

A Systematic Review of the Efficacy of Interventions that Aim to Increase Self-Compassion on Nutrition Habits, Eating Behaviours, Body Weight and Body Image

Hania Rahimi-Ardabili¹ · Rebecca Reynolds¹ · Lenny R. Vartanian² · Leigh Victoria Duyen McLeod² · Nicholas Zwar^{1,3}

Published online: 20 September 2017
© Springer Science+Business Media, LLC 2017

Abstract Overweight and obesity are universal health challenges, with behavioural weight management often failing to produce long-term effects. Various psychological factors, including body dissatisfaction and disordered eating, have been linked to weight gain overtimes. However, the majority of weight loss interventions do not address these aspects. Additionally, there has been a growing interest in the potential benefits of self-compassion as a new approach to promoting both physical and mental health. This systematic review investigated the effects of interventions that aim to increase self-compassion on obesity and weight-related psychological conditions. Four electronic databases were searched using terms adapted from previous systematic reviews on nutrition and body weight, self-compassion, eating disorders and body image. This review was conducted using the PRISMA guidelines for systematic reviewers. The search identified six studies that met eligible criteria for the review. Results indicate that self-compassion can be beneficial for weight loss, nutrition behaviours, eating behaviours and body image. However, the number of studies is limited, and most of the studies have serious limitations. Further research using robust methodologies is needed to determine the efficacy of self-compassion on body weight and related behaviours.

Keywords Systematic review · Self-compassion · Nutrition behaviours · Eating behaviour · Obesity · Body image

Introduction

The high prevalence of overweight and obesity is a major public health concern in many countries, including Australia (Australian Bureau of Statistics 2015). Excess body fat is associated with an increased risk of serious consequences, both physical (e.g. type 2 diabetes; Calle et al. 1999) and psychological (e.g. eating disorders; Avila et al. 2015; Haynos and O'Donohue 2012). There is also evidence that losing even modest amounts of weight can significantly reduce the health risks associated with obesity (Wing et al. 2011). However, conventional weight management interventions usually have poor long-term outcomes (Elfhag and Rossner 2005). Therefore, there is a need for a better understanding of the factors that might improve the effectiveness of weight loss programs.

Psychological conditions such as body dissatisfaction and disordered eating are important factors that have been linked to weight gain and poor weight maintenance over time (Lazzeretti et al. 2015). However, the majority of behavioural weight loss approaches have not addressed these factors. Multidimensional approaches that also address obesity-related psychological factors may facilitate weight management (Bean et al. 2008). Specifically, third-wave cognitive-behavioural approaches, such as mindfulness and self-compassion, have had positive effects in facilitating dietary behaviour changes (Mantzios and Wilson 2015b; Olson and Emery 2015) and alleviating disordered eating, such as binge eating (Godfrey et al. 2015). Recent conceptual and empirical evidence indicates that self-compassion might be a particularly

✉ Hania Rahimi-Ardabili
hania.rahimi@gmail.com

¹ School of Public Health and Community Medicine, UNSW Sydney, Sydney, NSW 2052, Australia

² School of Psychology, UNSW Sydney, Sydney, NSW 2052, Australia

³ School of Medicine, University of Wollongong, Wollongong, NSW 2522, Australia

beneficial cognitive-behavioural approach for reducing body dissatisfaction and disordered eating (Braun et al. 2016).

Self-compassion is derived from Buddhism and is strongly associated with mental well-being (Barnard and Curry 2011). Neff (2003b) defined self-compassion as being composed of three interrelated components: self-kindness, common humanity and mindfulness. Self-kindness refers to being kind and understanding towards oneself, rather than being harshly judgmental. Common humanity involves realising that everyone is imperfect, fails, makes mistakes and faces challenges, as opposed to feeling isolated in times of suffering and considering that it is only “me” who has a difficult time. Mindfulness within the self-compassion framework entails being aware of one’s negative thoughts and emotions in a balanced way, without any exaggeration or ignorance (Neff 2003b). A self-compassionate frame of mind can be beneficial to various forms of internal and external suffering, such as personal inadequacy or flaws and external emotional distress (Neff 2003b).

Body dissatisfaction is defined as having negative thoughts about one’s body (Dounchis et al. 2001), which include negative judgements about one’s size and shape and a perceived discrepancy between one’s ideal and actual body (Cash and Szymanski 1995). Body dissatisfaction is a risk factor for both obesity and eating disorders (Haines and Neumark-Sztainer 2006). A recent systematic review found that obese people have higher levels of body dissatisfaction than do normal weight people (Weinberger et al. 2016). Research also indicates that body dissatisfaction has a negative impact on adherence to healthy eating behaviours and other lifestyle behaviours, such as physical activity (Teixeira et al. 2004; Traverso et al. 2000). For example, a weight loss study found that initial levels of body dissatisfaction predicted attrition and unsuccessful weight management at 1-year follow-up (Teixeira et al. 2004). In addition, people who have a tendency to evaluate themselves based on their weight and shape—a tendency that is related to higher levels of body dissatisfaction (Trottier et al. 2013)—are more likely to fail to maintain their weight after initial weight loss (Byrne et al. 2003).

A recent study showed that self-compassion is related to improved body image (Albertson et al. 2015). There are several theoretical explanations for how self-compassion might decrease body dissatisfaction. First, being kind and understanding towards oneself (self-kindness) is inconsistent with the basis of body dissatisfaction, which involves criticising one’s body (Albertson et al. 2015). Second, a compassionate attitude may help individuals realise that all human beings are imperfect and that many people experience body-related inadequacies to some extent (common humanity). Therefore, a self-compassionate perspective might allow individuals to consider their bodies from a perspective that minimises body shame. Similarly, by encouraging a non-judgmental and balanced view (mindfulness), self-compassion helps people avoid being overwhelmed by negative thoughts (related to imperfect

body characteristics) or emotions (e.g. the feelings that would follow the thought, “I am not attractive”) (Albertson et al. 2015). Furthermore, self-compassion may enhance body appreciation and acceptance by providing people with an alternative way to value themselves rather than striving for societal standards of physical attractiveness (Berry et al. 2010).

Disordered eating behaviours (such as binge eating, purging, restriction and disinhibition) are more prevalent in overweight and obese individuals and are associated with weight gain over time (Pereira and Alvarenga 2007; Urquhart and Mihalyuk 2011). These maladaptive habits that are used to control weight do not reach levels of frequency or severity to fulfil diagnostic criteria for clinical eating disorders, but are nonetheless associated with negative outcomes (Pereira and Alvarenga 2007). Of these disordered eating behaviours, binge eating is the most common in obese people and is characterised by the consumption of large amounts of food in a short period of time accompanied by a sense of loss of control over eating (Stunkard and Allison 2003).

