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**Family mealtimes and eating psychopathology: The role of anxiety and depression
among adolescent girls and boys.**

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Running head: Family mealtimes and psychopathology in adolescents

26

Abstract

27 Characteristics of family mealtimes are associated with disordered eating behaviours.
28 However, little is known about the relationships between characteristics of family mealtimes
29 and disordered eating attitudes, or how symptoms of anxiety or depression may contribute to
30 these relationships. This study therefore aimed to examine differences between adolescent
31 girls and boys in the relationship between family mealtime characteristics and eating
32 psychopathology, and to explore the influence of anxiety and depression on this relationship.
33 Adolescents (N = 535; 286 girls and 249 boys) aged 14 to 18 years completed self-report
34 measures of family mealtime characteristics, eating psychopathology, anxiety and
35 depression. Reports of more frequent family mealtimes, a more positive mealtime
36 atmosphere and a high level of priority placed on mealtimes were all associated with
37 significantly lower levels of eating-disordered attitudes among girls only. For boys, all four
38 mealtime measures (higher mealtime frequency, more positive mealtime atmosphere,
39 greater priority of mealtimes and higher levels of mealtime structure) were associated with
40 lower levels of depression. Among girls, several of the family mealtime and eating
41 psychopathology relationships were partially or fully mediated by either anxiety or
42 depression. While these findings require longitudinal replication, family mealtimes are likely
43 to be important in promoting psychological well-being among both girls and boys. Families
44 should be encouraged to think beyond the frequency of mealtimes and to foster a positive
45 mealtime environment which may help to promote adolescent psychological wellbeing, and
46 might even protect young females against the development of eating psychopathology.

47

48 **Key words:** Family mealtime frequency; family mealtime priority; family mealtime
49 atmosphere; family mealtime environment; anxiety; depression; eating disorders.

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Family mealtimes and eating psychopathology:

The role of anxiety and depression among adolescent girls and boys.

Family mealtimes are important in promoting positive dietary behaviours among adolescents (e.g., Neumark-Sztainer, Hannan, Story, Croll & Perry, 2003). For example, an increased frequency of family mealtimes has been associated with healthier diets (e.g., Gilman et al., 2000), a reduced likelihood of overweight or obesity (e.g., Fulkerson, Kubik, Story, Lytle, & Arcan, 2009), and the prevention of extreme weight control behaviours, such as the use of laxatives, diet pills, diuretics or self-induced vomiting (Neumark-Sztainer, Wall, Story & Fulkerson, 2004). Additionally, positive family mealtime environments (including placing a high priority on family meals, positive mealtime atmosphere and greater mealtime structure) are also considered to be protective against adolescents engaging in extreme weight control behaviours (Neumark-Sztainer et al., 2004).

In addition to their relationship with eating behaviours, characteristics of family mealtimes have also been linked with depression, with lower levels of depressive symptoms related to more frequent family meals among both boys and girls (Eisenberg, Olson, Neumark-Sztainer, Story, & Bearinger, 2004; Fulkerson, Story, Mellin, Leffert, Neumark-Sztainer & French, 2006). Furthermore, depressive symptoms have been negatively related to mealtime priority, but only among overweight boys (Fulkerson, Strauss, Neumark-Sztainer, Story & Boutelle, 2007). Despite these associations between depression and family mealtime characteristics (e.g., Eisenberg et al., 2004), and the established co-morbidities of anxiety and depression (e.g., Brady & Kendall, 1992), little research has examined the relationship between family mealtimes and anxiety.

It is common for mental health symptoms to co-occur among adolescents (e.g., Lewinsohn, Hops, Roberts, Seeley & Andrews, 1993). For example, there is a reported link

78 between disordered eating and high levels of anxiety and depression (Hou et al., 2013;
79 McCabe & Vincent, 2003). However, despite the established relationships between
80 disordered eating and family mealtime characteristics (Neumark-Sztainer et al., 2004), and
81 between anxiety and depression (Hou et al., 2003; McCabe & Vincent, 2003), little is known
82 about the extent to which anxiety and depression may contribute to the relationship between
83 family mealtimes characteristics and eating psychopathology.

