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Restrained eating and energy-dense food consumption: the moderating effect of self-compassion

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Abstract

Background The increasing consumption of energy-dense foods has become a subject of scientific debate as it has been identified as one of the main risk factors for eating disorders, including obesity. At the same time, interventions aimed at promoting healthier eating habits have shown poor long-term effectiveness rates. In this context, the present study answers the call to identify strategies capable of promoting the effectiveness of these interventions by evaluating the association between restrained eating and energy-dense food consumption and focusing on the potential buffering role of self-compassion – considering both the self-compassionate engagement and self-compassionate action – in such a relationship.

Method A total of 240 Italians completed a self-reported questionnaire measuring restrained eating, self-compassionate engagement, self-compassionate action, and energy-dense food intake.

Results Findings indicated that restrained eating was positively associated with energy-dense food consumption. In addition, among the two aspects of self-compassion considered, only self-compassionate action significantly moderated the impact of restrained eating on energy-dense food intake.

Conclusions The limitations of the study and the implications for intervention leveraging self-compassion and future research in the realm of eating habits are discussed.

Keywords Self-compassion, Restrained eating, Energy-dense food, Eating habits

Introduction

Worldwide, at least 2.8 million deaths annually are attributed to overweight and obesity [64], with these conditions also accounting for an estimated 35.8 million (2.3%) of disability-adjusted life years (DALYs). Their treatment has become one of the major cost drivers for healthcare organizations [21], as underscored by the fact that member countries of the Organization for Economic Cooperation and Development (OECD) [47] allocate, on average, 8.4% of their healthcare budget to address the consequences of these conditions. These data can be better understood by noting that obesity substantially

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contributes to healthcare costs associated with other chronic diseases [21], notably diabetes (71%), cardiovascular diseases (23%), and certain types of cancer (9%). In such an analysis, it must be considered that overweight and obesity also put individuals at risk of negative psychological outcomes, such as depression and anxiety disorders [2]. Consequently, the total economic burden of obesity on healthcare systems likely exceeds the 8.4% figure reported by the OECD [47].

A significant factor in the growing prevalence of overweight and obesity can be attributed to the increasing intake of *energy-dense foods* that are rich in fat, sugar, and salt but with low nutritional value [58]. In light of this, it is readily comprehensible why governments have invested substantial resources in implementing obesity preventive programs. In fact, even modest decreases in body weight have been demonstrated to mitigate the health risks associated with obesity [65]. However, as Rahimi-Ardabili et al. [53] argued, these interventions typically report poor long-term effectiveness rates. In other words, the majority of individuals who lose weight tend to regain it after some time [22]. These outcomes can be explained by taking into account that most intervention programs primarily adopt an informational approach [13, 49]. This includes educational campaigns, nutritional labeling, dietary guidelines, and awareness programs aimed at informing and guiding people's choices about which types of foods should be consumed more frequently, such as fruits, vegetables, lean meats, fish, and wholegrain cereals, and which should be eaten less frequently, like sugary and fatty foods [14, 41]. In order to enhance their effectiveness, Khattab [38] suggests adopting a multidimensional approach that considers a broad range of factors, including psychological ones. Among them, the present study focused on *restrained eating* and *self-compassion* to investigate their potential role in disinhibition and consequent intake of energy-dense foods. More in detail, by providing a better understanding of these factors, the study aimed to inform the development of more effective interventions that address the complex interactions between psychological and behavioral dimensions of overweight and obesity.

Restrained eating

Rarely do people consume food based solely on biochemical signals. More frequently, their eating choices are the result of social interactions, external stimuli, or emotional states. As postulated by Van Strien et al. [60], we can consider various eating styles or manifestations of individual tendencies to regulate food consumption. These include *emotional* and *external* eating which are, respectively, characterized by food intake independent of the internal state of hunger and satiety but instead based on emotional stimuli (e.g., anxiety, boredom, or loneliness; [61]) and eating in response to external stimuli related to food (e.g., the appearance or smell of food, seeing other individuals eating [60]). An additional eating style of particular note in the context of food restriction is *restrained* eating. This style is characterized by adopting food restrictions to control and manage body weight [50].

Although it has been well acknowledged that these eating styles can predict overweight and disordered eating patterns [6, 52], the nature of the relationship between restrained eating and health outcomes is still debated within the academic community. According to the *Restraint theory* [32, 33], the strict dietary rules of restrained eating require considerable cognitive resources, making restrained eaters more vulnerable to losing control over their eating. Specifically, due to the high cognitive load, they have fewer resources to draw upon when facing stressors related to their diet. This condition, along with the physiological discomfort caused by hunger, can trigger a process of food disinhibition, leading to overeating or binge eating [11, 12, 39, 51, 52], a crucial symptom of bulimia nervosa [66]. Furthermore, such increased cognitive load can result in an attentional bias toward food cues. Accordingly, those who intentionally limit their food consumption are more likely to pay attention to food-related stimuli [30], and this awareness can, in turn, trigger or intensify the strong desire for a specific type of food or *food cravings* [24]. In this context, experimental studies have demonstrated that restrained eaters consume similar amounts of high-calorie foods as unrestrained eaters under conditions of full cognitive capacity [7]. However, under conditions of high cognitive load, restrained eaters exhibit significantly greater consumption than their unrestrained counterparts [63]. Therefore, paradoxically, restrained eaters can be identified as a group at risk for weight gain and obesity. In support of such speculation, the literature has recognized restrained eating as a potential risk factor for poor eating-related outcomes. More specifically, Bellisle et al. [5] reported positive relationships between restrained eating and both disinhibition and hunger. Additionally, Hunt et al. [34] and van Strien et al. [61] showed that dietary restraint can predict weight gain. Consistent with these findings, Cui and colleagues [17] identified restrained eating as a potential antecedent of overeating, negative affects, and mortality threat.

