

Emotional eating among adults with healthy weight, overweight and obesity: a systematic review and meta-analysis

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Abstract

Background: Emotional eating (EE) is a disordered eating behaviour which may lead to overeating. It is not clear whether EE presents to an equal degree among adults, regardless of their body mass index (BMI) status. The aim of this study was to assess whether there is a difference in degree of EE between adults with healthy weight, overweight and obesity.

Methods: MEDLINE and APA PsycINFO databases were searched from inception up to January 2022 for studies that reported EE scores from validated questionnaires. The quality of all included studies was assessed using the AXIS tool. Meta-analysis used random effects and standardised mean difference (SMD). Heterogeneity was investigated using I^2 statistics and sensitivity analyses.

Results: A total of 11 studies with 7207 participants were included in the meta-analysis. Degree of EE was greater in adults with a BMI above the healthy range, compared to adults with a healthy BMI (SMD 0.31, 95% CI 0.17 to 0.45; $I^2 = 85\%$). However, subgroup analysis found that degree of EE was greater only in adults with obesity (SMD 0.61, 95% CI 0.41 to 0.81; $I^2 = 62\%$), and there was no difference in degree of EE between adults with overweight and those with a healthy BMI.

Conclusions: Degree of EE is greater among adults living with obesity, compared to adults with a healthy BMI, indicating a need for behavioural support to support EE among people living with obesity seeking weight management. Future research should examine the long-term effectiveness of interventions for EE.

KEYWORDS

BMI, emotional eating, obesity, overweight, weight status

Key points

- A systematic synthesis of published studies examining emotional eating and body mass index (BMI) status has not been conducted before.
- This meta-analysis found that the degree of emotional eating was greater in adults with a BMI above the healthy range, compared to adults with a healthy BMI.
- However, subgroup analysis found that the degree of emotional eating was greater only in adults with obesity and there was no difference between adults with overweight and those with a healthy BMI.
- These findings indicate a need for targeted screening and behavioural support for emotional eating among people living with obesity seeking weight management.

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INTRODUCTION

Obesity increases the risk of many serious diseases and health impairments such as cardiovascular diseases, type 2 diabetes and certain cancers, and is a leading cause of mortality.¹ Obesity is defined as a body mass index (BMI) of $\geq 30 \text{ kg/m}^2$ and overweight defined as BMI between 25 kg/m^2 and 29.9 kg/m^2 .¹ Obesity is recognised as a chronic, multifaceted disease, and by 2025, it is predicted that over 2.7 billion adults worldwide will be affected by overweight, and over 1 billion by obesity.²

Disordered eating is a term that describes a group of maladaptive attitudes, beliefs and behaviours that are linked to poor psychological and physiological health.³ Some disordered eating behaviours, such as emotional eating (EE), are associated with a higher BMI and waist circumference,⁴ which may be a result of overeating. EE is an eating behaviour towards a tendency to eat in response to either pleasant or unpleasant emotions, or both.⁵ There are no diagnostic criteria for EE; however, in the literature, it is usually identified using validated questionnaires^{6–10} (Table 1).

A growing body of research has explored the possible link between EE and obesity in adults. EE has been proposed as a mediator of the association between depression and obesity development¹¹ and increases susceptibility to weight gain¹¹ and hinders weight maintenance.¹² A previous systematic review¹³ investigated the relationship between emotion and eating behaviour among adults with BMI $20\text{--}30 \text{ kg/m}^2$. Negative emotions were associated with unhealthy eating behaviour, poorer dietary choices and higher energy consumption. Therefore, EE can have a negative impact on dietary intake, which can result in weight gain over time, increasing the risk of developing obesity.

To our knowledge, a systematic synthesis of studies examining EE and BMI status has not been conducted before. Our aim was to conduct a systematic review to examine whether there is a difference in the degree of EE

among adults with healthy weight, overweight and/or obesity, according to BMI classification.

