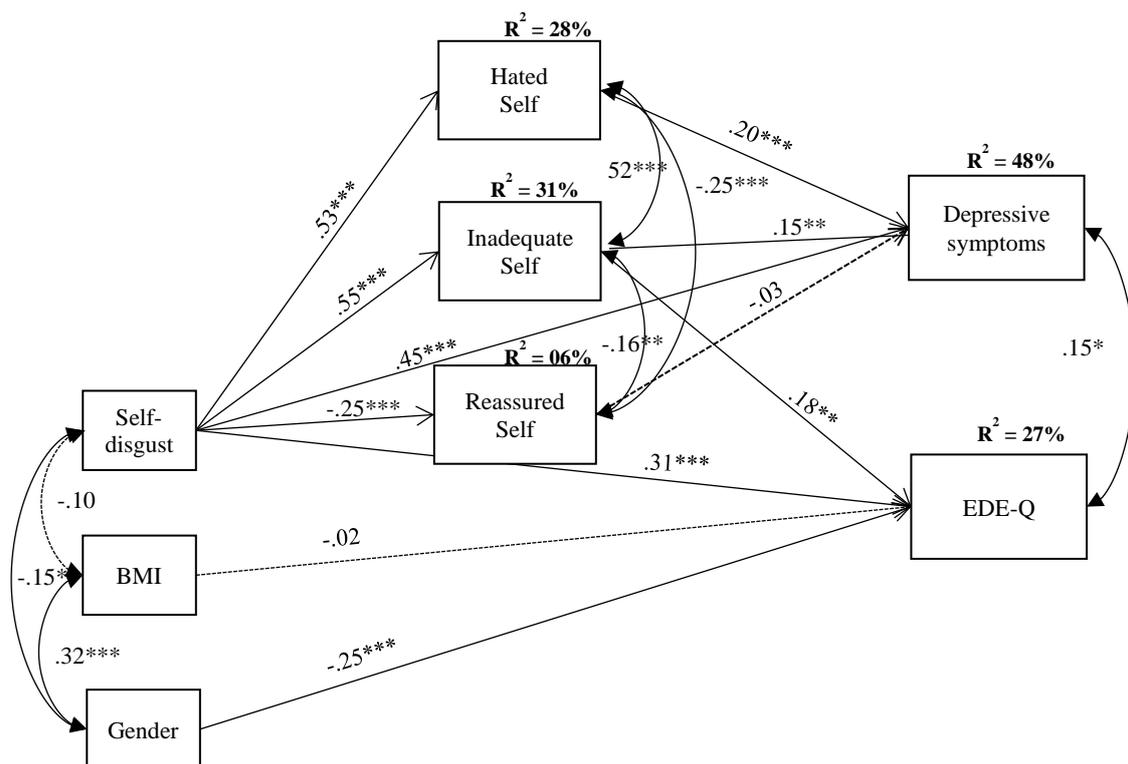


Figure 1. Path Model for the non-dieters group ($n = 284$).

Note. * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$; Standardized path coefficients among variables are presented. Dotted lines represent non-significant path coefficients.

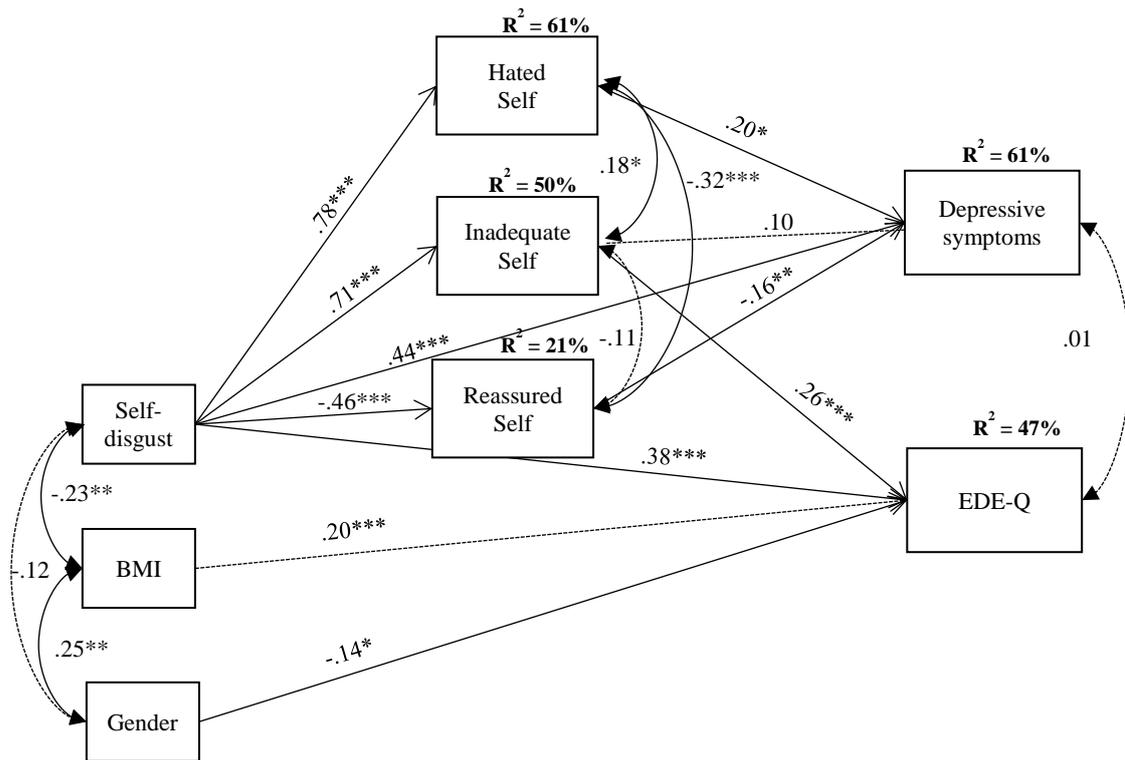


Figure 2. Path Model for the dieters group ($n = 164$).

Note. $^*p \leq .05$; $^{**}p \leq .01$; $^{***}p \leq .001$; Standardized path coefficients among variables are presented. Dotted lines represent the non-significant path coefficient.

Finally, to explore differences between groups among all parameter estimates, critical ratio differences were calculated. The test revealed two significant differences. One in the path between self-disgust and hated-self ($Z = 4.541$, $p < .001$). For the non-dieters group the standardized regression weight was $\beta = 0.087$, $p < .001$, whereas for the dieters group was $\beta = 0.143$, $p < .001$. This suggests that the relationship between self-disgust and hated-self seems to be stronger in the dieters group than in the non-dieters group. The second difference was in the path between reassured-self and depressive symptoms ($Z = 1.963$, $p < .05$). For the non-dieters group the standardized regression weight was non-significant ($\beta = -0.020$, $p = .518$) whereas for the dieters group was $\beta = 0.132$, $p = .006$. This suggests that the relationship between the inability to reassure oneself and depressive symptoms was only significant for the dieters groups.

DISCUSSION

The current study explored the mediator role of self-criticism and self-reassurance on the relationship between self-disgust in depressive and eating psychopathological symptoms in dieters and non-dieters.

Self-disgust was strongly associated with self-criticism, especially the hated-self, depression and eating psychopathology and negatively related to self-reassurance. This is in line with previous studies that have emphasize the close link between feeling disgust towards the self and the tendency to be harsh and critical when facing failures or setbacks (e.g., Gilbert et al., 2004), and how self-disgusted is associated with depression and eating disorders (Powell et al., 2013; Espeset et al., 2012; Ille et al., 2014). Similarly, it was found that both types of self-criticism measured in this study were related to psychopathology (Gilbert & Procter, 2006; Dunkley & Grilo, 2007), whereas the tendency to be warm and reassure oneself was negatively associated with depressive and eating psychopathological symptoms. Results suggest that individuals with a higher BMI, presenting a body type that is different from the socially valued one, also tend to experience higher levels of self-criticism, self-disgust, negative affect and more eating disordered attitudes and behaviors, and find it more difficult to reassure themselves.

Findings regarding differences between dieters and non-dieters revealed large differences in BMI and eating psychopathological symptoms, with dieters presenting higher levels than non-dieters. Dieters also reported more depressive symptoms than non-dieters. This is consistent with previous studies that have found that individuals seeking treatment for weight management tend to present higher levels of psychopathology (e.g., Wadden et al., 2006). Moreover, significant gender differences were found in both groups, with women presenting higher eating psychopathological symptoms and men presenting higher BMI, which is in line with existent studies (e.g., Buchanan et al., 2013).

As far as we are aware, this is the first study that explored differences between dieters and non-dieters in self-to-self relating. Results suggest that when compared with non-dieters, dieters with overweight and obesity report a relationship with the self that is characterized by feelings of aversion and revulsion for the self and a tendency to be harsh, critical and punitive with themselves when facing setbacks. However, the ability to be self-reassure when facing difficulties was similar in both groups.

The present study explored the mediator role of self-criticism and self-reassurance on the relationship between self-disgust and depressive and eating psychopathological symptoms, while controlling BMI and gender. Not surprisingly, presenting a higher BMI and being female was directly related to eating disordered attitudes and behaviors, which is largely empirically recognized (e.g. Buchanan, Bluestein, Nappa, Woods, & Depatite, 2013). Moreover, self-disgust

played a crucial role on both depressive and eating psychopathological symptoms. This is consistent with the recent research that associates self-disgust with psychopathology (Ille et al., 2014) and argues that self-disgust is a phenomenon intrinsically linked with the experience of being depressed (Powell et al., 2013, 2014). Furthermore, the results concerning the relationship between self-disgust and eating psychopathology symptoms seem to suggest that presenting feelings of aversion towards some parts of the self (e.g., physical attributes or behaviors) may lead individuals to become preoccupied with weight, shape and body-image and to adopt unhealthy eating behaviors.