As is the case with body dissatisfaction, self-compassion can also act as a buffer against disordered eating. Disordered eating is, in part, a consequence of self-criticism and body shame (McKinley and Hyde 1996). Struggling for an unrealistic body weight can lead to maladaptive weight loss behaviours, such as rigid dieting, negative self-evaluation and a feeling of guilt in response to diet failures (Moradi et al. 2005; Myers and Crowther 2007; Shafran et al. 2002). The feeling of guilt, in turn, could result in overeating as a means of coping with negative self-thoughts (Heatherton and Baumeister 1991; Jackson et al. 2003). Self-compassionate individuals are less self-critical when they have broken their diets (Adams and Leary 2007) and are therefore less likely to engage in overeating triggered by negative self-evaluation. Individuals who are compassionate towards themselves might realise that everyone makes mistakes (common humanity) and that there is no need to be self-critical (self-kindness) or to overemphasise negative feelings such as shame or guilt (mindfulness) (Sirois et al. 2015). Consequently, self-compassionate individuals can focus on long-term goals of healthy eating (Adams and Leary 2007) by having a more realistic self-appraisal that helps them to recognise that there is room for improvement, and by minimising their experience of negative affect which can interfere with goal progress (Breines and Chen 2012; Leary et al. 2007). In line with the theoretical evidence, a recent meta-analysis of eight data sets showed a positive link between self-compassion and healthy eating habits (Sirois et al. 2015).

Finally, more general psychological distress can negatively impact people’s eating behaviours and, consequently, interfere with their weight loss goals. For example, stress and anxiety can increase the feeling of hunger and result in a preference for high fat and sugary foods (Dallman 2010), or cause overeating as a coping strategy to distract from these unpleasant states

(Lazzeretti et al. 2015). Depression has also been associated with a lack of motivation to engage in healthy behaviours (Elfhag and Rossner 2005; Lazzeretti et al. 2015). A 2012 systematic review found a strong inverse relationship between self-compassion and psychological conditions such as depression, anxiety and stress (MacBeth and Gumley 2012). Self-compassion, which has been identified as a predictor of coping, is also associated with less rumination, perfectionism and fear of failure (Neff 2003b; Neff et al. 2005).

Self-compassion holds promise as a means of addressing some of the psychological risk factors related to obesity. The aim of the present systematic review was to assess the literature on the effect that self-compassion interventions have on weight management and related psychological risk factors. A recent review explored the relationship between self-compassion and negative body image and eating pathology across various study designs (Braun et al. 2016), but did not examine nutrition behaviours or weight loss. In contrast, the present review focused on intervention study designs that included nutrition behaviours, body weight and psychological risk factors as outcomes. We included studies in which the samples were healthy weight, overweight or obese people with or without disordered eating (but not with clinical eating disorders). Finally, in order to provide a good-quality systematic review, we assessed the quality of the studies that were included in the review. Elucidating the effect of self-compassion interventions on weight control and related outcomes might help future studies to find a better way to address weight loss and maintenance.

Method

This review was conducted according to the PRISMA guidelines for systematic reviews (Moher et al. 2009). PRISMA provides a 27-item checklist and diagram outlining items that are essential in systematic reviews, such as reporting the review protocol, stating the process of selecting studies and describing any assessment of the risk of bias that may affect the evidence (Moher et al. 2009).

Search Strategies

The following electronic databases were searched on 16th May 2016: MEDLINE, EMBASE, Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PsycINFO. Search terms were adapted from previous systematic reviews on nutrition and body weight (Arem and Irwin 2011; Jones et al. 2016), self-compassion (MacBeth and Gumley 2012), eating disorders and body image (Pratt and Woolfenden 2002).

Search results from each database were imported into separate Endnote reference manager files, and those files

were then combined and duplicate articles were removed. Two reviewers (HR and LM) each screened half of the articles to identify eligible articles by reviewing their title/abstract. These two reviewers also completed a 20% cross-over to assess inter-rater reliability, with any disagreements resolved by a third reviewer (RR). Full texts were then sourced for the articles identified from the title/abstract screening stage. Two reviewers (HR and LM) verified each of these full-text articles to confirm their relevance for inclusion in the review, with decisions compared and any disagreements resolved by a third reviewer (RR). The reference lists of the relevant articles were also reviewed by one reviewer (HR) to identify any other eligible studies that were missed in the initial search process.

Study Selection

Articles were included if they evaluated the effects of interventions that were conducted in humans, were peer-reviewed, were published in English and were published after 2003, i.e. after the development of the Self-Compassion Scale (Neff 2003a). Included studies had to have the aim of increasing self-compassion and had to have assessed at least one of the following outcomes: nutrition habits (e.g. energy intake), eating behaviours (e.g. binge eating), body mass index (BMI) or body weight, or body image. See Table 1 for detailed inclusion and exclusion criteria.

Data Extraction and Quality Assessment

The following information was extracted from the included articles: publication details (e.g. author details and year of publication), study location, duration of intervention, study design, participant number and characteristics, and outcomes (including statistical significance). Included studies were critically appraised using the Quality Criteria Checklist from the American Dietetic Association (American Dietetic Association 2012). Based on this checklist, the quality of studies is categorised into three groups: positive (+), neutral (Ø) and negative (−) (American Dietetic Association 2012). The type of study was defined using The National Health and Medical Research Council guide for levels of evidence (National Health and Medical Research Council 2000). This guide designates levels of evidence according to the types of research questions. For intervention studies, a level II of evidence refers to randomised controlled trials (RCTs); a level I study is a systematic review; and study designs that are less rigorous (such as non-randomised trials or before-after studies) are designated as level III (III-1, III-2 or III-3) or IV (National Health and Medical Research Council 2000).