METHODS

This study has been registered on PROSPERO (identifier CRD42022352559) and is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standard.¹⁴

Inclusion criteria

Inclusion criteria (Table 2) were adults aged ≥ 18 years old; without specific medical conditions, including no diagnosis of an eating disorder; reporting an EE score measured using a validated EE questionnaire (Table 1); included an exposure group with overweight and/or obesity; and had a comparator group with healthy BMI. Studies were included if they were observational and were peer-reviewed journal articles.

Literature search

The full search strategy (Supporting Information: S1) was tested and refined to maximise sensitivity for retrieving relevant studies. The databases MEDLINE and APA PsycINFO were searched from inception up to 29 January 2022 via EBSCO. Literature searches were limited to studies in English language.

References were imported into Covidence software¹⁵ for de-duplication and screening. Two reviewers (VV and SA) independently and in duplicate screened titles and abstracts and then screened full-text reports for all identified studies. Reviewers were blinded to each other's responses until each screening stage was complete. Disagreement was resolved by consensus between reviewers.

TABLE 1 Validated questionnaires to measure emotional eating.

Questionnaires	Outline
Three-Factor Eating Questionnaire 18 item (TFEQ-R18). ⁶	An 18-item self-report questionnaire which evaluates three dimensions of eating behaviour: (1) cognitive restraint, (2) uncontrolled eating and (3) emotional eating.
Three-Factor Eating Questionnaire 21 item (TFEQ-R21). ⁷	A 21-item version of the TFEQ-R18 with three new items added to the EE domain.
Dutch Eating Behaviour Questionnaire (DEBQ). ⁸	A 33-item self-report questionnaire that focuses on assessing restrained, emotional and external eating.
Emotional Eating Scale (EES). ⁹	A 25-item self-report questionnaire designed to investigate the link between specific negative emotions and overeating. The items are divided into three subscales: (1) anger/frustration, (2) anxiety and (3) depression.
Emotional Eater Questionnaire (EEQ). ¹⁰	A 10-item self-report questionnaire, created to determine the extent to which emotions influence eating behaviour in people with obesity. It identifies three factors: (1) 'disinhibition', (2) 'type of food', and (3) 'guilt'.

TABLE 2 Inclusion and exclusion criteria.

	Inclusion criteria	Exclusion criteria
Population	Adults > 18 years old Without eating disorders and specific medical conditions	Children/adolescents < 18 years old Adults diagnosed with eating disorder or specific medical conditions
Exposure	Overweight or obesity (BMI > 25 kg/m ²)	BMI not reported
Comparator	Healthy weight as defined in the studies	No healthy weight comparator
Outcome	EE score identified using validated questionnaires (outlined in Table 1)	Studies that did not use validated questionnaires to identify EE
Study	Observational studies Only peer-reviewed studies	Any qualitative or intervention study Conference proceeding studies Dissertations

Data extraction

Data were extracted by one reviewer (VV) and peer reviewed by the other (SA) using an electronic data extraction form. EE score data were extracted according to BMI status and expressed as either an absolute score or as a percentage of maximum possible raw score, depending on the reporting within the individual study.

Quality assessment

The AXIS quality appraisal tool¹⁶ was used to assess the quality and the risk of bias in the included studies. One reviewer (VV) completed the quality appraisal, and this was peer reviewed by the other (SA).

Statistical analysis

Meta-analysis was undertaken using Revman 5¹⁷ to examine EE scores of adults of healthy weight and above healthy weight (BMI \geq 25 kg/m²). A subgroup analysis was also performed to examine scores of adults of healthy weight compared to both overweight (BMI 25–29.9 kg/m²) and obesity (BMI \geq 30 kg/m²).

