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**Published version**

WILKINSON, Laura L., ROWE, Angela C., DOUGLAS, Tanisha, THIRKETTLE, Martin and NOLAN, Laurence J. (2022). Adult attachment anxiety is associated with night eating syndrome in UK and US-based samples: two cross-sectional studies. *Appetite*, 172, p. 105968.

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

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Running header: Attachment anxiety and night eating syndrome

27 **Abstract:**

28

29 Previous research has shown that “attachment anxiety” is a robust predictor of  
30 disinhibited eating behaviours and that this relationship is underpinned by difficulties  
31 in managing emotion. Night eating syndrome (NES), a proposed eating disorder  
32 characterized by evening hyperphagia, nocturnal awakenings to eat, and morning  
33 anorexia, is also associated with eating to manage emotion. Across two studies ( $N =$   
34  $276$  &  $N = 486$ ), we considered a relationship between attachment anxiety and NES.  
35 In Study 1, we hypothesised (pre-registered) that attachment anxiety would predict  
36 NES score and that this relationship would be mediated by disinhibited eating.  
37 Participants were asked to complete questionnaire measures of attachment  
38 orientation, disinhibited eating (emotional and uncontrolled eating) and NES. Our  
39 parallel mediation model confirmed a direct relationship between attachment anxiety  
40 and NES ( $p < .001$ ) and showed an indirect path via both emotional (95% CI: 0.15 -  
41 0.63) and uncontrolled eating (95% CI: 0.001 - 0.36). In Study 2, we showed that  
42 fear of negative evaluation of eating significantly mediated a reversed relationship  
43 between attachment anxiety and NES (95% CI: 0.02 - 0.04). Finally, across both  
44 studies we used a novel tool to assess “eating to cope”. We showed a relationship  
45 with emotional eating but failed to show a robust relationship with NES. Attachment  
46 orientation may represent a potential intervention target for night eating syndrome.  
47 Future research should consider a longitudinal approach to strengthen our  
48 understanding of directionality amongst these factors.

49

50 **Keywords:** Night eating syndrome; Attachment anxiety; disinhibited eating;

51 emotional eating; eating to cope

52

## 53 **1.0 Introduction**

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

67 When first described, it was suggested that the onset of NES was related to  
68 stressful experiences (Stunkard et al., 1955). Subsequent work has shown that NES  
69 is higher in those who perceive their stress to be higher, have higher trait anxiety and  
70 elevated cortisol levels, and engaging in a relaxation programme was associated  
71 with improvements in these symptoms (Pawlow et al., 2003). Wichianson et al.  
72 (2009) investigated the relationship between perceived stress and NES in a group of  
73 college students; they found that the use of maladaptive coping strategies mediated  
74 the relationship between the experience of stress and NES. Moderation analyses  
75 showed that the relationship between perceived stress and NES was stronger for  
76 those who engaged in less adaptive coping strategies (e.g., substance use, self-

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

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

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

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

110           Securely attached individuals are better able to effectively cope with their  
111 emotions in response to stress by engaging in productive interpersonal contact or in  
112 the absence of this, they are able to engage in “self-soothing” (i.e., soothe  
113 themselves in a way that emulates how a caregiver would soothe them) (Mikulincer  
114 & Florian, 1998). By contrast, insecurely attached individuals tend to be poorer at  
115 managing their emotions in response to upsetting or stressful events (Mikulincer,  
116 1998). Attachment avoidance is associated with the avoidance of emotions and  
117 suppression of stress and help-seeking (Mikulincer & Orbach, 1995). Individuals high  
118 in attachment anxiety experience a general hyperactivation of the attachment system  
119 and are hypervigilant to negative/stressful events (Mikulincer & Florian, 1998).  
120 Attachment anxious individuals are more likely to cope via external sources of affect  
121 regulation such as food, drugs and alcohol (Maunder & Hunter, 2001).

122           Indeed, a recent meta-analysis has shown that greater attachment insecurity  
123 (both attachment anxiety and avoidance) is associated with unhealthy eating  
124 behaviours (Faber et al., 2018). However, it should be noted that the association  
125 between attachment avoidance and unhealthy eating had a smaller effect size than

126 other associations reported, and that this relationship has been somewhat more  
127 elusive in the research literature (Wilkinson et al., 2019). These unhealthy eating  
128 behaviours (e.g., disinhibited eating and/or emotional eating) mediate a relationship  
129 between attachment orientation and BMI (Wilkinson et al., 2010; Wilkinson et al.,  
130 2019; Wilkinson et al., 2018; Wilkinson et al., 2017). Specifically, attachment anxiety  
131 seems to reliably be related to an inability to engage in goal directed behaviours  
132 when upset (i.e., an inability to disengage with upset; a form of emotion regulation  
133 difficulty), which is, in turn, related to stress induced eating and body mass index  
134 (Wilkinson et al., 2018).

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

140         In study 1, we first hypothesised that attachment anxiety would positively  
141 relate to NES and that this relationship would be mediated by disinhibited eating  
142 behaviours (emotional/uncontrolled eating). Second, previous findings have shown  
143 that older participants were more likely to report higher scores on the Night Eating  
144 Questionnaire compared to younger populations of participants across categories of  
145 night eating severity (mild, moderate or full) (Nolan & Geliebter, 2017) and reported  
146 more NES symptoms (Nolan & Geliebter, 2019). Therefore, in an exploratory  
147 hypothesis, we predicted that age would moderate the mediated relationship  
148 between attachment anxiety and NES via emotional and uncontrolled eating, with a  
149 stronger relationship between attachment anxiety and NES expected with older age.

150 Considering this, our recruitment strategies included both student and community  
151 sampling in order to maximise age range.

