Appetite 172 (2022) 105968

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Adult attachment anxiety is associated with night eating syndrome in UK and US-based samples: Two cross-sectional studies

Laura L. Wilkinson [a,*], Angela C. Rowe [b], Tanisha Douglas [a], Martin Thirkettle [c], Laurence J. Nolan [d]

[a] School of Psychology, Swansea University, Swansea, UK
[b] School of Psychological Science, University of Bristol, Bristol, UK
[c] Centre for Behavioural Science and Applied Psychology, Sheffield Hallam University, Sheffield, UK
[d] Department of Psychology, Wagner College, Staten Island, NY, 10301, USA

ARTICLE INFO

Keywords:
Night eating syndrome
Attachment anxiety
Disinhibited eating
Emotional eating
Eating to cope

ABSTRACT

Previous research has shown that "attachment anxiety" is a robust predictor of disinhibited eating behaviours and that this relationship is underpinned by difficulties in managing emotion. Night eating syndrome (NES), a proposed eating disorder characterized by evening hyperphagia, nocturnal awakenings to eat, and morning anorexia, is also associated with eating to manage emotion. Across two studies ($N = 276$ & $N = 486$), we considered a relationship between attachment anxiety and NES. In Study 1, we hypothesised (pre-registered) that attachment anxiety would predict NES score and that this relationship would be mediated by disinhibited eating. Participants were asked to complete questionnaire measures of attachment orientation, disinhibited eating (emotional and uncontrolled eating) and NES. Our parallel mediation model confirmed a direct relationship between attachment anxiety and NES ($p < .001$) and showed an indirect path via both emotional (95% CI: 0.15–0.63) and uncontrolled eating (95% CI: 0.001–0.36). In Study 2, we showed that fear of negative evaluation of eating significantly mediated a reversed relationship between attachment anxiety and NES (95% CI: 0.02–0.04). Finally, across both studies we used a novel tool to assess "eating to cope". We showed a relationship with emotional eating but failed to show a robust relationship with NES. Attachment orientation may represent a potential intervention target for night eating syndrome. Future research should consider a longitudinal approach to strengthen our understanding of directionality amongst these factors.

1. Introduction

Night eating syndrome (NES) is classified as an "other specified feeding or eating disorder" in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) and is characterized by episodes of night eating (defined by eating 25% or more of daily food consumption after the evening meal), nocturnal awakening to eat accompanied by the belief that eating would enable a return to sleep, and loss of appetite in the morning (Allison et al., 2010; Stunkard et al., 1955). NES prevalence is similar for women and men, and has been estimated to occur in 1.5% of the general population with a significantly higher incidence in patients with sleep disorders, binge eating disorder, obesity, and other psychiatric disorders (Vander Wal, 2012). NES is inconsistently associated with elevated body mass index (BMI), perhaps due to age and emotional eating acting as moderators of this relationship (Bruzas & Allison, 2019). NES is associated with poorer weight-loss outcomes for individuals with obesity attending an outpatient clinic (Gluck et al., 2001).

When first described, it was suggested that the onset of NES was related to stressful experiences (Stunkard et al., 1955). Subsequent work has shown that NES is higher in those who perceive their stress to be higher, have higher trait anxiety and elevated cortisol levels, and engaging in a relaxation programme was associated with improvements in these symptoms (Pawlow et al., 2003). Wichianson et al. (2009) investigated the relationship between perceived stress and NES in a group of college students; they found that the use of maladaptive coping strategies mediated the relationship between the experience of stress and NES. Moderation analyses showed that the relationship between perceived stress and NES was stronger for those who engaged in less adaptive coping strategies (e.g., substance use, self-distraction, and

* Corresponding author.
E-mail address: L.L.Wilkinson@swansea.ac.uk (L.L. Wilkinson).

https://doi.org/10.1016/j.appet.2022.105968
Received 13 July 2021; Received in revised form 31 January 2022; Accepted 7 February 2022
Available online 9 February 2022

self-blame) compared to those engaging in more adaptive coping strategies (e.g., use of emotional support, positive reframing and active coping).

Consistent with the finding that NES may be more problematic in those with poor coping strategies, NES is related to other eating psychopathologies, such as emotional eating (eating in the presence of negative emotion) and external eating (eating in the presence of food) (Meule et al., 2014a; Nolan & Geliebter, 2012) and "food addiction" (Nolan & Geliebter, 2016) which is when certain foods cause addiction-like behavioural and neural responses and overeating may represent an addicted behaviour (Schulte et al., 2015). Furthermore, emotional eating has been shown to moderate the relationship between NES and both binge eating and BMI (Meule et al., 2014b).

Indeed, in a qualitative exploration of the development, maintenance and consequences of NES a central concept of "emotional hunger" was developed, which reflected participants describing food as a way to manage overwhelming and intense emotions (Shillito et al., 2018). This core concept was supported by sub-themes including cultivating a dependency on food, relying on food to regulate emotions, understanding the significance of night-time, and acknowledging the consequences of night eating, including on interpersonal relationships. These findings further support the view that emotion regulation is a key component in the expression of NES. Given these reports, the overarching aim of the current studies was to investigate NES considering "attachment theory" (Bowlby, 1969), which incorporates a conceptual framework that has been widely used to understand emotion regulation in interpersonal functioning (Shaver & Mikulincer, 2007) and the use of food as a way to cope with negative emotion (Maunder & Hunter, 2001).

Adult attachment orientation reflects the quality of our interpersonal relationships and is influenced by our significant adult relationships as well as the early interactions we had with our caregivers (Bowlby, 1969). It is a key predictor of emotion regulation (Mikulincer & Shaver, 2019) and is commonly conceptualised and assessed in terms of two dimensions (Brennan et al., 1998); attachment anxiety is characterised by a fear of abandonment and attachment avoidance is characterised by a fear of intimacy. Broadly, attachment orientation can be viewed as "secure", reflected by low scores on both dimensions of attachment orientation, or "insecure", reflected by high scores on one or both attachment dimensions.

Securely attached individuals are better able to effectively cope with their emotions in response to stress by engaging in productive interpersonal contact or in the absence of this, they are able to engage in "self-soothing" (i.e., soothe themselves in a way that emulates how a caregiver would soothe them) (Mikulincer & Florian, 1998). By contrast, insecurely attached individuals tend to be poorer at managing their emotions in response to upsetting or stressful events (Mikulincer, 1998). Attachment avoidance is associated with the avoidance of emotions and suppression of stress and help-seeking (Mikulincer & Orbach, 1995). Individuals high in attachment anxiety experience a general hyperactivation of the attachment system and are hypervigilant to negative/stressful events (Mikulincer & Florian, 1998). Attachment anxious individuals are more likely to cope via external sources of affect regulation such as food, drugs and alcohol (Maunder & Hunter, 2001).

Indeed, a recent meta-analysis has shown that greater attachment insecurity (both attachment anxiety and avoidance) is associated with unhealthy eating behaviours (Faber et al., 2018). However, it should be noted that the association between attachment avoidance and unhealthy eating had a smaller effect size than other associations reported, and that this relationship has been somewhat more elusive in the research literature (Wilkinson et al., 2019). These unhealthy eating behaviours (e.g., disinhibited eating and/or emotional eating) mediate a relationship between attachment orientation and BMI (Wilkinson et al., 2010, 2017, 2018, 2019). Specifically, attachment anxiety seems to reliably be related to an inability to engage in goal directed behaviours when upset (i.e., an inability to disengage with upset; a form of emotion regulation difficulty), which is, in turn, related to stress induced eating and body mass index (Wilkinson et al., 2018).

Considering the explanatory power of attachment orientation (and in particular attachment anxiety) in understanding individual differences in eating behaviours as a function of emotion regulation and stress, and the importance of the latter in the aetiology of NES, across two US/UK studies, we tested a number of hypotheses to examine whether NES could be explained, at least in part, by attachment anxiety.

In study 1, we first hypothesised that attachment anxiety would positively relate to NES and that this relationship would be mediated by disinhibited eating behaviours (emotional/uncontrolled eating). Second, previous findings have shown that older participants were more likely to report higher scores on the Night Eating Questionnaire compared to younger populations of participants across categories of night eating severity (mild, moderate or full) (Nolan & Geliebter, 2017) and reported more NES symptoms (Nolan & Geliebter, 2019). Therefore, in an exploratory hypothesis, we predicted that age would moderate the mediated relationship between attachment anxiety and NES via emotional and uncontrolled eating, with a stronger relationship between attachment anxiety and NES expected with older age. Considering this, our recruitment strategies included both student and community sampling in order to maximise age range.