Table 1 Study eligibility criteria

	Inclusion	Exclusion
Participants	Adults aged 18+ years, male and female Healthy BMI of 18.50–24.99 kg/m ² or overweight or obese BMI 25+ kg/m ²	< 18 years Underweight BMI of < 18.5 kg/m ²
Participant medical conditions	Healthy, unhealthy/disordered eating behaviour, psychological disorders (including depression) or other diseases that do not directly result in weight change, e.g. type 2 diabetes	Clinically diagnosed eating disorders, such as bulimia nervosa; any condition or disease that results in weight change, e.g. HIV, cancer
Study design and publication type	English language, human participants, peer-reviewed Interventions including randomised controlled trial, controlled trial, quasi-experimental trial, before-after study, interrupted time series design	Any type of study without intervention such as qualitative studies, opinion pieces, editorial, reviews or meta-analyses, cross-sectional studies or case-control studies
Date of publication	2003+ (after the development of the Self-Compassion Scale, Neff 2003a)	< 2003
Intervention	Primary aim is to increase self-compassion with either self-compassion, mindful self-compassion or any other interventions that aimed to increase self-compassion.	
Outcomes	Primary: Minimum of one of the following subjectively or objectively measured outcomes: nutrition habits (e.g. energy intake); eating behaviours (e.g. binge eating, disinhibition); BMI or body weight; body image Secondary (if available): Depression, anxiety, stress, mood, mindfulness, affect, self-compassion	

BMI body mass index

Results

Study Selection

The four database searches produced 884 articles, with three extra articles sourced separately from reviewing the reference lists of the included studies. After removing duplicate articles, 677 articles remained. After title/abstract screening, 629 articles were excluded, leaving 48 articles for full-text verification. After full-text verification, five articles describing six studies were included, with 43 articles excluded for following reasons: 27 did not have a relevant intervention design, 10 were not from the included publication types, and six did not meet the inclusion criteria for participant characteristics. For a summary of the search process, see the PRISMA flow diagram in Fig. 1.

Study Characteristics

Six studies comprising four RCTs, one non-controlled before-after study and one lab-based manipulation were included in this review. Table 2 provides summary details of the studies included in this systematic review. These studies measured the effects of self-compassion interventions on the following primary outcomes: body weight ($n = 4$; Braun et al. 2012; Mantzios and Wilson 2014, 2015a), nutrition and other

health-related behaviours ($n = 1$; Braun et al. 2012), body dissatisfaction ($n = 1$; Albertson et al. 2015) and disinhibited eating ($n = 1$; Adams and Leary 2007).

Study populations were professional army soldiers (Mantzios and Wilson 2015a), undergraduate students (Adams and Leary 2007; Mantzios and Wilson 2014), middle-aged overweight and obese women (Braun et al. 2012) and women from the general community (Albertson et al. 2015). Half of the studies included female participants only (Adams and Leary 2007; Albertson et al. 2015; Braun et al. 2012), while the remainder included both male and female participants in approximately equal proportions (Mantzios and Wilson 2014, 2015a). The length of the studies ranged from a 1-day lab manipulation (Adams and Leary 2007) to a 6-month intervention with a 1-year follow-up (Mantzios and Wilson 2015a). Except for the two studies that had very short intervention periods (1 to 5 days), attrition rate during the studies ranged from 20 to 50%, with an average of 30% across studies. Attrition for the follow-up phase ranged from no attrition to 50% attrition. The sample size of the studies ranged from 31 (Braun et al. 2012) to 228 (Albertson et al. 2015) participants, with an average of 80 participants across studies. Three studies were conducted in Greece (Mantzios and Wilson 2014, 2015a), two were conducted in the USA (Adams and Leary 2007; Braun et al. 2012), and one was conducted across the world with the majority of

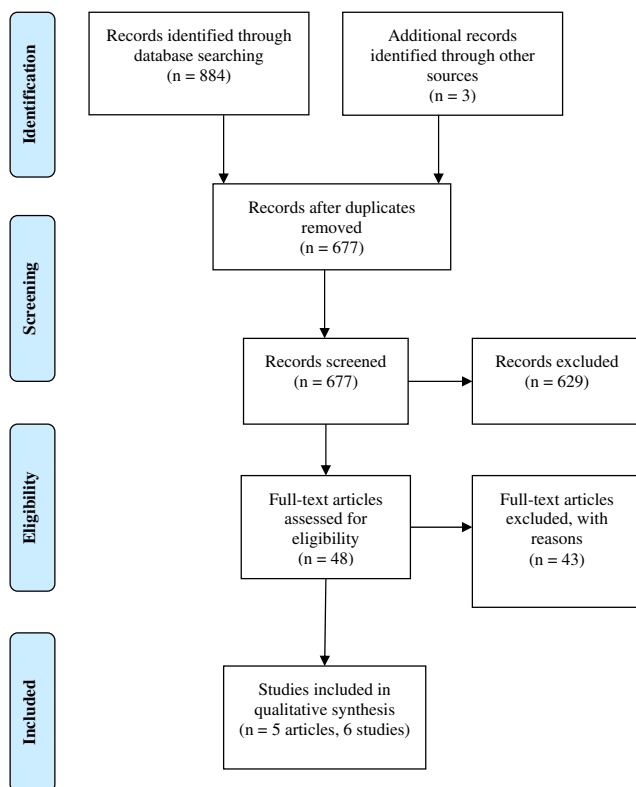


Fig. 1 PRISMA flow diagram

participants being from the USA (Albertson et al. 2015). Of the six studies included in the review, three studies measured self-compassion levels and reported significant increases in self-compassion (Albertson et al. 2015; Braun et al. 2012; Mantzios and Wilson 2014). Different types of interventions were used, including guided self-compassion meditation podcasts (Albertson et al. 2015), guided or individual mindful self-compassion meditation plus psycho-educational information related to eating behaviour (Mantzios and Wilson 2015a), a self-compassion eating diary (Mantzios and Wilson 2014) and a multi-faceted educational program based on self-compassion and self-acceptance (Braun et al. 2012). See Table 2 for more detail about each intervention.

Quality Assessment

With respect to study type, four of the six included studies were classified as having a high level of evidence (level II), while the other two studies were rated as being lower levels of evidence (levels III-1 and IV). However, only two studies were rated as being of high quality according to the quality checklist criteria, with the remaining four studies rated as neutral (Table 3).

Self-Compassion Interventions and Body Weight

Of the four studies examining weight loss, two of them used mindful diaries as an intervention (Mantzios and Wilson

2014). In one of these studies, participants who were trying to lose weight spent a few minutes before and during meals considering questions designed to increase mindful self-compassion attitudes (e.g. How does the food taste?), whereas participants in the control group answered questions that only provoked procedural mindset (e.g. Why is it important to eat less?) (Mantzios and Wilson 2014). In the second study, the effects of mindful diaries with a self-compassionate message were compared with meditations on mindfulness and loving-kindness after 5 weeks of the intervention and again after 3 months follow-up (Mantzios and Wilson 2014). A third study involved a 5-day yoga program focusing on mindful and intuitive eating and self-compassion with a 1-year follow-up for body weight (Braun et al. 2012). The fourth study compared the effects of mindful meditation and the effects of mindful self-compassion meditation to a control condition after 5 weeks, and again at 6 months, and 1-year follow-up (Mantzios and Wilson 2015a). All four studies reported significant weight loss for individuals in the intervention groups (Braun et al. 2012; Mantzios and Wilson 2014, 2015a). One of these studies indicated that there was no significant difference at 1-year follow-up between the self-compassion and control groups. However, in that study, the majority of participants had reported that they were not going to continue the self-compassion meditation after the intervention because they had achieved their desired weight (Mantzios and Wilson 2015a), and thus participants were no longer benefiting from the self-compassion intervention. None of the studies assessed the relationship between self-compassion levels and weight change. Weight was measured objectively in three studies (Mantzios and Wilson 2014, 2015a) and by self-report in one study (Braun et al. 2012).