However, as outlined by a literature review by Schaumberg et al. [54], this area of research is characterized by mixed findings. Indeed, in contrast with the studies mentioned above, other research showed no association between restrained eating and variables such as weight gain [42], binge eating [57], or unhealthy food intake [16]. In particular, a study conducted by Benbaibeche et al. [6] on a non-clinical population reported that restrained

eating did not significantly predict higher body mass index (BMI), while emotional and external eating did. Similarly, Ouwens et al. [48] found a non-significant path between restrained eating and food consumption. Moreover, a study by Caso et al. [16] conducted on a college population did not find a statistically significant association between restrained eating and unhealthy eating.

These inconsistent findings, therefore, suggest the need for a deeper understanding of the impact of restrained eating, which could be enriched by considering further variables that might moderate these relationships. Specifically, a large number of studies have pointed out that dietary restraint may be particularly problematic for individuals low in self-regulation [35, 59]. As postulated by the *Self-regulation theory* [31], self-regulation refers to individuals' ability to engage in and adhere to behaviors that foster health and well-being [19]. A subset of this ability is emotional self-regulation, which consists of the ability to manage effectively one's emotions [62]. Among studies that considered this ability in food choices, Burton and Abbott [10] found positive associations between restrained eating, low self-esteem, difficulty in emotional regulation, and binge eating. Similarly, a study by Hagerman et al. [28] used a daily diary design and reported that restrained eaters showed more cravings for unhealthy food and overeating in situations that undermine self-regulation. Thus, it can be assumed that such restrained eating behaviors are a manifestation of a maladaptive way of coping with stressful conditions, including those associated with dietary restraint. Therefore, it is plausible to hypothesize that promoting greater regulation skills among restrained eaters could limit the impact of dietary restraint on the consumption of unhealthy foods.

Self-compassion

A growing corpus of research has recently highlighted the need to pay attention to self-compassion in food decision-making processes. Notably, self-compassion is a term referring to healthy self-attitudes [43], an expression of the recognition that suffering, inadequacy, and failure are aspects constitutive of the human condition and that all people — oneself included — are worthy of compassion [26, 43]. Extant literature in this area has shown that self-compassion is a resource capable of improving mental health [27, 29, 44], to facilitate the adoption of healthy eating habits [23, 56], reduce energy-dense foods intake, and prevent unhealthy and pathological eating behaviors [53] associated with such foods.

These findings can be interpreted within the context of the strong empirical support of self-compassion as an adaptive emotional regulation and coping strategy [4, 8, 20, 46]. Indeed, self-compassion is intrinsically linked to "mindfulness" [3, 9, 45], which consists of a state of awareness in which thoughts and feelings are nonjudgmentally observed as they are. For this reason, self-compassionate individuals tend to employ this strategy when facing negative events. In these situations, they experience lower rumination levels, less extreme reactions, and more positive emotions since self-compassion allows them to reduce negative emotional patterns and promote positive feelings better than individuals low in self-compassion [1].

According to Gilbert et al. [27], self-compassion consists of two kinds of competencies.

The first involves *compassionate engagement*, which encompasses being sensitive and connected to stimuli of distress or suffering; adopting an accepting, non-critical, and non-judgmental attitude towards one's own feelings of suffering; and making sense of these experiences, understanding motivations underlying adopting such an approach [25]. The second competency reflects *compassionate action,* which, as Gilbert ([27] p.4) assert, "involves competencies for the effective turning of attention, reasoning, and behaviors to the alleviation and prevention of suffering. This competency encompasses intentionally directing attention toward strategies that can mitigate or prevent suffering; the adoption of mental imagery to identify potential solutions; the evaluation of the most effective actions to address a situation involving suffering; the ability to experience emotions that convey compassion, acknowledging that compassion comprehends more than a single emotional state; the use of bodily sensations and experiences to inform compassionate action; and the ability to translate compassionate intentions into concrete actions. Consequently, compassionate action can be conceived as an expression of an individual's general self-regulation ability.

As a whole, self-compassionate individuals should be less self-critical when they face stressors, including those related to dietary restraint. Such speculation is corroborated by Adams and Leary's [1] seminal study involving a non-clinical population of college women randomly assigned to one of three conditions: unhealthy food preload with self-compassion, unhealthy food preload without self-compassion, and no-preload control condition. The food preload consisted of simulating a diet break by asking participants to eat unhealthy food. While participants in the control condition received no food, those in both preload conditions consumed a set amount of food. Additionally, only women in preload with self-compassion condition met a researcher who spoke about the importance of self-compassion in addressing negative feelings associated with diet breaks.

Findings showed that highly restrictive eaters – exposed to both the unhealthy preload and the self-compassion manipulation – reported significantly lower unhealthy food intake compared to participants low in restrictive eating in the no-preload condition and marginally lower

food intake compared to restrictive eaters who received the preload without the self-compassion induction. Self-compassion manipulation also increased positive affect and reduced negative affect among restrained eaters, suggesting its potential to mitigate disinhibited eating and energy-dense food consumption. A subsequent laboratory study [55] on a clinical female population confirmed the positive impact of self-compassion on healthy food consumption. Following this line of research, Kelly and Stephen [37] conducted a daily diary study that involved female college students and reported negative associations between self-compassion and restrictive eating. In contrast, a positive relationship emerged between self-compassion and healthy food consumption.

While recognizing the value of these studies, it is noteworthy that they focused on specific populations (i.e., college students, women, and people with clinical conditions), raising questions about their ability to explain the pattern related to self-compassion in other demographics. Furthermore, those studies that adopted an experiment design to evaluate eating behaviors might not have reflected real-world eating patterns since eating in the lab may be unnatural, as Johnson et al. [36] suggest.