In a second study which built on study 1, based on the qualitative accounts of the lived experience of NES described above (Shillito et al., 2018), we also considered a potential effect of NES on interpersonal relationships; specifically, we measured a "fear of negative evaluation of eating behaviours" to capture participants' feelings of guilt and shame around eating behaviours. We hypothesised that fear of negative evaluation of eating would mediate a relationship between NES and attachment anxiety.

In addition, given the importance of coping strategies for the characterisation of NES and because food is used by attachment anxious individuals as a form of coping with negative emotion, across both studies, we explored coping strategies in response to stress with a novel diagrammatic measure (described in detail below). The advantage of including a diagrammatic approach such as this, is that it allows participants to name and place coping strategies on the measure in a way that is meaningful for them, relative to a central anchor point representing "me/the self". This approach offers ease and flexibility of response (for example, participants may name a specific food, and place it in relation to another coping strategy that is more or less important to them).

We predicted that individuals who had higher attachment anxiety scores and, in turn, higher scores on the Night Eating Questionnaire (NEQ) would be more likely to report that they used foods/eating as a coping strategy and that a pictorial representation of this coping strategy would be placed "closer to the self" on our tool. In study 1, we tested these hypotheses using a basic digital form of this measure (Distance Affect Regulation Mapping or DARM tool) (Kobori et al., 2020; Wilkinson & Rowe, 2016) and in study 2 we tested these hypotheses using a more developed digital form of this measure (re-named the Coping Strategies Assessment Tool or CSAT) (Douglas, 2020).

2. Study 1

2.1. Method

The hypotheses were pre-registered with the open science framework after data collection had commenced but prior to data analysis (https://osf.io/skztq/) and the dataset is available via the open science framework (https://osf.io/nf6qj/).

2.1.1. Participants

A total of 276 participants (male = 90, female = 183, nonbinary = 3) completed the study (see Table 1 for sample characteristics). Four hundred and ninety-five participants initiated the study, but 215 did not complete a sufficient number of key questions to be included in the

Table 1
Sample characteristics for study 1.

Gender	Women	66.3%
	Men	32.3%
	Non-binary	1.1%
Country	UK	28.3%
	USA	71.7%
TFEQ[a]	Mean	SD
Emotional Eating	6.97	2.42
Uncontrolled Eating	20.42	5.72
ECR		
Attachment Anxiety	4.16	1.50
Attachment Avoidance	3.43	1.19
NEQ	16.12	6.98
BMI	27.44	7.52
Age	32.80	16.85

[a] The mean emotional and uncontrolled eating scores provided are subscale scores averaged (mean) across participants, the subscale scores themselves were calculated by summing relevant items. However, given item-number differences across these subscales, this information does not allow for their easy comparison. Therefore, we also provide the subscale scores averaged (mean) across participants but when the subscales are calculated by averaging (mean) relevant items. Emotional eating (Mean = 2.32, SD = 0.80) and uncontrolled eating (Mean = 2.27, SD = .64).

dataset. In addition, 1 participant reported a BMI score that was very low (12 kg/m^2) and 3 participants reported a current or historic eating disorder and, therefore, were removed. An opportunistic sampling strategy was used with current or historical diagnosis of an eating disorder and having received bariatric-metabolic surgery as exclusion criteria. With 276 participants, according to sample size estimations for the detection of a mediated effect at 0.8 power by Fritz and MacKinnon (2007), we were adequately powered to detect small to medium effect sizes using bias-corrected boot-strapping.

The study included 78 participants who indicated living in the United Kingdom (a mixture of student and community participants) and 198 participants who indicated living in the United States. UK participants were recruited via social media, posters and the local psychology departmental participant pool. US participants were recruited from two populations. One consisted of undergraduate students (n = 88) who volunteered via an online participant pool as one way to satisfy an introductory psychology course research experience requirement. These students completed the questionnaires in groups in a computer laboratory environment. The other consisted of community members (n = 110) recruited by Qualtrics panel service and paid a nominal amount to complete the study. For the latter, the only additional requirement for participation was age >25 years old in order to sample age groups beyond that of a student population.

Qualtrics employs procedures to ensure that the participants are actual people because paid studies can attract automated response programs or "bots" (Prince et al., 2012). In addition, records were screened for inappropriate responses to open-ended questions and unusually short duration times, both indications of fake participants (Prince et al., 2012). No evidence of "bot" respondents was detected. The responses of 13 participants were removed for not following task instructions correctly and were replaced by other respondents while data collection was active.

Ethics approval was obtained from the local human research ethics committees of the first and last authors who led on data collection.

2.1.2. Measures

2.1.2.1 *NES* was assessed using the Night Eating Questionnaire (NEQ) (Allison et al., 2008), which is a 14-item scale assessing both behavioural and psychological components of NES. The questionnaire comprises three sections. All participants complete the first section. Participants only proceed to the second section if they score above a "0" for the last question of the first section (Other than only to use the bathroom, how often do you get up at least once in the middle of the night?). Participants only proceed to the third section if they score above a "0" for the last question of the second section (When you get up in the middle of the night, how often do you snack?). Two additional questions regarding personal distress related to night eating have been proposed (Allison et al., 2008) and were included in the present study. Items are scored on a 0–4 Likert scale, response anchors vary across questions but tend to be from "Not at all/Never" to "Extremely/Always", except for one question which has an additional option (question 7). Thirteen items are summed to give a total score. The standardised Cronbach alpha for this sample was 0.86.

2.1.2.2. *Attachment orientation* was assessed using the short 12-item version of the Experiences in Close Relationships Questionnaire (ECR) (Lafontaine et al., 2016). Participants were asked to reflect on their relationships in general (as opposed to specifically romantic relationships). This questionnaire contains two subscales of 6-items, one of which assesses attachment anxiety and the other which assesses attachment avoidance. Participants rate the extent to which they agree with statements on a 7-point Likert scale anchored to the left with "strongly-disagree" (1) and to the right with "strongly agree" (7). Subscale scores are calculated by averaging (mean) relevant items. The Cronbach's alpha for attachment anxiety was 0.89 and for avoidance anxiety was 0.80.

2.1.2.3 *Eating style* was assessed using the 18-item version of the Three-Factor Eating Questionnaire (TFEQ) (Karlsson et al., 2000) which comprises three subscales; cognitive restraint (6-items) reflects the extent to which individuals consciously apply restraint to their eating behaviour. Uncontrolled eating (9-items) reflects the extent to which individuals feel that they lose control over their eating behaviour. Emotional eating (3-items) reflects the extent to which an individual eats in response to emotional states. Participants are asked to respond to statements as they apply to themselves on a 4-point (scored 1–4) Likert scale anchored from "definitely true" to "definitely false" or a variation of this scale dependent on question. Relevant items were summed to calculate subscale scores. The Cronbach's alpha for both uncontrolled eating and for emotional eating was 0.85.

2.1.2.4 *Digital Distance Affect Regulation Mapping Tool (DARM)* is a digital version of a pilot measure (Kobori et al., 2020; Wilkinson & Rowe, 2016) based on the "hierarchical mapping" approach (Rowe & Carnelley, 2005). However, this version of the tool allows for the mapping of a range of internal and external affect regulation strategies including seeking proximity to people (e.g., a romantic partner), practices (e.g., meditation), substances (e.g., food) or anything else that an individual might use to manage their emotions at times of stress. Participants are asked to reflect on the different ways that they manage stress and to list these strategies. They are then asked to rate on a 100 mm visual analogue scale, how effective they find each strategy for the management of stress (responding from not at all to extremely). Finally, they are asked to place these strategies on a "bulls-eye" style diagram in relation to the centre, which is labelled "stressed me". They were asked to arrange their strategies in a way that is meaningful to them and are advised that those placed closer to the "stressed me" centre might be those that are relied on more often or of more importance. This information can be quantified in terms of the presence (or not) of a particular target strategy (here, this would be food/eating related strategies) and the distance of that strategy from the centre of the bulls-eye. This version of the tool is coded in JavaScript and is presented to the respondents as part of the same Qualtrics survey as other measures. Respondents selected their strategies from a drop-down list populated with their

earlier responses, presented in a randomised order, and then dragged a labelled icon across the "bulls-eye" diagram to place them as they wished. They were free to select strategies in any order and were free to return to adjust the position of strategies already placed. This allowed the DARM to capture all of a respondent's strategies, and the relationships between strategies' positions at once. The final position, in units of pixels within the 500x500 pixel space of the DARM was recorded as was the time spent placing each strategy and the number of times each strategy was selected and repositioned by the respondent. For a depiction of the DARM tool see (Wilkinson & Rowe, 2016).

