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Abstract: Objectives: This longitudinal study examined potential predictors of disordered eating attitudes (DEA) for male and female dancers, with a particular focus on whether environmental predictors (perceptions of task- and ego-involving motivational climate) added significantly to the prediction made by intrapersonal predictor variables (demographics/training, self-esteem, perfectionism).
Methods and Design: Young dancers (N = 597, 73.4% female, M = 14.69 years old, SD = 2.04) from UK Centres for Advanced Training completed questionnaires 1-5 times over a two-year period, depending on how long they were enrolled at their centre. Multilevel modelling was employed to examine both between- and within-person predictors of DEA.
Results: For females, lower self-esteem and higher perfectionistic concerns were significant between-person predictors of DEA. Increased levels of perfectionistic strivings and perfectionistic concerns were significant within-person predictors. For males, increased perfectionistic concerns and perceptions of the motivational climate as more task- and ego-involving were significant between-person predictors of DEA. No significant within-person predictors emerged.
Conclusions: Findings contribute to the literature on DEA in aesthetic activities and the debate concerning the (mal-)adaptiveness of perfectionistic strivings. They also raise questions about how environmental aspects should best be conceptualized and measured in studies of this type. In particular, however, results demonstrate that the predictors of DEA among males and females may not be the same, and suggest that future interventions may therefore need to be sex-specific.

Highlights

- Predictors of disordered eating attitudes (DEA) differed for males and females
- Only perfectionistic concerns predicted DEA for both sexes
- For females self-esteem and perfectionistic strivings were additional predictors
- For males task- and ego-involving climate perceptions were additional predictors

06 July 2016

Kathleen Martin Ginis & Bernd Strauss
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Dear Editors,

Thank you for your recent email outlining your editorial decision (dated 14th June 2016) and invitation to submit a revision of our manuscript "*Within- and Between-Person Predictors of Disordered Eating Attitudes among Male and Female Dancers: Findings from the UK Centres for Advanced Training*".

We have carefully considered the recommendations made by Reviewer 1 and made changes accordingly. We hope that the revised manuscript satisfactorily addresses all comments.

Best wishes,



Sanna Nordin-Bates, PhD CPsychol
on behalf of all authors: Drs J. Schwarz, E. Quested, J. Cumming, I. Aujla, and E. Redding

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1 **Within- and Between-Person Predictors of Disordered Eating Attitudes among Male**
2 **and Female Dancers: Findings from the UK Centres for Advanced Training**

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Abstract

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6 **Objectives:** This longitudinal study examined potential predictors of disordered eating
7 attitudes (DEA) for male and female dancers, with a particular focus on whether
8 environmental predictors (perceptions of task- and ego-involving motivational climate) added
9 significantly to the prediction made by intrapersonal predictor variables
10 (demographics/training, self-esteem, perfectionism).

11 **Methods and Design:** Young dancers (N = 597, 73.4% female, M = 14.69 years old, SD =
12 2.04) from UK Centres for Advanced Training completed questionnaires 1-5 times over a
13 two-year period, depending on how long they were enrolled at their centre. Multilevel
14 modelling was employed to examine both between- and within-person predictors of DEA.

15 **Results:** For females, lower self-esteem and higher perfectionistic concerns were significant
16 between-person predictors of DEA. Increased levels of perfectionistic strivings and
17 perfectionistic concerns were significant within-person predictors. For males, increased
18 perfectionistic concerns and perceptions of the motivational climate as more task- *and* ego-
19 involving were significant between-person predictors of DEA. No significant within-person
20 predictors emerged.

21 **Conclusions:** Findings contribute to the literature on DEA in aesthetic activities and the
22 debate concerning the (mal-)adaptiveness of perfectionistic strivings. They also raise
23 questions about how environmental aspects should best be conceptualized and measured in
24 studies of this type. In particular, however, results demonstrate that the predictors of DEA
25 among males and females may not be the same, and suggest that future interventions may
26 therefore need to be sex-specific.

27 Within- and Between-Person Predictors of Disordered Eating Attitudes among Male and

28 Female Dancers: Findings from the UK Centres for Advanced Training

29 In the context of dance, the prevalence of disordered eating attitudes (DEA) has

30 received considerable research attention over the past few decades (for a review see Arcelus,

31 Witcomb, & Mitchell, 2014). Hobart and Smucker (2000) defined DEA as the presence of

32 unhealthy attitudes and behaviours that range from strict dietary habits, aimed at losing or

33 maintaining weight, to severe food restriction. On the basis of studies into prevalence,

34 numerous authors have concluded that dancers should be considered an at-risk group for

35 DEA (e.g., Arcelus et al., 2014; Ringham et al., 2006; Thomas, Keel, & Heatherton, 2005;

36 Tseng et al., 2007). However, relatively low rates of DEA have also been observed (de Bruin,

37 Bakker, & Oudejans, 2009; Toro, Guerrero, Sentis, Castro, & Puértolas, 2009). It is likely

38 that some of these inconsistencies can be explained by inadequate sample sizes, given that

39 some studies have included as few as 29 dancers (Ringham et al., 2006). Importantly,

40 examining rates of DEA can at best highlight potential problems, yet give little guidance as to

41 what might be suitable areas for intervention if those problems are to be prevented. Hence,

42 there is a need to move beyond questions of prevalence and toward a better understanding of

43 the *predictors* of DEA so that prevention, identification, and treatment can be optimised. In

44 the present study, we examined both intrapersonal (demographic/training and personality-

45 related) and environmental (dance motivational climate) variables as potential predictors of

46 DEA in dance contexts using a longitudinal design.

47 **Intrapersonal Predictors of Disordered Eating Attitudes: Demographic and Training**

48 **Variables**

49 Research into DEA in dance has predominantly focused on females and classical

50 ballet (see Arcelus et al., 2014). The focus on ballet may have been warranted because the

51 body ideal in this dance style is particularly strict and centered on slender, long-limbed pre-