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

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

169 We predicted that individuals who had higher attachment anxiety scores and,  
170 in turn, higher scores on the Night Eating Questionnaire (NEQ) would be more likely  
171 to report that they used foods/eating as a coping strategy and that a pictorial  
172 representation of this coping strategy would be placed “closer to the self” on our tool.  
173 In study 1, we tested these hypotheses using a basic digital form of this measure  
174 (Distance Affect Regulation Mapping or DARM tool) (Kobori et al., 2020; Wilkinson &



175 Rowe, 2016) and in study 2 we tested these hypotheses using a more developed  
176 digital form of this measure (re-named the Coping Strategies Assessment Tool or  
177 CSAT) (Douglas, 2020).

178

## 179 **2.0 Study 1**

### 180 **2.1 Method**

181 The hypotheses were pre-registered with the open science framework after  
182 data collection had commenced but prior to data analysis (<https://osf.io/skztq/>) and  
183 the dataset is available via the open science framework  
184 ([https://osf.io/nf6qj/?view\\_only=942479ceb5634e269fc4f4bdaad1a5ee](https://osf.io/nf6qj/?view_only=942479ceb5634e269fc4f4bdaad1a5ee)).

#### 185 *2.1.1 Participants*

186 A total of 276 participants (male = 90, female = 183, nonbinary = 3) completed  
187 the study (see Table 1 for sample characteristics). Four hundred and ninety-five  
188 participants initiated the study, but 215 did not complete a sufficient number of key  
189 questions to be included in the dataset. In addition, 1 participant reported a BMI  
190 score that was very low (12 kg/m<sup>2</sup>) and 3 participants reported a current or historic  
191 eating disorder and, therefore, were removed. An opportunistic sampling strategy  
192 was used with current or historical diagnosis of an eating disorder and having  
193 received bariatric-metabolic surgery as exclusion criteria. With 276 participants,  
194 according to sample size estimations for the detection of a mediated effect at .8  
195 power by Fritz and Mackinnon (2007), we were adequately powered to detect small  
196 to medium effect sizes using bias-corrected boot-strapping.

197 The study included 78 participants who indicated living in the United Kingdom  
198 (a mixture of student and community participants) and 198 participants who indicated  
199 living in the United States. UK participants were recruited via social media, posters

200 and the local psychology departmental participant pool. US participants were  
201 recruited from two populations. One consisted of undergraduate students (n = 88)  
202 who volunteered via an online participant pool as one way to satisfy an introductory  
203 psychology course research experience requirement. These students completed the  
204 questionnaires in groups in a computer laboratory environment. The other consisted  
205 of community members (n = 110) recruited by Qualtrics panel service and paid a  
206 nominal amount to complete the study. For the latter, the only additional requirement  
207 for participation was age >25 years old in order to sample age groups beyond that of  
208 a student population.

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

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

## 218 2.1.2 Measures

219 2.1.2.1 NES was assessed using the Night Eating Questionnaire (NEQ)  
220 (Allison et al., 2008), which is a 14-item scale assessing both behavioural and  
221 psychological components of NES. The questionnaire comprises three sections. All  
222 participants complete the first section. Participants only proceed to the second  
223 section if they score above a “0” for the last question of the first section (Other than  
224 only to use the bathroom, how often do you get up at least once in the middle of the

225 night?). Participants only proceed to the third section if they score above a “0” for the  
226 last question of the second section (When you get up in the middle of the night, how  
227 often do you snack?). Two additional questions regarding personal distress related  
228 to night eating have been proposed (Allison et al., 2008) and were included in the  
229 present study. Items are scored on a 0-4 Likert scale, response anchors vary across  
230 questions but tend to be from “Not at all/ Never” to “Extremely/ Always”, except for  
231 one question which has an additional option (question 7). Thirteen items are  
232 summed to give a total score. The standardised Cronbach alpha for this sample was  
233 0.86.

234       2.1.2.2. *Attachment orientation* was assessed using the short 12-item version  
235 of the Experiences in Close Relationships Questionnaire (ECR) (Lafontaine et al.,  
236 2016). Participants were asked to reflect on their relationships in general (as  
237 opposed to specifically romantic relationships). This questionnaire contains two  
238 subscales of 6-items, one of which assesses attachment anxiety and the other which  
239 assesses attachment avoidance. Participants rate the extent to which they agree  
240 with statements on a 7-point Likert scale anchored to the left with “strongly-disagree”  
241 (1) and to the right with “strongly agree” (7). Subscale scores are calculated by  
242 averaging (mean) relevant items. The Cronbach’s alpha for attachment anxiety was  
243 0.89 and for avoidance anxiety was 0.80.

244       2.1.2.3 *Eating style* was assessed using the 18-item version of the Three-  
245 Factor Eating Questionnaire (TFEQ) (Karlsson et al., 2000) which comprises three  
246 subscales; cognitive restraint (6-items) reflects the extent to which individuals  
247 consciously apply restraint to their eating behaviour. Uncontrolled eating (9-items)  
248 reflects the extent to which individuals feel that they lose control over their eating  
249 behaviour. Emotional eating (3-items) reflects the extent to which an individual eats

250 in response to emotional states. Participants are asked to respond to statements as  
251 they apply to themselves on a 4-point (scored 1 – 4) Likert scale anchored from  
252 “definitely true” to “definitely false” or a variation of this scale dependent on question.  
253 Relevant items were summed to calculate subscale scores. The Cronbach’s alpha  
254 for both uncontrolled eating and for emotional eating was 0.85.