In light of the above, this study had two primary aims. The first aim was to explore the relationships between restrained eating and energy-dense food consumption within a broader population that does not consist solely of college students or women. The second aim was to examine whether self-compassion could be associated with energy-dense food consumption and moderate the relationship between restrained eating and the consumption of such foods. This second goal has more practical implications since it meets the need to improve low long-term effective rates of weight management intervention [53] and, in turn, mitigate poor health-related outcomes derived from energy-dense food consumption, including overweight and obesity.

Based on these aims, we tested the following hypotheses in the present study.

> Hypothesis 1 (H1) Restrained eating is positively associated with energy-dense food consumption.
> Hypothesis 2 (H2) Compassionate engagement moderates the relationship between restrained eating and energy-dense food consumption.
> Hypothesis 3 (H3) Compassionate action moderates the relationship between restrained eating and energy-dense food consumption.

Materials and methods

The current study used a cross-sectional design. The inclusion criteria included and reporting an $18.5 \geq BMI < 30$ (the cut-off point for normal weight). Participants were recruited by advertising a link to a self-report questionnaire on some of the main Italian social networking sites (e.g., Facebook groups). They were informed about the anonymity of data collection and signed the informed consent form. Thereafter, they completed an online self-reported questionnaire implemented on the Google Forms platform. The questionnaire took approximately 20 min to complete and required a mandatory answer to each item, so no respondents had missing values.

We carried out an a priori power analysis to estimate the required sample size for detecting a medium effect size ($f^2 = 0.15$) for multiple regression analysis with eight predictors, an alpha = 0.05 and power = 0.80. The estimated sample size was $N = 109$. Thus, we planned to recruit $N > 109$ into the study in order to ensure adequate power to detect potential moderation effects, also taking into account possible participants' ineligibility. Among the invited participants, $N = 330$, a total of 240 Italian individuals met the inclusion criteria and completed the questionnaire. They were mainly women (77.5%) and aged between 18 and 56 years ($M = 24.8$; $SD = 6.7$). Additionally, most were students (84.6%) and were in a romantic relationship (62.9%). Data were collected between July 2021 and April 2022. This study was conducted following the receipt of ethical approval from the Ethics Committee of the University of Turin (protocol number: 0338127).

Measures

In the first section of the questionnaire, participants filled out the informed consent form. Then, they were asked for their demographic information (i.e., age, work condition, relationship status, Italian region of residence), weight, and height. Besides, to evaluate the hypothesized relationship between psychological variables, the following measures were administered to all the participants in the same order.

Restrained eating

Restrained eating was assessed using the *Restrained Eating* subscale developed by Guidetti [69]. The instrument consists of 5 items (e.g., Do you eat less to avoid weight gain and become heavier?") rated on a 5-point scale (from 1 = "*never*" to 5 = "*very often*"). Cronbach's α = 0.86. Supplementary materials include items of the scale and the permission for its use.

Self-compassionate engagement

Self-compassionate engagement was assessed by adopting the *Self-compassion Engagement Scale* [27, 68]. The instrument consists of 8 items reflecting the various compassion engagement elements: 1) motivation to care for well-being 2) attention/sensitivity to suffering 3) sympathy 4) distress tolerance 5) empathy and 6) being accepting and non-judgemental. Participants are asked to

evaluate the items, considering how they respond when confronted by their own suffering, using a 10-point scale (from 1 = "*never*" to 10 = "*always*"). An example of an item is "I am accepting, non-critical, and non-judgemental of my feelings of distress." Cronbach's α = 0.63.

Self-compassionate action

Self-compassionate action was measured through the *Self-compassion Action Scale* [27, 68]. The instrument consists of 5 items reflecting the following compassion action elements: 1) directing attention to what is helpful 2) thinking and reasoning about what is likely to be helpful 3) taking helpful actions, and 4) creating inner feelings of support, kindness, helpfulness, and encouragement to deal with distress. Participants are asked to evaluate the items, considering how they respond when confronted by their own suffering, using a 10-point scale (from 1 = "*never*" to 10 = "*always*"). An example of an item is "I direct my attention to what is likely to be helpful to me." Cronbach's α = 0.84.

Frequency of energy-dense food consumption

Energy-dense food consumption was assessed by considering different types of foods that can be included in this category: fried food, mayonnaise and ketchup, prepackaged salty snacks, prepackaged sweet snacks, fast food, chocolate, cold cuts, and sugar-sweetened beverages. Participants were asked to respond to the question, "How often have you eaten this food in the last two weeks?" on a 5-point scale from 1 = "*never*" to 5 = "*more than once a day*." Cronbach's α = 0.79.

Statistical analyses

Statistical analyses were conducted using IBM SPSS version 29. Firstly, descriptive analyses were performed on all variables included in the study. Subsequently, bivariate correlations were computed to assess the association between these variables. In order to examine the statistical significance of predictors and the potential moderation effects of self-compassion dimensions, hierarchical multiple regression analyses were carried out. Prior to performing the analyses, all quantitative variable scores were standardized. The variables were then entered into the regression model in the following order: age, sex, BMI (Model 1); restrained eating (Model 2); self-compassionate action, self-compassionate engagement (Model 3); interactions terms (Model 4). The latter were self-compassionate engagement × restrained eating and self-compassionate action × restrained eating. Finally, as Dawson [18] suggests, simple slope analyses were performed through PROCESS macro (Model 1) to interpret the significant interactions.