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52 pubescent physiques. Classical ballet subculture has therefore at times been seen as a unique
53 risk factor, as it might encourage dancers to strive for a body ideal so slim that it for some
54 dancers may only be achievable via unhealthy eating practices (see e.g., Neumärker et al.,
55 1998; Toro et al., 2009). Similarly, the focus on females is unsurprising: most dancers are
56 female and they have been identified as having a greater risk of DEA (e.g., Neumärker,
57 Bettel, Bettel, Dudeck, & Neumärker, 1998; Sundgot-Borgen & Torstveit, 2004). Such
58 findings are typically explained using arguments that females experience stronger pressures
59 relating to appearance and slimness (e.g., Neumärker et al., 1998). Lately, however, it has
60 been argued that such pressures on males have increased, emphasizing the enhanced cultural
61 importance of a fit, muscular body (e.g., Petrie, Greenleaf, Carter, & Reel, 2007). Petrie et al.
62 (2007) also found that risk factors commonly associated with DEA for females were not
63 significant for male athletes. Furthermore, DEA may be constructed, viewed and disclosed
64 differently for male and female athletes (Busanich, McGannon, & Schinke (2014). In a recent
65 study of young dancers training in mixed dance styles, equal proportions of males (7.6%) and
66 females (7.3%) scored above clinical cut-off on a measure of DEA (Nordin-Bates, Walker, &
67 Redding, 2011). Extending the findings of Petrie et al. (2007), correlates of DEA were not the
68 same for males and females, with fewer correlates identified for males. Overall, it seems
69 important to continue identifying potential determinants of DEA for male dancers, and for
70 dancers in styles other than ballet (see also Krentz & Warschburger, 2013).

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71 In the study by Nordin-Bates, Walker et al. (2011), age was not predictive of DEA
72 within the 10-18 year old sample. This contrasts with research indicating that in non-dance
73 samples, the rate of DEA is positively related to age for girls (e.g., Gardner, Stark, Friedman
74 & Jackson, 2000; Jones, Bennett, Olmsted, Lawson, & Rodin, 2001). However, this may not
75 be the case for boys (Gardner et al., 2000). Discrepant findings like these suggest that studies
76 should continue to examine predictors such as age in an effort to build a more conclusive

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77 picture of their role as potential determinants of DEA. It would stand to reason that age can
78 act as a positive predictor of DEA, given that older dancers may have been impacted by risk
79 factors, in life but likely also in dance, for longer. At the same time, one might speculate that
80 dancers can grow more realistic as they mature and settle into their post-pubertal bodies. For
81 instance, they may realize that few bodies are “ideal” but that skills and experience can trump
82 pre-pubescent looks, and thereby reduce their DEA symptoms. In sum, the potential role of
83 age in predicting DEA is unclear yet potentially highly relevant, and we consequently chose
84 to include it in our models.

85 Dance-specific training-related variables, including hours of training, dance
86 experience and style, may also play a role in the development of DEA among dancers, simply
87 because training intensely from a young age in a domain where being lighter and slimmer is
88 often perceived to confer performance advantages may increase the risk of DEA (e.g.,
89 Sundgot-Borgen & Torstveit, 2004). Such intense training, alongside a focus on weight and
90 shape, is typical of high-level dance, but perhaps less so in more modern styles as compared
91 to classical ballet (e.g., Benn & Walters, 2001; Nordin-Bates, Walker et al., 2011; Tseng et
92 al., 2007; van Staden, Myburgh, & Poggenpoel, 2009). However, these potential predictors of
93 DEA have rarely been examined systematically. Hence, we also considered dance style,
94 years of experience and training hours as potential predictors of DEA.

95 **Intrapersonal Predictors of Disordered Eating Attitudes: Personality Variables**

96 Other than demographic or training-related variables, key intrapersonal variables
97 often related to DEA include the personality constructs perfectionism and self-esteem.
98 Several studies in dance and sport have confirmed that there is a negative relationship
99 between self-esteem and DEA (Berry & Howe, 2000; Engel et al., 2003; Petrie, Greenleaf,
100 Reel, & Carter, 2009), and interventions focused on enhancing performers’ self-esteem
101 appear to help prevent DEA development for females (e.g., Martinsen et al., 2014; Piran,

1999). Yet although self-esteem and perfectionism are understood to be related constructs (e.g., Hall, Hill, & Appleton, 2012), research findings conflict as to their relative predictive power as regards DEA. For example, self-esteem predicted DEA in a study with athletes but perfectionism did not (Petrie et al., 2009), but the opposite was found in a study with dancers (Nordin-Bates, Walker et al., 2011). In the present study, we aimed to extend such cross-sectional findings to a larger sample using a longitudinal design. This is important for the design of future preventive efforts so that they may focus on the variable(s) that are most central to DEA development. As the effectiveness of such interventions depends on reliable evidence, traditional cross-sectional studies may be insufficient given that they often focus exclusively on between-person differences. By also examining within-person differences, a better understanding of associations between variables may be gained. That is, we can understand whether variation in an independent variable (e.g., perfectionism, self-esteem) is associated with variation in a dependent variable (e.g., DEA) *for each individual*.

In the wider literature perfectionism is considered to predict both the development and maintenance of DEA (e.g., Fairburn, Cooper, & Shafran, 2003; Forsberg & Lock, 2006), and has also been one of the most studied risk factors for DEA in the dance literature (e.g., de Bruin et al., 2009; Nordin-Bates, Walker et al., 2011; Penniment & Egan, 2011; Thomas et al., 2005). Despite this research attention, however, studies have often relied on unidimensional measures of what is now firmly established to be a multidimensional construct (Hall et al., 2012). Although authors have used different terms for the dimensions of perfectionism, there is growing consensus that *perfectionistic strivings* may be used as an umbrella term for highly purposeful striving toward particularly challenging personal goals (such as excellence or perfection), whereas *perfectionistic concerns* comprise cognitions such as doubts, concerns, and rumination as well as a very critical attitude regarding mistakes (Gotwals, Stoeber, Dunn, & Stoll, 2012; Hall et al., 2012; Hill et al., 2004; Stoeber, 2012).

127 Studies commonly find that perfectionistic concerns predict maladaptive outcomes (e.g.,
128 burnout, anxiety), but the consequences of perfectionistic strivings are less clear. For
129 instance, some studies have found that perfectionistic strivings predict adaptive outcomes
130 such as good performance and well-being (Stoeber, 2012). Other research suggests
131 perfectionistic strivings to predict maladaptive outcomes, or to be unassociated with either
132 adaptive or maladaptive constructs (Gotwals et al., 2012; Hall et al., 2012).