255         2.1.2.4 *Digital Distance Affect Regulation Mapping Tool (DARM)* is a digital  
256 version of a pilot measure (Kobori et al., 2020; Wilkinson & Rowe, 2016) based on  
257 the “hierarchical mapping” approach (Rowe & Carnelley, 2005). However, this  
258 version of the tool allows for the mapping of a range of internal and external affect  
259 regulation strategies including seeking proximity to people (e.g., a romantic partner),  
260 practices (e.g., meditation), substances (e.g., food) or anything else that an  
261 individual might use to manage their emotions at times of stress. Participants are  
262 asked to reflect on the different ways that they manage stress and to list these  
263 strategies. They are then asked to rate on a 100 mm visual analogue scale, how  
264 effective they find each strategy for the management of stress (responding from not  
265 at all to extremely). Finally, they are asked to place these strategies on a “bulls-eye”  
266 style diagram in relation to the centre, which is labelled “stressed me”. They were  
267 asked to arrange their strategies in a way that is meaningful to them and are advised  
268 that those placed closer to the “stressed me” centre might be those that are relied on  
269 more often or of more importance. This information can be quantified in terms of the  
270 presence (or not) of a particular target strategy (here, this would be food/ eating  
271 related strategies) and the distance of that strategy from the centre of the bulls-eye.  
272 This version of the tool is coded in JavaScript and is presented to the respondents  
273 as part of the same Qualtrics survey as other measures. Respondents selected their  
274 strategies from a drop-down list populated with their earlier responses, presented in

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

283         2.1.2.5 *Demographics* Participants were asked to report their age, gender and  
284 whether they were a UK- or US-based respondent. They were asked to report  
285 whether they had a current or historical diagnosis of an eating disorder or had  
286 received bariatric-metabolic surgery. Finally, in order to calculate body mass index,  
287 participants were asked to report their height and weight.

288         2.1.2.6 *Demand awareness* An open-text response question was included at  
289 the end of the questionnaire (but prior to debriefing information) which asked  
290 participants to indicate what they thought the study was investigating.

### 291 2.1.3 *Procedure*

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

300 questions and finally the demand awareness question. They were then provided with  
301 a debrief screen.

#### 302 2.1.4. *Data analysis*

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

311 All models presented here were conducted using the PROCESS v3.1 (Hayes,  
312 2017) add in for SPSS 26 (IBM Corp. Armonk NY). All PROCESS models were set  
313 up to run 5000 bootstrap samples and to control for covariates at the level of both  
314 the mediator and the outcome. Notably, a significant mediated relationship is  
315 indicated if the lower and upper confidence intervals (LLCI and ULCI, respectively)  
316 do not cross zero – p-values are generally not produced for the indirect (mediated)  
317 pathway.

318 2.1.4.1 *Confirmatory analyses* First, we examined whether attachment anxiety  
319 positively related to NES and whether this relationship was mediated by disinhibited  
320 eating behaviours (emotional and uncontrolled eating). We conducted a parallel  
321 multiple mediation model using PROCESS model 4. This allowed for the  
322 simultaneous assessment of both emotional and uncontrolled eating as potential  
323 mediators of a relationship between attachment anxiety and NES. For this model,  
324 attachment anxiety was the predictor, NES was the outcome and emotional and

325 uncontrolled eating were parallel mediators. Following previous research which  
326 included similar models, attachment avoidance, age, gender and location were  
327 included as covariates in our model (Wilkinson et al., 2018).

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

336         2.1.4.2 *Exploratory analyses* In order to examine a possible moderation effect  
337 of age on the mediated relationship between attachment anxiety and night eating via  
338 emotional and uncontrolled eating, we conducted a moderated mediation model  
339 (PROCESS model 59). This model tests for moderation for all relationships in the  
340 mediation model (i.e., between the predictor and the mediator, the mediator and the  
341 outcome and the direct relationship between the predictor and outcome). Notably,  
342 the current sample had an age range of 62 years with a minimum age of 18 years  
343 old and a maximum age of 80 years old.

344

## 345 **2.2 Results**

### 346 2.2.1 *Descriptive statistics*

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

### 348 2.2.2 *Confirmatory analyses*

349           2.2.2.1 *The relationship between attachment anxiety and NES* A significant  
350 relationship between attachment anxiety and night eating was evident when  
351 mediators were not included in the model (total effects;  $B = 2.27$ ,  $SE = 0.27$ , 95% CI:  
352 1.74 - 2.79,  $p < .001$ ). When mediators were included in the model, this direct  
353 relationship remained significant (direct effects;  $B = 1.74$ ,  $SE = 0.26$ , 95% CI: 1.22 -  
354 2.26,  $p < .001$ ) and significant indirect relationships via both uncontrolled ( $B = 0.16$ ,  
355  $SE = 0.09$ , 95% CI: 0.001 - 0.35) and emotional eating ( $B = 0.37$ ,  $SE = 0.12$ , 95% CI:  
356 0.15 - 0.63) were found. There were no significant effects of any of the covariates  
357 and the overall model was significant,  $F(7,268) = 19.71$ ,  $p < .001$ ;  $R^2$  for the total  
358 effects model (mediators not included) was .24 and  $R^2$  for the mediated model was  
359 .34.

360           2.2.2.2 *Eating to cope* Mediation analysis using binary logistic regression  
361 showed that there was no significant direct effect of attachment anxiety on likelihood  
362 of reporting food as a coping strategy on the DARM tool (log-odds = 0.05,  $SE = 0.10$ ,  
363  $p = 0.63$ , 95% CI: -0.15 – 0.25) and no mediated effect of attachment anxiety on  
364 likelihood of reporting food as a coping strategy on the DARM tool via night eating  
365 questionnaire score (log-odds = 0.03,  $SE = 0.05$ , 95% CI: -0.07 - 0.13). Only gender  
366 (and no other covariate) was significantly related to reporting of eating/food as a  
367 coping strategy (log-odds = 1.06,  $SE = 0.27$ ,  $p < .001$ , 95% CI: 0.53 - 1.61). A post-  
368 hoc chi-square test showed that female participants were significantly more likely to  
369 have listed food/eating as a coping strategy on the DARM tool compared to male  
370 participants,  $\chi^2(2, N = 276) = 24.7$ ,  $p < .001$ . The mediation model was significant ( $p$   
371  $< .001$ ) and Cox and Snell  $R^2$  for the mediated model was .10 (total effects models  
372 are not produced when the outcome measure is dichotomous).