A chi-squared based test of homogeneity was undertaken using Cochran's Q statistic and I^2 , to describe the percentage of the variability in effect estimates resulting from heterogeneity as opposed to sampling error.¹⁸ Due to substantial heterogeneity which was defined as $I^2 > 50\%$ and $p \leq 0.10$,¹⁸ the random-effects model using DerSimonian and Laird methods were used. As data came from several different EE screening tools, meta-analysis was performed using standard mean difference (SMD). Sensitivity analyses were also conducted to explore heterogeneity by excluding an 'outlier' study.¹⁸

The subgroup analysis analysed studies which reported EE scores for overweight and obesity populations separately. Where individual studies provided EE scores for both overweight and obesity groups, the sample size of the healthy BMI comparator group was split equally to avoid double counting the pooled results.¹⁸

RESULTS

Study selection

The study selection process is outlined in the PRISMA flowchart¹⁴ (Figure 1). After duplicates were removed, the database searches yielded 343 studies, of which 76 studies were potentially eligible for inclusion after title and abstract screening. At the full-text screening stage, the main reason for exclusion was due to not reporting EE score for BMI \geq 25 kg/m². A total of 12 studies^{19–30} were identified for inclusion in the review.

Study characteristics

The characteristics of the included studies and participants are detailed in Table 3. The sample size of the participants varied from 56 to 35,641, and the mean age ranged from 19 to 50 years. Only one study reported ethnicity.²¹ The participants in all studies were either entirely or mostly women, except for one study²⁶ where men and women were equally represented.

EE scores: healthy BMI versus above healthy BMI (\geq 25 kg/m²)

Of the 12 included studies, 1 study²⁰ reported non-parametric data for EE scores, and therefore 11 studies with 7207 participants were included in the meta-analysis

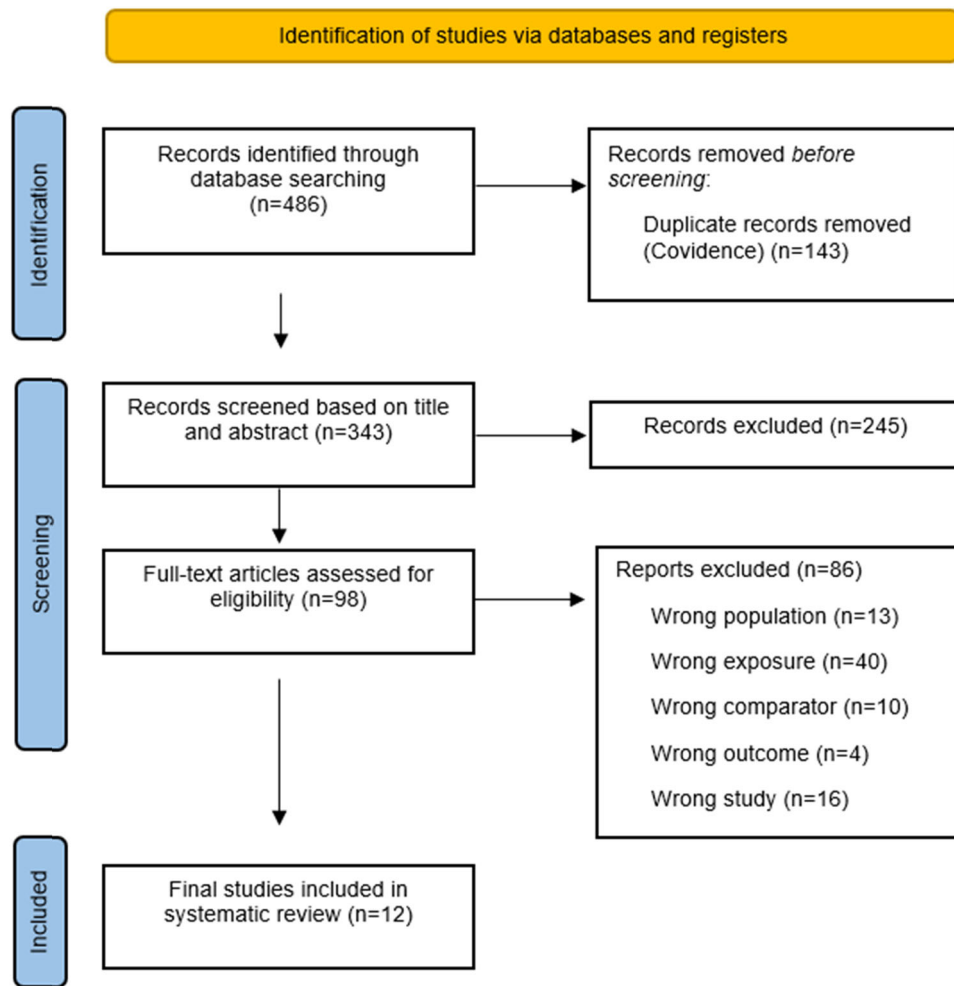


FIGURE 1 Adapted PRISMA flow chart.