Another key finding was the fact that the relationship between self-disgust and depressive and eating psychopathological symptoms was partially mediated by the tendency to be harsh, critical and punitive towards the self and the inability to have a warm and kind attitude when things go wrong. Overall, the model explained 55% of depressive symptoms and 41% of eating psychopathology. More specifically, inadequate and hated-self together with the inability to be reassuring partially mediated the impact of self-disgust on depressive symptoms. This gives support to the close link between self-disgust and self-criticism, and adds to current knowledge by suggesting that (at least partially) the impact of self-disgust in depressive symptoms occurs to the existence of an internal relationship where one part of the self-attacks, condemns and devaluates the self and the other feels beaten (Gilbert & Procter, 2006; Whelton & Greenberg, 2005). On the other hand, only inadequate-self mediated the relationship between self-disgust and eating psychopathological symptoms. This is an interesting result, as it suggests that engaging in unhealthy eating behaviours may function as a way to deal with feeling of revulsion towards the self and that this occurs through the existence of a self that is seen as inadequate, flawed and inferior. In this sense, controlling one's eating and weight may arise as a strategy to avoid inferiority and improve one's status (Gilbert, 2002; Simpson et al., 2010).

Finally, this model was not invariant across dieters and non-dieters, highlighting that those in the dieter group seem to be particularly vulnerable to depressive and eating psychopathology. In fact, results suggested a stronger relationship between self-disgust and hated-self in the dieter group. Additionally, the link between the ability to reassure the self and depressive symptoms was only significant in the dieters group. It seems that for these individuals, having self-disgust, an internal relationship characterized by negative self-evaluations and difficulties in being warm and caring may lead to more depressive symptoms. Hence, promoting an acceptance and caring attitude towards the self may be particularly important emotional regulation strategy to help these individuals to accept and nurture themselves instead of becoming trapped in the self-perpetuating cycle of self-criticism and self-disgust.

This study has a number of limitations that should be taken into account. The cross-sectional nature of the study precludes causality conclusions. Also, the sample size from both samples are not identical and samples are unbalanced regarding gender. Furthermore, we deliberately restrained our model to explore the role of self-criticism. However, it is possible that other emotional regulation processes may be involved on the relationship between self-disgust and depressive and eating psychopathological symptoms.

Despite these limitations, we believe that this study contributes to a better understanding of the role that self-disgust and self-criticism patterns play on mental health, particularly of those trying to lose weight. However, future studies are needed to better understand the origins of self-disgust, its association with constructs such as body shame and the role it plays on eating patterns (e.g. binge eating) and quality-of-life of this population.

In highlighting the damaging role that self-disgust and self-criticism plays in depressive and eating disordered attitudes and behaviors the present study has important clinical implications, especially for people with overweight and obesity seeking treatment. It suggests that interventions should address and target self-disgust, for example by helping individuals to develop their affiliative/soothing system and to be able to nurture even those parts of the self that are seen as aversive (Gilbert, 2010; Goss & Allan, 2014).

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CHAPTER IV |

GENERAL DISCUSSION

4. GENERAL DISCUSSION

In this chapter we sought to provide an integrative discussion of the main results from the preceding empirical studies that comprise this work. Although results are discussed in detail in each empirical study, in this chapter we present an integrative synthesis of the main results, emphasising what they add to the current knowledge. The discussion was divided in three distinct parts, given the three main aims presented in chapter II. Thus, first we discuss results from studies concerning weight self-stigma. Then, results from the Kg-Free intervention are outlined. Lastly, we focused on results from the studies regarding self-disgust. Furthermore, studies strengths and main limitations are also highlighted. Finally, we point out suggestions for future studies and key clinical implications for research and interventions with people with overweight and obesity seeking treatment for weight loss.

4.1. SUMMARY AND INTEGRATIVE DISCUSSION OF MAIN RESULTS

Obesity is currently one of the most threatening noncommunicable diseases associated with important mortality and morbidity health risks (DGS, 2014; WHO, 2016). Although obesity is associated with some genetic and metabolic factors, other social and environmental factors also play an important role. Unfortunately, the current modern Western societies provide a difficult context for weight loss. The fact that our brains did not evolved to restrain us from eating, together with the high palatable food availability and no need to expend much energy daily sets a perfect context for steady weight gain. Nonetheless, the risk of becoming overweight or obese depends on a complex and multifactorial combination of genetic, metabolic, physiological, contextual and behavioural factors (Brownell & Wadden, 1991; NIH, 1998).

The current gold standard treatment for obesity includes dietary and physical exercise modification, as well as some type of behavioural intervention (Jensen et al., 2014; NIH, 1998). Usually, these CBT components target individuals' motivation and work on goal setting, modifying dysfunctional thoughts and managing lapses to enhance adherence to dietary and physical exercise prescriptions (e.g., Shaw, O'Rourke, Del Mar, & Kenardy, 2005). Although most traditional weight loss treatments can produce significant weight losses at short-term and important health and psychological improvements (DGS, 2014; Laikiewicz et al., 2014; NIH, 1998), the majority of individuals keep struggling to lose weight or regain their initial weight

(e.g., NIH, 1998; Wadden et al., 2012; Wilson & Brownell, 2002), even after bariatric surgery (e.g., Courcoulas et al., 2013).

In their literature review Elfhag and Rossner (2005) propose that managing weight should be addressed from a psychological point of view. Still, the majority of the weight loss interventions still does not include any psychological intervention (Avenell et al., 2004; Byrne et al., 2003). Moreover, there is evidence suggesting that weight loss may not necessarily improve individual's psychological health or decrease weight stigma (Latner et al., 2012; O'Hara & Gregg, 2006; Puhl & Heuer, 2009; Tylka et al., 2014).

Weight-based stigmatization remains one of the few forms of stigmatization that remains socially accepted and is sometimes even spread as a way of preventing or fighting against obesity (e.e., Andreyeva et al., 2008; Latner et al., 2008; Puhl & Brownell, 2001). Nonetheless, the harmful consequences of weight-based stigmatization and discrimination in the life of those living with overweight and obesity (especially in female adolescents and women) are well documented (e.g., Puhl & Heuer, 2001; Davidson et al., 2008). Research shows that weight-based stigmatization is associated with poorer outcomes, including unhealthy eating patterns and even weight gain (Carels, et al., 2009; Major et al., 2014; Sutin & Terraciano, 2013). In turn, this makes people more vulnerable to being discriminated against, fuelling a self-perpetuating vicious cycle. Frequently, these weigh-based stigmatization messages are internalized by those with overweight and obesity reflecting weight self-stigma experiences (Durso et al., 2012a; Lillis et al, 2010). Weight self-stigma has been proposed as a key risk factor for unhealthy eating and poorer health and psychological outcomes (Hilbert et al., 2013; Latner et al., 2013).

Although literature emphasis the harmful role of weight self-stigma in the life of those with overweight and obesity, the psychological mechanisms that underlie the association between weight self-stigma and poorer outcomes are just starting to be explored (Vartanian & Porter, 2016). It is likely the way individuals respond to those undesired weight-related internal experiences (taking an accepting and detached attitude vs an avoidance and judgmental attitude) may play an important role on the tendency to engage in unhealthy eating patterns and may impact on one's quality-of-life.

Another emerging topic in the literature concerns self-disgust. Although, research on self-disgust is still in its early stages, the existent studies suggest its key role in eating disorders and in depressive aetiology (Fox & Power, 2009; Powell et al., 2013; 2015). Self-disgust is intrinsically related to one's social context, eliciting avoidance-based strategies (Espeset et al., 2012; Gilbert, 20015; Powell et al., 2015). Literature suggest that self-disgust may be particularly harmful when directed at relatively stable and unchangeable characteristics of the self (such as

one's weight, physical appearance or unwanted internal events) and that once acquired the disgust response it is hard to unlearn (Powell et al., 2015). Self-disgust has been linked with unhealthy eating patterns in women with eating disorders (Espeset et al., 2012; Ille et al., 2014), but is largely unexplored in people with overweight and obesity. Nonetheless, we believe that self-disgust may be relevant for this population, given that being overweight or obese is the opposite of socially valued physical appearance and may be considered an aversive or repugnant feature. In turn, when a feature of the self is appraised as repulsive, this view may become inbuilt in the self-system as disgusting (Gilbert et al., 2015), eliciting strategies to modify or get rid of those features seen as disgusting. Thus, in the last studies we aimed to study self-disgust in two distinct samples, one community non-dieter sample and another sample of people seeking nutritional treatment for weight loss. Additionally, we explored whether self-compassion and self-criticism played a role on the association between self-disgust and eating and depressive psychopathological symptoms.

Several authors proposed that the standard weight loss interventions may be insufficient, as they do not cultivate the psychological competencies needed to maintain healthy behaviours in the current environment (Forman et al., 2013; Lillis et al., 2009; Lillis & Kendra, 2015; Shaw et al., 2005). Furthermore, it has been suggested that the control strategies promoted in CBT interventions might make it more difficult for individuals to cope with cravings, especially for those highly susceptible to food cues (Forman et al., 2007a,b). Additionally, growing evidence emphasises the importance of promoting well-being and quality-of-life regardless of one's weight, especially as diet-focused interventions seem to be ineffective and may even carry unintended harmful effects, such as increasing unhealthy eating behaviours, body image dissatisfaction, stigma, shame and self-criticism tendencies (e.g., Bacon et al., 2002; 2005; Chevey et al., 2011; Tylka et al., 2014). An alternative health-focused approach has been proposed, focused on promoting healthy behaviours (e.g., healthy eating and physical exercise habits) and helping people to develop a more accepting and healthier relationship with their eating and weight-related experiences (Hilbert et al., 2013; Tylka et al., 2014) to improve well-being and quality-of-life (e.g., Blaine et al., 2007) regardless of one's weight.

In this context, the 'third wave' behavioural therapies seem suitable for those with eating and weight issues and obesity (Forman et al., 2013; Kelly & Carter, 2014; Lillis et al., 2009; O'Reilly et al., 2014; Rogers et al., 2016), providing the development of acceptance and mindfulness skills to promote a valued and meaningful life. In the current obesogenic environment, having the ability to be aware, willing and able tolerate unpleasant internal experiences (e.g., thoughts, emotions and urges) seems to be key in maintaining healthy behavioural patterns.