373 Mediation analysis ( $n = 128$ ) showed that there was no significant direct effect  
374 of attachment anxiety on distance from the centre that food/eating was placed on the  
375 DARM tool ( $B = 7.44$ ,  $SE = 4.94$ ,  $p = .13$ , 95% CI: -2.32 - 17.22), total effect ( $B =$   
376  $4.58$ ,  $SE = 4.6$ ,  $p = .32$ , 95% CI: -4.56 – 13.72) or mediated effect via night eating  
377 questionnaire score ( $B = -2.86$ ,  $SE = 2.49$ , 95% CI: -8.36 – 1.58). Attachment  
378 avoidance was the only covariate that was significantly related to the distance from  
379 the centre that food/eating was placed on the DARM tool ( $B = -11.91$ ,  $SE = 5.25$ ,  $p =$   
380  $.025$ , 95% CI: -22.30 - -1.50). The  $R^2$  for the total effects model was .10 and the  $R^2$   
381 for the mediated model was .12. Overall, the mediated model was significant ( $p =$   
382  $.016$ ).

383

### 384 2.2.3 Exploratory analyses

385 *Age as a moderator of the mediated relationship between attachment anxiety*  
386 *and NES.* The model for predicting night eating score was statistically significant,  
387  $F(10, 265) = 15.24$ ,  $p < .001$ ;  $R^2 = 0.37$  (total effects models are not available for  
388 PROCESS model 59). When age was entered as a moderator, emotional eating and  
389 uncontrolled eating were not significant mediators although emotional eating did  
390 predict elevated night eating score. Age was not a significant predictor of night eating  
391 score, emotional eating, or uncontrolled eating but there was a significant age X  
392 attachment anxiety interaction effect on night eating score ( $B = 0.05$ ,  $SE = 0.02$ ,  $p =$   
393  $.002$ , 95% CI: 0.02 – 0.08). The test of highest order unconditional interaction  
394 indicated that the model fit was significantly improved due to the age X attachment  
395 anxiety interaction,  $F(1, 265) = 9.40$ ,  $p = .002$ ;  $R^2$  change = 0.02. Age did not interact  
396 with either mediator. The conditional direct effect of attachment anxiety on night  
397 eating score was significant across age values (see Table 2). The conditional indirect

398 effect of attachment anxiety on night eating score through emotional eating was  
399 significant at lower ages but not at the higher suggesting moderated mediation (see  
400 Table 2). The moderated mediation is presented in Figure 1.

### 401 402 2.3 Interim Discussion

403  
404 For the first time, a direct relationship between attachment anxiety and NES  
405 has been shown. The relationship was present in an international (US, UK) sample  
406 of undergraduate students and individuals from the community. Furthermore, as  
407 predicted, this relationship was mediated by disinhibition of eating in the form of  
408 uncontrolled and emotional eating. The association between emotional eating as  
409 measured by the TFEQ is consistent with previous work which has demonstrated a  
410 positive association between emotional eating (measured by the Dutch Eating  
411 Behavior Questionnaire) and night eating in students (Nolan & Geliebter, 2012). The  
412 positive relationship between uncontrolled eating and NES in the general population  
413 (i.e., those without diagnosed eating disorder) is novel.

414 Despite the identification of two significant mediators of the relationship  
415 between attachment anxiety and NES, the direct effect between these factors  
416 remains significant within the mediated model. This suggests that the mediators we  
417 have included do not fully explain the relationship between attachment anxiety and  
418 NES and other mediators are likely to exist. The qualitative study by Shillito et al.  
419 (2018) examined the relationship between NES and the experience of emotion in  
420 adults who met the diagnostic criteria for moderate or full NES and were accessing a  
421 weight management service. They found that when “acknowledging the  
422 consequences of night eating”, participants talked about social effects, in particular in  
423 difficulties in relationships. While Fischer et al. (2012) reported that compared to  
424 healthy controls and individuals living with obesity (without NES), individuals with

425 NES were more affected by social stress (including social overload, lack of social  
426 recognition, social tension and social isolation). Furthermore, for the NES group,  
427 Fischer et al. (Fischer et al., 2012) reported a correlation between ratings of social  
428 stress and rated distress and impairment due to NES symptoms. It is notable that the  
429 centrality of social cues in these findings is similar to the hyper-vigilance that is  
430 characteristic of attachment anxiety.

431 One possibility is that the experience of NES alters attachment anxiety in  
432 terms of fear of abandonment (i.e., reverse causality whereby individuals are  
433 concerned that the consequences of NES will cause others to abandon them).  
434 Indeed, whilst adult attachment has generally been viewed as a stable trait across  
435 time with changes only tending to occur in response to specific events (Waters et al.,  
436 2000), increasing evidence suggests that shifts in attachment orientation can take  
437 place readily (Fraley et al., 2011), occurring in response to relationship status and  
438 across specific periods of life such as adolescence (Chopik et al., 2017). Therefore,  
439 in study 2 we sought to explore this reversed relationship (albeit cross-sectionally)  
440 with the inclusion of a mediator reflecting the fear of negative evaluation by others of  
441 night eating behaviours as well as the addition of demographic questions to provide  
442 context about the sample's living situation (i.e., living alone or co-habiting) and if co-  
443 habiting, the closeness of that interpersonal relationship.