(Figure 2). Degree of EE was greater in the above healthy BMI group, compared to healthy BMI group (SMD 0.31, 95% CI 0.17–0.45, $p < 0.0001$; $I^2 = 85\%$). One included study conversely found that EE was higher in the healthy BMI than in the above healthy BMI category.²⁵ Sensitivity analysis was performed by removing this outlier study; however, this did not alter the findings (SMD 0.36, 95% CI 0.24–0.47, $p < 0.00001$) or heterogeneity ($I^2 = 77\%$) (Supporting Information: S2).

EE scores: subgroup analysis of healthy BMI versus overweight (BMI 25–29.9 kg/m²) or obesity (BMI ≥ 30 kg/m²)

Of the 11 studies, 7 studies with 3517 participants reported EE scores according to BMI classifications of overweight (25–29.9 kg/m²) and obesity (≥ 30 kg/m²) separately and were included in the subgroup analysis (Figure 3). Overall, EE score was still greater in the above healthy BMI compared to healthy BMI groups (SMD 0.37, 95% CI 0.13–0.60, $p = 0.002$; $I^2 = 88\%$).

However, subgroup analysis revealed a difference ($p = 0.0002$) between EE scores of overweight and obesity subgroups, compared to healthy BMI. EE scores were greater in the obesity group compared to healthy BMI group (SMD 0.61, 95% CI 0.41–0.81, $p < 0.00001$; $I^2 = 62\%$). Meanwhile, there was no difference in EE scores between overweight and healthy BMI groups (SMD 0.00, 95% CI –0.24 to 0.25, $p = 0.98$; $I^2 = 75\%$). Sensitivity analysis was performed by removing the outlier study²⁵ from the overweight subgroup, which dealt with heterogeneity ($I^2 = 0\%$) and resulted in a stronger observed difference, albeit not statistically significant ($p = 0.07$) (Supporting Information: S3).

Quality assessment and risk of bias

The mean AXIS score for all included studies was 16.3 out of 24 (Supporting Information: S4). Reasons for not fulfilling quality assessment criteria was predominately due to no justification of the population sample size ($n = 10$) and not reporting measures to address and

TABLE 3 Characteristics of included studies and participants.

Study	Country	Sample size, n =	Women, %	Age, mean (SD)	Non-white ethnicity, n = (%)
Aoun et al. (2019) ¹⁹	Lebanon	400	66	20.4 (1.8)	Not reported
Péneau et al. (2013) ²⁰	France	35,641	76	45.2 (14.4)	Not reported
Quick et al. (2014) ²¹	U.S.	1252	59	19.1 (1.2)	249 (19.9)
Vega et al. (2016) ²²	Chile	344	58	39.1 (6.6)	Not reported
Baños et al. (2014) ²³	Spain	291	100	30.5 (10.1)	Not reported
Rommel et al. (2012) ²⁴	France	94	100	40.2 (11.9)	Not reported
Sanlier et al. (2015) ²⁵	Turkey	503	74	20.2 (1.3)	Not reported
van Strien et al. (2012) ²⁶	Netherlands	590	48	40.2 (11.9)	Not reported
van Strien et al. (2009) ²⁷	Netherlands	1342	61	33.6 (9.4)	Not reported
Varela et al. (2019) ²⁸	Spain	473	77	32.7 (11.4)	Not reported
Madalı et al. (2021) ²⁹	Turkey	1626	70	30 (11)	Not reported
Barcin-Güzeldere & Devrim-Lanpir (2021) ³⁰	Turkey	506	76.5	32.5 (11.5)	Not reported