Over the last decade growing empirical support has been found for the use of acceptance and mindfulness-based interventions in obesity (e.g., O'Reilly et al., 2014; Rogers et al., 2016). Although less studied, several authors have been calling for the importance of developing of compassion in people struggling with eating and weight (Goss & Allan, 2010; 2014; Kelly & Carter, 2014). This is particularly important because when individuals with overweight and obesity face failures or setbacks, they tend to become highly ashamed and self-critical (Adams & Leary; Gilbert et al., 2014). In turn, shame and self-criticism are consistently related to unhealthy eating patterns (e.g., Duarte et al., 2015; 2017; Dunkley & Grilo, 2007; Frank, 2011), whereas self-compassion enhances the ability to maintain healthy behaviours (Adams & Leary, 2007; Braun et al., 2016; Magnus et al., 2010).

Taken together, evidence points out the importance of developing distinct and yet related competencies (acceptance, cognitive defusion, distress tolerance, values and committed actions, mindfulness and self-compassion) that are considered key to maintaining healthy behaviours in the current obesogenic environment (Forman et al., 2015; Lillis et al., 2015)

This thesis, **When weight stigma gets under the skin: The development of Kg-Free - a new integrated acceptance, mindfulness and compassion-based group intervention** unfolds three main goals. Although this is not a thesis about obesity itself, this work specifically aims to provide a significant contribution to improve both the assessment and interventions offered to those who live with overweight and obesity and want to break free from the heavy weight that weight has in their lives.

Given the amount of evidence highlighting the harmful role of weight self-stigma in the life of those with overweight and obesity, this work aimed to contribute to the understanding of the emotional regulation strategies involved in the relationship between weight self-stigma and eating behaviours and quality-of-life of women with overweight and obesity with and without binge eating disorder. Then, the second and ultimately the main goal of this thesis was the development and test of the efficacy of a new group-based intervention (Kg-Free), for women with overweight and obesity, that integrates mindfulness, ACT and self-compassion components. The development of this intervention was based on the growing call in the scientific community for the importance to promote compassion in acceptance and mindfulness-based interventions to tackle shame and self-stigma (Luoma & Platt, 2015; Neff & Tirch, 2013). Finally, the last goal of this work explored the link between self-disgust and eating and depressive symptoms in people seeking nutritional treatment for weight loss. As far we know, no previous studies explored self-disgust in this population and research on self-disgust remains a promising venue still largely unknown.

To comply with the goals that we have proposed, we needed to translate and validate two instruments for the population in study, since there was a lack of Portuguese measures to assess weight self-stigma and patterns of experiential avoidance related to weight and eating. Thus, the first two studies contribute to the validation of two self-report questionnaires for the Portuguese population of women with overweight and obesity. **The empirical study I** presented a confirmatory factor analysis of the Portuguese version of the **Acceptance and Action Questionnaire for Weight-related Difficulties** (AAQW; Lillis et al., 2008). The AAQW was developed to assess experiential avoidance patterns specifically related to weight, eating and physical activity (Lillis et al., 2008). In fact, the need to develop content specific measures, particularly for chronic health conditions, had already been emphasised (Gregg et al., 2007; Ferreira, Eugenicos, Morris, & Gilanders, 2013), as the AAQ-II focuses on general mental health (Bond et al., 2011). Thus, the AAQW significantly contributes to the assessment of experiential avoidance regarding one's eating and weight-related difficulties. Nevertheless, the factor structure of the AAQW was inconsistent and needed to be further examined. Although the original authors theoretically proposed a unifactorial structure (Lillis et al., 2008), results from the validation study conducted with patients submitted to bariatric surgery revealed a five-factor structure (Wineland et al., 2012). Moreover, the initial exploratory factor analysis of the AAQW Portuguese version (Cardoso et al., 2016) failed to support the existent five-factor structure, finding evidence for a three-factor solution. Therefore, this study aimed to test and compare the two existent factor structures using a confirmatory factor analysis approach in a mixed sample (comprising women from the general community samples, and women with overweight and obesity).

The three-factor structure comprising fifteen items revealed a better model fit to the data than the five-factor structure. Still, five items did not meet the recommended cut-off points for items reliability and were excluded. The final model (10 items) revealed a good fit to the data and included three factors: food as control; weight as a barrier to living; and weight-stigma. Finally, and consistent with the theoretical model proposed by the original authors, a second-order factor model was also tested, which may provide a more parsimonious interpretation of the data (see study I). Given that only ten of the original twenty-two items from the original version were retained, we suggested that this revised and shorten measure should be referred to as Acceptance and Action Questionnaire for Weight-related Difficulties-Revised (AAQW-R; Palmeira, Cunha, Pinto-Gouveia, Carvalho, & Lillis, 2016).

Overall, the AAQW-R proved to be a reliable measure. The three factors presented adequate internal consistency, composite reliability and variance extracted measure. The AAQW-R showed adequate temporal stability over a period of three months and proved to be highly sensitivity to

clinical changes. Results concerning the convergent and divergent construct validity of the AAQW-R supported the initial hypothesis. As expected, AAQW-R was positively related to BMI, eating psychopathological symptoms, binge eating and external shame and negatively associated with subjective happiness. These results support the associations between experiential avoidance patterns and negative eating and health-related outcomes. Accordingly, it seems that women that tend to avoid, control or suppress their weight-related internal events (thoughts, emotions and eating urges), also present more eating psychopathological symptoms, including binge eating symptoms, higher BMIs, believe that others see them as inferior or inadequate and report being less satisfied with their lives. Furthermore, the relation between the general experiential avoidance and the AAQW-R was slightly lower than expected confirming that both measures assess related yet distinct constructs.

Furthermore, the AAQW-R factor structure proved to be invariant across the two distinct samples (a community sample and a sample of women with overweight and obesity enrolled in nutritional treatment for weight loss). Additionally, significant group differences were found with women with overweight and obesity presenting higher tendency to control and suppress their weight-related internal experiences when compared with women from the general community within the normative BMI range.

Taken together, results from study I make a significant contribution to the assessment of weight-related experiential avoidance providing evidence for the reliability and stability of a short version of the AAQW. This instrument seems to be particularly useful to assess weight-related experiential avoidance patterns in women with overweight and obesity enrolled in weight loss treatments. The existence of a brief and reliable measure to assess weight-related experiential avoidance is crucial since weight-related experiential avoidance has been consistently related to poorer outcomes. The AAQW-R may be a useful screening tool to determine those individuals that may require additional interventions to achieve the best outcomes. Furthermore, given its high sensitivity to clinical changes the AAQW-R may be especially useful to assess changes during treatment.

Empirical study II first aim was to conduct a confirmatory factor analysis and explore the psychometric properties of the **Weight Self-Stigma Questionnaire** (WSSQ; Lillis et al., 2010; Palmeira, Cunha, & Pinto-Gouveia, 2017). The WSSQ is an instrument specifically developed for people with overweight and obesity. It measures weight-stigma internalisation multidimensionally. Consistent with previous versions (Lillis et al., 2010; Hain et al., 2015), the Portuguese version of the WSSQ revealed a two-factor structure. Thus, the WSSQ comprises two factors namely: self-devaluation and fear of enacted stigma. All items presented a good local

adjustment, and the model had a good fit to the data. The fact that both factors were strongly associated led us to test a unifactorial solution. However, this solution showed a poor fit to the data, which supported the multidimensionality of the WSSQ.

The examination of the psychometric properties revealed that the WSSQ's total score and its subscales presented high internal consistency and composite reliability. Moreover, both factors had good average variance extracted, meaning that the individual indicators are truly representative of the latent construct. WSSQ and both subscales also showed temporal stability and internal responsiveness to change over a period of three months.

In addition, the WSSQ also presented good adequate convergent and divergent construct validity. Weight self-stigma was associated with higher levels of weigh-related experiential avoidance, unhealthy eating behaviours and diminished quality-of-life and subjective happiness. Also, consistent with previous studies (Lillis et al., 2010; Hain et al., 2015) having a higher BMI was associated with higher levels of overall weight self-stigma and fear of enacted stigma. Nevertheless, the self-devaluation dimension was not significantly related to BMI. These results suggest that the overall levels weight self-stigma and the fear of being stigmatised tend to increase alongside with one's BMI, whereas the tendency to have self-devaluating thoughts and emotions regarding one's weight status, when a person is already overweight or obese does not.

Overall, the Portuguese version of the WSSQ is a short, reliable and stable measure to assess levels of internalised weight stigma. In clinical interventions with people seeking weight loss, assessing weight self-stigma seems to be particularly important, given its associations with poorer eating and health-related outcomes.

To sum up, these two first studies provided evidence for the reliability and usefulness of these two brief self-report measures in research and clinical settings. Since both measures assess key constructs and can be easy and quickly administered, we believe that these instruments could be used when screening individuals with overweight and obesity enrolled in weight loss treatments. This is particularly relevant given that people with obesity represent a heterogeneous group. Thus, interventions may need to take this high variability into account, as one unique treatment may not fit all individual's needs.

Weight self-stigma, eating behaviours and poorer quality-of-life

Empirical studies **II**, **III** and **IV** focused on exploring the psychological processes involved in the relationship between weight self-stigma and unhealthy eating patterns and quality-of-life in women with overweight and obesity with and without binge eating. As mentioned in Chapter I, literature has been highlighting the detrimental effects of weight stigma and weight stigma internalisation on the life of those with overweight and obesity. Specifically, growing research points weight self-stigma as a crucial risk factor for poorer outcomes, including unhealthy eating, anxiety and depressive symptoms, and decreased quality-of-life (Durso et al., 2012a; Durso & Latner, 2008; Hilbert et al., 2013; Latner et al., 2013). The multidimensional nature of the weight self-stigma is still preliminary, with only one study suggesting that self-devaluation is stronger related to psychopathological symptoms and unhealthy eating patterns, whereas fear of enacted stigma is closer associated to decreased quality-of-life (Lillis et al., 2010). Nevertheless, the mechanisms that underly the relationship between weight self-stigma and poorer outcomes in individuals with overweight and obesity are still scarcely uncovered (Vartanian & Porter, 2016). So far only one recent study found evidence for the mediator role of self-compassion on the relationship between weight self-stigma and health outcomes (Hilbert et al., 2015).