Self-Compassion Intervention, Nutrition Behaviours and Other Health-Related Behaviours

Braun et al. (2012) evaluated the effects of a multi-faceted 5-day program on nutrition behaviours, physical activity, mindfulness, stress management and mood disturbance immediately after the intervention, and again after 3 months. Health-related behaviours were measured using the physical activity, nutrition, spiritual growth and stress management subscales of the Health-Promoting Lifestyle Profile (Walker and Hill-Polerecky 1996). Braun et al. (2012) found significant improvement in all of the outcomes after the 5-day program. Furthermore, except for physical activity and mood disturbance, all of the changes remained significant at the 3-month follow-up.

Self-Compassion Manipulation and Dietary Disinhibition

A lab-based experiment sought to increase self-compassion related to eating unhealthy food among undergraduate women (Adams and Leary 2007). In this study,

Table 2 Characteristics of included studies ($n = 6$)

Author, date, location	Duration	Study design	Intervention(s) and control(s)	Participant characteristics	SC	MF	MSC	Affect and/or mood
Adams and Leary (2007), USA	1 day	Lab-based manipulation	Group (1): unhealthy food preload + SC; group (2): unhealthy food preload; group (3): no preload, no SC —all followed by a bogus taste test (ad libitum chocolate intake)	$n = 84$, female undergraduates; BMI $23.1 \text{ kg/m}^2 \pm \text{SD } 3.84 \text{ kg/m}^2$	√			√ +affect √ – affect
Braun et al. (2012), USA	5-day intervention with 3-month follow-up and 1-year weight follow-up	Non-CT	Group (1): 5-day yoga-based weight loss program: mindful eating + SC + intuitive eating + fitness	$n = 31$, $n = 18$ at 3-month follow-up (42% lost to follow-up), $n = 19$ at 1-year follow-up (39% lost to follow-up); female; 32–65 years; overweight and obese BMI $> 25 \text{ kg/m}^2$	√	√		√ mood
Mantzios and Wilson (2014) study 1, Greece	5 weeks	RCT	Group (1): intervention, daily MFSC eating diary; group (2): control, abstract diary (reasons behind eating)	$n = 72$ (36 group (1) and 36 group (2)); 42 male:30 female; 21.11 years $\pm \text{SD } 3.64$ years; normal and overweight undergraduates interested in losing weight; BMI $25.55 \text{ kg/m}^2 \pm \text{SD } 4.78 \text{ kg/m}^2$			√	√ – automatic thoughts
Mantzios and Wilson (2014) study 2, Greece	5 weeks with 3-month follow-up	RCT	Group (1): daily MSFC eating diary; group (2): MFSC meditation	$n = 98$ (48 group (1) and 50 group (2)); 57 male:41 female; 23.30 years $\pm \text{SD } 5.53$ years; normal and overweight undergraduates interested in losing weight; BMI $25.79 \text{ kg/m}^2 \pm \text{SD } 3.97 \text{ kg/m}^2$	√	√		
Albertson et al. (2015), worldwide	3-week intervention and 3-month follow-up in group (1)	RCT	Group (1): 20-min daily SC meditation podcast; group (2): waitlist	$n = 228$ (98 group (1), 130 group (2)); $n = 51$ at 3-month follow-up (50% attrition); all female; 36.42 years $\pm \text{SD } 1.31$ years; general community sample			√	
Mantzios and Wilson (2015a), Greece	5-week guided meditation 3×/day, 6-month individual meditation and 1-year follow-up	Pilot RCT	Group (1): MFSC + eating behaviour information; group (2): MF + eating behaviour information; group (3): control, eating behaviour information;	$n = 63$ (14 group (1), 19 group (2), 30 group (3)); 41 male:22 female; 23.03 years $\pm \text{SD } 3.10$ years; professional army soldiers; BMI $26.63 \text{ kg/m}^2 \pm \text{SD } 4.35 \text{ kg/m}^2$				

Table 2 (continued)

Outcomes	Author, date, location	Restrained eating or eating attitudes	Body weight	Nutrition or PA behaviours	Other	Results and conclusions	Quality assessment/level of evidence ^a
	Adams and Leary (2007), USA	√ restrained eating √ SC eating attitude			√ grams of candy eaten after unhealthy food preload	SC eating attitude ↓ in group (2) compared to groups (1) and (3) ($p = 0.03$); restrictive eaters ate ↓ after preloads in groups (1) compared to groups (2) ($p < 0.08$) and (3) ($p = 0.05$); restrictive eaters ↑ +affect and ↓ -affect in group (1) compared to group (2) ($p < 0.05$) SC intervention significantly ↓ eating following the food preload in restrictive eaters	∅ neutral quality/level III-1
	Braun et al. (2012), USA		√ self-reported body weight	√ nutrition √ PA	√ stress management √ spiritual growth	Mood disturbance ↓ and all other outcomes improved with an ↑ ($p < 0.001$) after 5 days; all changes remained significant ($p < 0.05$) except PA and mood disturbance at 3-month follow-up; body weight ↓ ($p < 0.001$) at 1-year follow-up; association between SC and MF and other outcomes was not assessed Multi-faceted yoga program significantly improved health behaviours and resulted in weight loss	∅ neutral quality/level IV
	Mantzios and Wilson (2014) study 1, Greece		√		√ cognitive-behavioural avoidance	Body weight ↓ ($p < 0.001$) in group (1) compared to group (2); SC and MF ↑ ($p < 0.001$), –automatic thought and cognitive-behavioural avoidance ↓ ($p < 0.001$) in group (1) compared to group (2) MFSC diary significantly ↓ body weight and negative automatic thoughts compared to abstract diary	∅ neutral quality/level II
	Mantzios and Wilson (2014) study 2, Greece Albertson et al. (2015), worldwide		√		√ body image ^b	Body weight ↓ in groups (1) and (2); SC and MF ↑ ($p < 0.001$) in groups (1) and (2) MFSC diary and MFSC meditation did not result in any differences in weight loss, although both resulted in significant weight loss All body image-related outcomes correlated with SC at baseline ($p < 0.01$); body dissatisfaction, body shame, body appreciation ($p < 0.001$) and self-worth based on appearance ($p < 0.01$) ↓ in group (1) compared to group (2); all changes remained significant at 3-month follow-up; ↑ in SC was significantly	∅ neutral quality/level II + positive quality/level II