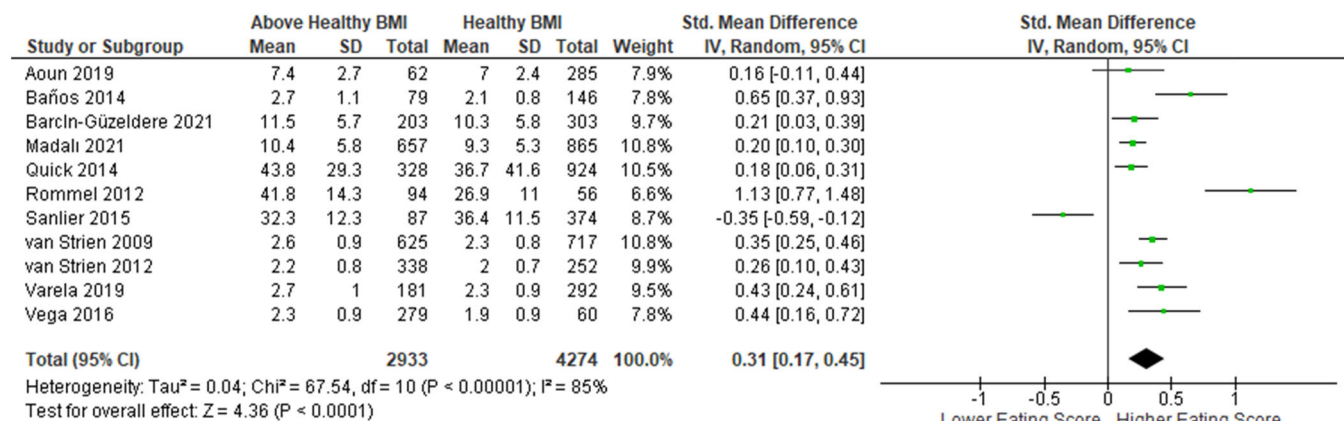


FIGURE 2 Emotional eating scores.

categorise ($n = 6$), or describe ($n = 8$), non-responders. The outlier study²⁵ that was removed in the sensitivity analyses had the lowest AXIS score (14 out of 24).

DISCUSSION

This is the first systematic review and meta-analysis that compared the degree of EE among adults according to BMI status. We found that the degree of EE was significantly greater among adults with a BMI above the healthy range compared to adults with a healthy BMI. However, subgroup analysis revealed that, compared to adults with a healthy BMI, EE scores were significantly greater for adults with obesity, but not for adults with overweight BMI.

Our findings align with previous research which has found EE to be associated with obesity.¹³ Although our

study focused on a population without specific medical conditions, our findings are consistent with previous research that demonstrated a higher degree of EE among adults with obesity, in populations with comorbidities³¹ and people with binge-eating disorder.^{3,32}

Our study has established that the degree of EE is greater in adults with obesity compared to healthy weight BMI; however it was beyond the scope of this review to determine causality. Drawing upon previous research, an association between higher consumption of high-energy foods and snacks and EE has been found,³³ which may explain an increase in risk of developing excess adiposity. Moreover, adults with abdominal obesity who were categorised as emotional/very-emotional eaters reported a lower intake of fibre and a higher intake of fat,³⁴ which can contribute to a greater energy intake overall.

On the contrary, it is arguable that living with obesity may itself result in EE behaviour. Weight stigma