444 Notably age was a significant moderator of the direct relationship between  
445 attachment anxiety and NES, specifically those in our older age category who also  
446 had a higher attachment anxiety score, were more likely to have a higher night  
447 eating score than those in our younger age category also with a higher attachment  
448 anxiety score. In general, research has suggested that attachment anxiety is higher  
449 in younger individuals compared to older individuals (Chopik et al., 2017). One

450 possibility is that our older age group with higher attachment anxiety scores may  
451 represent a more persistent attachment insecure group who are also more  
452 vulnerable to other psychopathologies including NES. Indeed, there is evidence that  
453 NES in older groups is more associated with psychopathologies than it is in younger  
454 groups (Nolan & Geliebter, 2016).

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

### 475 **3.0 Study 2**

476 In study 2 we sought to extend our findings by first testing an alternative  
477 explanation for the direct effect between attachment anxiety and night eating score  
478 based on reverse causality, whereby the experience of interpersonal shame as a  
479 *consequence* of NES would alter an individuals' attachment orientation, in particular  
480 attachment anxiety. Considering our exploratory finding from study 1 that age was a  
481 moderator of the relationship between attachment anxiety and night eating  
482 questionnaire score, we included age as a moderator in this model. We  
483 hypothesised that a positive relationship between night eating score and attachment  
484 anxiety would be significantly mediated by a measure of fear of negative evaluation  
485 of eating behaviour and that older age would result in a stronger relationship  
486 between night eating score and attachment anxiety.

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

490 Finally, in an exploratory analysis we sought to extend our main finding from study 1  
491 that showed that the relationship between attachment anxiety and night eating was  
492 mediated by both emotional and uncontrolled eating but did not further explore how  
493 these mediators might relate to each other. Indeed, previous work on the relationship  
494 between attachment orientation and eating behaviours has modelled an inter-  
495 relationship between emotional and uncontrolled eating (Wilkinson et al., 2019).  
496 Specifically, we examined whether our results were consistent with the "escape from  
497 self-awareness theory of overeating" (Heatherton & Baumeister, 1991) which  
498 suggests that some forms of disinhibited eating (binge eating in their paper) may  
499 occur with a narrow focus on "immediate sensation" from food as a form of

500 “motivated escape from meaningful self-awareness”. As described by van Strien  
501 (2018), escape from self-awareness theory suggests that uncontrolled eating may  
502 occur when some people (e.g., emotional eaters) narrow their level of attention to the  
503 presence of food and become vulnerable to external cues to overeat. Thus, we  
504 hypothesised that attachment anxiety and night eating would be *serially* mediated by  
505 emotional eating followed by uncontrolled eating.

### 506 **3.1 Method**

507 The hypotheses were pre-registered with the open science framework after  
508 data collection had commenced but prior to data analysis (<https://osf.io/8zyas>) and  
509 the dataset is available via the open science framework  
510 ([https://osf.io/nf6qj/?view\\_only=942479ceb5634e269fc4f4bdaad1a5ee](https://osf.io/nf6qj/?view_only=942479ceb5634e269fc4f4bdaad1a5ee)).

#### 511 *3.1.1 Participants*

512 Four hundred and eighty-six participants (male = 177, female = 309)  
513 completed the study. Five hundred and eight participants initiated the study in total,  
514 but 22 did not answer a sufficient number of key questions to be included in the  
515 dataset. An opportunistic sampling strategy was used and recruitment methods were  
516 similar to study 1. The final sample included 267 participants who indicated living in  
517 the UK (98 via Qualtrics panel) and 207 participants who indicated living in the US  
518 (95 via Qualtrics panel). 12 participants (3 in UK and 9 in US) selected “other” for  
519 country in which they reside (2 and 9 were students respectively). One hundred and  
520 twelve of the US participants and 91 of the UK participants were students, remaining  
521 participants were non-student community members. Additional sample  
522 characteristics are presented in Table 3.

#### 523 *3.1.2 Measures*

524           *Measures* As in study 1, night eating was assessed using the Night Eating  
525 Questionnaire; for study 2, the standardised reliability coefficient was .75.  
526 Attachment orientation was measured using the Experiences in Close Relationships  
527 Questionnaire; the Cronbach's alpha for attachment avoidance and attachment  
528 anxiety were .85 and .89 respectively. Eating styles were measured using the 18-  
529 item version of the Three Factor Eating Questionnaire. The reliability for uncontrolled  
530 eating scale was .81 and for the emotional eating scale was .84.

531           3.1.2.1 *Affect Regulation* Affect regulation was measured by the Coping  
532 Strategy Assessment Tool (CSAT) (Douglas, 2020). See description of DARM in  
533 study 1 for an overview of how the tool works. This updated version of the tool had  
534 improved clarity of instructions and visual representation of the tool.

535           3.1.2.2 *Fear of negative evaluation of eating behaviour* In order to assess  
536 concern for being evaluated negatively for eating, 7 items from the Brief Fear of  
537 Negative Evaluation Scale—Revised (Carleton et al., 2006) were utilized and  
538 modified by changing the wording to refer to eating behaviour. For example, “I worry  
539 about what other people will think of me even when I know it doesn't make any  
540 difference” was changed to “I worry about what other people will think of my eating  
541 even when I know it doesn't make any difference.” Items were summed to produce a  
542 total scale score. Cronbach's alpha for this measure was .95.

543           3.1.2.3 *Closeness of Co-habiting Relationships* The participants were asked  
544 to indicate whether they lived alone or with others (options: parents, friends, romantic  
545 partner, or roommates who are not friends) and the degree of closeness with those  
546 they live with (options: not at all close, slightly close, moderately close, very close, or  
547 extremely close).