Furthermore, among those presenting overweight and obesity, literature has also been emphasising significant differences between those with and without BED. Generally, having binge eating is related to poorer outcomes in both community and clinical populations (Baiano et al., 2014; Bulik et al., 2002; Hudson et al., 2007; Kessler et al., 2013; Wilfley et al., 2003) that surpass the experience of being obese (De Zwaan, et al., 2002; Herbozo et al., 2015). Additionally, binge eaters seem to present enhanced difficulties in emotional regulation (Kingston et al., 2010; Lillis et al., 2011; Whiteside et al., 2007), representing a distinct neurobiological phenotype within the obesity spectrum with differentiated treatment needs (Leehr et al., 2015).

In line with previous research, results from our studies (Studies II, III and IV) consistently pointed out differences between women with overweight and obesity with and without binge eating. Overall, women with binge eating symptoms reported more internalised weight stigma and weight-related experiential avoidance, showed a higher tendency to adopt a critic attitude towards themselves, lower abilities to reassure themselves and decreased quality-of-life. BMI differences between binge eaters and non-binge-eaters were somehow inconsistent across studies, with study III suggesting significant differences, while study IV did not. However, there are important differences across this two studies that need to be taken into account when looking at these findings. First, while in study II BMI was self-reported, in study IV BMI was measured with a body composite analyser which provides a more reliable assessment. Second, in study IV the

two groups were established using a structured clinical interview to determine the existence of Binge Eating Disorder, whereas in study II we used BES cut-off scores that only indicate the presence of binge eating symptoms but do not assert a full BED diagnosis. Thus, it is likely that BMI differences across groups may be rather small, if significant. In fact, even the difference found in study II represent a small effect size.

Results from **Study II**, besides providing evidence for the reliability of the WSSQ, also revealed that the association between weight self-stigma and unhealthy eating behaviours occurs, at least partially, through the tendency to control or suppress unwanted weight-related internal experiences. Moreover, results also support that the internalisation of the stigmatisation messages is directly and indirectly (through weight-related experiential avoidance) linked to loss of control over eating and emotional eating patterns, whereas the effect of being afraid of being a target of stigma in unhealthy eating occurs when one tries to avoid and control their unwanted weight-related internal experiences. This is in line with the study by Lillis and collaborators (2011) that highlighted the role of experiential avoidance in binge eating episodes.

Study III provided additional evidence for the multidimensionality of the weight self-stigma. In this study, we aimed to test whether the unwillingness to be in contact with difficult weight-related internal experiences mediated the association between both weight self-stigma dimensions and quality-of-life while controlling for BMI. Results demonstrated that weight self-devaluation was only indirectly related to diminished quality-of-life, whereas fear of enacted stigma presented both a direct and an indirect association (through weight-related experiential avoidance) with poorer quality-of-life. This means that the internalisation of the stigmatising messages is only related to poorer quality-of-life when individuals make efforts to control their unwanted and weight-related internal experiences. In addition, being afraid of being a target of discrimination due to one's weight in social situations was strongly and directly associated with decreased quality-of-life. This association was also partially mediated by the tendency to escape from weight-related thoughts and emotions. Finally, this study significantly contributes to previous knowledge, pointing out the detrimental role of weight self-stigma and weight-related experiential avoidance for women with overweight and obesity, in particular for those with binge eating symptomatology.

Additionally, **study IV** also contributes to further understand the psychological processes involved in the relationship between weight self-stigma and unhealthy eating behaviours, by exploring the mediator role of self-criticism and self-reassurance tendencies on the relationship between internalised weight stigma and binge eating in a mixed sample of women with overweight and obesity with and without BED. Globally, although weight self-stigma was directly

associated with binge eating symptoms, results also suggest that this relationship is partially mediated through the tendency to attack and condemn the self and lower abilities to be warm and provide reassurance when facing errors or failures. It seems that women that internalise the weight stigmatisation messages may develop a harsh and punitive internal relationship with themselves and struggle to be supportive and caring when facing difficulties that consequently turns them more vulnerable to binge eating symptomatology. Remarkably, only the more toxic form of self-criticism (hated-self) mediated the association between weight self-stigma and binge eating, whereas inadequate-self (which refers to an internal relationship focused on one's inadequacies and flaws) did not. This is in line with previous studies (Castilho et al., 2015, Duarte et al., 2014; Dunkley & Grilo, 2007) highlighting the link between the more pathogenic form of self-criticism and psychopathology.

To sum up, this first set of studies shed some light on the understanding of the psychological processes involved in the relationship between internalised stigma and unhealthy eating behaviours and quality-of-life. Results highlight that women that internalize the weight stigmatisation messages are more vulnerable to engage in emotional, uncontrolled and binge eating patterns and have poorer quality-of-life. The relationship between weight stigma internalization and these poorer outcomes seems to occur (although partially) through the tendency to control and change one's weight-related unwanted internal events and by a self-to-self-relationship that is characterized by intense and harsh criticism and few abilities to reassure the self when facing difficulties. Thus when facing their internal weight stigmatization thoughts (e.g., "*I became overweight because I'm a weak person*"), women may be caught up with the urge to eliminate those thoughts and struggle with their inner critic, being unable to reassure themselves, which in turn may lead to unhealthy eating patterns and impact their quality-of-life.

Furthermore, by highlighting important differences between women with and without binge eating, our findings support the assumption that binge eaters represent a distinctive group within the obesity spectrum characterised by enhanced emotional regulation difficulties (e.g., Leeher et al., 2015) that may involve relevant clinical challenges.

Bringing acceptance and compassion into obesity interventions

Given the pervasive role of weight self-stigma on the life of women living with overweight and obesity and the importance of several (mal)adaptive psychological processes (e.g., weight-related experiential avoidance, self-criticism and self-compassion), we developed a new integrate group-based intervention named Kg-Free. Kg-Free aimed specifically to reduce weight self-

stigma and unhealthy eating patterns and increase well-being and quality-of-life of women with overweight and obesity. Several reasons led us to choose a group format. First, group-based interventions enhance participants' support and provide a context where people may realise that their experiences are identical to the experiences of others, which reduces shame and promotes a sense of common humanity. Additionally, group interventions are cost-effective, as they can promote significant cognitive, emotional and behavioural, while at the same time reduce costs with human resources and the time and space needed for the intervention.

Studies **V** and **VI** focused on exploring the effectiveness of Kg-Free at posttreatment and 3-months follow-up, as well as to examine the processes that mediated changes after the Kg-Free intervention. Overall, participants considered the Kg-Free intervention to be very important and useful in helping them deal with their difficult internal experiences (e.g. thoughts, emotions and urges) and improving their quality-of-life. Participants also expressed that the sessions that focused on learning mindfulness, acceptance, cognitive defusion and self-compassion skills were the most useful. Concerning the participants' manual, almost 60% of the participants (59.3%) considered the manual to be important or very important throughout the intervention. Still, only 40.8% reported using the manual frequently during the intervention. In the same line, the majority of the participants (89%) practised less than three times per week the audio records with the mindfulness and compassion-based exercises, which may account (at least partially) for the results found for changes in mindfulness and self-compassion.

Overall, results from the randomised controlled trial (**Study V**) provided evidence for the efficacy of the Kg-Free intervention. When compared to the TAU group, at post-treatment, participants from the Kg-Free intervention, showed significant improvements in weight self-stigma, quality-of-life and unhealthy eating patterns. These differences reflected moderate to very large effect sizes. These results are particularly noteworthy given the detrimental effect that weight self-stigma has on people's unhealthy eating patterns and quality-of-life. It seems that the intervention helped participants to decrease their weight self-devaluating thoughts and to be less afraid to be discriminated against in social situations, which may account for the reported increase in quality-of-life. After Kg-Free participants also showed increased abilities to maintain healthy eating behaviours, revealing a reduction in emotional and uncontrolled eating behaviours.

Moreover, significant differences between groups at post-treatment were found in some of the secondary outcomes, namely: decreased BMI and psychopathological distress and increased physical exercise frequency. In fact, at post-treatment, while participants from the Kg-Free intervention engaged in physical exercise four to five times a week, those in TAU group engaged in physical exercise less than once a week. Despite the fact that the intervention did not directly

target the reduction of psychopathological symptoms, participants from the Kg-Free intervention produced a clinically significant change. Participants from the Kg-Free group moved from a clinically relevant mean score ($M = 26$) at baseline to a non-distress mean score ($M = 17$) in the General Health Questionnaire, that is one of the most widely used measures to assess psychiatric problems. According to Goldberg (1978), results above than 22/23 indicate the presence of significant psychological distress. These results suggest that by helping participants' to develop a more aware, accepting and kind relationship with themselves and treat all their internal experiences with tolerance and equanimity, the intervention had a significant impact on their overall psychological health that goes beyond the weight and eating-issues.

Concerning changes in BMI from baseline to post-treatment, participants from Kg-Free lost in average 1.8kg, while participants that maintained TAU had no significant weight changes. Although group differences regarding weight changes reflected a small effect size, it resembles the results found in previous mindfulness and acceptance-based interventions (O'Reilly et al., 2014; Tapper et al., 2009). Although these small weight changes may not typically be seen as impressive there are some aspects that need to be taken into consideration. First, all participants were enrolled in weight loss treatments and were struggling to lose weight. Second, the intervention was not aimed to produce weight loss. In fact, only one psychoeducation session (session 2) focused on giving participants general principles of healthy eating (e.g., eat every three hours, include all types of food) and physical exercise (e.g., exercise at least 30 minutes daily) and participants were not instructed to follow any diet or dietary restriction plan. The intervention focused on helping participants to develop a more accepting and positive relationship with their eating and weight-related experiences and to lessen the excessive role that weight had in their daily lives. We wanted to promote valued actions, despite participants' weight status (for instances, one participant accepted to do a photo session that she was avoiding due to her weight).

No significant between-group differences regarding changes waist circumference from baseline to post-treatment. Still, participants from the Kg-Free showed a decrease (in average waist circumference decreased two centimetres), whereas the TAU group did not. Furthermore, results for total cholesterol revealed that both groups improved from baseline to post-treatment (although the result was not statistically significant). Both groups, at post-treatment, presented optimal levels of total cholesterol ($<200\text{mg/dl}$), which mirrors results from a previous study that found that both diet and non-dieting focused interventions were associated with significant metabolic benefits (Bacon et al., 2002).