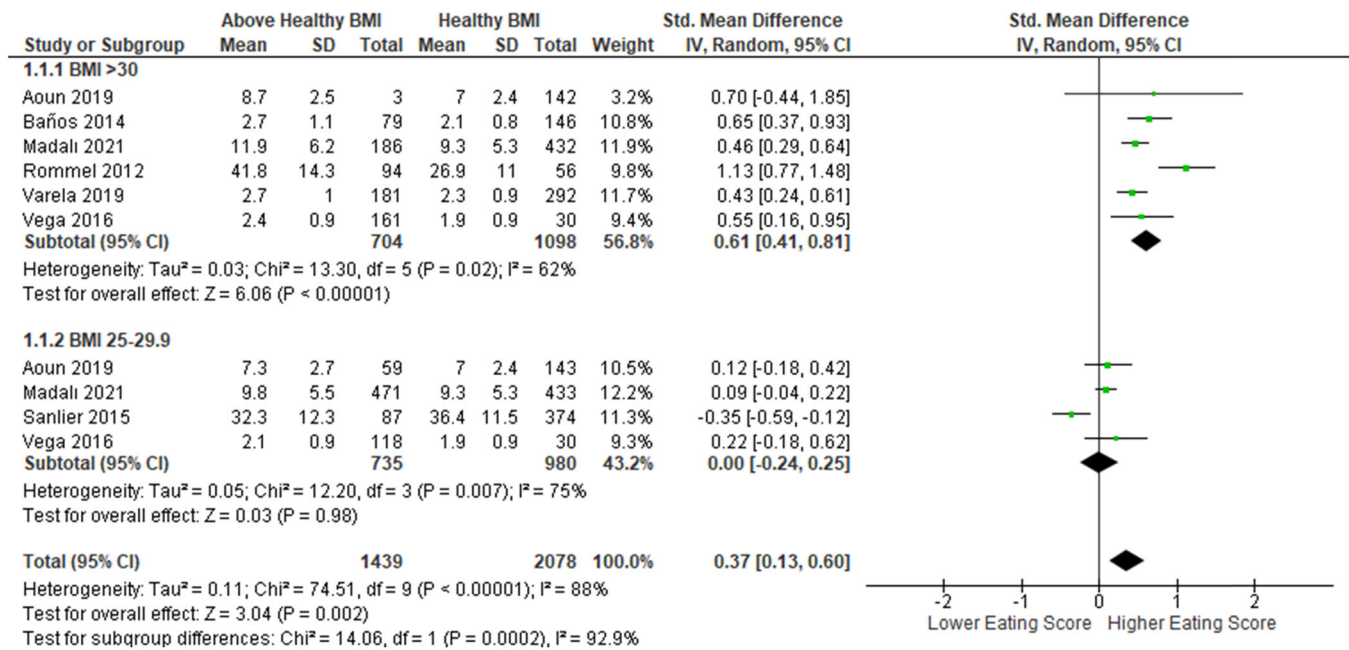


FIGURE 3 Subgroup analysis of emotional eating scores according to body mass index (BMI) classification.

experienced by individuals living with obesity has been linked with physiological dysregulation,³⁵ leading to disordered eating behaviours, including EE.^{36,37} The prevalence of depression among people with obesity is also twice as high as in people with healthy weight,³⁸ and depression and EE are positively correlated, with both predicting long-term increases in BMI.³⁹ Recently, in a study conducted during the COVID-19 pandemic, an increase in EE behaviour was reported, as people used EE as a coping mechanism for mental health disturbances.⁴⁰ Therefore, it seems that EE may be both a contributing factor to, and a consequence of, living with obesity.

Strengths and limitations

This study has several methodological strengths, including the prospective registration on PROSPERO, ensuring transparency and reduction of the potential for bias and avoiding unintentional duplication of reviews.⁴¹ Also, the search strategy was designed to achieve maximum sensitivity, reducing likelihood of missing relevant literature. Screening was conducted by two blinded reviewers, and data extraction was peer reviewed, to minimise the risk of selection bias and data errors.⁴² Finally, studies were included only if they used the five validated questionnaires (Table 1) to identify EE, to maximise internal validity and reliability.