Table 2 (continued)

Outcomes						
Author, date, location	Restrained eating or eating attitudes	Body weight	Nutrition or PA behaviours	Other	Results and conclusions	Quality assessment/level of evidence ^a
Mantzios and Wilson (2015a), Greece	√				<p>associated with ↑ in all body image-related outcomes</p> <p>SC meditation significantly ↓ body dissatisfaction</p> <p>Body weight ↓ in groups (1) and (2) but ↑ in group (3) over 5 weeks ($p < 0.001$); body weight ↓ in group (1) after 6-month individual meditation ($p < 0.001$); body weight ↑ in groups (1) and (2) at 1-year follow-up while ↓ in group (3); SC was not measured.</p> <p>The overall weight change in Group (1) was higher than the other groups, but not significant.</p>	+ positive quality/level II

BMI body mass index, CT controlled trial, MF mindfulness, MFSC mindful self-compassion, NA not applicable, PA physical activity, SC self-compassion, RCT, randomised controlled trial; ↑, increase; ↓, decrease

^a Negative (–): if most (six or more) of the answers to the validity criteria are “No,” the quality assessment labelled negative (–) symbol, indicating a poor quality of the study; Neutral (∅): If the answers to the validity criteria 2, 3, 6 and 7 are “No”, this means that the study is not exceptionally strong and is labelled with a neutral (∅) symbol; Positive (+): if most of the answers to the questions are “Yes” (including criteria 2, 3, 6, 7 and at least one additional “Yes”), the study is labelled positive (+), indicating that it is of high quality. This level of evidence hierarchy designates levels of evidence according to the types of study questions. For intervention studies, a level I study is a systematic review. Study designs that are progressively less vigorous are designated as level III (III-1, III-2 or III-3) or IV

^b Body shame, body shape, body appreciation, self-worth based on appearance

Table 3 Quality assessment of included studies (*n* = 6)

	Adams and Leary (2007)	Braun et al. (2012)	Mantzios and Wilson (2014) study 1	Mantzios and Wilson (2014) study 2	Albertson et al. (2015)	Mantzios and Wilson (2015a)
Questions						
1. Was the research question clearly stated?	Y	Y	Y	Y	Y	Y
2. Was the selection of study subjects free from bias?	Y	Y	N	N	Y	Y
3. Were study groups comparable?	UC	NA	Y	Y	Y	Y
4. Was method of handling withdrawals described?	NA	Y	Y	Y	Y	Y
5. Was blinding used to prevent introduction of bias?	Y	NA	UC	UC	N	N
6. Were intervention/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?	Y	Y	Y	Y	Y	Y
7. Were outcomes clearly defined and the measurements valid and reliable?	N	N	Y	Y	Y	Y
8. Was the statistical analysis appropriate for the study design and type of outcome indicators?	Y	Y	Y	Y	Y	Y
9. Were conclusions supported by results with biases and limitations taken into consideration?	Y	Y	Y	Y	Y	Y
10. Is bias due to study’s funding or sponsorship unlikely?	Y	N	Y	Y	Y	Y
Negative (–)						
If most (six or more) of the answers to the above validity questions are “No,” the report should be designated with a minus (–) symbol.						
Neutral (∅)						
If the answers to validity criteria questions 2, 3, 6, and 7 do not indicate that the study is exceptionally strong, the report should be designated with a neutral (∅) symbol.						
Positive (+)						
If most of the answers to the above validity questions are “Yes” (including criteria 2, 3, 6, 7 and at least one additional “Yes”), the report should be designated with a plus symbol (+).						
	∅	∅	∅	∅	+	+
Sum (Y)	7	6	8	8	9	9
Sum (N)	1	2	1	1	1	1
Sum (NA)	1	2	0	0	0	0
Sum (UC)	1	0	1	1	0	0

NA not applicable, UC unclear

participants were randomly assigned to one of three conditions: unhealthy food preload with self-compassion, unhealthy food preload without self-compassion and no food preload. Following the preload/self-compassion manipulations, all participants were given ad libitum access to candies (e.g. chocolate). Highly restrictive eaters who received both the unhealthy preload and the self-compassion manipulation ate significantly fewer candies than did restrictive eaters who did not receive the preload and marginally fewer candies than did restrictive eaters who received the preload without the self-compassion manipulation. These findings suggest that self-compassion can reduce disinhibited eating in the face of a diet-breaking preload among restrictive eaters. The self-compassion intervention also increased positive affect and decreased negative affect in participants high in guilt and in restrictive eaters following the food preload (Adams and Leary 2007), suggesting possible mechanisms through which self-compassion might reduce disinhibition.

Self-Compassion Intervention and Body Dissatisfaction

One RCT examined whether listening to self-compassion meditation podcasts could attenuate body dissatisfaction in women. In that study, women were allocated into either a self-compassion group or a waitlist group (Albertson et al. 2015). Different aspects of body image concern were measured by the Body Shape Questionnaire (Evans and Dolan 1993), the Body Shame subscale of the Objectified Body Consciousness Scale (McKinley and Hyde 1996), the Body Appreciation Scale (Avalos et al. 2005) and the Appearance subscale of the Contingencies of Self-Worth Scale (Crocker et al. 2003). During the 3-week intervention, the self-compassion group received a 20-min audio recording every week containing a self-compassion meditation and were asked to listen to the recording every day for 1 week; the waitlist group was told that they would receive the meditations after completing the second survey (Albertson et al. 2015). The intervention group had higher self-compassion and more

positive body image after the intervention relative to the control group. Albertson et al. (2015) also reported that increased levels of self-compassion were associated with a more positive body image.

Discussion

The current systematic review aimed to investigate the efficacy of self-compassion interventions on nutrition habits, eating-related behaviours, body weight and body image. Although only a small number of studies were included in the review, all of the studies suggested that self-compassion might have beneficial effects on a range of outcomes in healthy, normal weight or overweight people. These benefits can include weight loss (Mantzios and Wilson 2014, 2015a), improved nutrition behaviours (Braun et al. 2012), reduced dietary disinhibition (Adams and Leary 2007) and reduced risk factors such as body dissatisfaction (Albertson et al. 2015). These results are consistent with the theoretical evidence explaining how self-compassion might alleviate barriers to healthy weight management (e.g. disordered eating and body dissatisfaction), specifically through emotional regulation such as decreasing self-critical thoughts, decreasing stress and increasing acceptance (Adams and Leary 2007; Albertson et al. 2015). Our findings are also similar to those reported by Braun et al. (2016), indicating that self-compassion could be a protective factor against body dissatisfaction and eating disordered behaviours. Self-compassion interventions also promoted psychological well-being (such as reducing negative affect and mood disturbance or increasing stress management) that can be associated with unhealthy eating behaviours (Braun et al. 2012; Mantzios and Wilson 2014). Such findings are also consistent with a recent meta-analysis that indicated a strong relationship between self-compassion and mental health and well-being (MacBeth and Gumley 2012). In addition, our review suggests that even self-compassion manipulations that are brief (Braun et al. 2012) or that require low involvement (writing daily diaries rather than meditation) (Mantzios and Wilson 2014) can promote healthy eating behaviours.