84

85 Although family mealtimes have an important role in the prevention of disordered
86 eating behaviours, this function may differ for boys and girls, with longitudinal evidence
87 suggesting a protective role of family mealtimes among adolescent girls but not boys
88 (Neumark-Sztainer, Wall, Haines, Story, Sherwood & van den Berg, 2007; Neumark-
89 Sztainer, Eisenberg, Fulkerson, Story & Larson, 2008). Specifically, it has been suggested
90 that mealtime experiences may differ for girls and boys, with girls being influenced more by
91 family relationships which may enable them to benefit more from the shared meal
92 experience (Neumark-Sztainer et al., 2008). Furthermore, it is well reported that adolescent
93 girls and boys differ in their levels of eating psychopathology (e.g., Goodwin, Haycraft, Willis
94 & Meyer, 2011), depression (e.g., Ferreiro, Seoane & Senra, 2011; Hankin, Abramson,
95 Moffir, Silva, McGee & Angell, 1998) and anxiety (e.g., Leikanger & Larsson, 2012), with
96 girls typically reporting greater levels of psychopathology than boys.

97

98 In summary, family mealtimes are important for the development of positive dietary
99 behaviours and in protecting against disordered eating behaviours. However, gender
100 differences and links with anxiety and depression have also been highlighted. To date,
101 current research has focused on the relationships between family mealtime characteristics
102 and disordered eating behaviours alone, using specific questions to assess unhealthy weight
103 control behaviours (extreme and less extreme), binge eating with loss of control and chronic
104 dieting (Neumark-Sztainer et al., 2004). No research has used a well-validated measure of
105 eating psychopathology in order to fully examine the relationship between family mealtimes

106 and disordered eating attitudes and behaviours. This would be beneficial to enable
107 comparisons between samples of adolescents regarding the levels of eating
108 psychopathology reported. Furthermore, no research has examined the mediating effects of
109 anxiety and depression on the relationship between family mealtimes and disordered eating
110 attitudes. Therefore, the aims of this study are two-fold. First, to replicate and extend
111 previous research examining gender differences in the relationships between family
112 mealtime characteristics (frequency, atmosphere, structure and priority) and disordered
113 eating behaviour and attitudes within a sample of adolescents. Following on from the work of
114 Neumark-Sztainer and colleagues (2004), it is hypothesised that more *frequent* family
115 mealtimes, a more *positive* mealtime atmosphere, a higher *priority* placed on mealtimes and
116 a higher level of *structure* at mealtimes will be associated with significantly lower levels of
117 disordered eating attitudes and behaviours. The second aim is to extend previous findings
118 by examining the mediating role of anxiety and depression in the relationship between family
119 mealtime characteristics and disordered eating attitudes. Bringing together the findings of
120 Neumark-Sztainer and colleagues (2004), Eisenberg and colleagues (2004), Hou and
121 colleagues (2013) and McCabe and Vincent (2003), it is hypothesised that the relationship
122 between family mealtime characteristics and disordered eating attitudes will be mediated by
123 anxiety and depression levels.

124

125

Method

126 *Participants*

127 A sample of 535 participants (286 girls, 249 boys) with a mean age of 15.9 years
128 (range = 14.5 to 18.7 years; *SD* = 1.11) was recruited through state (non-private) schools
129 and colleges from three counties in England. Participants (*n* = 38) who indicated that they
130 had either previously sought, or were currently seeking, professional help or treatment for
131 their eating behaviour (*n* = 24) (or did not answer a screening question related to this; *n* =
132 14) were retained in the final sample in order to obtain a range of eating psychopathology

133 representative of a school-based or community sample (Fairburn & Beglin, 1994). BMI
134 scores were able to be calculated for 67.9% of the sample using self-reported height and
135 weight data. These values were converted to BMI Z scores to account for age and gender
136 (Child Growth Foundation, 1996), producing a mean value of .07 (range = -6.68 to 4.17; *SD*
137 = 1.24). The sample was 74% white British, however ethnicity data were missing for 14% of
138 the sample. English was the first language for 92% of the sample, with missing data for 2%.