2.1.2.5 *Demographics* Participants were asked to report their age, gender and whether they were a UK- or US-based respondent. They were asked to report whether they had a current or historical diagnosis of an eating disorder or had received bariatric-metabolic surgery. Finally, in order to calculate body mass index, participants were asked to report their height and weight.

2.1.2.6 *Demand awareness* An open-text response question was included at the end of the questionnaire (but prior to debriefing information) which asked participants to indicate what they thought the study was investigating.

2.1.3. Procedure

The study was hosted on Qualtrics survey software (Qualtrics, Provo, UT, USA). Participants were recruited either through an anonymous link (advertised via social media or posters), a researcher who provided access to the online questionnaire via a computer laboratory or a Qualtrics online panel sample. They were asked to read information outlining the protocol for the study and asked to provide informed consent via a tick box consent screen. Participants were asked to complete the DARM, the short Experiences in Close Relationships Questionnaire, the Night Eating Questionnaire, the Three Factor Eating Questionnaire, demographic questions and finally the demand awareness question. They were then provided with a debrief screen.

2.1.4. Data analysis

In accordance with recommendations from the Center for Open Science, we conducted our analyses in two phases; the first phase contained confirmatory analyses (i.e., those that directly speak to our preregistered hypotheses). The second phase contained exploratory analyses, those that were informed by the results of our confirmatory analysis but were not a part of our initial set of hypotheses. We have provided a supplementary file where analyses and additional information can be found relating to hypotheses that are listed in our preregistration but are not included here.

All models presented here were conducted using the PROCESS v3.1 (Hayes, 2017) add in for SPSS 26 (IBM Corp. Armonk NY). All PROCESS models were set up to run 5000 bootstrap samples and to control for covariates at the level of both the mediator and the outcome. Notably, a significant mediated relationship is indicated if the lower and upper confidence intervals (LLCI and ULCI, respectively) do not cross zero – p-values are generally not produced for the indirect (mediated) pathway.

2.1.4.1 *Confirmatory analyses* First, we examined whether attachment anxiety positively related to NES and whether this relationship was mediated by disinhibited eating behaviours (emotional and uncontrolled eating). We conducted a parallel multiple mediation model using PROCESS model 4. This allowed for the simultaneous assessment of both emotional and uncontrolled eating as potential mediators of a relationship between attachment anxiety and NES. For this model, attachment anxiety was the predictor, NES was the outcome and emotional and uncontrolled eating were parallel mediators. Following previous research which included similar models, attachment avoidance, age, gender and location were included as covariates in our model (Wilkinson et al., 2018).

Using a binary logistic mediation model (PROCESS model 4), we examined whether higher NES scores mediated a positive relationship between attachment anxiety and greater likelihood of reporting eating/food as a coping strategy on the DARM tool. In addition, for those who listed food/eating as a coping strategy, we also conducted this model with distance from the centre (denoting greater significance of a coping strategy to an individual) as the outcome variable. In both models, attachment avoidance, gender, age and location were included as covariates.

2.1.4.2 *Exploratory analyses* In order to examine a possible moderation effect of age on the mediated relationship between attachment anxiety and night eating via emotional and uncontrolled eating, we conducted a moderated mediation model (PROCESS model 59). This model tests for moderation for all relationships in the mediation model (i.e., between the predictor and the mediator, the mediator and the outcome and the direct relationship between the predictor and outcome). Notably, the current sample had an age range of 62 years with a minimum age of 18 years old and a maximum age of 80 years old.

2.2. Results

2.2.1. Descriptive statistics

Cohort level means for each measure can be found in Table 1.

2.2.2. Confirmatory analyses

2.2.2.1 The relationship between attachment anxiety and NES A significant relationship between attachment anxiety and night eating was evident when mediators were not included in the model (total effects; $B = 2.27$, $SE = 0.27$, 95% CI: 1.74–2.79, $p < .001$). When mediators were included in the model, this direct relationship remained significant (direct effects; $B = 1.74$, $SE = 0.26$, 95% CI: 1.22–2.26, $p < .001$) and significant indirect relationships via both uncontrolled ($B = 0.16$, $SE = 0.09$, 95% CI: 0.001–0.35) and emotional eating ($B = 0.37$, $SE = 0.12$, 95% CI: 0.15–0.63) were found. There were no significant effects of any of the covariates and the overall model was significant, $F(7,268) = 19.71$, $p < .001$; R^2 for the total effects model (mediators not included) was 0.24 and R^2 for the mediated model was 0.34.

2.2.2.2 Eating to cope Mediation analysis using binary logistic regression showed that there was no significant direct effect of attachment anxiety on likelihood of reporting food as a coping strategy on the DARM tool (log-odds = 0.05, SE = 0.10, p = .63, 95% CI: −0.15 – 0.25) and no mediated effect of attachment anxiety on likelihood of reporting food as a coping strategy on the DARM tool via night eating questionnaire score (log-odds = 0.03, SE = 0.05, 95% CI: −0.07 - 0.13). Only gender (and no other covariate) was significantly related to reporting of eating/food as a coping strategy (log-odds = 1.06, $SE = 0.27$, $p < .001$, 95% CI: 0.53–1.61). A post-hoc chi-square test showed that female participants were significantly more likely to have listed food/eating as a coping strategy on the DARM tool compared to male participants, $\chi^2(2, N = 276) = 24.7$, $p < .001$. The mediation model was significant ($p < .001$) and Cox and Snell R^2 for the mediated model was 0.10 (total effects models are not produced when the outcome measure is dichotomous).

Mediation analysis ($n = 128$) showed that there was no significant direct effect of attachment anxiety on distance from the centre that food/eating was placed on the DARM tool ($B = 7.44$, $SE = 4.94$, $p = .13$, 95% CI: −2.32 - 17.22), total effect ($B = 4.58$, $SE = 4.6$, $p = .32$, 95% CI: −4.56 – 13.72) or mediated effect via night eating questionnaire score ($B = -2.86$, $SE = 2.49$, 95% CI: −8.36 – 1.58). Attachment avoidance was the only covariate that was significantly related to the distance from the centre that food/eating was placed on the DARM tool ($B = -11.91$, $SE = 5.25$, $p = .025$, 95% CI: −22.30 to −1.50). The R^2 for the total effects model was 0.10 and the R^2 for the mediated model was *0.12*. Overall, the mediated model was significant ($p = .016$).

2.2.3. Exploratory analyses

Age as a moderator of the mediated relationship between attachment anxiety and NES. The model for predicting night eating score was

statistically significant, $F(10, 265) = 15.24$, $p < .001$; $R^2 = 0.37$ (total effects models are not available for PROCESS model 59). When age was entered as a moderator, emotional eating and uncontrolled eating were not significant mediators although emotional eating did predict elevated night eating score. Age was not a significant predictor of night eating score, emotional eating, or uncontrolled eating but there was a significant age X attachment anxiety interaction effect on night eating score ($B = 0.05$, $SE = 0.02$, $p = .002$, 95% CI: 0.02–0.08). The test of highest order unconditional interaction indicated that the model fit was significantly improved due to the age X attachment anxiety interaction, $F(1, 265) = 9.40$, $p = .002$; R^2 change = 0.02. Age did not interact with either mediator. The conditional direct effect of attachment anxiety on night eating score was significant across age values (see Table 2). The conditional indirect effect of attachment anxiety on night eating score through emotional eating was significant at lower ages but not at the higher suggesting moderated mediation (see Table 2). The moderated mediation is presented in Fig. 1

2.3. Interim discussion

For the first time, a direct relationship between attachment anxiety and NES has been shown. The relationship was present in an international (US, UK) sample of undergraduate students and individuals from the community. Furthermore, as predicted, this relationship was mediated by disinhibition of eating in the form of uncontrolled and emotional eating. The association between emotional eating as measured by the TFEQ is consistent with previous work which has demonstrated a positive association between emotional eating (measured by the Dutch Eating Behavior Questionnaire) and night eating in students (Nolan & Geliebter, 2012). The positive relationship between uncontrolled eating and NES in the general population (i.e., those without diagnosed eating disorder) is novel.