The study was limited by reliance on database searches, without handsearching relevant journals, and therefore source selection bias cannot be eliminated. We did not search unpublished studies and applied an

English language limiter; therefore this review is likely to be susceptible to publication bias.⁴³ There were no studies conducted in the UK setting, and ethnicity was poorly reported, and therefore the findings of our study may not be generalised to the UK population and across ethnic groups. In addition, the participants were predominantly female; therefore, the research findings may be less generalised to the male population. To that end, the included studies did not use ethnic specific cut-off points for BMI, as recommended by the National Institute for Health and Care Excellence⁴⁴; therefore, it may be that not all participants were categorised to the appropriate BMI classification. Moreover, emotional eating questionnaires have not been validated among ethnic minority groups. In some ethnic groups, over-eating is normalised and is seen as a means to strengthen social bonds,⁴⁵ and therefore emotional eating may not be perceived as problematic and may require a different approach to screening across ethnic groups. Lastly, it was not possible to conduct meta-regression to explore heterogeneity in more detail due to the insufficient number of included studies.¹⁸

Implications for practice

This review suggests that degree of EE is greater in people living with obesity. There is a growing body of research suggesting that obesity interventions should target treating EE to support long-term weight management.^{3,46} One study has reported that a behavioural weight loss intervention led to the reduction in EE over a 12-month period and increased the likelihood of

achieving >7% weight-loss by 1.7-fold.³¹ It is therefore important for healthcare professionals, including dietitians, to screen for and treat EE, as the presence of EE can have a negative impact on weight status and may be a barrier to weight management.

Our findings support that adults with obesity should be routinely screened for emotional eating using one of the validated questionnaires outlined in Table 1. However, we acknowledge that time may be a constraint within the weight management consultation; thus a shorter questionnaire (e.g., the EEQ¹⁰) may be more pragmatic. Although such questionnaires may support the identification of EE, they do not explore the frequency, the causes or the consequences of emotional eating; therefore, these areas will require further exploration within the consultation itself.

In regards to managing EE, mindfulness and self-compassion are important psychological approaches within weight-loss interventions, associated with improvements in EE and weight loss outcomes.^{47–52} Systematic review data have shown that interventions with a mixture of cognitive behaviour therapy (CBT), diet and exercise and mindfulness improved EE and weight loss outcomes.⁵³ Therefore, alongside dietary interventions, dietitians and nutrition professionals treating obesity should employ CBT and mindfulness interventions. However, lack of confidence and training in the application of techniques such as CBT have previously been reported by registered dietitians.⁵⁴ Therefore, training in applying theories of CBT and mindfulness to improve the effectiveness of EE interventions in the treatment of obesity is required for dietitians and nutrition professionals working in weight management.

Implications for future research

Although our study has established that the degree of EE is greater in adults living with obesity, it was beyond the scope of this review to explore why. The present review highlights the need for further high-quality studies to examine EE as a cause and/or consequence of obesity. Although CBT, diet and exercise and mindfulness interventions, combined, are shown to reduce emotional eating and enhance short-term weight loss treatment outcomes,⁵³ the long-term effectiveness of these interventions requires further research. Therefore, there is a need for RCTs and longitudinal studies to assess the long-term effectiveness of EE interventions for weight management.

CONCLUSION

We found that the degree of EE is significantly greater among adults living with obesity compared to adults with a healthy BMI. Further research is needed to explore the

causes of EE, how EE affects weight status and weight management, as well as the long-term effectiveness of interventions that combine dietary intervention with CBT and mindfulness to manage EE.

AUTHOR CONTRIBUTIONS

S.A. and V.V. designed the study and independently and in duplicate screened titles and abstracts and full-text reports of all identified studies. Data were extracted by V.V. and were peer reviewed by S.A. V.V. and S.A. analysed the data and contributed to the interpretation of findings and the writing of the manuscript work.

CONFLICT OF INTEREST STATEMENT

All authors declare that there are no financial relationships with any organisations that could appear to have influenced the submitted work.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

This research was conducted as part of a BSc (Hons) Dietetics; therefore, ethical approval was granted by the Ethics Committee at Coventry University (P130039).

TRANSPARENCY DECLARATION

The lead author affirms that this manuscript is an honest, accurate and transparent account of the study being reported. The reporting of this work is compliant with PRISMA guidelines. The lead author affirms that no important aspects of the study have been omitted and that there were no discrepancies from the study as planned.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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