Results

Descriptive analysis

Descriptive analyses and Pearson's correlations among variables are shown in Table 1. On average, participants declared that they adopted a restrained eating style and had eaten energy-dense food about once a week during the previous two weeks. Specifically, such consumption tended to increase when they reported higher levels of restrained eating. Regarding self-compassion, participants reported above-average levels in the two assessed dimensions: self-compassionate engagement and self-compassionate action.

The latter, in particular, was higher among men than women and, overall, among participants with higher levels of self-compassionate engagement.

Hierarchical regression analysis

The results of the hierarchical regression analysis are displayed in Table 2. Model 1, which only included sociodemographic variables, did not account for a significant portion of the variance in energy-dense food intake ($R^2 = 0.008$, $F_{(3,236)} = 0.639$, $p = 0.591$). Specifically, no variable emerged as a significant predictor of energy-dense food consumption. The inclusion of the restrained eating variable in Model 2 resulted in a substantial increase in the explained variance ($R^2 = 0.039$, $\Delta R^2 = 0.031$, $F_{(4,235)} = 4.215$, $p = 0.006$). Specifically, restrained eating ($\beta = 0.179$, $p = 0.006$) emerged as a positive predictor of energy-dense food intake. In Model 3, although self-compassionate engagement and self-compassionate action were added, restrained eating ($\beta = 0.184$, $p = 0.005$) was still the only significant predictor of energy-dense food intake. Thus, the observed increase in explained

Table 1 Descriptive statistics and Pearson's correlations among the variables

	M (SD)	1	2	3	4	5	6
1. Age	24.8 (6.70)	1					
2. Sex	1.78 (0.42)	.02	1				
3. BMI	22.58 (2.45)	.09	-.21**	1			
4. Restrained eating	3.11 (1.14)	-.05	-.01	-.12	1		
5. SC engagement	6.03 (1.43)	-.04	.15*	.08	-.01	1	
6. SC action	6.46 (2.12)	.06	-.13*	.06	.03	.41**	1
7. Energy-dense food	2.16 (0.65)	-.06	-.03	-.06	.19**	-.10	-.02

*$p < .05$; **$p < .01$; SC = Self-compassionate; Sex coding: 1 = male

Table 2 Hierarchical multiple regression analysis of energy-dense food consumption

Independent variables	Model 1 β	Model 2 β	Model 3 β	Model 4 β
Step 1: Control variables				
Age	-.056	-.049	-.048	-.042
Gender	-.040	-.033	-.035	-.049
BMI	-.061	-.038	-.035	-.038
Step 2: Restrained eating				
Restrained eating	-	.179*	.184**	.317
Step 3: Self-compassion				
SC engagement	-	-	-.062	-.498*
SC action	-	-	.014	.699**
Step 4: Interaction terms				
Restrained eating × SC engagement	-	-	-	.754
Restrained eating × SC action	-	-	-	−1.017**
Adjusted R^2	-.005	.023	.018	.049
ΔF	-	.031**	.003	.038**

*$p < 0.05$; **$p < 0.01$

variance in Model 3 was not statistically significant ($R^2 = 0.042$, $\Delta R^2 = 0.003$, $F_{(6,233)} = 1.719$, $p = 0.703$). Finally, in Model 4, a significant interaction between self-compassionate action and restrained eating emerged (β = − 1.017, $p = 0.002$). This fourth model emerged as best fitting, explaining the higher portion of the variance in energy-dense food consumption ($R^2 = 0.081$, $F_{(8,231)} = 6.76$, $p = 0.009$). Regarding the main effects of this model, self-compassionate engagement (β = − 0.498, $p = 0.033$) negatively predicted energy-dense food consumption, whereas self-compassionate action positively predicted it (β = 0.699, $p = 0.003$).

In order to interpret the moderation effect of self-compassionate action on restrained eating in relation to energy-dense food intake, a simple slope analysis was carried out. The results of this analysis (Fig. 1) showed that restrained eating significantly predicted energy-dense food consumption only for participants with lower self-compassionate action scores. Indeed, restrained eating led to an increased energy-dense food consumption among individuals who showed lower self-compassionate action (B = 0.033; $p < 0.001$; 95% CI [0.150, 0.507]). Among those with higher levels of self-compassionate action, the association between restrained eating and energy-dense food consumption was not statistically significant (B = 0.03; $p = 0.739$; 95% CI [− 0.151, 0.213]). Consequently, H3 was confirmed, while H2 was not.

Discussion

The present study explored the association between restrained eating and energy-dense food consumption, also considering the potential moderating role of both dimensions of self-compassion (i.e., compassionate engagement and compassionate action [27]). This investigation addresses the critical need to identify psychosocial resources that may be leveraged to enhance the effectiveness of weight management and healthy eating interventions [53], which should primarily aim at reducing the energy-dense food intake [58].

The analysis of the results revealed that most of the hypothesized relationships were confirmed. More in detail, in line with H1, restrained eating – net of the impact of self-compassion – was positively associated with energy-dense food intake. This result aligns with previous studies that have demonstrated the detrimental impact of such eating style on increased food consumption [28] and eating disorders [10]. Moreover, as posited by the Restraint theory [33], it is reasonable to suppose that restrained eaters are at heightened risk of making unhealthy food choices. Thus, adopting this eating style