139

140 *Measures and procedure*

141 After obtaining institutional review board ethical approval, parental consent was
142 sought for all participants under the age of 18 years either via opt-out letters sent home to
143 parents, or via the school providing consent on behalf of the parents. In addition, all
144 participants provided informed consent or assent and were invited to complete a
145 questionnaire, either online via a survey website, or on paper. The questionnaire pack
146 consisted of three measures presented in the following order:

147

148 Project-EAT Family Mealtime Questions

149 Participants were asked to complete questions from the Project EAT-I (Eating Among
150 Teens) survey (Neumark-Sztainer, Story, Ackard, Moe & Perry, 2000; Neumark-Sztainer et
151 al., 2004). This measure comprises four sub-components: family meal frequency (1 item),
152 priority of family meals (5 items), atmosphere of family meals (4 items), and structure/rules of
153 family meals (5 items). Frequency of family mealtimes was assessed based on the response
154 to the question: “*During the past seven days, how many times did all, or most, of your family*
155 *living in your house eat a meal together?*” Response options were never, 1-2 times, 3-4
156 times, 5-6 times, 7 times, or more than 7 times. Mean scores were calculated using the
157 midpoints of the response category selected (e.g., 1.5, 3.5, 5.5, 7.0, 10.0), as described by
158 Neumark-Sztainer and colleagues (2000). Responses to priority of family meals, atmosphere
159 of family meals and structure/rules of family meals were rated on a four-point scale from
160 strongly disagree (1) to strongly agree (4). Scores were calculated based on the mean of the

161 total subscale score, with a higher score representing a higher level of priority placed on
162 mealtimes, a more positive mealtime atmosphere or more structure/rules placed on
163 mealtimes. Reliability in the current sample was acceptable for priority of family meals
164 (Cronbach's alpha = .78) and structure/rules of family meals (Cronbach's alpha = .70), and
165 good for atmosphere of family meals (Cronbach's alpha = .84).

166

167 Hospital and Anxiety Depression Scale (HADS; Zigmond & Snaith, 1983)

168 The HADS is a 14-item self-report measure of anxiety and depression. The items are
169 split equally between two subscales (anxiety and depression) with higher scores indicative of
170 increased psychopathology. The HADS has been validated as a useful screening tool for
171 adolescents in the community and in clinical settings (e.g., White, Leach, Sims, Atkinson &
172 Cottrell, 1999). Reliability in the current sample was good for anxiety (Cronbach's alpha =
173 .82) and acceptable for depression (Cronbach's alpha = .70).

174

175 Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994; 2008)

176 The EDE-Q (version 6.0) is a 28-item self-report version of the Eating Disorder
177 Examination (EDE) which was developed by Cooper and Fairbairn (1987) to measure eating
178 psychopathology. Recent research has proposed an alternative three subscale structure for
179 the attitudinal questions of the EDE-Q for use in research with community samples of
180 adolescents (White, Haycraft, Goodwin & Meyer, in press). The three subscales reported by
181 White and colleagues (in press) are: Shape and Weight Concerns (10 items), Restriction (5
182 items) and Preoccupation and Eating Concern (7 items). Items are rated on a seven point
183 Likert scale (0-6), with a global score calculated as a mean of the three subscales. Higher
184 scores indicate greater levels of disturbance in eating attitudes. Frequencies of key eating-
185 disordered behaviours were also measured via the EDE-Q: dietary restraint; objective binge
186 episodes; self-induced vomiting; laxative misuse; and excessive exercise. Reliability in the
187 current sample was high for Shape and Weight Concerns (Cronbach's alpha = .96) and

188 good for Restriction (Cronbach's alpha = .88), Preoccupation and Eating Concern
189 (Cronbach's alpha = .87) and the global score (Cronbach's alpha = .89).

190

191 *Data analysis*

192 The Shapiro-Wilk statistic indicated that all variables were non-normally distributed.
193 Preliminary non-parametric tests of difference (Mann-Whitney U tests) conducted on Project-
194 EAT Mealtime, HADS and EDE-Q scores identified some significant gender differences (see
195 Table 1). As a result, subsequent analyses were conducted separately for girls and boys.
196 Spearman's rho one-tailed correlations were used to examine the relationships of Project-
197 EAT Mealtime scores (Frequency, Priority, Atmosphere and Structure) with EDE-Q and
198 HADS scores. A significance level of $p < .01$ was adopted given the high number of
199 correlations conducted, to reduce the risk of type 1 errors.