Despite the identification of two significant mediators of the relationship between attachment anxiety and NES, the direct effect between these factors remains significant within the mediated model. This suggests that the mediators we have included do not fully explain the relationship between attachment anxiety and NES and other mediators are likely to exist. The qualitative study by Shillito et al. (2018) examined the relationship between NES and the experience of emotion in adults who met the diagnostic criteria for moderate or full NES and were accessing a weight management service. They found that when "acknowledging the consequences of night eating", participants talked about social effects, in particular in difficulties in relationships. While Fischer et al. (2012) reported that compared to healthy controls and individuals living with obesity (without NES), individuals with NES were more affected by social stress (including social overload, lack of social recognition, social tension and social isolation). Furthermore, for the NES group, Fischer et al. (Fischer et al., 2012) reported a correlation between ratings of social stress and rated distress and impairment due to NES symptoms. It is notable that the centrality of social cues in these findings is similar to the hyper-vigilance that is characteristic of attachment anxiety.

Table 2
Conditional direct and indirect effects of attachment anxiety on NES at values of the moderator (age) with 95% confidence interval in study 1.

Conditional Direct Effect of Attachment Anxiety on NEQ Score					
Age	*B*	*SE*	*p*	*LLCI*	*ULCI*
19	1.09	0.33	.001	0.43	1.75
24.5	1.35	0.29	<.0001	0.78	1.92
55	2.81	0.44	<.0001	1.94	3.68
Conditional Indirect Effect Via Uncontrolled Eating Mediator					
Age	*B*	*Boot SE*		*LLCI*	*ULCI*
19	0.09	0.08		−0.02	0.30
24.5	0.12	0.08		−0.01	0.31
55	0.34	0.28		−0.14	0.96
Conditional Indirect Effect Via Emotional Eating Mediator					
Age	*B*	*Boot SE*		*LLCI*	*ULCI*
19	0.37	0.15		0.10	0.70
24.5	0.37	0.14		0.13	0.65
55	0.22	0.24		−0.21	0.75

One possibility is that the experience of NES alters attachment anxiety in terms of fear of abandonment (i.e., reverse causality whereby individuals are concerned that the consequences of NES will cause others to abandon them). Indeed, whilst adult attachment has generally been viewed as a stable trait across time with changes only tending to occur in response to specific events (Waters et al., 2000), increasing evidence suggests that shifts in attachment orientation can take place readily (Fraley et al., 2011), occurring in response to relationship status and across specific periods of life such as adolescence (Chopik et al., 2017). Therefore, in study 2 we sought to explore this reversed relationship (albeit cross-sectionally) with the inclusion of a mediator reflecting the fear of negative evaluation by others of night eating behaviours as well as the addition of demographic questions to provide context about the sample's living situation (i.e., living alone or co-habiting) and if co-habiting, the closeness of that interpersonal relationship.

Notably age was a significant moderator of the direct relationship between attachment anxiety and NES, specifically those in our older age category who also had a higher attachment anxiety score, were more likely to have a higher night eating score than those in our younger age category also with a higher attachment anxiety score. In general, research has suggested that attachment anxiety is higher in younger individuals compared to older individuals (Chopik et al., 2017). One possibility is that our older age group with higher attachment anxiety scores may represent a more persistent attachment insecure group who are also more vulnerable to other psychopathologies including NES. Indeed, there is evidence that NES in older groups is more associated with psychopathologies than it is in younger groups (Nolan & Geliebter, 2016).

Inconsistent with our hypotheses, we failed to find a relationship between attachment anxiety, night eating score and likelihood of reporting eating to cope on our novel DARM tool. For those who did report eating to cope, we also failed to find a relationship between attachment anxiety, night eating score and placement of "eating to cope" on the DARM. This is despite the finding that emotional eating scores were associated with both placement of eating to cope and its distance from the centre on the DARM, suggesting basic validity of the use of the tool in this context (see supplementary file). It is likely that night eating scores capture a more heterogenous set of characteristics than emotional eating score alone and therefore spontaneous recognition of eating behaviours as a coping strategy as a function of night eating score may be less likely. For example, cravings or urges to eat snacks after supper are a characteristic of NES but the reason the individual thinks they experience those cravings or urges is not stipulated as part of the Night Eating Questionnaire. Another possibility is that the DARM tool was not received by participants as intended and therefore measurement noise affected our results, with only the strongest relationships remaining evident (i.e., with emotional eating). Elsewhere, we have developed and improved the clarity of instructions/wording and the visual representation of the tool (Douglas, 2020). This revised tool was re-named the Coping Strategies Assessment Tool (CSAT) and was used instead of the DARM in study 2.

2.4. Study 2

In study 2 we sought to extend our findings by first testing an alternative explanation for the direct effect between attachment anxiety and night eating score based on reverse causality, whereby the experience of interpersonal shame as a *consequence* of NES would alter an individuals' attachment orientation, in particular attachment anxiety.

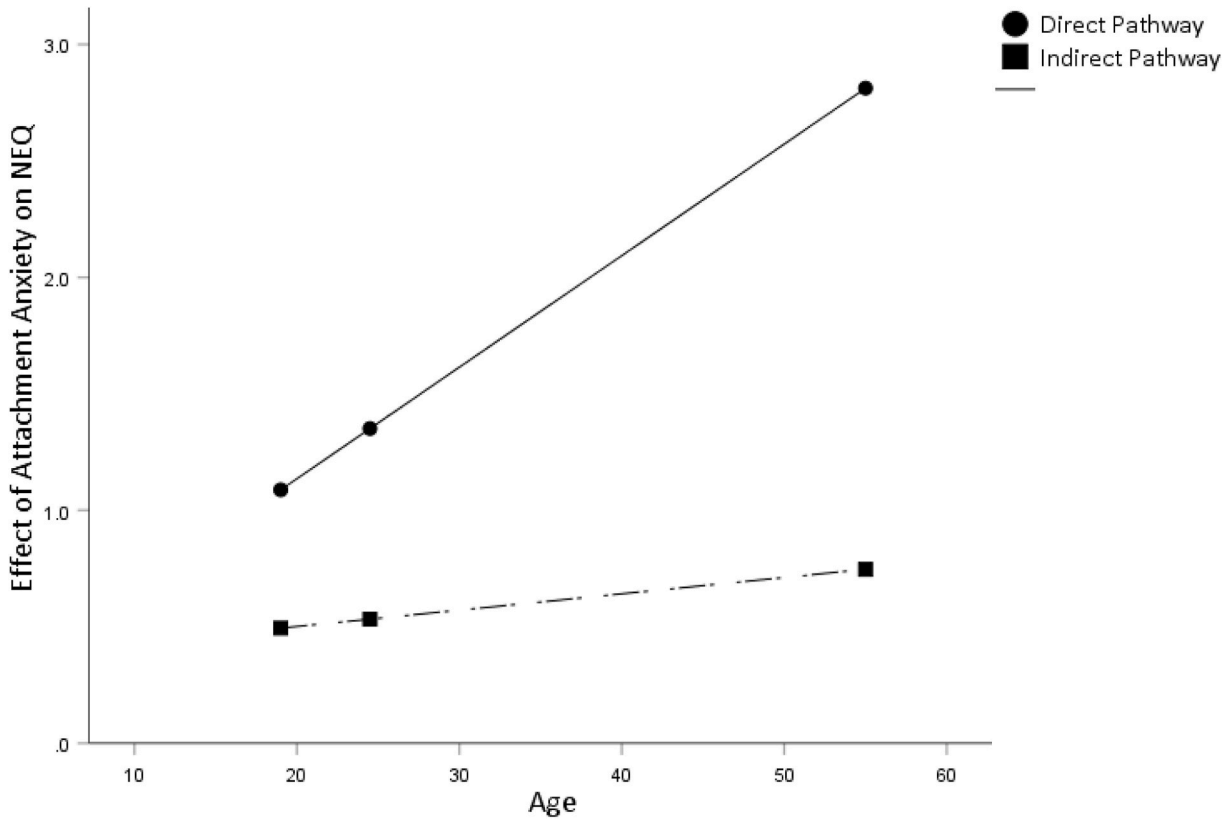

Fig. 1. The direct and indirect (via emotional eating) effects of attachment anxiety on NEQ score as moderated by age for study 1. Coefficients increase across age for the direct pathway.