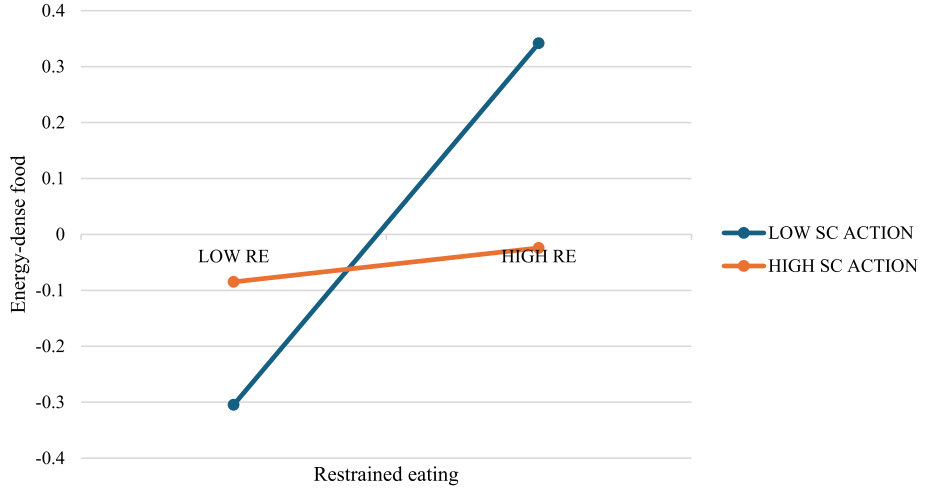

Fig. 1 The moderating effect of self-compassionate action on the relationship between restrained eating and energy-dense food consumption. Note. RE = Restrained eating; SC = Self-compassionate

translates into the paradox of consuming those same foods – energy-dense foods – that these individuals aim to avoid. In other words, the cognitive load associated with dietary restraint and the resulting food disinhibition can lead not only to overeating and binge eating [10, 17] but also to the consumption of such unhealthy foods. Although this evidence contributes to the inconsistent literature on the relationship between restrained eating and energy-dense food consumption, it is partially in contrast with earlier research [15, 16]. These differences could be explained by taking into account the main characteristics of samples included in existing literature. Specifically, it must be underscored that the prior studies were predominantly conducted among college students, yielding potentially misleading results, as these individuals face specific stressors [67] that can influence the relationships under investigation. Hence, this demographic composition prompts two considerations. On the one hand, it could explain the discrepancy between previous studies findings and those of the present study. On the other hand, it highlights that limiting the investigation of restrained eating to college students might fail the aim of grasping the different nuances of restrained eating manifestation as well as related psychosocial factors across a broader spectrum of the population.

Additionally, the moderation analysis results, which confirmed H3 but not H2, revealed that compassionate action may play a buffering role in the relationship between restrained eating and energy-dense food intake. However, the findings did not support such a role for compassionate engagement. In this regard, it is important to note that most prior studies have not differentiated between compassionate engagement and compassionate action competencies, as the present study did. In this vein, these results suggest a specific role of self-compassionate action among restrained eaters. Specifically, the potential of this self-compassion dimension in improving individuals' regulation of emotional discomfort through concrete coping strategies can explain why it negatively moderated the relationship between restrained eating and energy-dense food consumption. At the same time, self-compassionate action had a positive association with energy-dense food consumption, presumably because individuals may still indulge in high-calorie foods as a form of self-soothing in non-restrained eating contexts. In this case, energy-dense foods may be seen as a way to care for oneself or reduce stress, regardless of dietary restraint. Thus, even though self-compassionate action can reduce the harmful effects of restrained eating by promoting healthier emotional regulation, it might not necessarily lead to healthier eating habits in general, resulting in higher energy-dense food consumption. In contrast, self-compassionate engagement — focused on mindful awareness and acceptance — was negatively associated with energy-dense food consumption, as individuals who can leverage a heightened awareness of their emotional states may recognize unhealthy cravings and, in turn, resist them. However, the lack of significant moderation by self-compassionate engagement in the relationship between restrained eating and energy-dense food consumption suggests that mere awareness and acceptance of distress may not be sufficient to counteract the cognitive and emotional burden of restrained eating. Although these individuals may be able of recognizing their feelings and being open to their suffering as well as the underlying motivation for such an attitude, this may not translate into healthier food choices without the skills enabling the action to address them in the restrained eating context. On the contrary, it can be stated that self-compassionate action can enable individuals to take practical steps to mitigate the stress of dietary restraint, reducing the impact of restrained eating on energy-dense food consumption. These findings align with the conclusions of Adams and Leary [1], since the authors reported that self-compassion acts differently among restrained and non-restrained eaters. Additionally, Gilbert et al.'s [27] argument supports this speculation, positing that mere compassionate engagement may not be enough to influence behavior without the ability to act upon that awareness. Thus, people showing restrictive eating patterns and lower in compassionate action tend to eat more unhealthy foods than those higher on this self-compassion dimension. Arguably, the former are more likely to engage in unhealthy eating because they are unable to use the competencies characteristics of compassionate action or rely on those of compassionate engagement, which alone cannot result in effective emotional self-regulation. Consequently, as suggested by Adams and Leary [1], when these individuals experience stressful situations – such as those related to breaking diets – they may cope with the resulting negative affects (e.g., discomfort and self-criticism) or escape from self–awareness by eating unhealthy food. In other words, they may struggle to employ adaptive coping strategies, resulting in a stronger food disinhibition response and in more frequent consumption of energy-dense foods rather than people higher in self-compassionate action. This reasoning is corroborated by the similarities identified between compassionate action competencies and self-regulation skills [27] as well as findings from prior studies [10, 28] which recognize the lack of self-regulation as a critical factor in explaining the process underlying the disinhibition among restrained eaters.

Conclusion

The findings of the present study have significant implications for a better understanding of the disinhibition effect associated with restrained eating habits, as well as

the potential impact of such an eating style and self-compassion on energy-dense food intake.