200

201 To test the study's second hypothesis, mediation analyses were conducted to
202 examine if significant relationships between Project-EAT Mealtime scores and EDE-Q global
203 score were mediated by HADS Anxiety or Depression scores. The global EDE-Q score was
204 used as the dependent variable for all mediation analyses, which were conducted in
205 accordance with Baron and Kenny (1986). The following associations were examined for
206 significance: the independent variable (IV) predicting the dependent variable (DV); the IV
207 predicting the mediator; and the mediator predicting the DV (when controlling for the IV).
208 According to Baron and Kenny, if all these associations are significant, then the relationship
209 between the IV and the DV (when controlling for the mediator) is subsequently examined. If
210 the effect of the IV on the DV is less when controlling for the mediator, mediation has
211 occurred. Full mediation occurs when the relationship between the IV and DV is no longer
212 significant when controlling for the mediator (Baron & Kenny, 1986; Haycraft & Blissett,
213 2010; Holmbeck, 2002). Sobel tests were conducted to assess the significance of partial
214 mediations (Sobel, 1982). All regressions were one tailed and a significance level of $p < .05$
215 was adopted for the mediational analyses in view of the smaller number of analyses being

216 run and the lower chance of type I errors occurring. Missing data were excluded from all
217 analyses.

218

219 **Results**

220 Descriptive statistics for Project-EAT Mealtime, EDE-Q and HADS scores and results
221 of the Mann-Whitney U tests of difference for girls and boys are shown in Table 1.

222

223 INSERT TABLE 1 ABOUT HERE

224

225 All EDE-Q attitudinal scores were significantly higher among the girls than the boys.
226 In addition, girls' mean HADS Anxiety scores were significantly higher than boys' scores.
227 Both HADS Anxiety and Depression scores for girls and boys were comparable to previous
228 research with adolescents (White et al., 1999).

229

230 *Associations of mealtime characteristics with eating pathology, anxiety and depression*

231 A series of one-tailed Spearman's rho correlations were conducted for girls (Table 2)
232 and boys (Table 3) to examine associations between all Project-EAT Mealtime, EDE-Q and
233 HADS scores.

234

235 INSERT TABLE 2 ABOUT HERE

236

237 Girls

238 In relation to EDE-Q attitudes, significant negative associations were found between
239 Project-EAT Mealtime, Priority and Atmosphere and both EDE-Q Shape and Weight
240 Concerns and EDE-Q global subscales. Significant negative associations were also found
241 between Project-EAT Mealtime Frequency and Priority and EDE-Q Restriction scores.
242 Furthermore, significant negative associations were also found between Project-EAT
243 Mealtime Priority and Atmosphere and EDE-Q Preoccupation and Eating Concern scores.

244 With regard to EDE-Q behaviours, significant negative relationships were found between
245 Project-EAT Mealtime Frequency, Priority and Atmosphere and EDE-Q Dietary Restraint.
246 Additionally, significant negative relationships were found between Project-EAT Mealtime
247 Atmosphere and EDE-Q Self-induced Vomiting, and between Project-EAT Mealtime Priority
248 and EDE-Q Excessive Exercise.

249

250 Also, among girls, significant negative associations were found between Project-EAT
251 Mealtime Priority and HADS Anxiety scores, and between Project-EAT Mealtime Frequency
252 and HADS Depression scores. In addition, significant negative associations were found
253 between Project-EAT Mealtime Atmosphere and both HADS Anxiety and Depression scores.
254 No other relationships were found to be significant.

255

256 INSERT TABLE 3 ABOUT HERE

257

258 Boys

259 In relation to EDE-Q attitudes, no significant relationships were found between any of
260 the Project-EAT Mealtime subscales (Frequency, Priority, Atmosphere or Structure) and any
261 EDE-Q subscale or global scores. With regard to EDE-Q behaviours, significant negative
262 associations were found between Project-EAT Mealtime Priority and EDE-Q Laxative
263 Misuse, and between Project-EAT Mealtime Priority and EDE-Q Excessive Exercise.

264

265 Also among boys, a significant negative association was found between Project-EAT
266 Mealtime Priority and HADS Anxiety scores. In addition, there were significant negative
267 associations between all Project-EAT Mealtime subscales and HADS Depression scores. No
268 other relationships were found to be significant.

269

270 In order to confirm associations between eating psychopathology, anxiety and
271 depression, a further series of one-tailed Spearman's correlations was conducted.

272 Significant, positive associations were found between EDE-Q scores (both at global and
273 subscale level) and HADS Anxiety and Depression scores for girls ($r > 0.26$, $p \leq .001$ in all
274 cases). For boys, no significant relationships were found between EDE-Q Shape and Weight
275 Concerns, Restriction or global scores and HADS Depression scores ($r < 0.14$, $p > .01$).
276 However, a significant, positive relationship was found between EDE-Q Preoccupation and
277 Eating Concern scores and HADS Depression scores ($r = 0.22$, $p = .001$). Similarly,
278 significant, positive relationships were found between all EDE-Q scores and HADS Anxiety
279 scores ($r > 0.32$, $p < .001$).