133 Studies into perfectionism and DEA reflect the typical findings, with all of the most
134 recent studies having found that constructs akin to perfectionistic concerns predict DEA
135 (Goodwin, Arcelus, Geach, & Meyer, 2014; Nordin-Bates, Walker, et al., 2011; Shanmugam
136 & Davies, 2015). However, the perfectionistic strivings-DEA relationship remains unclear.
137 No studies to date have examined the role of both perfectionistic strivings and concerns as
138 predictors of DEA in a longitudinal design. It is important to do so, because each construct
139 has the potential to impact on a dancer's eating attitudes. First, perfectionistic concerns
140 involve worrying excessively and being highly self-critical. For a dancer, therefore, having
141 high levels of perfectionistic concerns may involve thoughts such as "I worry that if I do not
142 reduce my calorie intake, I will never be good enough to reach my performance goals", and
143 lead to dietary restraint or purging (see e.g., Brannan, Petrie, Greenleaf, Reel, & Carter,
144 2009). It is also possible that conflating thinness and success ("thin is going to win"; e.g.,
145 Krentz & Warschburger, 2013) may contribute to DEA for a dancer for whom success is very
146 important – that is, a dancer high in perfectionistic strivings.

147 As regards self-esteem, this could be expected to predict DEA negatively, as it likely
148 exerts a protective effect. For instance, a dancer would be less likely to act on pressures to be
149 thin if s/he does not feel that her entire self is defined by thinness or dance success (e.g.,
150 Brannan et al., 2009; Shanmugam, Jowett, & Meyer, 2013). Still, it can be noted that the
151 relationship between self-esteem and DEA-related variables in the literature outside of sport

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152 and dance is not entirely clear, and appears to differ between males and females (e.g.,
153 Furnham, Badmin, & Sneade, 2002). In the present study, we address a gap in the literature
154 regarding potential sex differences in the predictive power of self-esteem and perfectionism
155 via an investigation with young people in dance, a domain where perfectionistic tendencies
156 are relatively commonplace (e.g., Nordin-Bates, Cumming, Aways, & Sharp, 2011).

157 **Environmental Predictors of Disordered Eating Attitudes: the Dance Milieu**

158 Many have argued that the dance environment is implicated in DEA development by
159 being highly stressful, competitive and/or pressured (e.g., Benn & Walters, 2001; Thomas et
160 al., 2005; Toro et al., 2009; van Staden et al., 2009). Later studies concluded that it is the
161 learning experiences within the environment that matter (e.g., learning that thinness is
162 important; Annus & Smith, 2009; Penniment & Egan, 2011; Toro et al., 2009). These studies,
163 however, are difficult to compare due to the use of study-specific measures and varying
164 conceptualizations of the dance environment. A theoretically grounded approach to explore
165 the role of the learning environment is to adopt the lens of achievement goal theory (AGT;
166 Ames, 1992). AGT concerns the extent to which dancers perceive their training context to be
167 task- and/or ego-involving. A task-involving climate exists when individual improvement is
168 highly valued, leading to an emphasis on self-referenced learning, collaborative learning, and
169 equal valuing of all students. An ego-involving climate is said to be in evidence when
170 objective success is valued most highly; in such a climate, teachers often give
171 disproportionate recognition to talented students, encourage rivalries, and are more likely to
172 punish mistakes (Ames, 1992; Newton, Duda, & Yin, 2000). The power of motivational
173 climate perceptions to explain variability in a broad range of indices of well- and ill-being
174 and healthful functioning has been supported in dance studies, just as in sport. Broadly
175 speaking, perceptions of a task-involving climate have been associated with adaptive
176 characteristics and well-being indicators (e.g., satisfaction of basic psychological needs and

177 positive affect; Quested & Duda, 2009; 2010) whereas perceptions of an ego-involving
178 climate have yielded more maladaptive correlates such as anxiety and aspects of
179 perfectionistic concerns (e.g., Carr & Wyon, 2003; Nordin-Bates, Quested, Walker, &
180 Redding, 2012).

181 Findings such as those highlighted above make conceptual sense, because outcomes
182 such as anxiety and concern over mistakes may well develop when competition is
183 emphasised and mistakes punished (i.e., the climate is ego-involving). Dancers may also do
184 whatever it takes to get ahead of their peers when rivalry and results are in focus. De Bruin,
185 Bakker, and Oudejans (2009) used the term “competitive thinness” to describe what may
186 result when such climates are perceived in aesthetic activities. In their study of female
187 dancers and gymnasts, these authors found that having a stronger ego-orientation, and lower
188 perceptions of a task-involving climate, were predictive of dieting frequency. Additional
189 positive correlates of ego-involving motivational climate perceptions were use of pathogenic
190 weight control methods (e.g., vomiting), weight-related pressure from peers and coaches, and
191 perfectionism. Self-esteem was negatively correlated with ego-involving motivational climate
192 perceptions. By contrast, perceptions of task-involving motivational climates were positively
193 correlated with self-esteem and negatively correlated with weight-related pressure from peers
194 and coaches. On the basis of these results, de Bruin et al. (2009) concluded that task-
195 involving climates could be considered to exert a protective effect on DEA development. In
196 the present study, we extend their cross-sectional findings by studying these relationships
197 with both males and females, over a period of two years, and in a larger sample of
198 performers, to see whether motivational climate perceptions have predictive utility beyond
199 that of the more well-researched intrapersonal DEA risk factors (i.e., demographics/training,
200 self-esteem, and perfectionism). Another reason for this analytical choice was to add clarity
201 regarding DEA risk factors: that is, if only intrapersonal variables were predictive then

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202 interventions should presumably focus on individuals, while if environmental variables
203 predict DEA, such interventions could perhaps instead be aimed at dance teachers.

204 By using a longitudinal design, it was also possible to address whether changes in
205 predictor variables over time (i.e., changes in perfectionism and/or motivational climate
206 perceptions) would be associated with changes in DEA *within* an individual. To achieve our
207 aim, we studied dancers as part of a larger, multi-disciplinary talent development research
208 project with UK government-funded centres known as Centres for Advanced Training
209 (CATs; Aujla, Nordin-Bates, Redding & Jobbins, 2014). The CATs aim to provide high-
210 quality part-time dance training across England for young people with talent or “exceptional
211 potential”. Importantly, the sample included dancers aged 10-18 years, spanning the critical
212 developmental period for DEA development (e.g., Gardner et al., 2000; Jones et al., 2001).
213 We are aware of only a small number of studies in sport (e.g., Krentz & Warschburger,
214 2013), and none in dance, that have tracked young people and their scores on DEA as well as
215 key potential predictor variables over time.