However, this contribution should be considered in the context of the limitations that characterize the present study. Firstly, the cross-sectional design of the study limits the possibility of inferring cause-and-effect relationships. Secondly, the self-report measures adopted in the study may be susceptive to social desirability bias. For instance, participants may have underestimated the consumption of energy-dense foods. Hence, future studies should include more accurate measures of eating behavior, for example, using food diary apps [40]. Moreover, it should be emphasized that we focused solely on restrained eating and did not consider the impact of other eating styles (e.g., emotional eating and external eating) on the examined relationships. Finally, although this study suggests that compassionate action can reduce the negative effects of restrained eating, it did not explore the specific skills involved (e.g., attention, reasoning, and behavior [27]). Therefore, future studies should consider the different facets of eating style and compassionate action to thoroughly evaluate their potential implications for eating behaviors.

Despite these limitations, the present study sheds light on the inconsistent evidence of the relationship between restrained eating and food intake. Specifically, it underscores that restrained eaters reporting higher self-compassionate action might be better able to reduce the frequency of unhealthy eating. Consequently, the results support the potential beneficial effects of such a self-compassion dimension in coping effectively with negative emotions, thereby reducing unhealthy food consumption among restrained eaters only, suggesting thereby a more nuanced relationship between self-compassion and food intake than previously reported.

Specifically, the results contribute to the literature by simultaneously considering two aspects of self-compassion and examining their buffering role in relation to restrained eating and the related disinhibition since – as far as we know – no prior study has examined these relationships. In doing so, the present study supports the notion that not all aspects of self-compassion may affect eating behaviors and the different roles of such a factor among individuals who adopt restrained and non-restrained eating.

In light of the above, the current study can inform future interventions about the factors that should be taken into account to promote healthy eating of restrained eaters. In order to improve their effectiveness, it seems essential that these interventions should aim to support individuals to control their eating in a less rigid manner and react in more adaptive ways to stress cues, including those arising from diet failures [1] by improving the self-compassionate skills able to enhance their regulation about eating.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s40359-025-03531-0.

Supplementary Material 1

Authors' contributions

Conceptualization: A.R.D, G.S., M.C., C.G., C.M., A.N., C.R., D.C. Methodology: A.R.D., G.S., M.C., C.G., C.M., A.N., C.R., D.C. Formal analysis: G.S. Investigation: C.R. Data curation: G.S. Writing–original draft: G.S. Review & editing: A.R.D., G.S., M.C., C.G., C.M., A.N., C.R., D.C. Visualization: G.S. All the authors have read and approved the final manuscript.

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Data availability

The data presented in this study are available on request. The data are not publicly available due to privacy reasons.

Declarations

Ethics approval and consent to participate

Before starting our research, we submitted our research plan to the Academic Ethics Committee of the University of Turin (protocol number: 0338127), and obtained moral approval and review of the plan's content. All the participants willingly took part in the questionnaire survey, and the participants and the organization provided written informed consent. We ensure the guidelines outlined in the Declaration of Helsinki were followed.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. Adams CE, Leary MR. Promoting self–compassionate attitudes toward eating among restrictive and guilty eaters. J Soc Clin Psychol. 2007;26(10):1120–44.
2. Avila C, Holloway AC, Hahn MK, Morrison KM, Restivo M, Anglin R, et al. An overview of links between obesity and mental health. Curr Obes Rep. 2015;4:303–10.
3. Baer RA, Lykins EL, Peters JR. Mindfulness and self-compassion as predictors of psychological wellbeing in long-term meditators and matched nonmeditators. J Posit Psychol. 2012;7(3):230–8.
4. Bakker AM, Cox DW, Hubley AM, Owens RL. Emotion regulation as a mediator of self-compassion and depressive symptoms in recurrent depression. Mindfulness. 2019;10(6):1169–80. https://doi.org/10.1007/s12671-018-1072-3.
5. Bellisle F, Clément K, Le Barzic M, Le Gall A, Guy-Grand B, Basdevant A. The eating inventory and body adiposity from leanness to massive obesity: a study of 2509 adults. Obes Res. 2004;12(12):2023–30.
6. Benbaibeche H, Saidi H, Bounihi A, Koceir EA. Emotional and external eating styles associated with obesity. J Eat Disord. 2023;11(1):67. https://doi.org/10.1186/s40337-023-00797-w.
7. Boon B, Vogelzang L, Jansen A. Do restrained eaters show attention toward or away from food, shape and weight stimuli? Eur Eat Disord Rev. 2000;8(1):51–8.
8. Braun TD, Park CL, Gorin A. Self-compassion, body image, and disordered eating: a review of the literature. Body Image. 2016;17:117–31.