280

281 The mediating roles of anxiety and depression in the relationship between Project-EAT 282 scores and EDE-Q global scores

283 Mediation analyses were only conducted where there were significant correlations
284 between: 1) a Project-EAT Mealtime score and EDE-Q global scores; 2) a Project-EAT
285 Mealtime score and either HADS Anxiety or Depression scores; and 3) HADS Anxiety or
286 Depression scores and EDE-Q global scores. In view of the absence of significant
287 relationships between the IV (Project-EAT Mealtime) and DV (EDE-Q global) for boys,
288 mediational analyses were only conducted for girls.

289

290 Mealtime frequency and eating psychopathology among girls

291 Project-EAT Mealtime Frequency negatively predicted EDE-Q global score ($\beta = -.17$,
292 $R^2 = .03$, $p = .004$). In addition, Project-EAT Mealtime Frequency negatively predicted HADS
293 Depression scores ($\beta = -.15$, $R^2 = .02$, $p = .007$). In the final regression analysis, the
294 relationship between the HADS Depression and the EDE-Q global was examined when
295 controlling for the Project-EAT Mealtime Frequency. HADS Depression positively predicted
296 EDE-Q global score ($\beta = .26$, $p < .001$). The final step was to examine the relationship
297 between Project-EAT Mealtime Frequency and EDE-Q global score when controlling for
298 HADS Depression. The relationship between Project-EAT Mealtime Frequency and EDE-Q
299 global score was still significant ($p = .013$), although the effect was lower, suggesting a

300 partial mediation. A Sobel test performed on this relationship found this partial mediation to
301 be significant ($Z = -2.12, p = .034$).

302

303 Mealtime priority and eating psychopathology among girls

304 Project-EAT Mealtime Priority negatively predicted EDE-Q global score ($\beta = -.24, R^2$
305 $= .06, p < .001$). Likewise, Project-EAT Mealtime Priority negatively predicted HADS Anxiety
306 levels ($\beta = -.19, R^2 = .04, p = .001$). The final regression analysis found that when controlling
307 for Project-EAT Mealtime Priority, HADS Anxiety positively predicted EDE-Q global score (β
308 $= .39, p < .001$). However, when controlling for HADS Anxiety the relationship between
309 Project-EAT Mealtime Priority and EDE-Q global score was still significant ($\beta = -.17, p =$
310 $.002$), but with a lower effect than in the second regression, suggesting a partial mediation.
311 The significance of this partial mediation was confirmed via a Sobel test ($Z = -2.80, p =$
312 $.005$).

313

314 Mealtime atmosphere, anxiety and eating psychopathology among girls

315 Project-EAT Mealtime Atmosphere negatively predicted EDE-Q global score ($\beta = -$
316 $.21, R^2 = .04, p = .001$). In addition, Project-EAT Mealtime Atmosphere negatively predicted
317 levels of HADS Anxiety ($\beta = -.31, R^2 = .10, p < .001$). A further regression analysis found
318 HADS Anxiety positively predicted EDE-Q global score when controlling for Project-EAT
319 Mealtime Atmosphere ($\beta = .41, p < .001$). However, when controlling for HADS Anxiety the
320 relationship between Project-EAT Mealtime Atmosphere and EDE-Q global score was no
321 longer significant ($\beta = -.09, p = .075$), highlighting a full mediational pathway.

322

323 Mealtime atmosphere, depression and eating psychopathology among girls

324 Project-EAT Mealtime Atmosphere was shown to negatively predict EDE-Q global
325 score ($\beta = -.21, R^2 = .04, p = .001$). In addition, Project-EAT Mealtime Atmosphere
326 negatively predicted levels of HADS Depression ($\beta = -.33, R^2 = .11, p < .001$). Next, HADS
327 Depression positively predicted EDE-Q global score when controlling for Project-EAT

328 Mealtime Atmosphere ($\beta = .23, p < .001$). At the final stage of the analysis, the relationship
329 between Project-EAT Mealtime Atmosphere and EDE-Q global score remained significant
330 when controlling for HADS Depression ($\beta = -.11, p = .045$), however again with a lower effect
331 which suggested a partial mediation. A Sobel test found this partial mediation to be
332 significant ($Z = -2.94, p = .003$).