216 Potential predictors of DEA were selected based on previous research and AGT
217 (Ames, 1992), with the aim of examining the relative predictive power of a range of relevant
218 variables. More specifically, our aim was to examine whether intrapersonal factors (i.e.,
219 demographics and training variables including age, training hours, dance experience and
220 style; and personality constructs perfectionism and self-esteem) were predictive of DEA, and
221 whether environmental factors (i.e., perceptions of motivational climate) added significantly
222 to this prediction. As well as between-person differences, we were interested in investigating
223 whether varying levels of these predictors within an individual co-varied significantly with
224 changes in DEA, and whether predictors differed for males and females. It was hypothesized
225 that DEA would be positively predicted by (1) indicators of intense dance involvement such
226 as hours of training, and/or years of dance experience; (2) perfectionistic concerns; (3)

227 perceptions of an ego-involving motivational climate. We further hypothesized that DEA
 228 would be negatively predicted by (4) self-esteem, and (5) perceptions of a task-involving
 229 motivational climate. No specific hypotheses were formulated in relation to perfectionistic
 230 strivings, given the inconsistency of the research literature in this area. Generally, our
 231 hypotheses were created from the best available evidence. Yet, this evidence base is built
 232 mostly from studies with females. Thus, it was also hypothesized that (6) the significant
 233 predictors of DEA would differ for males and females. We made no more specific hypotheses
 234 regarding age or sex differences, however, given the limited and at times inconsistent
 235 previous research available to do so.

236 **Methods**

237 **Participants**

238 A total of 752 dancers completed identical packs of questionnaires at one or more
 239 time points; however, the analyses used required complete data in order for a particular time
 240 point to “count”, reducing the effective sample size to 597 (see Table 1). All students
 241 enrolled at one of the eight participating CATs were invited to take part at each time point,
 242 however students entered and left the scheme throughout the research period. For more
 243 information on sample size, see Tables 1 and 2. Overall, females comprised 73.43% of the
 244 sample, and dancers ranged between 10 and 18 years of age. At the start of the project, the
 245 average age was 14.69 years ($SD = 2.04$) and the dancers had typically attended a CAT for a
 246 little over one year, although the standard deviation was large ($M = 15.40$ months, $SD =$
 247 15.52). The dancers had taken part in some form of dance for an average of 8.86 years ($SD =$
 248 3.73).

249 The eight CATs are located in UK cities and provide extra-curricular, high-level
 250 dance training for young people. One CAT focuses on ballet and five focus on contemporary
 251 dance; one offers training in either contemporary or South Asian styles, and one offers urban

252 and contemporary strands. However, all students take classes in more than one style. At time
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2 253 1, self-report data indicated that dancers participated in weekly CAT training for an average
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4 254 of 8.81 hours ($SD = 3.72$), training in other dance schools for 5.49 hours ($SD = 5.89$), and
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7 255 undertook non-dance physical activity for 3.45 hours ($SD = 3.28$).

256 **Measures**

257 **Demographics and Training Data.** Participants were asked to note their sex, age,
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14 258 dance experience (months in CAT and years in dance) and training habits for various styles
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17 259 of dance and non-dance physical activities (hours per week in CAT, non-CAT dance schools,
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19 260 sport, exercise and other physical activities). Their primary dance style was inferred by their
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22 261 belonging to a CAT specializing in a particular style (contemporary, classical ballet, South
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24 262 Asian dance, or urban styles).

263 **Disordered eating attitudes.** To capture attitudes and behaviors related to disordered
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29 264 eating, we employed the Eating Attitudes Test (EAT-26; Garner, Olmsted, Bohr, &
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31 265 Garfinkel, 1982). The scale comprises 26 items falling into three subscales (Dieting, Bulimia
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34 266 and Food Preoccupation, and Oral Control), scored on a scale ranging from 0 (*never, rarely,*
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36 267 *or sometimes*) to 3 (*always*) where interim anchors are 1 (*often*) and 2 (*very often*). A score \geq
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39 268 20 is used as a clinical cut-off, beyond which dancers were referred for further investigation
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41 269 of suspected disordered eating (Garner et al., 1982). Validity and reliability information has
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44 270 been published for the EAT-26 (Garner et al., 1982). In the present study, not all items were
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46 271 internally consistent within their subscales. Only the Dieting subscale consistently yielded a
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48
49 272 good score ($\alpha = .82 - .86$). To improve reliability, it was necessary to remove items 9 and 26
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51 273 from the Bulimia and Food Preoccupation subscale, and items 2 and 19 from the Oral Control
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53 274 subscale, leaving four and five items, respectively. Following these changes, scores were
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56 275 more acceptable ($\alpha = .60 - .73$ depending on time point). The percentage of dancers scoring
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58 276 above clinical cut-off was computed using all items; thereafter internally consistent subscales
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277 were calculated and used to compute a total score for use in analyses. Use of only the main
278 scale for analyses has a precedent in performance research, because the original factor
279 structure of the EAT-26 has not consistently been replicated in such settings yet the measure
280 remains one of the most frequently employed (Doninger, Enders, & Burnett, 2005; Krentz &
281 Warschburger, 2011; Lane, Lane, & Matheson, 2004).

Perfectionism. To capture perfectionism, the Perfectionism Inventory (PI; Hill et al.,
2004) was used. However, the scale was slightly amended for use in a dance context (see
Nordin-Bates, Walker, et al., 2011). This dance-specific PI comprises 51 items and seven
subscales, that were used as proxies for perfectionistic strivings (Striving for Excellence,
Planfulness, High Standards for Others) and perfectionistic concerns (Concern over Mistakes,
Need for Approval, Teacher Pressure, and Rumination), given that these are the dimensions
of perfectionism currently most agreed upon as useful units of analysis (e.g., Gotwals et al.,
2012; Stoeber, 2012). Items are rated on a Likert scale ranging from 1 (*strongly disagree*) to
5 (*strongly agree*). The authors of the PI (Hill et al., 2004) published validity and reliability
information for the scale. Although psychometric testing has not yet been performed for the
dance-specific version of the PI, it is worth noting that Cronbach's alpha statistics are, at all
time points, similarly high in the present study ($\alpha = .75 - .89$) as they were in a previous study
using the adapted scale (Nordin-Bates, Walker, et al., 2011).

Self-Esteem. To capture dancers' attitudes toward themselves, the Rosenberg self-
esteem scale (RSES; Rosenberg, 1965) was used. The RSES comprises 10 items scored on a
Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Half of the items are
reverse-coded. Blascovich and Tomaka (1991) published support for the validity and
reliability of the RSES and in the present study, internal reliability was very good ($\alpha = .82 -$
.87 depending on time point).