9. Brown KW, Ryan RM. The benefits of being present: mindfulness and its role in psychological well-being. J Pers Soc Psychol. 2003;84(4):822.
10. Burton AL, Abbott MJ. Processes and pathways to binge eating: development of an integrated cognitive and behavioural model of binge eating. J Eat Disord. 2019;7(1):18. https://doi.org/10.1186/s40337-019-0248-0.
11. Burton P, Smit HJ & Lightowler HJ. The influence of restrained and external eating patterns on overeating. Appetite. 2007; 49(1):191–197. https://doi.org/10.1016/j.appet.2007.01.007
12. Canova L, Bobbio A, Benincà A, Manganelli AM. Italian validation of a short version of the Dutch eating behavior questionnaire: Psychometric properties and relationships with self-esteem, eating self-efficacy, and snacking habits in university students. Health Psychology Open. 2024;11. https://doi.org/10.1177/20551029241262665.
13. Capacci S, Mazzocchi M, Shankar B, Brambila Macias J, Verbeke W, Pérez-Cueto FJ, et al. Policies to promote healthy eating in Europe: a structured review of policies and their effectiveness. Nutr Rev. 2012;70(3):188–200.
14. Capasso M, Califano G, Caracciolo F, Caso D. Only the best for my kids: an extended TPB model to understand mothers' use of food labels. Appetite. 2023;191:107040. https://doi.org/10.1016/j.appet.2023.107040.
15. Caso D, Guidetti M, Capasso M, Cavazza N. Finally, the chance to eat healthily: Longitudinal study about food consumption during and after the first COVID-19 lockdown in Italy. Food Qual Prefer. 2022;95:104275.
16. Caso D, Capasso M, Fabbricatore R, Conner M. Unhealthy eating and academic stress: the moderating effect of eating style and BMI. Health Psychol Open. 2020;7(2):2055102920975274.
17. Cui Y, Liu X, Xiang G, Li Q, Xiao M, Chen H. The association of restrained eating and overeating during COVID-19: a cross-lagged model. Nutrients. 2021. https://doi.org/10.3390/nu13124535.
18. Dawson JF. Moderation in management research: what, why, when, and how. J Bus Psychol. 2014;29(1):1–19. https://doi.org/10.1007/s10869-013-9308-7.
19. De Ridder DT, de Wit JB. Self-regulation in health behavior: Concepts, theories, and central issues. Self-regulation in health behavior. 2006:1–23. https://doi.org/10.1002/9780470713150.ch1.
20. Diedrich A, Burger J, Kirchner M, Berking M. Adaptive emotion regulation mediates the relationship between self-compassion and depression in individuals with unipolar depression. Psychol Psychother Theory Res Pract. 2017;90(3):247–63.
21. Dixon JB. The effect of obesity on health outcomes. Mol Cell Endocrinol. 2010;316(2):104–8.
22. Elfhag K, Rössner S. Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. Obes Rev. 2005;6(1):67–85.
23. Fan L, Wang Y. Healthy eating behaviors and self-control in scarcity: the protective effects of self-compassion. Appetite. 2022;169:105860.
24. Fedoroff I, Polivy J, Herman CP. The specificity of restrained versus unrestrained eaters' responses to food cues: General desire to eat, or craving for the cued food? Appetite. 2003;41(1):7–13.
25. Gilbert P. The Compassionate Mind: A New Approach to Life. 2009.
26. Gilbert P. Psychotherapy for the 21st century: an integrative, evolutionary, contextual, biopsychosocial approach. Psychol Psychother Theory Res Pract. 2019;92(2):164–89.
27. Gilbert P, Catarino F, Duarte C, Matos M, Kolts R, Stubbs J, et al. The development of compassionate engagement and action scales for self and others. J Compassionate Health Care. 2017;4(1):4. https://doi.org/10.1186/s40639-017-0033-3.
28. Hagerman CJ, Stock ML, Beekman JB, Yeung EW, Persky S. The ironic effects of dietary restraint in situations that undermine self-regulation. Eat Behav. 2021;43:101579. https://doi.org/10.1016/j.eatbeh.2021.101579.
29. Han A, Kim TH. Effects of self-compassion interventions on reducing depressive symptoms, anxiety, and stress: a meta-analysis. Mindfulness. 2023. https://doi.org/10.1007/s12671-023-02148-x.
30. Heatherton TF, Baumeister RF. Binge eating as escape from self-awareness. Psychol Bull. 1991;110(1):86.
31. Heatherton TF, Baumeister RF. Self-regulation failure: past, present, and future. Psychol Inq. 1996;7(1):90–8.
32. Herman CP, Polivy J. Anxiety, restraint, and eating behavior. J Abnorm Psychol. 1975;84(6):666.
33. Herman CP, Polivy J. A boundary model for the regulation of eating. Res Publ Assoc Res Nerv Ment Dis. 1984;62:141–56.
34. Hunt TK, Forbush KT, Hagan KE, Chapa DA. Do emotion regulation difficulties when upset influence the association between dietary restraint and weight gain among college students? Appetite. 2017;114:101–9.
35. Imhoff R, Schmidt AF, Gerstenberg F. Exploring the interplay of trait self-control and ego depletion: empirical evidence for ironic effects. Eur J Pers. 2014;28(5):413–24. https://doi.org/10.1002/per.1899.
36. Johnson F, Pratt M, Wardle J. Dietary restraint and self-regulation in eating behavior. Int J Obes. 2012;36(5):665–74.
37. Kelly AC, Stephen E. A daily diary study of self-compassion, body image, and eating behavior in female college students. Body Image. 2016;17:152–60. https://doi.org/10.1016/j.bodyim.2016.03.006.
38. Khattab R. Weight Loss Programs: Why Do They Fail? A Multidimensional Approach for Obesity Management. Current Nutrition Reports. 2024. https://doi.org/10.1007/s13668-024-00551-x.
39. Linardon J. The relationship between dietary restraint and binge eating: examining eating-related self-efficacy as a moderator. Appetite. 2018;127:126–9. https://doi.org/10.1016/j.appet.2018.04.026.
40. Linardon J, Messer M, Shatte A, Skvarc D, Rosato J, Rathgen A, et al. Targeting dietary restraint to reduce binge eating: a randomized controlled trial of a blended internet-and smartphone app-based intervention. Psychol Med. 2023;53(4):1277–87.
41. Lobstein T, Davies S. Defining and labelling 'healthy' and 'unhealthy' food. Public Health Nutr. 2009;12(3):331–40. https://doi.org/10.1017/S1368980008002541.
42. Lowe MR, Annunziato RA, Markowitz JT, Didie E, Bellace DL, Riddell L, et al. Multiple types of dieting prospectively predict weight gain during the freshman year of college. Appetite. 2006;47(1):83–90.
43. Neff K. Self-compassion: an alternative conceptualization of a healthy attitude toward oneself. Self Identity. 2003;2(2):85–101.
44. Neff KD. Self-compassion, self-esteem, and well-being. Soc Personal Psychol Compass. 2011;5(1):1–12. https://doi.org/10.1111/j.1751-9004.2010.00330.x.
45. Neff KD, Dahm KA. Self-compassion: What it is, what it does, and how it relates to mindfulness. Handbook of mindfulness and self-regulation. 2015;121–137. https://doi.org/10.1007/978-1-4939-2263-5_10.
46. Neff KD, Hsieh Y-P, Dejitterat K. Self-compassion, achievement goals, and coping with academic failure. Self Identity. 2005;4(3):263–87.
47. OECD. The Heavy Burden of Obesity: The Economics of Prevention. Organization for Economic Co-operation and Development. 2019. https://www.oecd-ilibrary.org/social-issues-migration-health/the-heavy-burden-of-obesity_67450d67-en. Accessed 8 Jan 2025.
48. Ouwens MA, van Strien T, van Leeuwe JFJ, van der Staak CPF. The dual pathway model of overeating. Replication and extension with actual food consumption. Appetite. 2009;52(1):234–7. https://doi.org/10.1016/j.appet.2008.07.010.
49. Pereira AR, Oliveira A. Dietary interventions to prevent childhood obesity: a literature review. Nutrients. 2021;13(10):Articolo 10. https://doi.org/10.3390/nu13103447.
50. Polivy J, Herman CP. Restrained eating and food cues: recent findings and conclusions. Curr Obes Rep. 2017;6:79–85.
51. Polivy J, Herman CP. Overeating in restrained and unrestrained eaters. Front Nutr. 2020;7:30.
52. Polivy J, Herman CP, Mills JS. What is restrained eating and how do we identify it? Appetite. 2020;155:104820. https://doi.org/10.1016/j.appet.2020.104820.
53. Rahimi-Ardabili H, Reynolds R, Vartanian LR, McLeod LVD, Zwar N. A systematic review of the efficacy of interventions that aim to increase self-compassion on nutrition habits, eating behaviours, body weight and body image. Mindfulness. 2018;9(2):388–400. https://doi.org/10.1007/s12671-017-0804-0.
54. Schaumberg K, Anderson D, Anderson L, Reilly E, Gorrell S. Dietary restraint: what's the harm? A review of the relationship between dietary restraint, weight trajectory and the development of eating pathology. Clin Obes. 2016;6(2):89–100.
55. Serpell L, Amey R, Kamboj SK. The role of self-compassion and self-criticism in binge eating behaviour. Appetite. 2020;144:104470. https://doi.org/10.1016/j.appet.2019.104470.
56. Sirois FM, Kitner R, Hirsch JK. Self-compassion, affect, and health-promoting behaviors. Health Psychol. 2015;34(6):661.
57. Spoor ST, Stice E, Bekker MH, Van Strien T, Croon MA, Van Heck GL. Relations between dietary restraint, depressive symptoms, and binge eating: a longitudinal study. Int J Eat Disord. 2006;39(8):700–7.
58. Stelmach-Mardas M, Rodacki T, Dobrowolska-Iwanek J, Brzozowska A, Walkowiak J, Wojtanowska-Krosniak A, et al. Link between food energy density and body weight changes in obese adults. Nutrients. 2016;8(4):229. https://doi.org/10.3390/nu8040229.