Although all six included studies showed a positive effect of self-compassion interventions on weight loss or obesity-related risk factors such as body dissatisfaction, there are several limitations to this review. First, the number of studies included was small and thus any conclusions must be tentative. Future research is needed to replicate and extend these findings. Second, the included studies were heterogeneous in study design, intervention components, target population and duration. Third, most studies were not methodologically strong and had serious limitations, such as lack of control group (Braun et al. 2012), short-term intervention (Adams and Leary 2007; Braun et al. 2012), high rates of attrition (50%) in the intervention phase (Albertson et al. 2015;

Mantzios and Wilson 2014, 2015a) and/or the follow-up phase (Albertson et al. 2015; Braun et al. 2012), not using a validated scale (Adams and Leary 2007; Braun et al. 2012) or using self-reported weight to calculate weight change (Braun et al. 2012). Indeed, most of the included studies did not have high-quality ratings and were categorised as “neutral” based on quality criteria assessments. Therefore, particular caution is required in interpreting the results of these studies.

Of the six included studies, only one study measured the relationship between changes in self-compassion and changes in outcomes (Albertson et al. 2015). Measuring this relationship is necessary to determine the efficacy of the self-compassion intervention, especially when studies have other intervention components. Some of the studies in this review also included other intervention elements, such as mindfulness and psycho-educational information related to eating behaviours (Mantzios and Wilson 2015a) and yoga and intuitive eating (Braun et al. 2012). Therefore, it is difficult to make definitive claims about the influence of self-compassion on outcomes, because it is not possible to discern whether self-compassion was the active component in these studies.

Another consideration is that the majority of the studies included only women. Women are more self-critical and tend to judge themselves more negatively than men do (DeVore 2013; Leadbeater et al. 1999). Such evaluative tendencies might affect their attitudes towards self-compassion and how they respond to self-compassion interventions. Indeed, a recent meta-analysis showed that women are slightly less compassionate towards themselves than are men (Yarnell et al. 2015). Therefore, women may be more likely to benefit from these self-compassion interventions. At the same time, there is some evidence that people high in self-criticism might be resistant to the idea of self-compassion training (Gilbert et al. 2011). Likewise, some of the studies included in this review reported a higher rate of attrition in female participants compared to male participants (Mantzios and Wilson 2014, 2015a). It would be beneficial for future studies to examine men and women’s attitude towards self-compassion interventions. Further research is also needed to examine the effect of various types of self-compassion interventions among men and women to determine who would benefit most from cultivating self-compassion.

All of the features and limitations noted above make the conclusions of our review tentative. Further research with robust methodology and longer study periods is needed to fully understand the effect of self-compassion on nutrition-related behaviours and outcomes. Furthermore, it would be important for future studies to investigate the mechanisms through which self-compassion might affect outcomes related to weight maintenance. According to the studies included in this review, self-compassion promotes self-regulation (Adams and Leary 2007) and body satisfaction (Albertson et al. 2015), and reduces automatic negative thoughts and cognitive-behavioural avoidance (Mantzios and Wilson 2014). However, only one study

measured the association between changes in self-compassion and the outcomes of interest (Albertson et al. 2015).

It would also be important for future research to examine the different sub-components of self-compassion (self-kindness, common humanity and mindfulness), which would help determine whether the various interventions improve some or all of the components of self-compassion. These findings would provide better insight into the positive and negative aspects of each type of intervention and help researchers develop more effective programs for self-compassion training. Examining the association of each component of self-compassion with the study outcomes would provide insight into which aspects of self-compassion are most strongly related to weight management. A recent opinion paper suggested that not all aspects of self-compassion would be equally effective in facilitating health behaviour changes, and further suggested that promoting only a single element might not be helpful. For example, the authors proposed that self-kindness can be described in different forms, and that even engaging in unhealthy behaviours (such as indulging in high-calorie foods or binge drinking to alleviate psychological distress) could be considered acts of self-kindness. However, engaging in unhealthy behaviours as a form of self-kindness is not consistent with the concept of self-compassion. Rather, self-kindness within a holistic self-compassion approach relates to simultaneously providing physiological and psychological self-care (Mantzios and Egan 2017).

Conclusions and Recommendations for Future Research

This review aimed to examine the effect of self-compassion interventions on weight management and associated psychological factors. All six included studies showed promise for self-compassion interventions for improving weight loss, nutrition behaviours and psychological factors associated with obesity such as body dissatisfaction and dietary disinhibition in healthy, normal weight or overweight people. These findings suggest that self-compassion training might be a new approach for fostering healthy dietary habits. However, due to the limited number of experimental studies, the heterogeneity of the study designs and methodological limitations, the results of this review should be interpreted with caution. Comprehensive research with robust methodology and a longer period is warranted to test the self-compassion efficiency for weight management. It would also be beneficial for future studies to examine the different components of self-compassion and measure the relationship between changes in self-compassion and changes in study outcomes. Researchers should also consider how different genders respond to various types of interventions to identify who would get the most benefit from enhanced self-compassion.

Elucidating the effects of self-compassion interventions on weight control and related outcomes could potentially improve the success of weight loss and weight maintenance programs.

Acknowledgements Special thanks to Natalie Reily for her helpful feedback on the manuscript.