548           3.1.3 *Procedure*

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

#### 552 3.1.4 *Data Analysis*

553           Confirmatory analyses included the following to test pre-registered  
554 hypotheses. First, we examined whether night eating would predict higher  
555 attachment anxiety via fear of negative evaluation of eating with age as a moderator  
556 (PROCESS Model 59). For this model, night eating was the predictor, attachment  
557 anxiety was the outcome and fear of negative evaluation of eating was the mediator.  
558 Age was included as a moderator (of every relationship in the mediated model).  
559 Following previous research which included similar models, attachment avoidance,  
560 gender and location were included as covariates in our model (Wilkinson et al.,  
561 2018).

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

570           Finally, an exploratory analysis was conducted to examine whether there was  
571 a serial mediation (PROCESS model 6) of the relationship between attachment  
572 anxiety and night eating via emotional followed by uncontrolled eating. Following  
573 previous research which included similar models, attachment avoidance, age,



574 gender, and location were included as covariates in our models (Wilkinson et al.,  
575 2018).

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

## 579 **3.2 Results**

### 580 3.2.1 *Descriptive statistics*

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

### 582 3.2.2 *Confirmatory analyses*

583 3.2.2.2 *Association between Night Eating and Attachment Anxiety Mediated*  
584 *by Fear of Negative Evaluation of eating behaviour.* Age was not a significant  
585 moderator of any of the relationships within the mediated model (night eating to fear  
586 of negative evaluation of eating ( $p = .62$ ), night eating to attachment anxiety ( $p = .51$ )  
587 or fear of negative evaluation to attachment anxiety ( $p = .46$ )). A significant direct  
588 relationship between night eating and attachment anxiety was evident at every age  
589 percentile tested (see table 4). A significant indirect relationship from night eating to  
590 attachment anxiety via fear of negative evaluation was also evident at every age  
591 percentile tested (see table 4). Location was not a significant covariate but  
592 attachment avoidance ( $B = -.10$ ,  $SE = 0.05$ ,  $p = .03$ , 95% CI: -0.19 - -0.01) and  
593 gender ( $B = 0.27$ ,  $SE = 0.11$ ,  $p = .02$ ; 95% CI: 0.04 – 0.50) were significant covariates  
594 within the model. A post hoc independent samples t-test showed that female  
595 participants had a higher mean attachment anxiety score ( $M = 4.12$ ,  $SE = 0.08$ )  
596 compared to male participants ( $M = 3.64$ ,  $SE = 0.11$ ;  $t(484) = -3.53$ ,  $p < .001$ ). The  
597 overall mediated model was significant,  $p < .001$ ;  $R^2 = .32$  (total effects models are  
598 not available for PROCESS model 59).

599           3.2.2.3 *Eating to Cope (CSAT)* Mediation analysis using binary logistic  
600 regression showed that there was a significant direct effect of attachment anxiety on  
601 likelihood of reporting food as a coping strategy on the CSAT tool (log-odds = 0.24,  
602 SE = 0.08,  $p = 0.002$ , 95% CI: 0.08 – 0.39) but no mediated effect of attachment  
603 anxiety on likelihood of reporting food as a coping strategy on the CSAT tool via  
604 night eating (log-odds = 0.02, SE = 0.03, 95% CI: -0.03 - 0.08). Only age (and no  
605 other covariate) was significantly related to reporting of eating/food as a coping  
606 strategy (log-odds = -0.01, SE = 0.01,  $p = .02$ , 95% CI: -0.03 - -0.002). The  
607 mediation model was significant ( $p < .001$ ) and Cox and Snell  $R^2$  for the mediated  
608 model was .07 (total effects models are not produced when the outcome measure is  
609 dichotomous).

610           Mediation analysis ( $n = 114$ ) showed that there was no significant direct effect  
611 of attachment anxiety on distance from the centre that food/eating was placed on the  
612 CSAT tool ( $B = 4.81$ , SE = 4.41,  $p = .28$ , 95% CI: -3.93 - 13.54; total effect:  $B = -0.2$ ,  
613 SE = 4.23,  $p = .96$ , 95% CI: -8.6 – 8.19). However, there was a significant indirect  
614 effect of attachment anxiety on distance from the centre that food/eating was placed  
615 on the CSAT via night eating ( $B = -5.01$ , SE = 2.18, 95% CI: -9.82 – -1.34).  
616 Attachment avoidance, age, gender and location were not significant covariates  
617 within the model. The  $R^2$  for the total effects model was .03 and the  $R^2$  for the  
618 mediated model was .11. Overall, the mediated model just missed statistical  
619 significance ( $p = .053$ ).

620

### 621 3.2.3 *Exploratory analyses*

622           3.2.3.2 *Serial Mediation: Effect of attachment anxiety via emotional and*  
623 *uncontrolled eating* In order to examine whether the results were consistent with the

624 escape from self-awareness model, a serial mediation analysis examining whether  
625 attachment anxiety predicted night eating via an increase in emotional eating which  
626 itself predicts uncontrolled eating. A significant direct effect between attachment  
627 anxiety and night eating was evident for both models excluding mediators (total  
628 effects,  $B = 1.82$ ,  $SE = 0.20$ ,  $p < .001$ ; 95% CI: 1.41 – 2.22) and including mediators  
629 ( $B = 1.29$ ,  $SE = 0.20$ ,  $p < .001$ ; 95% CI: 0.89 -1.69). The indirect effect between  
630 attachment anxiety and night eating via emotional and uncontrolled eating was  
631 significant ( $B = 0.24$ ,  $SE = 0.07$ , 95% CI: 0.12 - 0.40). Within the mediated model  
632 (including both mediators), the indirect effect from attachment anxiety to night eating  
633 via uncontrolled eating alone was significant ( $B = 0.19$ ,  $SE = .07$ , 95% CI: 0.07 -  
634 0.33) but was not significant via emotional eating alone ( $B = 0.10$ ,  $SE = .08$ , 95% CI:  
635 -0.06 - 0.27). The overall model was statistically significant ( $p < .001$ ), the  $R^2$  for the  
636 total effects model was .23 and for the mediated model was .32. In the mediated  
637 model, gender and age were not statistically significant covariates but attachment  
638 avoidance ( $B = 0.74$ ,  $SE = 0.21$ , 95% CI: 0.32 – 1.16) and country of residence ( $B =$   
639 1.7,  $SE = 0.43$ , 95% CI: 0.85 – 2.56) were statistically significant covariates. A post-  
640 hoc independent samples t-test showed that participants located in the United States  
641 scored significantly higher on night eating ( $M = 16.6$ ,  $SE = .49$ ) than participants  
642 located in the United Kingdom ( $M = 13.82$ ,  $SE = .41$ ;  $t(472) = -4.38$ ,  $p < .001$ ).