Additionally, significant differences in psychological processes (weight-related experiential avoidance and self-criticism) were found at post-treatment in participants from the Kg-Free group,

when compared with those in TAU. These findings are relevant as Kg-Free was designed to decrease weight-related experiential avoidance, by promoting the development of willingness, distress tolerance skills and an acceptance and detached attitude towards all internal experiences, to foster healthy behaviours that are in line with participants health-related life core values. Furthermore, throughout the intervention we promoted a deshaming and non-judgmental environment and participants were taught not to overidentify themselves with their inner critics and to develop a kind and warm attitude towards themselves, especially in times of need. Results suggest that this was important to help participants' to have a less critical and punitive relationship towards themselves from baseline to post-intervention.

Nonetheless, differences between groups at post-treatment failed to reach significance for self-compassion and mindfulness skills. Still, results from within groups differences from baseline to post-treatment revealed that women in the Kg-Free group showed improvements, whereas participants from TAU group did not. We believe that these results may have, at least, two distinct explanations. First, self-compassion was only directly promoted in Kg-Free's last sessions, and it is possible that more time and practice are needed to detect or produce significant changes in self-compassion. An alternative explanation may rely on the use of the instrument used to assess self-compassion (SCS, Self-Compassion Scale). It is possible that the SCS may not fully capture the changes occurred in participant's self-compassion abilities. Nonetheless, at the time of the study, the SCS was the only available self-reported instrument to assess self-compassion. However, results from study VI that used a larger sample size and assessed changes from baseline to posttreatment and 3-months follow up suggest that the participants increased their self-compassion skills. During the intervention, participants enhanced their understanding regarding the nature of the human mind, thoughts and emotions as well as the way the three emotional regulation systems operate. We wanted participants to recognize the way our minds and bodies work is not our fault, as we did not choose them but we still have to learn to live with them and do the best we can. Specifically, one session demonstrated the toxic role that shame and self-criticism play in our lives and how we can learn to relate to ourselves in a more positive and supportive manner. This new way of self-to-self-relating was promoted through the compassionate mind training, including several exercises aimed to develop compassion towards the self. Participants enrolled in different types of self-compassionate exercises, using guided meditations, imagery and compassion letter writing.

Similarly, no significant changes at post-treatment were found for mindfulness. Although this result was unexpected, the majority of the participants reported that they practice less than three times a week between sessions. In addition, the fifteen items versions of the FFMQ presented

internal consistency problems at baseline and research has shown that assessing mindfulness with self-report measures is particularly challenging in non-meditator samples (Baer et al., 2006).

Finally, and given that significant differences between groups at post-treatment existed regarding BMI, we tested whether the reduction in BMI was responsible for the changes found in weight self-stigma, quality-of-life and unhealthy eating behaviours. Results suggested that changes in the outcomes mentioned above were independent of the amount of weight loss, suggesting that it is possible to improve well-being and quality-of-life regardless of the amount of weight lost.

To sum up, results from study V provide evidence for the efficacy of integrating into one comprehensive program mindfulness, ACT and self-compassion components to reduce weight self-stigma and promote healthy behaviours and quality-of-life in women with overweight and obesity struggling with their weight. It seems that at the end of the intervention participants had developed a different and more positive relationship with their unwanted internal experiences and themselves. In turn, these seem to contribute to foster healthier behaviours (eating patterns and physical exercise) that may have an impact on BMI. Additionally, these new emotional regulation skills may have contributed to the reduction of weight self-stigma and to the improvement of participant's mental health status and quality-of-life. Kg-Free has a significant contribution, as it is the first Portuguese intervention that directly targets the reduction of weight self-stigma.

Study VI further extends the findings from the previous study regarding the Kg-Free effectiveness by exploring the maintenance of changes at 3-months follow-up and the psychological mechanisms that mediated changes between baseline and post-intervention in weight, eating and health-related outcomes. This study included all participants that completed Kg-Free intervention (N = 53). Overall, significant differences were found in all outcomes from baseline to post-intervention and 3-months follow-up assessments, reflecting medium to large effect sizes. All changes were maintained from post-treatment to 3-months follow-up. Participants that completed the Kg-Free intervention revealed significant reductions in weight self-stigma, shame, self-criticism, emotional eating and weight-related experiential avoidance and enhanced quality-of-life, mindfulness and self-compassion skills. Lastly, albeit small, changes in BMI were maintained at 3-months follow-up.

Furthermore, the second aim of study VI was to examine the psychological mechanisms that mediated the changes in intervention's main outcomes. Gathering knowledge on the processes that mediate changes in treatment outcomes is crucial to understand how treatments work and to further develop more parsimonious interventions (McCracken & Gutiérrez-Martínez, 2011; Murphy et al., 2009). Thus, we explored whether shame, self-judgment, self-compassion, weight-

related experiential avoidance and mindfulness mediated changes on participant's health-related (e.g., weight self-stigma and quality-of-life) and weight- and eating-related outcomes (BMI and emotional eating) after the Kg-Free intervention. Results showed that reductions in weight self-stigma at post-treatment were mediated by decreased levels of shame, weight-related experiential avoidance and self-judgment tendencies and increased mindfulness and self-compassion abilities. Similarly, participant's quality-of-life was improved through decreased weight-related experiential avoidance, shame and self-judgment levels and increased mindfulness abilities.

Together these results highlight the importance of decreasing shame, self-criticism and weight-related experiential avoidance to promote quality-of-life and tackle weight self-stigma in women with overweight and obesity seeking weight loss. Previously, Lillis and collaborators (2011) had also found that weight-related experiential avoidance played a mediator role in changes in weight self-stigma after a one-day ACT-workshop. Our results expand previous knowledge by unveiling other important mediators responsible for reductions of weight self-stigma and increased quality-of-life. Besides the crucial role of weight-related experiential avoidance, our findings suggest the importance of the development of a self-to-self relationship based on acceptance, warm and kindness that helps individuals to deactivate their threat/ defence system, reducing their shame and self-criticism levels to lessen internalized weight stigma and improve quality-of-life. The development of mindfulness abilities also played an important mediator role on changes in weight self-stigma and quality-of-life. It seems that by developing a more aware, accepting and non-judgmental attitude towards all experiences, participants endorsed fewer stigmatisation messages and increased their quality-of-life.

Finally, the development of self-compassion skills mediated changes in weight self-stigma, but not obesity-related quality-of-life. These results emphasise the importance of changing the way people relate to themselves. By being able to show acceptance and kindness and offer support in times of need, participants were able to lessen the internalisation of the weight stigmatization messages were less afraid of being discriminated against in social situations. In light of Gilbert's emotional regulation model, it seems that the intervention helped participants' to develop their soothing-system and reduce the activation of the threat/defence system that is linked with shame and self-criticism (e.g., Gilbert, 2010; Goss, 2011). The fact that increased self-compassion abilities were not a significant mediator of changes in obesity-related quality-of-life may be because self-compassion was only specifically promoted in the Kg-Free's last sessions. Contrarily, throughout the intervention, a deshaming and judgmental attitude was promoted. Thus, it is plausible that participants considered themselves as less self-critical and less ashamed

but not necessarily more self-compassionate, particularly for those with highly self-critic that may require more time and practice to fully develop a compassionate mind frame.

Concerning changes in BMI and emotional eating, results highlighted weight-related experiential avoidance was the key mediator. In fact, enhancing people's abilities to accept and tolerate weight-related difficult internal experiences was the only significant mediator for changes in participant's BMI. This result is similar to the one found after a one-day ACT workshop (Lillis et al., 2009, 2011) that showed that weight-related experiential avoidance mediated changes in binge eating symptoms. Together, these results underline the importance of helping people with overweight and obesity to develop a more accepting, detached and tolerant relationship with their eating and weight-related unwanted internal experiences to promote healthy eating patterns that may lead to weight loss. Particularly in the current obesogenic environment, these skills are considered crucial to maintaining healthy behaviours, given the current sedentary lifestyles and the fact that we are constantly being prompted to eat (e.g., Forman et al., 2015).

Although reducing weight-related experiential avoidance played a key role in reducing participant's emotional eating, increased mindfulness and self-compassion abilities also emerged as important mediators. These findings give support to the importance of delivering interventions that promote mindfulness and self-compassion for women struggling with their eating and weight. More specifically, it is possible that the development of mindfulness competencies helped participants' to be aware of internal and external cues associated with their eating patterns, helping them to make healthier eating and physical exercise choices. In fact, mindfulness has been suggested as an important mechanism to reduce emotional and binge eating patterns (e.g., Kristeller & Wolever, 2011). Furthermore, given that emotional eating patterns are closely related to shame and self-criticism (e.g., Duarte et al., 2014; Dunkley & Grilo, 2007), the development of self-compassion may be essential to provide other ways for individuals to soothe themselves without relying on food as the only source of comfort.

Finally, and given that previous studies highlighted the harmful role that weight-related experiential avoidance and weight self-stigma play on quality-of-life (Lillis et al., 2011; Palmeira, Pinto-Gouveia, & Cunha, 2016), a serial mediational model was tested. Overall, results suggest that the effect of the intervention on participants' quality-of-life was occurred due to reductions in weight self-stigma and that those changes were partially mediated by the reduction of the avoidance-based strategies to deal with unwanted weight-related internal experiences.

Taken together, results from these two studies supported the efficacy of the Kg-Free intervention in reducing weight self-stigma, emotional and uncontrolled eating patterns and promoting well-being and quality-of-life. Improvements in all outcomes were sustained at 3-

months follow-up. Moreover, changes in weight-related experiential avoidance, shame and self-criticism patterns and increased mindfulness and self-compassion skills mediated changes in weight self-stigma and quality-of-life. Concerning changes in BMI and emotional eating levels, results point out the importance of promoting weight-related psychological flexibility, mindfulness and self-compassion as key abilities that allow people to make healthier choices in the current obesogenic environment. Thus, this study contributes to the growing amount of evidence that supports that ACT, mindfulness and also compassion-based interventions operate through their proposed mechanisms of change. Knowledge about what processes are important in a given intervention is essential to optimise outcomes and continue to develop the intervention itself (e.g., Murphy et al., 2009).

The link between self-disgust and eating and depressive symptoms

The third main goal of this thesis was to shed some light on the role of a relatively unexplored emotion – self-disgust. Therefore, the last two empirical studies focus on exploring whether self-compassion and self-criticism mediated the link between self-disgust and eating psychopathological and depressive symptoms in samples with individuals from both genders.