Authors Contributions RR and HR designed the systematic review methodology. HR searched the databases. LM and HR conducted the title/abstract screening and full-text verification stages, and any disagreements at these stages were reviewed by RR. HR extracted the data and did the critical appraisal. HR wrote the first draft of the manuscript and RR, LRV and NZ contributed to the final manuscript.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

References

- Adams, C. E., & Leary, M. R. (2007). Promoting self-compassionate attitudes toward eating among restrictive and guilty eaters. *Journal of Social and Clinical Psychology, 26*(10), 1120–1144. <https://doi.org/10.1521/jscp.2007.26.10.1120>.
- Albertson, E. R., Neff, K. D., & Dill-Shackleford, K. E. (2015). Self-compassion and body dissatisfaction in women: A randomized controlled trial of a brief meditation intervention. *Mindfulness, 6*(3), 444–454. <https://doi.org/10.1007/s12671-014-0277-3>.
- American Dietetic Association. (2012). *Evidence analysis manual: steps in the academy evidence analysis process*. Chicago: American Dietetic Association.
- Arem, H., & Irwin, M. (2011). A review of web-based weight loss interventions in adults. *Obesity Reviews, 12*(5), e236–e243.
- Australian Bureau of Statistics (2015). Overweight and obesity. *National health survey: first results, 2014–15*.
- Avalos, L., Tylka, T. L., & Wood-Barcalow, N. (2005). The body appreciation scale: development and psychometric evaluation. *Body Image, 2*(3), 285–297.
- Avila, C., Holloway, A. C., Hahn, M. K., Morrison, K. M., Restivo, M., Anglin, R., et al. (2015). An overview of links between obesity and mental health. *Current Obesity Reports, 4*(3), 303–310. <https://doi.org/10.1007/s13679-015-0164-9>.
- Barnard, L. K., & Curry, J. F. (2011). Self-compassion: Conceptualizations, correlates, & interventions. *Review of General Psychology, 15*(4), 289–303.
- Bean, M. K., Stewart, K., & Olbrisch, M. E. (2008). Obesity in America: implications for clinical and health psychologists. *Journal of Clinical Psychology in Medical Settings, 15*(3), 214–224. <https://doi.org/10.1007/s10880-008-9124-9>.
- Berry, K. A., Kowalski, K. C., Ferguson, L. J., & McHugh, T. L. F. (2010). An empirical phenomenology of young adult women exercisers' body self-compassion. *Qualitative Research in Sport and Exercise, 2*(3), 293–312.
- Braun, T. D., Park, C. L., & Conboy, L. A. (2012). Psychological well-being, health behaviors, and weight loss among participants in a residential, Kripalu yoga-based weight loss program. *International Journal of Yoga Therapy, 22*(1), 9–22.

- Braun, T. D., Park, C. L., & Gorin, A. (2016). Self-compassion, body image, and disordered eating: a review of the literature. *Body Image, 17*, 117–131. <https://doi.org/10.1016/j.bodyim.2016.03.003>.
- Breines, J. G., & Chen, S. (2012). Self-compassion increases self-improvement motivation. *Personality and Social Psychology Bulletin, 38*(9), 1133–1143. <https://doi.org/10.1177/0146167212445599>.
- Byrne, S., Cooper, Z., & Fairburn, C. (2003). Weight maintenance and relapse in obesity: a qualitative study. *International Journal of Obesity and Related Metabolic Disorders, 27*(8), 955–962. <https://doi.org/10.1038/sj.ijo.0802305>.
- Calle, E. E., Thun, M. J., Petrelli, J. M., Rodriguez, C., & Heath Jr., C. W. (1999). Body-mass index and mortality in a prospective cohort of U.S. adults. *New England Journal of Medicine, 341*(15), 1097–1105. <https://doi.org/10.1056/NEJM199910073411501>.
- Cash, T. F., & Szymanski, M. L. (1995). The development and validation of the body-image ideals questionnaire. *Journal of Personality Assessment, 64*(3), 466–477. https://doi.org/10.1207/s15327752jpa6403_6.
- Crocker, J., Luhtanen, R. K., Cooper, M. L., & Bouvrette, A. (2003). Contingencies of self-worth in college students: theory and measurement. *Journal of Personality Social Psychology, 85*(5), 894–908.
- Dallman, M. F. (2010). Stress-induced obesity and the emotional nervous system. *Trends in Endocrinology & Metabolism, 21*(3), 159–165.
- DeVore, R. (2013). Analysis of gender differences in self-statements and mood disorders. *McNair Scholars Research Journal, 9*(1), 7.
- Douchis, J. Z., Hayden, H. A., & Wilfley, D. E. (2001). Obesity, body image, and eating disorders in ethnically diverse children and adolescents. In J. K. Thompson & L. Smolak (Eds.), *Body image, eating disorders, and obesity in youth: assessment, prevention, and treatment* (pp. 67–98). Didcot: Taylor Francis.
- Elfhag, K., & Rossner, S. (2005). Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. *Obesity Reviews, 6*(1), 67–85. <https://doi.org/10.1111/j.1467-789X.2005.00170.x>.
- Evans, C., & Dolan, B. (1993). Body shape questionnaire: derivation of shortened “alternate forms”. *International Journal of Eating Disorders, 13*(3), 315–321.
- Gilbert, P., McEwan, K., Matos, M., & Rivis, A. (2011). Fears of compassion: Development of three self-report measures. *Psychology and Psychotherapy: Theory, Research and Practice, 84*(3), 239–255.
- Godfrey, K. M., Gallo, L. C., & Afari, N. (2015). Mindfulness-based interventions for binge eating: a systematic review and meta-analysis. *Journal of Behavioral Medicine, 38*(2), 348–362. <https://doi.org/10.1007/s10865-014-9610-5>.
- Haines, J., & Neumark-Sztainer, D. (2006). Prevention of obesity and eating disorders: a consideration of shared risk factors. *Health Education Research, 21*(6), 770–782.
- Haynos, A. F., & O'Donohue, W. T. (2012). Universal childhood and adolescent obesity prevention programs: review and critical analysis. *Clinical Psychology Review, 32*(5), 383–399. <https://doi.org/10.1016/j.cpr.2011.09.006>.
- Heatherton, T. F., & Baumeister, R. F. (1991). Binge eating as escape from self-awareness. *Psychological Bulletin, 110*(1), 86–108.
- Jackson, B., Lynne Cooper, M., Mintz, L., & Albino, A. (2003). Motivations to eat: scale development and validation. *Journal of Research in Personality, 37*(4), 297–318. [https://doi.org/10.1016/S0092-6566\(02\)00574-3](https://doi.org/10.1016/S0092-6566(02)00574-3).
- Jones, B. A., Haycraft, E., Murjan, S., & Arcelus, J. (2016). Body dissatisfaction and disordered eating in trans people: a systematic review of the literature. *International Review of Psychiatry, 28*(1), 81–94. <https://doi.org/10.3109/09540261.2015.1089217>.
- Lazzeretti, L., Rotella, F., Pala, L., & Rotella, C. M. (2015). Assessment of psychological predictors of weight loss: how and what for? *World Journal of Psychiatry, 5*(1), 56–67.
- Leadbeater, B. J., Kuperminc, G. P., Blatt, S. J., & Hertzog, C. (1999). A multivariate model of gender differences in adolescents' internalizing and externalizing problems. *Developmental Psychology, 35*(5), 1268–1282.
- Leary, M. R., Tate, E. B., Adams, C. E., Allen, A. B., & Hancock, J. (2007). Self-compassion and reactions to unpleasant self-relevant events: the implications of treating oneself kindly. *Journal of Personality Social Psychology, 92*(5), 887–904. <https://doi.org/10.1037/0022-3514.92.5.887>.
- MacBeth, A., & Gumley, A. (2012). Exploring compassion: a meta-analysis of the association between self-compassion and psychopathology. *Clinical Psychology Review, 32*(6), 545–552. <https://doi.org/10.1016/j.cpr.2012.06.003>.
- Mantzios, M., & Egan, H. H. (2017). On the role of self-compassion and self-kindness in weight regulation and health behavior change. *Frontiers in Psychology, 8*, 229. <https://doi.org/10.3389/fpsyg.2017.00229>.
- Mantzios, M., & Wilson, J. (2014). Making concrete construals mindful: a novel approach for developing mindfulness and self-compassion to assist weight loss. *Psychology & Health, 29*(4), 422–441.
- Mantzios, M., & Wilson, J. (2015a). Exploring mindfulness and mindfulness with self-compassion-centered interventions to assist weight loss: theoretical considerations and preliminary results of a randomized pilot study. *Mindfulness, 6*(4), 824–835. <https://doi.org/10.1007/s12671-014-0325-z>.
- Mantzios, M., & Wilson, J. (2015b). Mindfulness, eating behaviours, and obesity: a review and reflection on current findings. *Current Obesity Reports, 4*(1), 141–146. <https://doi.org/10.1007/s13679-014-0131-x>.
- McKinley, N. M., & Hyde, J. S. (1996). The objectified body consciousness scale development and validation. *Psychology of Women Quarterly, 20*(2), 181–215.
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of Internal Medicine, 151*(4), 264–269.
- Moradi, B., Dirks, D., & Matteson, A. V. (2005). Roles of sexual objectification experiences and internalization of standards of beauty in eating disorder symptomatology: a test and extension of objectification theory. *Journal of Counseling Psychology, 52*(3), 420–428.
- Myers, T. A., & Crowther, J. H. (2007). Sociocultural pressures, thin-ideal internalization, self-objectification, and body dissatisfaction: could feminist beliefs be a moderating factor? *Body Image, 4*(3), 296–308. <https://doi.org/10.1016/j.bodyim.2007.04.001>.
- National Health and Medical Research Council (2000). How to review the evidence: systematic identification and review of the scientific literature. In NHMRC (Ed.), Canberra.
- Neff, K. D. (2003a). The development and validation of a scale to measure self-compassion. *Self and Identity, 2*(3), 223–250.
- Neff, K. D. (2003b). Self-compassion: an alternative conceptualization of a healthy attitude toward oneself. *Self and Identity, 2*(2), 85–101.
- Neff, K. D., Hsieh, Y.-P., & DeJitterat, K. (2005). Self-compassion, achievement goals, and coping with academic failure. *Self and Identity, 4*(3), 263–287. <https://doi.org/10.1080/13576500444000317>.
- Olson, K. L., & Emery, C. F. (2015). Mindfulness and weight loss: a systematic review. *Psychosomatic Medicine, 77*(1), 59–67. <https://doi.org/10.1097/psy.0000000000000127>.
- Pereira, R. F., & Alvarenga, M. (2007). Disordered eating: identifying, treating, preventing, and differentiating it from eating disorders. *Diabetes Spectrum, 20*(3), 141–148. <https://doi.org/10.2337/diaspect.20.3.141>.
- Pratt, B. M., & Woolfenden, S. (2002). Interventions for preventing eating disorders in children and adolescents. *Cochrane Database of Systematic Reviews, 2*, CD002891.
- Shafraan, R., Cooper, Z., & Fairburn, C. G. (2002). Clinical perfectionism: a cognitive-behavioural analysis. *Behaviour Research and Therapy, 40*(7), 773–791.