333

334 In summary, the results of the mediational analyses conducted among girls indicate
335 that the relationship between Project-EAT Mealtime Frequency and EDE-Q global score is
336 partially mediated by HADS Depression. Similarly, the relationship between Project-EAT
337 Mealtime Priority and EDE-Q global score is partially mediated by HADS Anxiety.
338 Furthermore, the relationship between Project-EAT Mealtime Atmosphere and EDE-Q global
339 score is partially mediated by HADS Anxiety. However, the relationship between Project-
340 EAT Mealtime Atmosphere and EDE-Q global score is fully mediated by HADS Depression
341 levels, as shown in Figure 1.

342

343

Discussion

344 The aims of this study were twofold. First, to replicate and extend previous research
345 by Neumark-Sztainer and colleagues (2004) examining gender differences in the
346 relationship between characteristics of family mealtimes (frequency, atmosphere, structure
347 and priority) and disordered eating attitudes and behaviours in adolescents. Second, to
348 examine the mediating effect of anxiety and depression on the relationship between
349 mealtime characteristics and disordered eating attitudes. The findings of this study show a
350 significant inverse relationship between characteristics of family mealtimes (frequency,
351 priority and atmosphere) and disordered eating attitudes among girls. In addition,
352 mediational analyses revealed that several of these relationships were mediated partially or
353 fully by girls' anxiety and depression levels. These findings for girls, and the lack of
354 significant associations for boys, provide partial support for the study's first and second
355 hypotheses. However, despite the lack of significant relationships with disordered eating

356 attitudes among boys, significant negative relationships were found between all family
357 mealtime characteristics and levels of depression.

358

359 For girls, the significant relationships found in this study between aspects of family
360 mealtimes and disordered eating attitudes and behaviours provide partial support for
361 previous research examining the relationship between family mealtime characteristics and
362 unhealthy weight control behaviours (extreme and less extreme), binge eating with a loss of
363 control, and chronic dieting (Neumark-Sztainer et al, 2004). However, fewer significant
364 relationships were found between mealtime characteristics and disordered eating behaviours
365 in this study compared to the findings of Neumark-Sztainer and colleagues (2004), which
366 may be a reflection of the different measures used. For instance, the current study assessed
367 disordered eating behaviours occurring during the last 28-days whereas previous research
368 (Neumark-Sztainer et al., 2004) examined the occurrence of behaviours over a previous 12
369 month period, which may account for some of the differences, perhaps due to accuracy of
370 recall.

371

372 The findings from the current study and previous research (Fulkerson et al., 2007;
373 Neumark-Sztainer et al., 2004; Neumark-Sztainer et al., 2007; Neumark-Sztainer et al.,
374 2008) highlight associations between certain characteristics of family mealtimes and eating
375 psychopathology. However, the relationship between certain mealtime characteristics and
376 eating psychopathology may not be as direct as perhaps previously thought. The findings of
377 this study also suggest that for girls, anxiety and depression levels may play an important
378 role in the relationship. Specifically, the current findings highlight that family mealtime factors
379 may be more important in predicting eating psychopathology in girls who are also
380 experiencing low mood or symptoms of anxiety. The contribution of anxiety and depression
381 levels to the relationship between mealtime characteristics and disordered eating attitudes
382 reinforces the complexity of this relationship and the need to prioritise the promotion of
383 psychological well-being among girls.

384

385 For boys, family mealtimes were not found to be directly related to disordered eating
386 attitudes, and hence similar to previous findings (e.g., Neumark-Sztainer et al., 2007;
387 Neumark-Sztainer et al., 2008), family mealtimes may not have the same protective function
388 for eating psychopathology for boys. However, the significant relationships between family
389 mealtimes and depression again highlight the important role that family mealtimes may have
390 for adolescents' psychological well-being, particularly boys. Furthermore, research has
391 previously reported the emotional benefits of family mealtimes, with negative associations
392 reported between family mealtime frequency and depressive symptoms among adolescent
393 girls and boys (Eisenberg et al., 2004). Given that eating disorders are less prevalent in
394 adolescent males (Kjelsås, Bjørnstrøm & Gunnar Götestam, 2004), these results suggest
395 that family mealtimes might be more useful for buffering against boys developing low mood
396 by providing a forum within which to interact and discuss issues (Ackard & Neumark-
397 Sztainer, 2001).