59. van Koningsbruggen GM, Stroebe W, Aarts H. Successful restrained eating and trait impulsiveness. Appetite. 2013;60:81–4. https://doi.org/10.1016/j.appet.2012.09.016.
60. Van Strien T, Frijters JE, Bergers GP, Defares PB. The dutch eating behavior questionnaire (DEBQ) for assessment of restrained, emotional, and external eating behavior. Int J Eat Disord. 1986;5(2):295–315.
61. van Strien T, Ouwens MA, Engel C, de Weerth C. Hunger, inhibitory control and distress-induced emotional eating. Appetite. 2014;79:124–33. https://doi.org/10.1016/j.appet.2014.04.020.
62. Vohs KD & Baumeister RF. Handbook of self-regulation: Research, theory, and applications. Guilford Publications. 2016.
63. Ward A, Mann T. Don't mind if i do: disinhibited eating under cognitive load. J Pers Soc Psychol. 2000;78(4):753.
64. WHO. Obesity. 2024. https://www.who.int/news-room/facts-in-pictures/detail/6-facts-on-obesity. Accessed 8 Jan 2025.
65. Wing RR, Lang W, Wadden TA, Safford M, Knowler WC, Bertoni AG, et al. Benefits of modest weight loss in improving cardiovascular risk factors in overweight and obese individuals with type 2 diabetes. Diabetes Care. 2011;34(7):1481–6.
66. Wolfe BE, Baker CW, Smith AT, Kelly-Weeder S. Validity and utility of the current definition of binge eating. Int J Eat Disord. 2009;42(8):674–86. https://doi.org/10.1002/eat.20728.
67. Schettino, G., Marino, L. & Capone, V. Technology-Enhanced Learning and Well-being: a Contribution to the Validation of a Measure to Assess University Students'Technostress in the Italian Context. Int J Ment Health Addiction. 2024;22:1515–29. https://doi.org/10.1007/s11469-022-00940-9.
68. Nerini A, Matera C, Donizzetti AR, Caso D, Rollero C, et al. Assessing compassionate abilities: Translation and psychometric properties of the Italian version of the compassionate engagement and action scales (CEAS). PLOS ONE. 2025;20(7):e0326922. https://doi.org/10.1371/journal.pone.0326922.
69. Guidetti, M. Gli adolescenti a tavola. Studi sull'influenza dei genitori e dei pari. Unpublished PhD Dissertation. 2010.

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