643

#### 644 4.0 Discussion

645 Consistent with our pre-registered hypotheses and across two studies, we  
646 showed for the first time that attachment anxiety was a significant predictor of night  
647 eating. Furthermore, across both studies, we showed that this relationship was  
648 significantly mediated by measures of disinhibited eating (emotional and uncontrolled

649 eating). We also tested an alternative theoretically driven (escape from self-  
650 awareness theory; Heatherton & Baumeister, 1991) serial mediation model that  
651 allowed for a nuanced indirect pathway incorporating an inter-relationship between  
652 emotional eating and uncontrolled eating. We showed an indirect pathway which  
653 suggests that attachment anxiety may lead to night eating by increasing eating when  
654 experiencing negative affect which, in turn, elevates uncontrolled eating. In both  
655 cases, these models accounted for just over 30% of the variance associated with  
656 night eating.

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

667         In study 2 we also considered a reversed relationship between attachment  
668 anxiety and night eating score with a fear of negative evaluation of eating behaviour  
669 as a potential mediator. Consistent with Shillito et al. (2018), we found a significant  
670 indirect relationship whereby night eating score was a significant predictor of fear of  
671 negative evaluation of eating and this, in turn, was a significant predictor of  
672 attachment anxiety. Overall, it is likely that more complex bidirectional relationships  
673 exist between night eating and attachment anxiety and future research might explore

674 this possibility further using longitudinal approaches. One area that might be  
675 particularly fruitful is consideration of directionality of inter-relationships (e.g., a  
676 vicious cycle) between factors, for example, attachment anxiety is associated with  
677 emotional eating and uncontrolled eating that are associated with night eating, which  
678 leads to a fear of negative evaluation of eating and is associated with higher  
679 attachment anxiety. Moreover, from a theoretical perspective, fear of negative  
680 evaluation of eating could be considered an “ego threat” – an aversive self-  
681 perception which causes distress. This is itself a key component of the escape from  
682 self-awareness theory (mentioned above), as this distress leads to emotional eating  
683 and uncontrolled/external eating via the mechanisms described above (Heatherton &  
684 Baumeister, 1991).

685 More generally, our findings contribute to a body of research linking  
686 attachment orientation to eating disorders (Oldham-Cooper et al., 2021; Tasca,  
687 2019; Tasca & Balfour, 2014; Ward et al., 2000) but that has, to date, neglected  
688 NES. The benefit of understanding NES as an outcome of a broader set of  
689 processes that underpin the aetiology and maintenance of disordered eating is in  
690 terms of opportunities for intervention. For example, Tasca et al. (Tasca et al., 2006)  
691 found that attachment orientation predicted differential outcomes for two group  
692 therapy protocols for patients with binge eating disorder; for those participants  
693 randomised to group psychodynamic interpersonal psychotherapy, higher  
694 attachment anxiety was associated with improvements in binge eating post-  
695 treatment. Whereas, for those participants randomised to group cognitive  
696 behavioural therapy, lower attachment anxiety was associated with improvements in  
697 binge eating post treatment. In the latter condition, attachment avoidance was also  
698 positively associated with drop-out rate.

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

711           Across our two studies we also incorporated a novel tool (the DARM in study  
712 1 and a developed version of the DARM, named the CSAT, in study 2) which asks  
713 participants to consider and prioritise their approaches to coping with negative  
714 emotion and stress. In both studies we failed to find a relationship between  
715 attachment anxiety, night eating and likelihood of naming eating as a coping  
716 strategy. Although in study 2, for those participants who reported eating as a coping  
717 strategy, we showed a significant indirect relationship with higher attachment anxiety  
718 relating to the placement of eating to cope closer to the centre of our tool (which  
719 represents the self) via night eating. However, the overall model just missed  
720 significance and only accounted for 11% of the variance associated with placement  
721 of eating to cope. One possibility is that, for this analysis, we were underpowered  
722 because only a sub-set of our sample could be included in this analysis due to a  
723 need to have reported eating to cope in the first place and some missing data.

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

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

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

753

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

759

760 **Author Contributions:** All authors contributed to the design of the studies. LLW and  
761 LJJ led data collection, data analyses and drafted the manuscript. MT and TD  
762 programmed and supported the use of the DARM/ CSAT tool. ACR and MT provided  
763 editorial comments. All authors have approved the final article.