398

399 It is plausible that family mealtimes provide a context in which adolescents learn
400 healthy dietary behaviours through modelling of eating behaviour (Larson, Neumark-
401 Sztainer, Hannan & Story, 2007; Palfreyman, Haycraft & Meyer, 2012). Additionally, family
402 mealtimes may help to build family relationships and provide an arena within which to
403 discuss any problems; both of which may subsequently help to promote psychological well-
404 being. However, even when controlling for family connectedness, the frequency of family
405 meals has been reported as a predictor of reduced disordered eating behaviours amongst
406 adolescent females (Neumark-Sztainer et al., 2008). This suggests that there may be other
407 features occurring during the family meal, possibly not related to the quality of family
408 relationships, which may also help to promote adolescents' psychological well-being.
409 Problem-focused coping has been highlighted as a mediator of the relationship between
410 family meal frequency and stress, drive for thinness and bulimic symptoms among
411 adolescent girls longitudinally (Franko, Thompson, Affenito, Barton & Striegel-Moore, 2008).

412 Therefore, one model might suggest that the strategies and skills developed during family
413 mealtimes might help to promote psychological well-being among adolescents, and which
414 might subsequently reduce eating psychopathology among girls.

415

416 This study is the first to replicate the research by Neumark-Sztainer and colleagues
417 (2004) and helps increase our understanding of the characteristics of family mealtimes within
418 a British sample. The sample size is good and was obtained from several counties within
419 England, which increases the generalisability of the findings. Furthermore, the inclusion of
420 individuals who reported seeking professional help or treatment for their eating behaviour in
421 addition to those who have not, creates a diverse sample in relation to eating
422 psychopathology (Fairburn & Beglin, 1994). Mediation analyses increase our
423 understanding about additional influencing factors within previously reported relationships,
424 such as mealtime atmosphere and disordered eating behaviour (Neumark-Sztainer et al.,
425 2004). This subsequently highlights potential protective pathways for further interventions to
426 target which may reduce eating psychopathology. However, while this study makes several
427 advances to the field it is limited by its cross-sectional design. In addition, mealtimes may be
428 experienced, and reported more negatively, by adolescents who report higher levels of
429 psychopathology (Fulkerson et al., 2007), especially characteristics such as mealtime
430 atmosphere which is a subjective emotional construct. The use of self-reported BMI data is a
431 limitation as this may result in inaccurate reporting and it is also noteworthy that BMI values
432 could not be calculated for around one third of the sample due to missing data. Given the
433 established links between BMI and eating psychopathology (e.g., Haycraft, Goodwin &
434 Meyer, 2013), future research would benefit from obtaining objective BMI measurements in
435 order that BMI can be accounted for in the analyses. Although the current sample was
436 geographically varied, the high proportion of white British participants limits the
437 generalizability of the findings. Significant racial differences have previously been reported in
438 relation to family mealtime frequency (Neumark-Sztainer et al., 2003) and hence further
439 research is needed to examine the relationships between mealtime characteristics with

440 eating psychopathology among a more ethnically diverse sample of adolescents.
441 Furthermore, participants were all recruited from state (not private) schools within the UK but
442 specific details of the socio-economic status (SES) of families was not assessed which could
443 further affect generalizability, particularly as differences in family meal frequency have also
444 been reported based on SES (Neumark-Sztainer et al., 2003).

445

446 Having identified the contributions of anxiety and depression to the relationship
447 between mealtime characteristics and eating psychopathology for girls, it would be beneficial
448 for future research to explore other environmental factors which might influence the
449 atmosphere at family mealtimes, including interactions between family members. In addition,
450 importance needs to be placed on understanding more about the role of family mealtimes for
451 young males, for whom they may be linked with lower levels of depression. The findings of
452 this study highlight the importance of encouraging families of adolescents to concentrate on
453 the quality and positivity of eating environments, in addition to the quantity of family meals,
454 which may help to promote adolescent psychological well-being, and a lower level of
455 disordered eating among girls. Information regarding the importance of family meals should
456 be disseminated via schools to help encourage more families to make the time to eat
457 together as a family.