301 **Motivational Climate.** To capture motivational climate perceptions, the Perceived
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2 302 Motivational Climate in Sport Questionnaire – 2 (PMCSQ-2; Newton et al., 2000) was used.
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4 303 As for the PI, we used a version of the questionnaire that has been slightly modified for the
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6 304 dance context (see Quested & Duda, 2009, 2010). This 24-item version comprises five
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8 305 subscales capturing perceptions of a task-involving climate (i.e., a focus on Effort and
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10 306 Improvement, Cooperative Learning, and everybody having an Important Role in the group)
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12 307 and an ego-involving climate (i.e., there being Unequal Recognition based on ability, and
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14 308 Punishment for Mistakes). Items are scored on a Likert scale ranging from 1 (*strongly*
15
16 309 *disagree*) to 5 (*strongly agree*). The authors of the PMCSQ-2 (Newton et al., 2000) published
17
18 310 validity and reliability information for the scale, and the dance-specific version has been
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20 311 found adequate (Nordin-Bates et al., 2012; Quested & Duda, 2009; 2010). In the current
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22 312 study, internal reliability scores were generally good ($\alpha = .71 - .93$) but the Cronbach's alpha
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24 313 for the subscale Punishment for Mistakes was improved by deletion of the item "*Dancers are*
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26 314 *afraid to make mistakes*" ($\alpha = .71 - .81$ instead of $.64 - .74$).
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34 315 **Procedures**

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36 316 As part of a larger project, the present study acquired approval from a University
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38 317 ethical review board. Study information was provided and informed consent obtained from
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40 318 all dancers and from parents for participants under 16. Questionnaires were completed in
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42 319 group sessions led by at least one researcher, with a request that teachers should not be
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44 320 present. Questions were encouraged and anonymity clarified: specifically, dancers were
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46 321 assigned individual ID codes to enable matching of data over time, precluding the need for
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48 322 names on the questionnaires. The first data collection took place in winter 2008-2009 and the
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50 323 fifth in winter 2010-2011, with intermediate data collections being scheduled as close to
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52 324 every six months as possible.
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58 325 **Data Analysis**

326 Data were first screened for inputting errors and normality. Not all variables were
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2 327 normally distributed; in particular, scores on the EAT-26 exhibited negative skew (1.98 -
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4 328 2.91). However, this pattern is expected when a questionnaire for which normal, healthy
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7 329 responses yield a score of zero is used in a non-clinical population. Although most studies
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10 330 using the EAT-26 appear to use the “raw” data, we opted to log-10 transform scores, which
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12 331 improved the distribution (.14 - .33). Importantly, this was only an added precaution because
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14 332 multilevel modelling does not require variables to be univariate or multivariate normal;
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17 333 instead, it is the normal distribution of the residuals that is of importance (Rabe-Hesketh &
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19 334 Skrondal, 2008). This distribution was therefore inspected for the final models, post-analyses.

22 335 A combination of statistical methods was used to analyse the data. First, descriptive
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24 336 statistics were calculated using SPSS to gain an overview of the variables, including the
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27 337 levels (low/high) of various constructs (see Table 1). Our main study aim, to investigate
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29 338 whether a range of intrapersonal variables were predictive of DEA, and whether
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31
32 339 environmental variables contributed significantly to this prediction, was examined via
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34 340 multilevel modelling (MLM; Multilevel mixed-effects linear regression) using the procedure
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36 341 mixed in STATA 13.1 with a random intercept for individual. Approximately half of the total
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39 342 sample participated at more than one time point, but only a small proportion contributed
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41 343 complete data at all five time points over the two years. On average, both males and females
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44 344 contributed data at 1.8 time points; see Table 2 for details of the number of participants
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46 345 contributing complete data 1, 2, 3, 4 and 5 times.

48 346 Usefully, MLM can accommodate unbalanced datasets; that is, the method does not
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51 347 presume that all participants contribute to each time point in a longitudinal design, but rather
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53 348 makes use of all available data at each time point to form estimates (Rabe-Hesketh &
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56 349 Skrondal, 2008). Note, however, that participants whose data was incomplete at a specific
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58 350 time point were excluded from analyses of that time point. In order to investigate whether
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351 between- as well as within- person changes in a predictor variable were associated with
1
2 352 changes in DEA, we applied a procedure to separate between- and within- participant effects
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5 353 (Hoffman & Stawski, 2009; van de Pol & Wright, 2009). Each predictor was therefore
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7 354 person-mean centred resulting in (i) a time-invariant covariate that contains the person-
8
9 355 specific mean and (ii) a time-varying predictor, that is calculated by subtracting the person
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11 356 mean from the original covariate. The time-constant person mean is used to capture whether
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13 357 individuals with scores on a predictor that are, on average, higher would also report different
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15 358 DEA scores compared to the wider sample (between-person effect). The time-varying
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17 359 predictor is used to address whether change in a predictor is associated with changed DEA
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19 360 scores, for each individual (within-person effect).
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24 361 Separate models were run for females and males. In the first set of models,
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26 362 relationships between DEA and self-esteem, perfectionism, training hours (both between- and
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28 363 within-participant effects) were evaluated by entering them as predictors (fixed effects). In
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30 364 reality, individuals were nested within CATs. Due to the limited number (N = 8) of CATs,
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32 365 however, dummy variables were included in the fixed part of the model instead of using
33
34 366 nested models. Using a CAT focusing on ballet as reference was a way of modelling any
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36 367 differences between CATs due to dance style, because most other CATs focus on
37
38 368 contemporary dance (i.e., all non-ballet groups were compared to the ballet reference group).
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40 369 All analyses were adjusted for age at wave1, time, and dance experience. Dance experience
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42 370 was addressed using dummy variables for months in the CAT (< 1 year as reference; < 2
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44 371 years; > 2 years) and years in any form of dance (< 6 years as reference; < 11 years; > 11
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46 372 years). Categorization was preferred to using years of experience as continuous variables,
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48 373 because data were non-normally distributed. An autoregressive residual structure was chosen
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50 374 to account for the longitudinal setup.
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375 Next, we added perceptions of the task- and ego- involving features of the
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 2 376 motivational climate to the models in order to test whether these environmental variables
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 4 377 significantly contributed to model fit. Comparisons of models 1 and 2 were conducted by
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 7 378 fitting both models using maximum likelihood, and applying maximum likelihood testing. In
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 9 379 addition, the model fit was evaluated using Akaike's Information Criterion (AIC; Akaike,
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 11 380 1974), which is a model fit criterion that penalizes for the loss of parsimony due to adding
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 13 381 more parameters. A smaller AIC indicates a better model fit.
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382 Results