Firstly we tested gender differences, given that previous research had already pointed out the existence of significant gender differences in eating psychopathology and self-compassion, with women revealing higher levels of eating psychopathological symptoms (e.g., Buchanan et al., 2013) and fewer abilities to be kind and supportive with themselves (Yarnell et al., 2015) than men. Albeit less studied, gender differences concerning self-disgust have also been found, with women showing higher levels than men (Ille et al., 2014). Our findings mirror the ones found in the literature (see study VII), with significant gender differences being found in our sample of people with overweight and obesity. All differences reflected small effect sizes, except eating psychopathological symptoms that presented a moderate effect size. Furthermore, in study VIII we explored gender differences within a dieter and a non-dieter group. While in both groups significant gender differences were found for eating psychopathological symptoms and BMI, in the non-dieters group significant (albeit modest) gender differences were also found for self-disgust and depressive symptoms with women showing higher levels than men. Concerning eating psychopathological symptoms, weight and shape concerns reflected the largest gender differences between women and men, with women expressing more concerns with their physical appearance than men. This result may be comprehended given the central role that physical appearance has, especially for women, in Western societies. In fact, physical appearance is considered a key self-evaluative dimension used to gather positive social attention and be valued

by others (Ferreira et al., 2011; Gilbert, 2002; Gilbert et al., 1995; Troop et al., 2003). This excessive emphasis on physical appearance as a source of self-evaluation enhances the proneness of body-related shame and disgust feelings, which in turn leaves people more vulnerable to disordered eating patterns (Fox et al., 2015).

Moreover, there were also important group differences between the community sample of non-dieters and the dieter sample. Those seeking a diet showed higher BMIs and more eating psychopathological symptoms, with differences reflecting large effect sizes. Furthermore, small effect sizes differences were also found for self-disgust, depressive symptoms and self-criticism tendencies. People enrolled in a diet for weight loss showed more depressive symptomatology, disgust towards themselves and higher tendencies to engage in internal criticism patterns when facing errors or failures. Contrarily, no group differences were found concerning the ability to reassure the self when things go wrong. These results are in line with previous studies that argued that individuals with overweight and obesity seeking weight loss treatments tend to have higher levels of psychopathology (e.g., Wadden et al., 2006) and struggle to be compassionate towards themselves in the face of errors and failures (Gilbert et al., 2014).

Study VII explored the association between self-disgust, eating psychopathology and the ability to be warm and kind towards oneself when facing struggles in a sample of men and women with overweight and obesity seeking nutritional treatment for weight loss. As expected, individuals with higher self-disgust also presented higher levels of eating psychopathological symptoms. These results are in accordance with previous research conducted with women with eating disorders (Espet et al., 2012) that linked self-disgust with body image dissatisfaction and unhealthy eating behaviours (e.g., eating restriction, purging). It is possible that when feeling disgusted with certain features of the self (e.g., one's weight or physical appearance), individuals may increase their weight control strategies as a way to change or exclude of those unwanted and aversive characteristics. According to Gilbert (2015), attempts to modify and get rid of those aspects of the self that are seen as disgusting may enclose the desire to enhance one's social status and be socially valued within the group, avoiding rejection and exclusion. Contrarily the ability to be self-compassionate was inversely related to feelings of disgust towards the self. This means that individuals that experience disgust towards themselves have fewer abilities to be kind and supportive towards themselves when things go wrong.

Finally, in study VII we also examine whether self-compassion mediated the link between self-disgust and eating psychopathological symptoms, while controlling for BMI and gender. Findings revealed that self-disgusting-related thoughts and emotions were strongly and directly associated with eating psychopathological symptoms. Albeit weakly, being female and having a

higher BMI were also directly linked to eating psychopathological symptoms. Still, evidence for the mediational role of self-compassion was also found. Besides the direct effects, there was also a significant indirect effect (through self-compassion) between feeling disgust towards oneself and eating psychopathology. It is possible that when facing self-disgusting thoughts and emotions, individuals may not be able to have an accepting, detached and kind attitude with themselves, which in turn may lead to unhealthy eating. However, self-compassion has been consistently pointed out as a major resource against unhealthy eating patterns (Braun et al., 2016; Duarte et al., 2015; Ferreira et al., 2013; Hilbert et al., 2015). Thus, these results suggest the importance of developing a self-compassionate attitude even for those disgusting thoughts and emotions regarding the features of the self that are seen as repugnant. By showing compassion for those aversive parts of the self, one might decrease the likelihood of engaging in disorder eating patterns. In other words, these findings stress the importance of stimulate positive emotions focused on self-care and self-compassion, instead of being trapped in self-directed disgust feelings that are associated to contempt, anger towards the self and avoidance-based strategies.

Lastly, **empirical study VIII** extends the previous study by testing whether self-criticism and self-reassurance tendencies acted as mediators of the relationship between self-disgust and depressive and eating psychopathological symptoms in a mixed sample of dieters and non-dieters from both genders. As expected, self-disgust was closely related to self-criticism and depressive symptoms and inversely related to self-reassurance tendencies. Thus, people with high self-disgust feelings, also present more depressive symptoms, higher levels of self-criticism and fewer abilities to reassure themselves when facing struggles. Results from the mediation analysis showed that self-disgust and depressive symptoms were both directly and indirectly associated. This means that, at least partially, this association occurs through an internal self-to-self-relationship characterised by harsh criticism, feeling of inadequacy and inferiority and fewer abilities to reassure the self when facing difficulties.

Furthermore, inadequate-self was the only significant mediator of the relationship between self-disgust and eating psychopathological symptoms. These findings suggest that the unhealthy eating patterns may arise as a way for individuals to deal with their self-disgusting experiences. In addition, this also seems to occur partially through the development of a critical internal relationship focused on one's inferiority and personal inadequacies. These findings offer support to Gilbert's social mentalities theory that postulates that individuals' attempts to control one's weight and physical appearance may be conceptualised as ways for individuals to avoid feelings of inferiority and social rejection (Gilbert, 2002).

Interestingly, the mediational model tested in this study was different across the two groups. Results from the multi-group analysis point out that dieters seem to be more vulnerable to depressive and eating psychopathology than non-dieters. Additionally, the association between self-disgust and the more toxic form of self-criticism was stronger in the dieter group, and the mediator role of the ability to reassure the self in the relationship between self-disgust and depressive symptoms was only significant for the dieter group. In other words, these results suggest that dieters that have disgusting feelings towards the self may have enhanced difficulties in reassuring themselves when facing errors or failures. In turn, the experience of self-disgust together with decreased self-reassurance abilities may contribute to the development of depressive symptoms in individuals attempting to lose weight.

To sum up, the results from study VIII highlight the harmful role that self-disgust and self-criticism play on individuals' healthy eating behaviours and mental health, particularly for women and those trying to lose weight. In addition, results also emphasize the importance of the development of an internal relationship that provides acceptance and reassurance and helps people to support and nurture even those parts of the self that are seen as aversive, instead of becoming trapped in the self-perpetuating cycle of self-disgust and self-criticism.

Taken together, results from the current work may be summarised into four major and distinct points. Firstly, empirical studies I and II provided evidence for the usefulness and reliability of two self-report measures (AAQW-R and WSSQ) particularly relevant for people with overweight and obesity. As far as we are aware, no translated or validated questionnaires to assess weight-related experiential avoidance, and weight self-stigma existed in Portugal. These short and reliable self-report measures can be easily incorporated when evaluating patients with overweight and obesity seeking treatment for weight loss as a way of determining those who may benefit from additional psychological intervention to improve outcomes. Furthermore, these instruments may be useful to assess meaningful information concerning clinical changes within interventions. Thus, these two questionnaires constitute a significant contribution for research and treatment with people with overweight and obesity, especially given that people that try to control, alter or eliminate their weight-related internal events and endorse high levels of internalized weight stigma also tend to report worst eating and health-related outcomes.

Secondly, results from studies II to IV highlight the detrimental role of weight self-stigma in unhealthy eating behaviours and quality-of-life of women with overweight and obesity, with and without BED. Consistently with the existent literature, several differences between women with overweight and obesity, with and without BED were highlighted. The results seem to support the claim that people with BED represent a distinct group within those with overweight and obesity,

presenting enhanced emotional regulation deficits. This reinforces the importance of screening patients with overweight and obesity that seek treatment for weight loss to assert the existence of binge eating symptomatology (and other relevant disturbed eating behaviours). This would allow to tailor interventions to one's individual needs and to determine the need for specific psychological interventions to tackle disordered eating features and key psychological processes related to poorer outcomes. In the same line, specific interventions aiming at promoting adaptive emotional regulation skills (e.g., BEfree intervention, Pinto-Gouveia et al., 2017) should be offered to those struggling with BED.

Moreover, these studies significantly contributed to unveil some of the (mal)adaptive emotional regulation strategies (weight-related experiential avoidance, self-criticism and self-reassurance) involved in the relationship between weight self-stigma dimensions and unhealthy eating and quality-of-life. Overall, the effect of the internalization of the stigmatizing messages on the adoption of unhealthy eating patterns (emotional, uncontrolled and binge eating) and impaired quality-of-life seems to occur (at least partially) through the tendency to try to alter and suppress one's weight-related internal events. Similarly, the above mentioned effect can be also partially explained by the individuals' inability to be kind, reassuring and supportive to themselves when facing errors or failures. Instead, when facing difficult times, those with overweight and obesity tend to present an internal relationship characterized by harsh criticism, hostility and condemnation that has been consistently linked to negative affect and mental health problems.

Notably, these results emphasize the relevance of promoting the development of adaptive emotional regulation skills in interventions aiming to enhance healthy eating and quality-of-life in people with overweight and obesity. Fostering acceptance, mindfulness and self-compassion may be especially important, as these abilities change the way people relate to themselves and their unwanted internal experiences, instead of changing the content of those internal events. In this context, people learn to detach themselves, tolerate and accept their internal events, seeing their thoughts, emotions and urges as mere products of the wandering and evaluative mind and not as facts or commands that need to be obeyed. Additionally, the development of self-compassion is key to decrease shame feelings and self-criticism patterns that fuel the relationship between negative weight-related experiences (including weight self-stigma) and unhealthy eating behaviours and poorer quality-of-life. By being self-compassionate individuals recognize their mistakes and that errors and failures are inherent to all human beings (and not only themselves). Also, treating oneself with kindness and support (as we would treat a friend in need) is helpful to enhance and maintain positive affect and maintain valued and healthy behaviours.