Considering our exploratory finding from study 1 that age was a moderator of the relationship between attachment anxiety and night eating questionnaire score, we included age as a moderator in this model. We hypothesised that a positive relationship between night eating score and attachment anxiety would be significantly mediated by a measure of fear of negative evaluation of eating behaviour and that older age would result in a stronger relationship between night eating score and attachment anxiety.

Secondly, we also further tested the role that food plays in coping in relation to attachment anxiety and night eating using the CSAT, a more user-friendly version of the DARM tool. Hypotheses were identical to those listed in study 1.

Finally, in an exploratory analysis we sought to extend our main finding from study 1 that showed that the relationship between attachment anxiety and night eating was mediated by both emotional and uncontrolled eating but did not further explore how these mediators might relate to each other. Indeed, previous work on the relationship between attachment orientation and eating behaviours has modelled an inter-relationship between emotional and uncontrolled eating (Wilkinson et al., 2019). Specifically, we examined whether our results were consistent with the "escape from self-awareness theory of overeating" (Heatherton & Baumeister, 1991) which suggests that some forms of disinhibited eating (binge eating in their paper) may occur with a narrow focus on "immediate sensation" from food as a form of "motivated escape from meaningful self-awareness". As described by van Strien (2018), escape from self-awareness theory suggests that uncontrolled eating may occur when some people (e.g., emotional eaters) narrow their level of attention to the presence of food and become vulnerable to external cues to overeat. Thus, we hypothesised that attachment anxiety and night eating would be *serially* mediated by emotional eating followed by uncontrolled eating.

2.5. Method

The hypotheses were pre-registered with the open science framework after data collection had commenced but prior to data analysis (https://osf.io/8zyas) and the dataset is available via the open science framework (https://osf.io/nf6qj/).

2.5.1. Participants

Four hundred and eighty-six participants (male = 177, female = 309) completed the study. Five hundred and eight participants initiated the study in total, but 22 did not answer a sufficient number of key questions to be included in the dataset. An opportunistic sampling strategy was used and recruitment methods were similar to study 1. The final sample included 267 participants who indicated living in the UK (98 via Qualtrics panel) and 207 participants who indicated living in the US (95 via Qualtrics panel). 12 participants (3 in UK and 9 in US) selected "other" for country in which they reside (2 and 9 were students respectively). One hundred and twelve of the US participants and 91 of the UK participants were students, remaining participants were non-student community members. Additional sample characteristics are presented in Table 3.

2.5.2. Measures

Measures As in study 1, night eating was assessed using the Night Eating Questionnaire; for study 2, the standardised reliability coefficient was 0.75. Attachment orientation was measured using the Experiences in Close Relationships Questionnaire; the Cronbach's alpha for attachment avoidance and attachment anxiety were 0.85 and 0.89 respectively. Eating styles were measured using the 18-item version of the Three Factor Eating Questionnaire. The reliability for uncontrolled eating scale was 0.81 and for the emotional eating scale was 0.84.

3.1.2.1 *Affect Regulation* Affect regulation was measured by the

Table 3
Sample characteristics in study 2.

Gender	Women	63.6%
	Men	36.4%
Country	UK	54.9%
	USA	42.6%
	Other	2.5%
Co-habitation		
Live with?	Alone	14.6%
	Parents	28.4%
	Friends	18.1%
	Partner	35.4%
	Roommate	3.5%
How close?	Not at all	1.5%
	Slightly	2.7%
	Moderately	12.6%
	Very	30.8%
	Extremely	52.5%
TFEQ[a]	Mean	SD
Emotional Eating	6.43	2.39
Uncontrolled Eating	18.98	5.49
ECR		
Attachment Anxiety	3.94	1.47
Attachment Avoidance	3.51	1.26
NEQ	15.15	7.03
BMI	26.01	6.92
Age	37.13	18.61

[a] The mean emotional and uncontrolled eating scores provides are sub-scale scores averaged (mean) across participants, the subscale scores themselves were calculated by summing relevant items. However, given item-number differences across these subscales, this information does not allow for their easy comparison. Therefore, we also provide the subscale scores averaged (mean) across participants but when the subscales are calculated by averaging (mean) relevant items. Emotional eating (Mean = 2.14, SD = 0.80) and uncontrolled eating (Mean = 2.11, SD = .61).

Coping Strategy Assessment Tool (CSAT) (Douglas, 2020). See description of DARM in study 1 for an overview of how the tool works. This updated version of the tool had improved clarity of instructions and visual representation of the tool.

3.1.2.2 *Fear of negative evaluation of eating behaviour* In order to assess concern for being evaluated negatively for eating, 7 items from the Brief Fear of Negative Evaluation Scale—Revised (Carleton et al., 2006) were utilized and modified by changing the wording to refer to eating behaviour. For example, "I worry about what other people will think of me even when I know it doesn't make any difference" was changed to "I worry about what other people will think of my eating even when I know it doesn't make any difference." Items were summed to produce a total scale score. Cronbach's alpha for this measure was 0.95.

3.1.2.3 *Closeness of Co-habiting Relationships* The participants were asked to indicate whether they lived alone or with others (options: parents, friends, romantic partner, or roommates who are not friends) and the degree of closeness with those they live with (options: not at all close, slightly close, moderately close, very close, or extremely close).

2.5.3. Procedure

The procedure was the same as that described for Study 1 except participants completed the CSAT in place of the DARM, the measure of fear of negative evaluation of eating behaviour and questions about their living situation.

2.5.4. Data analysis

Confirmatory analyses included the following to test pre-registered hypotheses. First, we examined whether night eating would predict higher attachment anxiety via fear of negative evaluation of eating with age as a moderator (PROCESS Model 59). For this model, night eating was the predictor, attachment anxiety was the outcome and fear of negative evaluation of eating was the mediator. Age was included as a moderator (of every relationship in the mediated model). Following previous research which included similar models, attachment avoidance, gender and location were included as covariates in our model (Wilkinson et al., 2018).

Secondly, using a binary logistic mediation model (PROCESS model 4), we examined whether higher NES scores mediated a positive relationship between attachment anxiety and greater likelihood of reporting eating/food as a coping strategy on the CSAT tool. In addition, for those who listed food/eating as a coping strategy (excluding 56 cases with unrecorded distance data), we also conducted this model with distance from the centre (denoting greater significance of a coping strategy to an individual) as the outcome variable. In both models, attachment avoidance, gender, age and location were included as covariates.

Finally, an exploratory analysis was conducted to examine whether there was a serial mediation (PROCESS model 6) of the relationship between attachment anxiety and night eating via emotional followed by uncontrolled eating. Following previous research which included similar models, attachment avoidance, age, gender, and location were included as covariates in our models (Wilkinson et al., 2018).

Again, analyses and additional information relating to hypotheses that are listed in our pre-registration but are not included here can be found in our supplementary file.

2.6. Results

2.6.1. Descriptive statistics

Cohort level means for each measure can be found in Table 3.

2.6.2. Confirmatory analyses

3.2.2.2 *Association between Night Eating and Attachment Anxiety Mediated by Fear of Negative Evaluation of eating behaviour*. Age was not a significant moderator of any of the relationships within the mediated model (night eating to fear of negative evaluation of eating (p = .62), night eating to attachment anxiety (p = .51) or fear of negative evaluation to attachment anxiety (p = .46)). A significant direct relationship between night eating and attachment anxiety was evident at every age percentile tested (see Table 4). A significant indirect relationship from night eating to attachment anxiety via fear of negative evaluation was also evident at every age percentile tested (see Table 4). Location was not a significant covariate but attachment avoidance (B = −.10, SE = 0.05, p = .03, 95% CI: −0.19 to −0.01) and gender (B = 0.27, SE = 0.11, p = .02; 95% CI: 0.04–0.50) were significant covariates within the model. A post hoc independent samples t-test showed that female participants had a higher mean attachment anxiety score (M = 4.12, SE = 0.08) compared to male participants (M = 3.64, SE = 0.11; t(484) =

Table 4
Conditional effects of NEQ on attachment anxiety via fear of negative evaluation at values of the moderator (age) with 95% confidence interval in study 2.