383 Descriptive Statistics

384 In Table 1 means and standard deviations for variables are displayed for each time
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 22 384 point, by sex. Dancers reported fairly high levels of self-esteem, moderate perfectionism, and
 23
 24 385 generally low but varied levels of disordered eating attitudes. Between 1.75% and 7.94% of
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 26 386 the sample scored above clinical cut-off on the EAT-26, depending on time point. Dancers
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 28 387 reported their perceptions of the prevailing motivational climate as highly task-involving and
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 30 388 low in ego-involving features.
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390 Multilevel Modelling: Predicting Disordered Eating Attitudes

391 For females, the likelihood-ratio test indicated that model 2, which included the
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 39 391 climate perception variables, did not improve model fit compared to model 1 (Likelihood
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 41 392 ratio test: $\chi^2(4) = 1.89, p = 0.76$; AIC for model 1 = 679.63; for model 2 = 685.74). Thus, in
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 43 393 the case of females, the results of model 1, fitted with restricted maximum likelihood, are
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 45 394 presented. As shown in Table 3, significant between-person effects for self-esteem ($z = -3.80,$
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 47 395 $p < .01$), and perfectionistic concerns ($z = 4.72, p < .01$) indicate that DEA is, on average,
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 49 396 higher when self-esteem is lower and perfectionistic concerns higher. Significant within-
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 51 397 person effects indicated that when females report higher perfectionistic strivings ($z = 2.79, p$
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399 < .01) or higher perfectionistic concerns ($z = 3.04, p < .01$) at one time point compared to
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3 400 their person-mean, they also display higher DEA scores at that time.

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5 401 Contrastingly, for males, the likelihood-ratio test indicated that model 2 significantly
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7 402 improved model fit compared to model 1 (Likelihood ratio test: $\chi^2(4) = 16.64, p < 0.01$;
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9 403 AIC for model 1 = 208.37; for model 2 = 199.73). Thus, the results of model 2, fitted with
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11 404 restricted maximum likelihood, are presented. As shown in Table 4, these results indicated
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13 405 only one similarity to the females: that higher levels of DEA are reported by dancers who
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15 406 also exhibit greater perfectionistic concerns ($z = 2.68, p < .01$). Male dancers who perceived
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17 407 their motivational climate to be more task-involving ($z = 2.42, p < .05$) or more ego-involving
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19 408 ($z = 3.18, p < .01$) than their peers also reported higher DEA scores. Finally, two dummy
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21 409 variables reached significance ($z = -3.67$ and -3.43 , both $p < .01$). These dummies both
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23 410 represented CATs focused on contemporary dance training; thus, male students in these
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25 411 centres reported significantly lower DEA than males in the reference CAT, that was focused
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27 412 on classical ballet. No significant within-person predictors emerged for males.
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33 413 Discussion

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36 414 The aim of the current study was to examine intra- and environmental predictors of
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38 415 disordered eating attitudes (DEA) in a sample of young dancers, using data spanning five
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40 416 time points over two years. Both within- and between-person effects were examined. It
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42 417 emerged that the predictors differed for males and females, with only perfectionistic concerns
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44 418 being a common predictor of DEA for dancers of both sexes. For females, a model including
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46 419 only intrapersonal predictor variables provided a better fit to the data than a model that also
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48 420 included environmental aspects (motivational climate perceptions). Also, none of the
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50 421 demographic or training-related variables emerged as predictive. In contrast, a model
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52 422 including both intrapersonal (training- and personality-related) and environmental aspects
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423 (motivational climate perceptions) provided the best fit to the data for males. Findings
424 relevant to the specific predictor variables examined will now be discussed in turn.

425 We examined a range of demographic and training-related variables including age,
426 dance experience and style, and training hours as potential predictors of DEA. Of all these
427 variables, only dance style was predictive, and only for some males. Specifically, males in
428 classical ballet training reported significantly higher DEA scores than males in two of the
429 centres with contemporary dance training. Thus, our hypothesis relating to dance style was
430 marginally supported. Sex was also a notable differentiating factor, with the separate models
431 clearly demonstrating that predictors of DEA may differ for young males and females. This
432 was as hypothesized, and extends our earlier cross-sectional work with an overlapping
433 sample (Nordin-Bates, Walker, et al., 2011). It also highlights the importance of further
434 research into DEA development among males, which is considerably behind that of females.
435 For instance, it would be interesting to examine further the potential importance of dance
436 style. It has previously been argued that classical ballet subculture in itself represents a risk
437 factor for DEA (Neumärker et al., 1998; Toro et al., 2009); however, in those studies females
438 were in focus. In doing so, it would also be important to specify clearly what it is about
439 classical ballet which conveys risk.

440 Beyond sex and dance style, even the non-significant findings regarding demographic
441 and training-related variables may be worthy of discussion. For instance, the dance and
442 physical activity habits of these young people did not appear to constitute risk factors for
443 DEA, as we initially hypothesized. That is, dancers in a range of styles, including females in
444 classical dance who had over 10 years of dance experience and reported intense involvement
445 in both dance and other forms of physical activity, were no more likely to report symptoms of
446 DEA than dancers in modern, urban and South Asian styles who reported only a few months
447 or years of dance experience and who participated only a few hours weekly. As such, it