Thirdly, the main contribution of this thesis was the development of the Kg-Free intervention. Kg-Free represents the first attempt to integrate components from distinct and yet related approaches, combining mindfulness, ACT and (self)compassion into one comprehensive intervention to tackle weight self-stigma, unhealthy eating and promote quality-of-life. Overall, results from the RCT and the follow-up study (Studies V and VI) supported the efficacy of Kg-Free at posttreatment and 3-months follow-up. At the end of the intervention and 3-months follow-up participants that completed the intervention had lower levels of weight self-stigma, increased their healthy eating and physical exercise patterns and mental health status and reported substantial improvements in their quality-of-life. Moreover, the intervention allowed participants to develop a more aware and detached stance towards their undesired internal events, to be more able to tolerate distress and show a warm and kind attitude towards themselves when facing failures. At the same time, participants' experiential avoidance tendencies, shame and self-criticism levels were reduced. All the skills inbuilt in Kg-Free intervention are considered essential to help people adopt and maintain healthy behaviours and pursue a valued and meaningful life in the context of the current obesogenic environment.

Furthermore, the effect the Kg-Free intervention on the reduction of emotional eating and weight self-stigma and improvement of quality-of-life occurred through the developed of the targeted mechanisms of change (weight-related experiential avoidance, shame, self-criticism, mindfulness and self-compassion). More specifically, developing acceptance, present moment awareness and self-compassion abilities were fundamental to decrease shame and self-criticism tendencies and improve health-related outcomes. Additionally, tackling weight-related experiential avoidance tendencies, as well as enhancing mindfulness and self-compassion skills are crucial to reduce emotional eating and weight.

Finally, studies VII and VIII highlight the detrimental role of self-disgust in eating psychopathology and depressive symptoms of people with overweight and obesity trying to lose weight. Results also suggest that those that have higher levels of disgust feelings towards themselves are more likely to develop depressive and eating disorders symptoms. Women and those with higher BMIs seem to be particularly more vulnerable than men and those within the normative BMI range that are not trying to lose weight. In addition, results point out the importance of the development self-compassion as a key resource to help individuals to break free from a self-perpetuating cycle of self-disgust and self-criticism that is associated with heighten eating psychopathological and depressive symptoms. This is particularly important as self-disgust has a harmful effect on people's wellbeing and is considered hard to unlearn. Thus,

learning the ability to have a kind, warm, accepting and tolerant attitude towards oneself (and even those features that are seen as repulsive) seems fundamental to ensure one's mental health.

4.2. LIMITATIONS

The current work also encloses limitations that need to be taken into consideration when interpreting the results found. Although studies' specific limitations were addressed in each study individually, next, we summarise the main studies' methodological limitations and provide some suggestions for future research.

The studies that explore the psychological mechanism involved in the relationship between weight self-stigma and unhealthy eating and quality of life, as well as the last two studies that focused on the role of self-disgust (Studies III, IV, VII and VIII), all had a cross-sectional design, which precludes any inference of causality. This type of design implies the circularity of the data, as alternative conclusions are possible to obtain from the same data. Thus, longitudinal studies that include two or more assessment moments and experimental studies are needed to replicate these findings and assert causality, directionality and temporal stability of the relationships between the variables (Maxwell, Cole, & Mitchell, 2011).

Secondly, all studies, except the last two, were conducted in samples of adult women with overweight and obesity seeking nutritional treatment. However, this population was chosen given that literature largely recognises that women are particularly vulnerable to the development of eating psychopathology (Wadden et al., 2002; Buchanan et al., 2013). Although women with overweight and obesity seeking nutritional treatment were our target population, this does not allow to generalise our findings to other populations. Thus, the role of weight self-stigma in other populations, such as men, children and adolescents is still largely unexplored. Furthermore, the samples used in the last study (study VIII) that examined differences between dieters and non-dieters from both genders were unbalanced, which is not ideal. Relatedly, the two community samples used were recruited by convenience, which may not accurately represent the population in study. Findings should be replicated with more geographically and representative samples.

Thirdly, most studies relied on self-reported measures that may introduce some bias in the results found. Still, studies IV, V and VII surpassed this limitation by including data collected by different methods (questionnaires, structured interviews and blood samples). Relatedly, most participants also self-reported their height and weight, which may not be entirely accurate. Nonetheless, in samples comprising individuals seeking nutritional treatment participants were asked to recall the weight measured in their last nutritional appointment and when possible they

reported their weight as measured on the day they filled the questionnaires. There is also evidence suggesting that self-reported weight does not significantly influence studies' results (e.g., Stommel & Schoenborn, 2009; White, Masheb, Burke-Martindale, Rothschild, & Grilo, 2007). Finally, in studies IV, V and VI participants' weight was measured using the same body composite analyser accurate to 0.1kg.

In addition, the mediational models tested in studies II, III and IV can be considered limited, as other variables and emotional regulation processes are likely to be involved in the examined relationships. However, we intentionally restrained the models to test the specific contribution of the variables being tested.

Specifically, the RCT study enclosed specific relevant limitations that need to be addressed. The sample size was limited, and the control group did not involve any psychological intervention. Thus, we can only state that adding Kg-Free intervention to TAU seems to bring meaningful improvements in our sample of women with overweight and obesity. Despite the randomization process, our groups held significant differences at baseline in some of the outcome variables. Nonetheless, we used ANCOVAs with baseline as covariate to control the influence of these baseline differences and provide a more robust estimate of the mean group differences at post-treatment (e.g., Zhang et al., 2014).

Given that Kg-Free is a group intervention it is possible that the group support may (albeit partially) account for participants improvements. Futures studies that include larger samples and compare Kg-Free with other psychological intervention are needed to further assert Kg-Free efficacy.

In the same line, study VI did not include any control group, which hinders the possibility to unequivocally determine that change in outcomes were entirely due to the effect of the Kg-Free intervention. Lastly, both Kg-Free studies share another limitation related to the length of the follow-period. In fact, until now we only explored the results at 3-months follow-up. Although results from follow-up at 6-months are now available and will be analysed, an extended follow-up (at least one or two-year follow-up) would be advisable. Nevertheless, time and resource constraints from the current research project prevented us from designing a study with a longer follow-period. This is relevant given the difficulties in weight loss maintenance at long-term.

4.3. STRENGTHS

Despite the above-mentioned methodological limitations, the current research encloses relevant strengths.

For instances, all studies included clinical samples of people with overweight and obesity seeking nutritional treatment for weight loss. This allowed us to test our hypothesis in our target population, rather than on community samples. Relatedly, the relatively large sample size from the samples used in tall cross-sectional studies (Studies I to III, VII and VIII) is important, as it allows us to perform more complex statistical procedures (e.g., path analysis and multi-group analysis to test the structural measures invariance and model invariances). In turn, these statistical procedures increase our confidence in the results and conclusion drawn.

Studies IV, V and VI combined multiple assessment methods including self-reported instruments, clinical structured interviews (to assert the presence/ exclude the existence of severe psychiatric illness or BED diagnosis), blood samples (to assess participant's lipid profiles) and measured weight using a body composite analyser. In fact, the literature suggests the importance of using distinct forms of assessment including self-report questionnaires, interviews and multiple sources of information and not rely solely on self-report measures.

The fact that the efficacy of the Kg-free interventions was tested with an RCT study is an important strength of this work since RCTs are considered the gold standard of evidence when assessing interventions efficacy. Finally, we believe that exploring the mechanism that mediated the effect of the Kg-Free intervention on main outcomes with a longitudinal design (study VI) is another strength of this work. This study allows us to examine whether changes in the results were due to the psychological mechanisms targeted, which increases our confidence in the effectiveness of the Kg-Free intervention.

4.4. FUTURE RESEARCH

Overall, the findings from the studies that comprise this work raise new questions and open novel avenues for future research.

For instances, it would be interesting to explore further the reliability of the two instruments examined in distinct samples and establish norms for their use in the Portuguese population. Specifically, it would be useful to assess the factor structure of both instruments in samples from both genders and compare their structural invariance.

Moreover, future studies should explore the role of weight self-stigma in male samples, and samples from diverse age groups, namely children and adolescents with and without eating psychopathological symptoms. Little is known about the role of internalized weight stigma and mal(adaptive) emotional regulation strategies within these samples. Which groups (based on gender, age or other features) are more vulnerable to the negative consequences of weight stigma and weight stigma internalisation, is a question that remains unanswered. Do individual characteristics moderate the link between stigmatisation experiences and disordered eating behaviours? Future longitudinal studies are needed to confirm the causality of the associations found in the cross-sectional studies and to determine the long-term effects of the weight stigma experiences.

Weight self-stigma is considered a key predictor of unhealthy eating patterns such as binge eating and bulimic symptoms, still its association with other disordered eating behaviours frequently reported in clinical practice such as the night eating syndrome, and grazing (e.g., consumption of small amounts of food over an extended period of time with a feeling of loss of control) is still unknown. Although less studied, research shows that grazing and night eating behaviours play an important role in obesity, even after bariatric surgery and warrant more research (e.g., Colles, Dixon, & O'Brien, 2008; Saunders, 2004).

Concerning the efficacy of the Kg-Free intervention, it would be important to further test its efficacy using an RCT with a larger sample, a longer follow-up period and comparing it with other psychological interventions. As mentioned above, next we will explore results from the 6-months follow-up period. Nonetheless, to determine efficacy in obesity studies longer follow-up periods are usually required. Furthermore, we believe that the intervention itself can also be further improved and researched. For instances, some participants suggested that they would like more sessions and a longer intervention to help them reinforce their new skills in the long-term. Another possibility would be to include a follow-up period with monthly sessions to boost participants' skills and help them to generalise their new skills in the face of adverse life events.