Conditional Direct Effect of NEQ Score on Attachment Anxiety					
Age	*B*	*SE*	*p*	*LLCI*	*ULCI*
19	0.04	0.01	.001	0.02	0.07
33	0.05	0.01	<.0001	0.03	0.07
60	0.06	0.01	.0001	0.03	0.09
Conditional Indirect Effect Via Fear of Negative Evaluation					
Age	*B*	*Boot SE*		*LLCI*	*ULCI*
19	0.03	0.01		0.02	0.05
33	0.03	0.01		0.02	0.04
60	0.02	0.01		0.01	0.04

−3.53, p < .001). The overall mediated model was significant, $p <$. 001; $R^2 = 0.32$ (total effects models are not available for PROCESS model 59).

3.2.2.3 *Eating to Cope (CSAT)* Mediation analysis using binary logistic regression showed that there was a significant direct effect of attachment anxiety on likelihood of reporting food as a coping strategy on the CSAT tool (log-odds = 0.24, SE = 0.08, p = .002, 95% CI: 0.08–0.39) but no mediated effect of attachment anxiety on likelihood of reporting food as a coping strategy on the CSAT tool via night eating (log-odds = 0.02, SE = 0.03, 95% CI: −0.03 - 0.08). Only age (and no other covariate) was significantly related to reporting of eating/food as a coping strategy (log-odds = −0.01, $SE = 0.01$, $p = .02$, 95% CI: −0.03 to −0.002). The mediation model was significant (p < .001) and Cox and Snell R^2 for the mediated model was 0.07 (total effects models are not produced when the outcome measure is dichotomous).

Mediation analysis ($n = 114$) showed that there was no significant direct effect of attachment anxiety on distance from the centre that food/eating was placed on the CSAT tool ($B = 4.81$, $SE = 4.41$, $p = .28$, 95% CI: −3.93 - 13.54; total effect: $B = −0.2$, $SE = 4.23$, $p = .96$, 95% CI: −8.6 – 8.19). However, there was a significant indirect effect of attachment anxiety on distance from the centre that food/eating was placed on the CSAT via night eating ($B = −5.01$, $SE = 2.18$, 95% CI: −9.82 to −1.34). Attachment avoidance, age, gender and location were not significant covariates within the model. The R^2 for the total effects model was 0.03 and the R^2 for the mediated model was *0.11*. Overall, the mediated model just missed statistical significance ($p = .053$).

2.6.3. Exploratory analyses

3.2.3.2 *Serial Mediation: Effect of attachment anxiety via emotional and uncontrolled eating* In order to examine whether the results were consistent with the escape from self-awareness model, a serial mediation analysis examining whether attachment anxiety predicted night eating via an increase in emotional eating which itself predicts uncontrolled eating (see Fig. 2). A significant direct effect between attachment anxiety and night eating was evident for both models excluding mediators (total effects, $B = 1.82$, $SE = 0.20$, $p < .001$; 95% CI: 1.41–2.22) and including mediators ($B = 1.29$, $SE = 0.20$, $p < .001$; 95% CI: 0.89–1.69). The indirect effect between attachment anxiety and night eating via emotional and uncontrolled eating was significant ($B = 0.24$, SE = 0.07, 95% CI: 0.12–0.40). Within the mediated model (including both mediators), the indirect effect from attachment anxiety to night eating via uncontrolled eating alone was significant ($B = 0.19$, SE = 0.07, 95% CI: 0.07–0.33) but was not significant via emotional eating alone ($B = 0.10$, SE = 0.08, 95% CI: −0.06 - 0.27). The overall model was statistically significant ($p < .001$), the R^2 for the total effects model was 0.23 and for the mediated model was 0.32. In the mediated model, gender and age were not statistically significant covariates but attachment avoidance ($B = 0.74$, SE = 0.21, 95% CI: 0.32–1.16) and country of residence ($B = 1.7$, SE = 0.43, 95% CI: 0.85–2.56) were statistically significant covariates. A post-hoc independent samples *t*-test showed that participants located in the United States scored significantly higher on night eating ($M = 16.6$, $SE = 0.49$) than participants located in the United Kingdom ($M = 13.82$, $SE = 0.41$; $t(472) = −4.38$, $p < .001$).

3. Discussion

Consistent with our pre-registered hypotheses and across two studies, we showed for the first time that attachment anxiety was a significant predictor of night eating. Furthermore, across both studies, we showed that this relationship was significantly mediated by measures of disinhibited eating (emotional and uncontrolled eating). We also tested an alternative theoretically driven (escape from self-awareness theory; Heatherton & Baumeister, 1991) serial mediation model that allowed for a nuanced indirect pathway incorporating an inter-relationship between emotional eating and uncontrolled eating. We showed an indirect pathway which suggests that attachment anxiety may lead to night eating by increasing eating when experiencing negative affect which, in turn, elevates uncontrolled eating. In both cases, these models accounted for just over 30% of the variance associated with night eating.

In both studies, despite the inclusion of significant mediator(s) in our models, the direct relationship between attachment anxiety and NES remained significant, suggesting that a portion of the variance remained unaccounted for by our mediator(s). It is possible that whilst affect regulation is an important facet of NES, this does not reflect the full aetiology of the proposed eating disorder and how it may relate to attachment anxiety. Future studies might consider the inclusion of potential additional mediators addressing depression, anxiety and sleep quality which have all been associated with NES (Rogers et al., 2006; Sevincer et al., 2016) and attachment anxiety (Adams et al., 2014) separately, but not as mediators of a relationship between the two.

In study 2 we also considered a reversed relationship between attachment anxiety and night eating score with a fear of negative evaluation of eating behaviour as a potential mediator. Consistent with Shillito et al. (2018), we found a significant indirect relationship whereby night eating score was a significant predictor of fear of negative evaluation of eating and this, in turn, was a significant predictor of attachment anxiety. Overall, it is likely that more complex bidirectional relationships exist between night eating and attachment anxiety and future research might explore this possibility further using longitudinal approaches. One area that might be particularly fruitful is consideration of directionality of inter-relationships (e.g., a vicious cycle) between factors, for example, attachment anxiety is associated with emotional

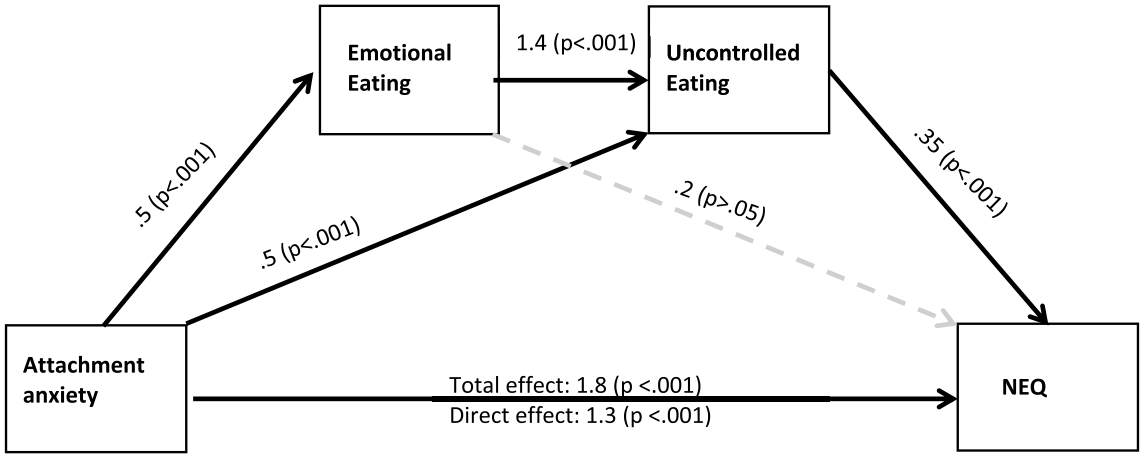

Fig. 2. Serial Mediation model of the association between attachment anxiety and NEQ via emotional eating and uncontrolled eating in study 2.

eating and uncontrolled eating that are associated with night eating, which leads to a fear of negative evaluation of eating and is associated with higher attachment anxiety. Moreover, from a theoretical perspective, fear of negative evaluation of eating could be considered an "ego threat" – an aversive self-perception which causes distress. This is itself a key component of the escape from self-awareness theory (mentioned above), as this distress leads to emotional eating and uncontrolled/external eating via the mechanisms described above (Heatherton & Baumeister, 1991).