1 448 appears that intense involvement in dance is not necessarily a causal risk factor for DEA, and
2 449 we agree with authors such as Annus and Smith (2009) and Anderson, Petrie, and Neumann
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4 450 (2012) that it is the perceived body and appearance related pressures in an environment –
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7 451 rather than just participation – which is likely to be important.
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10 452 Specifically regarding age, we found that within the 10-18 age range studied, younger
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12 453 and older dancers appeared equally likely to exhibit DEA. Previous literature is inconsistent
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14 454 as regards age; for instance, Jones et al. (2001) found age to predict DEA in a sample of
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17 455 females aged 12-18, and Gardner et al. (2000) found that age predicted DEA for girls, but not
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19 456 boys, in a sample aged 6-14. In light of such inconsistencies, consideration of the role of age
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22 457 should be a focus in future studies of DEA. In particular, age may be confounded with other
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24 458 potential DEA predictors such as pubertal development, and it may be hypothesized that for
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27 459 girls, pubertal developments are perceived as less desirable for a dance career (e.g.,
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29 460 development of breasts and rounding of hips) than they are for boys (who typically develop
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32 461 greater muscularity). A second consideration is that age might be related to DEA in a non-
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34 462 linear fashion, and thus require other analysis methods than those used here; for instance, age
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37 463 might positively predict DEA up to a point (e.g., around puberty), after which it predicts
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39 464 DEA negatively (e.g., as a consequence of maturing). It may also be that the age range
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41 465 studied here was too narrow, and that a wider band around each side of puberty would reveal
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44 466 different effects. Whatever the case, the current results suggest that dance educators should
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46 467 be mindful of signs of DEA among dancers as young as 10, even if they are rare.
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49 468 Both self-esteem and perfectionism emerged as additional intrapersonal DEA
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51 469 predictors, yet in differing ways; as such, the findings both aligned with and contradicted our
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54 470 stated hypotheses. Specifically for females, perfectionistic concerns acted as both a between-
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56 471 and within-person predictor, whereas self-esteem was a between-person predictor and
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58 472 perfectionistic strivings a within-person predictor. For males, only perfectionistic concerns
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473 emerged as significant among the personality-related predictors, and did so only at the
474 between-person level. These findings extend previous literature where the relative predictive
475 powers of self-esteem and perfectionism have been unclear (Nordin-Bates, Walker, et al.,
476 2011; Petrie et al., 2009), and suggest that both may be considered concurrent risk factors, or
477 warning signs, of DEA for females. Findings also cast some doubt on whether even the
478 successful interventions published in this area, which typically focus on enhancing self-
479 esteem (e.g., Martinsen et al., 2014; Piran, 1999), are likely to be equally effective for males,
480 given that self-esteem was not a significant predictor of DEA for them. Non-sport literature
481 similarly suggests that the role of self-esteem in DEA is complex and varies by sex (e.g.,
482 Furnham et al., 2002); clearly, further research into this intriguing issue is warranted.

483 Our findings also suggest that interventions targeting DEA may benefit from
484 inclusion of material (e.g., information, exercises, or other therapeutic content) concerning
485 perfectionism. In particular, such material should consider the differences between
486 perfectionistic strivings and concerns, and the extent to which it is possible to strive for
487 perfection without worrying unduly when it is not reached. Indeed, such a programme may be
488 more universally appropriate, given that perfectionistic concerns was the only DEA predictor
489 that was common to both sexes. To date, we are not aware of any such programs in dance or
490 sport. In a school setting, however, an eight-lesson intervention targeting perfectionism has
491 been found to reduce eating disorder risk, especially for high-risk participants (Wilksch,
492 Durbridge, & Wade, 2008).

493 The findings relating to perfectionism also add to the growing literature indicating
494 that perfectionistic concerns are typically associated with maladaptive outcomes, and to the
495 more inconsistent literature regarding perfectionistic strivings (Gotwals et al., 2012; Hall et
496 al., 2012; Stoeber, 2012). Even though it has been found that perfectionistic strivings are
497 variously associated with adaptive, maladaptive, and null findings, this evidence is primarily

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498 based on between-person comparisons from cross-sectional studies. By analyzing both
499 between- and within-person effects, it emerged that for female dancers, having higher
500 perfectionistic strivings than others was not associated with DEA, yet dancers reported more
501 DEA during periods when they reported an increased striving for perfection, in comparison to
502 themselves. Though using a different analytical approach, this finding is similar to that of
503 Krentz and Warschburger (2013), who found that the desire to be leaner to improve sports
504 performance was predictive of disordered eating one year later.

505 It is noteworthy that increases in *both* perfectionistic strivings and concerns were
506 within-person predictors of changes in DEA among females. This finding contrasts with
507 suggestions that perfectionistic strivings may only be maladaptive when accompanied by
508 concerns (Stoeber, 2012). Instead, our results are more aligned with the view that even
509 “positive” forms of perfectionism may ultimately be founded on an unhealthy and pressured
510 form of motivation (e.g., Hall et al., 2012). The results are also in line with research
511 suggesting that athletes may develop DEA as part of a striving for performance enhancement,
512 following maladaptive cognitions and beliefs such as “thin is going to win” (Krentz &
513 Warschburger, 2013). Worth considering here are also findings from Boone, Soenens,
514 Vansteenkiste and Braet (2012), who experimentally induced participants to higher personal
515 standards (akin to perfectionistic strivings), a combination of personal standards and
516 evaluative concerns (akin to perfectionistic concerns), or non-perfectionism. It was found that
517 for both perfectionism groups, DEA symptoms (restraint and bingeing) were elevated during
518 a 24-hour period after the induction procedure. The authors concluded that perfectionism is a
519 causal risk factor for DEA.

520 Findings suggest that identifying *why* and *how* performers increase their
521 perfectionistic tendencies is of paramount importance. In the present study, there were far
522 greater between- than within-person differences, supporting general psychology literature that

1 523 perfectionism is a largely stable personality construct (e.g., Rice & Aldea, 2006). However,
2 524 recent research indicates that perceptions of the motivational climate as task-involving may
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4 525 heighten dancers' perfectionistic strivings over a six-month time period (Nordin-Bates, Hill,
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7 526 Cumming, Aujla, & Redding, 2014). Future research might consider whether particularly
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9 527 stressful times, such as performance seasons or assessment periods, are associated with
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11 528 increased perfectionism for dance and sport performers, and the potential impact on outcomes
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13 529 such as DEA. In education, Sassaroli and Ruggiero (2005) have demonstrated that stress can
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15 530 indeed bring out an association between predisposing factors such as perfectionism and
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17 531 disordered eating symptoms.

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21 532 Many have suggested that the behaviours of teachers or other aspects of the dance
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23 533 environment are implicated in DEA development (Ackard et al., 2004; Annus & Smith, 2009;
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25 534 Benn & Walters, 2001; de Bruin et al., 2009; Penniment & Egan, 2011; Thomas et al., 2005;
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27 535 Toro et al., 2009; van Staden et al., 2009). However, none of these studies had confirmed the
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29 536 existence of such a relationship using a theory-driven, longitudinal design. We opted to use a
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31 537 conceptualization of environmental influence based in AGT (Ames, 1992), and captured
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33 538 dancers' perceptions of the prevailing motivational climate. Contrary to suggestions based in
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35 539 correlational work (de Bruin et al., 2009) and to our hypothesizing, it was found that no
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37 540 additional predictive power was afforded by including these variables in our analytical model
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39 541 for females. Similarly, Krentz and Warschburger (2013) found that social pressure did not
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41 542 reach significance as a predictor of disordered eating in their longitudinal study with aesthetic
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43 543 athletes; however, sample size did not allow distinction between males and females in their
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45 544 analyses.