Moreover, and given that the intervention integrates distinct modules or components it would be interesting to conduct further dismantling studies to examine the specific contribution of each component. This would be valuable to guide the clinical decision, as it would allow us to select which components to use with distinct patients presentations. To achieve this, we need evidence on how each component impacts on the therapeutic processes and outcomes and how the work when removed from the protocol being tested (e.g., Hayes et al., 2013). For example, little is yet known about the specific contribution that adding a self-compassion component adds to the intervention.

Relatedly, there is still a gap in the literature that should be addressed, given that almost the existent acceptance and mindfulness-based interventions for weight issues and obesity were only tested in Caucasian adult female samples. Thus, more studies are needed to test the effect of those intervention in more diverse samples. In addition, it would be particularly interesting to adapt and test the efficacy of such interventions in children and adolescents to develop a more positive and healthy relationship with food and eating at early stages. In turn, these new skills may help to reduce the daunting prevalence of child overweight and obesity.

Noteworthy is another line of research that is combining the standard CBT interventions with ACT components for people with overweight and obesity (Forman et al., 2014; Lillis et al., 2015). These interventions offer the advantage of directing promoting weight loss (through dietary and physical exercise prescriptions and standard behavioural strategies), while at the same time teaching acceptance, mindfulness and valued-based competencies to address unwanted internal events. Although preliminary, there is evidence suggesting that these approaches may increase weight loss and enhance weight loss maintenance in the long-term, particularly for those with higher emotional eating and disinhibition. Taken together, we believe that this may be a research field that is worth to pursue in the future.

Finally, research on self-disgust is a field full of new answered questions to be explored. First, it would be interesting to build new ways to assess self-disgust experiences, as self-disgust is a complex multidimensional construct. For the same reason, a clinical interview could be developed to enhance our knowledge on the phenomenology of the experience of disgust towards the self. More specifically, and given that self-disgust seems to have a powerful negative role on people with eating difficulties, it would be important to develop new instruments or adapt the existent Multidimensional Self-Disgust Scale (MSDS) to assess disgust feelings towards one's body image or physical appearance.

Moreover, the origins and impact of self-disgust in the lives of those living with overweight and obesity remain largely unexplored. Future studies could continue to examine the association of self-disgust and unhealthy eating attitudes and behaviours (e.g., dietary restriction, body-image dissatisfaction, binge eating) and its impact on peoples' quality-of-life. Finally, conducting longitudinal and experimental studies will be key to support further the importance of the development of acceptance and self-compassion skills to tackle disgust feelings towards the self.

4.5. CLINICAL IMPLICATIONS

Taken together, results from our empirical studies comprise crucial clinical implications, particularly for interventions with people with overweight and obesity seeking treatment for weight loss. More broadly we believe that this work also holds a significant contribution at a community level and for preventive actions for reducing weight stigma and promote individual's physical and psychological health. Next, we provide a reflection on the main implications drawn from our results.

Firstly, the two measures examined proved to be reliable, quick and easy to use by professionals working with people with overweight and obesity to assess weight-related experiential avoidance and weight self-stigma. Since there were no measures in Portugal to evaluate these two important constructs, these studies fill a gap at a national level and may be easily incorporated when assessing patients with overweight and obesity seeking treatment. This will allow professionals to identify those individuals that may be at higher risk of achieving poorer eating and health-related outcomes and may benefit from an additional psychological intervention. Furthermore, given that both instruments revealed a coherent structural factor and good psychometric properties, these instruments are also an important contribution to research.

Secondly, our studies highlighted the crucial and negative role of weight self-stigma and self-disgust feelings in the lives of those living with overweight and obesity seeking treatment for weight loss. We believe that this contribution is significant given that typically these issues are not addressed in obesity interventions that tend to focus only on weight loss. Thus, it is important for health professional treating people with obesity to be able to assess if their patients have high levels of internalised stigma and self-disgust experiences, as these aspects relate to unhealthy eating patterns and poorer quality-of-life.

Moreover, weight self-stigma arises from the internalisation of the stigmatising widespread messages, and these messages seem to prevail even among health professionals treating people with obesity (e.g., Durso & Latner, 2008; Lillis et al., 2010; Puhl & Heuer, 2009). Weight stigma has a powerful and harmful impact on those living with obesity (e.g., Puhl & Brownell, 2006; Puhl & Heuer, 2009). This calls for the importance of raising awareness among health professionals for the relevance of providing a deshaming and non-judgmental environment that offers acceptance and support to enhance patient's adherence to treatment and increase the likelihood of better outcomes.

At a community level, the dissemination of these findings is also relevant in the fight against weight discrimination that is still socially accepted, despite producing harmful effects and

increasing disparities (Crocker et al., 1993; Nolan & Eshleman, 2016; Puhl & Heuer, 2010). Furthermore, it would also be useful to spread these results in brief psychoeducation sessions, for instances in schools, companies and other institutions aiming at decrease several types of discrimination, including weight stigmatisation. Ideally, these should be included in schools, since even three-year-old children can display stigmatising attitudes towards their peers with overweight or obesity (Cramer & Steinwert, 1998).

Furthermore, our studies highlighted the detrimental role of two key psychological processes (e.g., weight-related experiential avoidance and self-criticism) on women's unhealthy eating patterns and diminished quality-of-life. Nevertheless, not all people with obesity seeking treatment may require a psychological intervention, given that obesity exists in a very heterogeneous group of people. Thus, by assessing the psychological constructs related to poorer outcomes, it is possible to distinguish better those who may benefit from additional interventions to achieve the best outcomes.

Overall, these studies support the importance of integrating into weight loss treatments, interventions that aimed for people to adopt a more healthy relationship with their eating and weight-related internal experiences and help to maintain healthy behaviours in the long-term. In addition, results also stress the importance of developing a warmer and caring internal relationship, especially when one faces errors or failures to decrease the tendency to be harsh and critical towards the self, which has been linked with poorer outcomes. These skills may be particularly important for those with BED that tend to reveal enhanced emotional regulation difficulties and may require differentiated interventions. The 'third wave' behavioural therapies seem suitable, as they focus on promoting acceptance, present moment awareness and more generally for people to pursue a meaningful life (e.g., Hayes et al., 2004). In the last decade, these approaches have been gaining empirical support for several psychological and medical conditions, including obesity and unhealthy eating behaviours (e.g., Forman et al., 2013a, 2015; Kelly & Carter, 2014; Kristeller & Wolever, 2011; Lillis et al., 2009; Gilbert et al., 2014).

Results from Kg-Free also held significant contributions to clinical interventions with people with overweight and obesity, supporting the importance of promoting quality-of-life, instead of an exclusive focus on weight loss. Kg-Free represents the first intervention aimed to tackle weight self-stigma and unhealthy behaviours and promote quality-of-life of women struggling to lose weight that integrates components from mindfulness, ACT, compassion approaches. Evidence was found for the usefulness of integrating different and yet related components into one comprehensive group-based intervention, with results being sustained at 3-months follow-up. Moreover, all proposed mechanism of change revealed different and relevant contributions to

changes in main outcomes, including weight self-stigma, psychological distress, quality-of-life, weight and emotional eating patterns. In addition, Kg-Free involves minimal human and material resources. The development of the intervention included the creation of two manuals (one for therapists and another for participants) and audio files with mindfulness and compassion-based exercises recorded in Portuguese that allows continuing research and future replications of the findings with larger samples.

Finally, at a preventive level, the development of acceptance, mindfulness and compassion-based interventions in school and college settings is worth exploring to prevent weight gain at an early stage and prevent or reduce the internalisation of weight stigma messages. Since the majority of young people attend school and college, these settings may constitute unique opportunities to teach broadly and briefly healthier ways to relate to food, eating, physical exercise experiences and even oneself. Also, this may be particularly relevant for young females given that the majority presents body-image dissatisfaction and unfavourable social comparisons based on physical appearance, which are two major predictors of disordered eating behaviours (e.g., Stice, Marti, & Durant, 2011).

4.6. CONCLUSION

Obesity is one of the most significant chronic health conditions. It is associated with considerable health risks and key quality-of-life impairments. Despite the growing number of interventions aiming at weight loss, overweight and obesity prevalence rates continue to rise. In fact, the environment from the modern western societies contributes to the steady weight gain, rather than promoting weight loss. Additionally, people living with a chronic condition such obesity are frequently the target of weight-based stigmatisation and discrimination that may influence all of their live domains. These messages can be internalised and reflect weight self-stigma attitudes that play a major role on unhealthy eating, diminished quality-of-life and may even promote weight gain. Furthermore, given that one's weight is not easily concealed from others, and that physical appearance has become a key domain in one's self-value, presenting an obese body type (which is different from the socially valued one) may be seen as aversive or repulsive by others and by the self, becoming a source of disgust.

To sum up, our results stress the importance of (mal)adaptive emotional regulation strategies (e.g., weight-related experiential avoidance, self-criticism and self-compassion) in the relationship between weight self-stigma and self-disgust and unhealthy eating patterns and decreased quality-of-life. More specifically, weight-related experiential avoidance and self-

criticism tendencies significantly contribute to decrease individual's well-being and to the adoption of unhealthy eating patterns, that in turn may hinder ones' weight loss attempts and lead to weight gain. Our findings highlight the importance of developing adaptive emotional regulation competencies based on acceptance, tolerance, mindfulness and promote a self-compassionate attitude to help people maintain healthy behaviours and increase quality-of-life.

Additionally, the development of the Kg-Free intervention constitutes one of the first attempts to integrate acceptance, mindfulness and (self)compassion skills directly to tackle weight self-stigma, unhealthy behaviours and promote quality-of-life. The intervention was able to significantly reduce experiential avoidance, shame and self-criticism patterns and promote more adaptive ways for participants' to deal with themselves and their undesired internal events. Results from the intervention contribute to the growing amount of evidence that argues for the importance of developing these skills as an adjunct to more traditional weight loss interventions, to further allow people to pursue a meaningful and valued life, where choices are based on one's values rather than one's weight status.

We hope that results from the current work may contribute to deepening our knowledge on the experiences (and processes involved) of those living with a chronic disease such as obesity. Likewise, we believe that these results may foster the curiosity to continue this field of research and contribute to the much-needed improvements in obesity treatments, highlighting the importance of bringing compassion and acceptance rather than shame and criticism to the therapeutic setting. Finally, the current thesis and more specifically the development of Kg-Free is a good starting point to further develop more effective interventions for this population.

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