- Sirois, F. M., Kitner, R., & Hirsch, J. K. (2015). Self-compassion, affect, and health-promoting behaviors. *Health Psychology, 34*(6), 661–669. <https://doi.org/10.1037/hea0000158>.
- Stunkard, A. J., & Allison, K. C. (2003). Two forms of disordered eating in obesity: binge eating and night eating. *International Journal of Obesity and Related Metabolic Disorders, 27*(1), 1–12. <https://doi.org/10.1038/sj.ijo.0802186>.
- Teixeira, P., Going, S., Houtkooper, L., Cussler, E., Metcalfe, L., Blew, R., et al. (2004). Pretreatment predictors of attrition and successful weight management in women. *International Journal of Obesity, 28*(9), 1124–1133.
- Traverso, A., Ravera, G., Lagattolla, V., Testa, S., & Adami, G. (2000). Weight loss after dieting with behavioral modification for obesity: the predicting efficiency of some psychometric data. *Eating and Weight Disorders, 5*(2), 102–107.
- Trottier, K., McFarlane, T., & Olmsted, M. P. (2013). A test of the weight-based self-evaluation schema in eating disorders: Understanding the link between self-esteem, weight-based self-evaluation, and body dissatisfaction. *Cognitive Therapy and Research, 37*(1), 122–126. <https://doi.org/10.1007/s10608-012-9446-7>.
- Urquhart, C. S., & Mihalynuk, T. V. (2011). Disordered eating in women: implications for the obesity pandemic. *Canadian Journal of Dietetic Practice and Research, 72*(1), e115–e125.
- Walker, S., & Hill-Polerecky, D. (1996). Psychometric evaluation of the health-promoting lifestyle profile II. *Unpublished manuscript, University of Nebraska Medical Center*, 120–126.
- Weinberger, N. A., Kersting, A., Riedel-Heller, S. G., & Luck-Sikorski, C. (2016). Body dissatisfaction in individuals with obesity compared to normal-weight individuals: a systematic review and meta-analysis. *Obesity Facts, 9*(6), 424–441.
- Wing, R. R., Lang, W., Wadden, T. A., Safford, M., Knowler, W. C., Bertoni, A. G., et al. (2011). Benefits of modest weight loss in improving cardiovascular risk factors in overweight and obese individuals with type 2 diabetes. *Diabetes Care, 34*(7), 1481–1486. <https://doi.org/10.2337/dc10-2415>.
- Yarnell, L. M., Stafford, R. E., Neff, K. D., Reilly, E. D., Knox, M. C., & Mullarkey, M. (2015). Meta-analysis of gender differences in self-compassion. *Self and Identity, 14*, 499–520.