More generally, our findings contribute to a body of research linking attachment orientation to eating disorders (Oldham-Cooper et al., 2021; Tasca, 2019; Tasca & Balfour, 2014; Ward et al., 2000) but that has, to date, neglected NES. The benefit of understanding NES as an outcome of a broader set of processes that underpin the aetiology and maintenance of disordered eating is in terms of opportunities for intervention. For example, Tasca et al. (Tasca et al., 2006) found that attachment orientation predicted differential outcomes for two group therapy protocols for patients with binge eating disorder; for those participants randomised to group psychodynamic interpersonal psychotherapy, higher attachment anxiety was associated with improvements in binge eating post-treatment. Whereas, for those participants randomised to group cognitive behavioural therapy, lower attachment anxiety was associated with improvements in binge eating post treatment. In the latter condition, attachment avoidance was also positively associated with drop-out rate.

Moreover, protocols that specifically target insecure attachment orientation by "boosting" attachment security (Mikulincer & Shaver, 2007; Rowe et al., 2020) may represent a promising avenue for future research into the effective treatment of night eating syndrome. In other populations, such protocols have shown early evidence for efficacy. For example, Carnelley et al. (2018) found that outpatients with depressive disorders who were repeatedly primed with attachment security reported lower depressed and anxious mood following the last prime. Repeated security priming has also been shown to decrease paranoia and negative affect, and improve help seeking in a sample with high levels of non-clinical paranoia (Newman-Taylor et al., 2021). Furthermore, preliminary work has shown that a single administration of security priming is associated with a lower intake of cookies compared to a single administration of an attachment anxiety prime (Wilkinson et al., 2013).

Across our two studies we also incorporated a novel tool (the DARM in study 1 and a developed version of the DARM, named the CSAT, in study 2) which asks participants to consider and prioritise their approaches to coping with negative emotion and stress. In both studies we failed to find a relationship between attachment anxiety, night eating and likelihood of naming eating as a coping strategy. Although in study 2, for those participants who reported eating as a coping strategy, we showed a significant indirect relationship with higher attachment anxiety relating to the placement of eating to cope closer to the centre of our tool (which represents the self) via night eating. However, the overall model just missed significance and only accounted for 11% of the variance associated with placement of eating to cope. One possibility is that, for this analysis, we were underpowered because only a sub-set of our sample could be included in this analysis due to a need to have reported eating to cope in the first place and some missing data.

Notably, emotional eating was significant predictor of naming and prioritisation of eating as a coping strategy (see supplementary file). Therefore, it may be that those scoring higher on the Night Eating Questionnaire may not spontaneously attribute eating behaviours to "coping" and coping may not be the most salient feature of night eating. Indeed, it is notable that in both studies, this tool was completed prior to being specifically asked about eating behaviours in the context of the Night Eating Questionnaire or the Three Factor Eating Questionnaire to afford a "spontaneous" response. This finding may highlight the importance of considering individuals' attribution of behaviours and how and why they may differ from existing theoretical models as well as the possibility of a broader pattern of coping behaviours that may co-exist.

The current studies are associated with a number of limitations. Our approach was cross-sectional and therefore directionality and causality cannot be determined. We relied on self-report questionnaires which can be prone to bias. Future studies might consider other methodologies of exploring relationships between our key concepts, for example, the "gold standard" for the assessment of attachment orientation is the "adult attachment interview" (George et al., 1985). In addition, within study 2, our assessment of "fear of negative evaluation of eating behaviour" did not ask specifically about fear of negative evaluation of *night* eating behaviours, rather it asked about eating behaviour more generally. A consequence of this may be an overestimation of the relationship between these two constructs whereby participants may engage in night eating and report fear of negative evaluation of eating behaviour but not as it relates to night eating (i.e., it may relate to other eating occasions). A future study may consider investigating this possibility further by adapting our measure to focus on night eating specifically.

Finally, we relied on convenience sampling and although we sampled participants with a range of responses on our key measures, future studies might consider specifically recruiting a group of patients with a night eating syndrome diagnosis with a control group for comparison with respect to attachment anxiety.

Author contributions

All authors contributed to the design of the studies. LLW and LJN led data collection, data analyses and drafted the manuscript. MT and TD programmed and supported the use of the DARM/CSAT tool. ACR and MT provided editorial comments. All authors have approved the final article.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical Statement

Ethical Statement for 'Attachment anxiety is associated with night eating syndromein UK and US-based samples: Two cross-sectional studies.'

Ethical approvals were granted for both studies at both institutions conducting data collection (Swansea University and Wagner College). Ethical approvals in all cases were provided by the local psychology department human research ethics committees. All participants provided informed consent.

Declaration of competing interest

None.

Acknowledgements

We thank Ryan Ireland (Swansea University), and Karen Gutierrez and Lauren Fay (Wagner College) for their assistance with data collection in Study 1. We thank Georgie Nicholas, Ffion Adams, Grace Ashwell and Allan Reid (Swansea University) for their assistance with data collection and preparation in Study 2.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2022.105968.

References

Adams, G. C., Stoops, M. A., & Skomro, R. P. (2014). Sleep tight: Exploring the relationship between sleep and attachment style across the life span. *Sleep Medicine Reviews, 18*(6), 495–507.

Allison, K. C., Lundgren, J. D., O'Reardon, J. P., Geliebter, A., Gluck, M. E., Vinai, P., … Crow, S. J. (2010). Proposed diagnostic criteria for night eating syndrome. *International Journal of Eating Disorders, 43*(3), 241–247.

Allison, K. C., Lundgren, J. D., O'Reardon, J. P., Martino, N. S., Sarwer, D. B., Wadden, T. A., … Stunkard, A. J. (2008). The night eating questionnaire (NEQ): Psychometric properties of a measure of severity of the night eating syndrome. *Eating Behaviors, 9*(1), 62–72.

Bowlby, J. (1969). *Attachment and loss: Attachment. John Bowlby*. Basic Books.

Brennan, K. A., Clark, C. L., & Shaver, P. R. (1998). Self-report measurement of adult attachment. *An integrative overview*.

Bruzas, M. B., & Allison, K. C. (2019). A review of the relationship between night eating syndrome and body mass index. *Current obesity reports, 8*(2), 145–155.

Carleton, R. N., McCreary, D. R., Norton, P. J., & Asmundson, G. J. (2006). Brief fear of negative evaluation scale—revised. *Depression and Anxiety, 23*(5), 297–303.

Carnelley, K. B., Bejinaru, M.-M., Otway, L., Baldwin, D. S., & Rowe, A. C. (2018). Effects of repeated attachment security priming in outpatients with primary depressive disorders. *Journal of Affective Disorders, 234*, 201–206.

Chopik, W. J., Edelstein, R. S., & Grimm, K. J. (2017). *Longitudinal changes in attachment orientation over a 59-year period*.

Douglas, T. (2020). *An exploration of the role of attachment orientation, emotional eating and other coping behaviours in patients undergoing bariatric surgery and members of the general population*. Swansea University.

Faber, A., Dubé, L., & Knäuper, B. (2018). Attachment and eating: A meta-analytic review of the relevance of attachment for unhealthy and healthy eating behaviors in the general population. *Appetite, 123*, 410–438.

Fischer, S., Meyer, A. H., Hermann, E., Tuch, A., & Munsch, S. (2012). Night eating syndrome in young adults: Delineation from other eating disorders and clinical significance. *Psychiatry Research, 200*(2–3), 494–501.

Fraley, R. C., Vicary, A. M., Brumbaugh, C. C., & Roisman, G. I. (2011). Patterns of stability in adult attachment: An empirical test of two models of continuity and change. *Journal of Personality and Social Psychology, 101*(5), 974.

Fritz, M. S., & MacKinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science, 18*(3), 233–239.

George, C., Kaplan, N., & Main, M. (1985). *Adult attachment interview*. Berkeley: University of California *(Unpublished manuscript*.

Gluck, M. E., Geliebter, A., & Satov, T. (2001). Night eating syndrome is associated with depression, low self-esteem, reduced daytime hunger, and less weight loss in obese outpatients. *Obesity Research, 9*(4), 264–267.

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford publications.

Heatherton, T. F., & Baumeister, R. F. (1991). Binge eating as escape from self-awareness. *Psychological Bulletin, 110*(1), 86.

Karlsson, J., Persson, L.-O., Sjöström, L., & Sullivan, M. (2000). Psychometric properties and factor structure of the Three-Factor Eating Questionnaire (TFEQ) in obese men and women. Results from the Swedish Obese Subjects (SOS) study. *International Journal of Obesity and Related Metabolic Disorders, 24*(12).