764

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

767

768 **Declarations of Interest:** None

769

770



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931  
 932  
 933 Table 1  
 934  
 935 Sample characteristics for study 1  
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|                      |            |       |
|----------------------|------------|-------|
| Gender               | Women      | 66.3% |
|                      | Men        | 32.3% |
|                      | Non-binary | 1.1%  |
| Country              | UK         | 28.3% |
|                      | USA        | 71.7% |
| TFEQ*                | 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 |

937 \*The mean emotional and uncontrolled eating scores provided are subscale scores averaged  
 938 (mean) across participants, the subscale scores themselves were calculated by summing  
 939 relevant items. However, given item-number differences across these subscales, this  
 940 information does not allow for their easy comparison. Therefore, we also provide the  
 941 subscale scores averaged (mean) across participants but when the subscales are calculated by  
 942 averaging (mean) relevant items. Emotional eating (Mean = 2.32, SD = 0.80) and  
 943 uncontrolled eating (Mean = 2.27, SD = .64).  
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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  | <i>B</i> | <i>SE</i> | <i>p</i> | <i>LLCI</i> | <i>ULCI</i> |
| 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  | <i>B</i> | <i>Boot SE</i> | <i>LLCI</i> | <i>ULCI</i> |
| 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        |

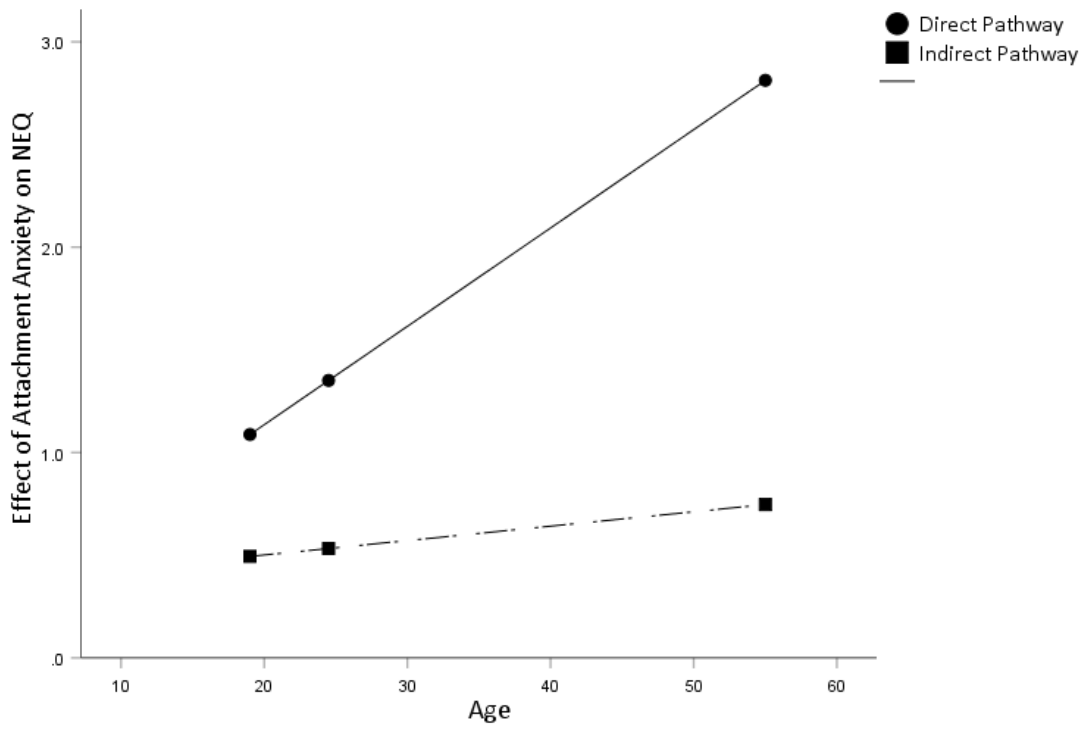
| Conditional Indirect Effect Via Emotional Eating Mediator |          |                |             |             |
|---|----------|----------------|-------------|-------------|
| Age   | <i>B</i> | <i>Boot SE</i> | <i>LLCI</i> | <i>ULCI</i> |
| 19  | 0.37     | 0.15           | 0.10        | 0.70        |
| 24.5  | 0.37     | 0.14           | 0.13        | 0.65        |
| 55  | 0.22     | 0.24           | -0.21       | 0.75        |

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Figure 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.



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1003 Table 3  
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 1005 Sample characteristics in study 2  
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|                      |             |           |
|----------------------|-------------|-----------|
| Gender               | Women       | 63.6%     |
|                      | Men         | 36.4%     |
| Country              | UK          | 54.9%     |
|                      | USA         | 42.6%     |
|                      | Other       | 2.5%      |
| <u>Co-habitation</u> |             |           |
| 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%     |
| <u>TFEQ*</u>         | <u>Mean</u> | <u>SD</u> |
| Emotional Eating     | 6.43        | 2.39      |
| Uncontrolled Eating  | 18.98       | 5.49      |
| <u>ECR</u>           |             |           |
| 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     |

1007 \* The mean emotional and uncontrolled eating scores provides are sub-scale scores averaged  
 1008 (mean) across participants, the subscale scores themselves were calculated by summing  
 1009 relevant items. However, given item-number differences across these subscales, this  
 1010 information does not allow for their easy comparison. Therefore, we also provide the  
 1011 subscale scores averaged (mean) across participants but when the subscales are calculated by  
 1012 averaging (mean) relevant items. Emotional eating (Mean = 2.14, SD = 0.80) and  
 1013 uncontrolled eating (Mean = 2.11, SD = .61).





1015 Table 4  
 1016  
 1017 Conditional effects of NEQ on attachment anxiety via fear of negative evaluation at  
 1018 values of the moderator (age) with 95% confidence interval in study 2.  
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| Conditional Direct Effect of NEQ Score on Attachment Anxiety |          |           |          |             |             |
|--|----------|-----------|----------|-------------|-------------|
| Age  | <i>B</i> | <i>SE</i> | <i>p</i> | <i>LLCI</i> | <i>ULCI</i> |
| 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   | <i>B</i> | <i>Boot SE</i> |  | <i>LLCI</i> | <i>ULCI</i> |
| 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        |

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Figure 2

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