458

459

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- 567

568 *Table 1: Mean values (and standard deviations) for Project-EAT mealtime, EDE-Q, and*
 569 *HADS scores for girls and boys, and Mann-Whitney U test of difference scores.*

	Girls	Boys	Mann-Whitney U- test (Z score)
Project EAT mealtime questions			
Frequency of family meals	5.17 (2.95)	5.02 (3.11)	0.53
Priority of family meals	2.75 (0.71)	2.80 (0.69)	0.71
Atmosphere at family meals	2.88 (0.70)	2.86 (0.72)	0.04
Structure/rules at family meals	2.53 (0.64)	2.58 (0.63)	1.02
EDE-Q			
Shape and Weight Concerns	2.82 (1.92)	0.87 (1.27)	11.71***
Restriction	1.92 (1.74)	0.63 (1.07)	9.79***
Preoccupation and Eating Concern	1.15 (1.29)	0.40 (0.85)	8.46***
Global	1.95 (1.51)	0.62 (0.92)	11.26***
HADS			
Anxiety	7.50 (4.28)	6.12 (4.11)	3.62***
Depression	4.10 (3.32)	4.26 (3.22)	0.91

570 *** $p \leq .001$

571 Project-EAT: Project Eating Among Teens, EDE-Q: Eating Disorder Examination
 572 Questionnaire, HADS: Hospital Anxiety and Depression Scale.

573

574 Table 2: One-tailed Spearman's rho correlations between Project-EAT family mealtime
 575 characteristics with EDE-Q and HADS scores, for girls ($n = 286$).

	Frequency	Priority	Atmosphere	Structure
EDE-Q – Attitudinal items				
Shape and Weight Concerns	-0.18***	-0.24***	-0.19***	-0.06
Restriction	-0.15**	-0.23***	-0.11	0.02
Preoccupation and Eating Concern	-0.10	-0.18**	-0.20***	0.04
Global	-0.18**	-0.24***	-0.20***	-0.01
EDE-Q – Behavioural items				
Dietary Restraint	-0.19***	-0.21***	-0.25***	-0.11
Objective Binge Eating Episodes	0.02	-0.08	-0.02	0.05
Self-induced Vomiting	-0.05	-0.11	-0.15**	-0.06
Laxative Misuse	0.02	-0.02	-0.09	0.00
Excessive Exercise	-0.14	-0.17**	-0.05	0.00
HADS				
Anxiety	-0.13	-0.19***	-0.31***	-0.02
Depression	-0.16**	-0.14	-0.33***	-0.07

576 ** $p \leq .01$, *** $p \leq .001$

577 EDE-Q: Eating Disorder Examination Questionnaire, HADS: Hospital Anxiety and
 578 Depression Scale.

579

580 Table 3: One-tailed Spearman's rho correlations between Project-EAT family mealtime
 581 characteristics with EDE-Q and HADS scores, for boys (n = 249).

	Frequency	Priority	Atmosphere	Structure
EDE-Q – Attitudinal items				
Shape and Weight Concerns	-0.04	-0.10	-0.05	0.05
Restriction	0.00	-0.01	0.04	0.06
Preoccupation and Eating Concern	-0.01	-0.11	-0.01	-0.02
Global	-0.05	-0.10	-0.04	0.04
EDE-Q – Behavioural items				
Dietary Restraint	-0.05	-0.06	-0.09	-0.03
Objective Binge Eating Episodes	-0.09	-0.15	-0.05	-0.01
Self-induced Vomiting	-0.03	-0.11	-0.02	-0.01
Laxative Misuse	-0.10	-0.18**	-0.06	0.02
Excessive Exercise	-0.06	-0.18**	-0.07	0.02
HADS				
Anxiety	-0.13	-0.26***	-0.15	-0.03
Depression	-0.33***	-0.30***	-0.36***	-0.17**

582 ** $p \leq .01$, *** $p \leq .001$

583 EDE-Q: Eating Disorder Examination Questionnaire, HADS: Hospital Anxiety and
 584 Depression Scale.

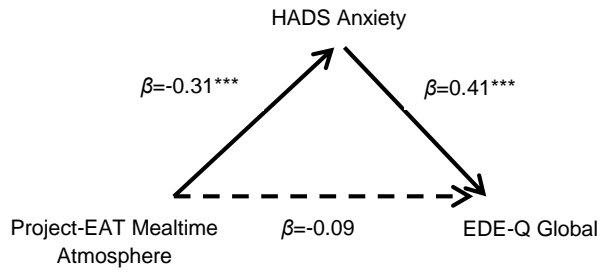
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590 * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

591 Figure 1: The full mediational pathway between Project-EAT Mealttime Atmosphere and

592 EDE-Q global scores, for girls, when controlling for HADS Anxiety.