Kobori, O., Sawamiya, Y., Yoshinaga, N., Rowe, A. C., & Wilkinson, L. L. (2020). Investigation of attachment orientation, and affect regulation: Use of a novel affect regulation mapping tool in Japanese athletes. *Psychologia*.

Lafontaine, M.-F., Brassard, A., Lussier, Y., Valois, P., Shaver, P. R., & Johnson, S. M. (2016). Selecting the best items for a short-form of the Experiences in Close Relationships questionnaire. *European Journal of Psychological Assessment, 32*(2), 140.

Maunder, R., & Hunter, J. (2001). Attachment and psychosomatic medicine: Developmental contributions to stress and disease. *Psychosomatic Medicine, 63*(4), 556–567.

Meule, A., Allison, K. C., & Platte, P. (2014a). A German version of the Night Eating Questionnaire (NEQ): Psychometric properties and correlates in a student sample. *Eating Behaviors, 15*(4), 523–527.

Meule, A., Allison, K. C., & Platte, P. (2014b). Emotional eating moderates the relationship of night eating with binge eating and body mass. *European Eating Disorders Review, 22*(2), 147–151.

Mikulincer, M. (1998). Adult attachment style and affect regulation: Strategic variations in self-appraisals. *Journal of Personality and Social Psychology, 75*(2), 420.

Mikulincer, M., & Florian, V. (1998). The relationship between adult attachment styles and emotional and cognitive. *Reactions to Stressful Events*.

Mikulincer, M., & Orbach, I. (1995). Attachment styles and repressive defensiveness: The accessibility and architecture of affective memories. *Journal of Personality and Social Psychology, 68*(5), 917.

Mikulincer, M., & Shaver, P. R. (2007). Boosting attachment security to promote mental health, prosocial values, and inter-group tolerance. *Psychological Inquiry, 18*(3), 139–156.

Mikulincer, M., & Shaver, P. R. (2019). Attachment orientations and emotion regulation. *Current Opinion in Psychology, 25*, 6–10.

Newman-Taylor, K., Sood, M., Rowe, A. C., & Carnelley, K. B. (2021). The impact of repeated attachment priming on paranoia, mood and help-seeking intentions in an analogue sample. *Brain Sciences, 11*(10), 1257.

Nolan, L. J., & Geliebter, A. (2012). Night eating is associated with emotional and external eating in college students. *Eating Behaviors, 13*(3), 202–206.

Nolan, L. J., & Geliebter, A. (2016). Food addiction" is associated with night eating severity. *Appetite, 98*, 89–94.

Nolan, L. J., & Geliebter, A. (2017). Validation of the Night Eating Diagnostic Questionnaire (NEDQ) and its relationship with depression, sleep quality,"food addiction". *And Body Mass Index. Appetite, 111*, 86–95.

Nolan, L. J., & Geliebter, A. (2019). Factor structure of the Night Eating Diagnostic Questionnaire (NEDQ) and an evaluation of the diagnostic criteria of the night eating syndrome. *Journal of eating disorders, 7*(1), 1–10.

Oldham-Cooper, R., Semple, C., & Wilkinson, L. L. (2021). Reconsidering a role for attachment in eating disorder management in the context of paediatric diabetes. *Clinical Child Psychology and Psychiatry*, Article 1359104520986215.

Pawlow, L., O'neil, P., & Malcolm, R. (2003). Night eating syndrome: Effects of brief relaxation training on stress, mood, hunger, and eating patterns. *International Journal of Obesity, 27*(8), 970.

Prince, K. R., Litovsky, A. R., & Friedman-Wheeler, D. G. (2012). Internet-mediated research: Beware of bots. *The Behavior Therapist*.

Rogers, N. L., Dinges, D. F., Allison, K. C., Maislin, G., Martino, N., O'Reardon, J. P., & Stunkard, A. J. (2006). Assessment of sleep in women with night eating syndrome. *Sleep, 29*(6), 814–819.

Rowe, A. C., & Carnelley, K. B. (2005). Preliminary support for the use of a hierarchical mapping technique to examine attachment networks. *Personal Relationships, 12*(4), 499–519.

Rowe, A. C., Gold, E. R., & Carnelley, K. B. (2020). The effectiveness of attachment security priming in improving positive affect and reducing negative affect: A systematic review. *International Journal of Environmental Research and Public Health, 17*(3), 968.

Schulte, E. M., Joyner, M. A., Potenza, M. N., Grilo, C. M., & Gearhardt, A. N. (2015). Current considerations regarding food addiction. *Current Psychiatry Reports, 17*(4), 19.

Sevincer, G. M., Ince, E., Taymur, I., & Konuk, N. (2016). Night eating syndrome frequency in university students: Association with impulsivity, depression, and anxiety. *Klinik Psikofarmakoloji Bülteni-Bulletin of Clinical Psychopharmacology, 26*(3), 238–247.

Shaver, P. R., & Mikulincer, M. (2007). *Adult attachment strategies and the regulation of emotion. Handbook of emotion regulation* (p. 44).

Shillito, J. A., Lea, J., Tierney, S., Cleator, J., Tai, S., & Wilding, J. P. (2018). Why I eat at night: A qualitative exploration of the development, maintenance and consequences of night eating syndrome. *Appetite, 125*, 270–277.

van Strien, T. (2018). Causes of emotional eating and matched treatment of obesity. *Current Diabetes Reports, 18*, 1–8.

Stunkard, A. J., Grace, W. J., & Wolff, H. G. (1955). The night-eating syndrome: A pattern of food intake among certain obese patients. *The American Journal of Medicine, 19*(1), 78–86.

Tasca, G. A. (2019). Attachment and eating disorders: A research update. *Current opinion in psychology, 25*, 59–64.

Tasca, G. A., & Balfour, L. (2014). Attachment and eating disorders: A review of current research. *International Journal of Eating Disorders, 47*(7), 710–717.

Tasca, G. A., Ritchie, K., Conrad, G., Balfour, L., Gayton, J., Lybanon, V., & Bissada, H. (2006). Attachment scales predict outcome in a randomized controlled trial of two group therapies for binge eating disorder: An aptitude by treatment interaction. *Psychotherapy Research, 16*(1), 106–121.

Vander Wal, J. S. (2012). Night eating syndrome: A critical review of the literature. *Clinical Psychology Review, 32*(1), 49–59.

Ward, A., Ramsay, R., & Treasure, J. (2000). Attachment research in eating disorders. *British Journal of Medical Psychology, 73*(1), 35–51.

Waters, E., Merrick, S., Treboux, D., Crowell, J., & Albersheim, L. (2000). Attachment security in infancy and early adulthood: A twenty-year longitudinal study. *Child Development, 71*(3), 684–689.

Wichianson, J. R., Bughi, S. A., Unger, J. B., Spruijt-Metz, D., & Nguyen-Rodriguez, S. T. (2009). Perceived stress, coping and night-eating in college students. *Stress and Health: Journal of the International Society for the Investigation of Stress, 25*(3), 235–240.

Wilkinson, L. L., & Rowe, A. C. (2016). The 'distance affect regulation mapping' (DARM) tool: A holistic approach to assessing individuals' affect regulation strategies. *Figshare, Paper*.

Wilkinson, L. L., Rowe, A. C., Bishop, R. J., & Brunstrom, J. M. (2010). Attachment anxiety, disinhibited eating, and body mass index in adulthood. *International Journal of Obesity, 34*(9), 1442–1445. https://doi.org/10.1038/ijo.2010.72

Wilkinson, L. L., Rowe, A. C., & Heath, G. H. (2013). Eating me up inside Priming attachment security and anxiety, and their effects on snacking. *Journal of Social and Personal Relationships, 30*(6), 795–804.

Wilkinson, L. L., Rowe, A. C., & Millings, A. (2019). Disorganized attachment predicts body mass index via uncontrolled eating. *International Journal of Obesity, 1*.

Wilkinson, L. L., Rowe, A. C., Robinson, E., & Hardman, C. A. (2018). Explaining the relationship between attachment anxiety, eating behaviour and BMI. *Appetite, 127*, 214–222.

Wilkinson, L. L., Rowe, A. C., Sheldon, C., Johnson, A., & Brunstrom, J. M. (2017). Disinhibited eating mediates differences in attachment insecurity between bariatric surgery candidates/recipients and lean controls. *International Journal of Obesity*.