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47 545 In our analyses environmental variables, in the form of motivational climate
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49 546 perceptions, did significantly predict DEA for males. First, we noted that male dancers who
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51 547 perceived their learning environment to be more ego-involving also reported greater DEA
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1 548 which is in line with previous theorizing and research using AGT (e.g., de Bruin et al., 2009),
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3 549 and confirmed our hypothesis. Indeed, it stands to reason that if mistakes are punished or
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5 550 teachers treat students unequally, dancers may resort to extreme measures to get seen and get
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7 551 ahead. Previous studies have also shown males to be lower in task orientation (e.g., Duda,
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9 552 Olson, & Templin, 1991), and to perceive their environment as more ego-involving than
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11 553 females (e.g., Miller, Roberts, & Ommundsen, 2004). This may suggest that ego-involving
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13 554 cues in the dance environment are more salient for males, and hence, their attitudes towards
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15 555 DE may be more readily influenced, if DE is perceived as a potential method to outperform
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17 556 others. Females on the other hand, may be somewhat buffered from the impact of ego-
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19 557 involving motivational climate cues upon DEAs on account of a typically stronger task
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21 558 orientation. This interpretation is speculative, however, and worthy of future research
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23 559 attention.

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29 560 Quite contrary to the theoretically aligned findings for ego-involving climates, and
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31 561 therefore also disconfirming our hypothesis, was the discovery that male dancers who
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33 562 perceived their learning environment to be more task-involving also reported greater DEA.
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35 563 As such, this finding requires some discussion. One potential explanation relates to the
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37 564 conceptualization and measurement of motivational climates. Specifically, we note that
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39 565 within the PMCSQ-2 (Newton et al., 2000), aspects of task-involving climates are captured
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41 566 via items such as “dancers feel successful when they improve” and “dancers are encouraged
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43 567 to work on their weaknesses”. Although they appear mostly benign (and very common), it
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45 568 might be that an excessive focus on progress and/or weakness is troublesome – especially for
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47 569 perfectionists who have low tolerance for others pointing out what they cannot do. Thus,
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49 570 though surely not the purpose of the PMCSQ-2, it remains possible that teachers who
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51 571 publically point out students’ mistakes and flaws become rated as highly task-involving even
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53 572 if their behaviours are felt to be pressurising.
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573 Carr and Wyon (2003) gave a similar interpretation following their result that
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2 574 dancers' task-involving climate perceptions positively predicted worry, speculating that "*It*
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4 575 *may be that when factors such as personal improvement are highly emphasized then*
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7 576 *individuals begin to develop a tendency to over-concern themselves with their ability to*
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9 577 *consistently improve and demonstrate personal progression, resulting in debilitating*
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11 578 *worries.*" (p. 112). Although the present study revealed no significant positive correlations
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13 579 between task-involving climate perceptions and either perfectionistic strivings or concerns at
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15 580 the bivariate level, such basic analyses may not be adequate in detecting relationships
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17 581 between these constructs. Indeed, the above noted study by Nordin-Bates et al. (2014),
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19 582 derived from the same cohort as the present study, found that task-involving climate
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21 583 perceptions predicted increases in perfectionistic strivings over time. In that same study, more
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23 584 perfectionistically concerned dancers perceived their motivational climate as becoming more
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25 585 ego-involving and less task-involving than their less perfectionistic peers (see also Penniment
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27 586 & Egan, 2011).

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34 587 In sum, the present way to capture potential environmental impacts on DEA may not
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36 588 be ideal. Future work is required to establish whether other conceptualizations or
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38 589 measurement approaches to teacher or peer behaviors, motivational climates, or other
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40 590 environmental aspects are better suited to understanding how performance environments may
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42 591 contribute to, or prevent, DEA development. One promising approach is based in self-
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44 592 determination theory (Ryan & Deci, 2000) and focuses on the study of controlling leadership;
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46 593 in fact, one cross-sectional study has demonstrated significant relationships between
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48 594 perceptions of controlling coach behaviours, psychological need thwarting, and DEA in sport
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50 595 (Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011).

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56 596 The relative stability of many of the study variables across time highlights one of the
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58 597 difficulties inherent in studying disordered eating development. Further longitudinal work,
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598 ideally over longer time scales, is clearly warranted; moreover, qualitative enquiry can aid a
599 deeper understanding (Papathomas & Lavalley, 2012). Other limitations of the present study
600 are also worth noting. First, only a small sub-set of dancers provided complete data at all five
601 time points, despite the study spanning two years and five data collections, with highly
602 committed dance centres who went out of their way to clear schedules for data collections.
603 The limited number of participants across all time points was partly alleviated, however, by
604 use of a statistical method that uses all available data points to model results; as such, we
605 believe that the relatively large sample size and longitudinal nature of the work, which
606 allowed examination of both between- and within-person effects, could be considered
607 strengths. At the same time, the choice to consider between- and within-person effects led us
608 to avoid examining potential moderator effects. It can be noted that such effects have been
609 demonstrated in studies examining between-person differences in disordered eating (e.g.,
610 Brannan et al., 2009), and this line of research certainly warrants extension.

611 In line with much previous literature in related domains, we used the EAT-26 (Garner
612 et al., 1982); however, this was not originally developed for use with children and use of a
613 child-specific scale (e.g., the ChEAT; Maloney, McGuire, & Daniels, 1988) may have been
614 preferable for our youngest participants. The questionnaires used were as relevant and dance-
615 specific as possible and in the present study their psychometric properties were supported.
616 However there are still no validated measures developed specifically for the domain of dance
617 targeting our variables of interest and this necessitated the use of slightly amended measures.
618 Further measure development in the domain of dance is warranted. At the same time,
619 extending our work into sport would be a valuable endeavor. In particular, there is a need for
620 further research into the predictors of DEA among, for instance, male athletes in aesthetic
621 sports such that future prevention efforts can be built on good-quality evidence regarding
622 which variables are most suitable as intervention targets.

623

Conclusion

1
2 624 In the present study, young dancers' attitudes relating to disordered eating (DEA)
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5 625 were studied, and DEA predictors were found to differ between males and females. Only
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7 626 perfectionistic concerns emerged as a common predictor variable for both sexes. For male
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10 627 dancers, additional significant predictors included perceptions of the motivational climate as
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12 628 task- and/or ego-involving. It was also noted that male dancers in a centre focused on
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15 629 classical ballet reported higher DEA scores than their peers in two of the centres focusing on
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17 630 contemporary dance. All of these predictors operated at the between-person level. For
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20 631 females, additional predictors emerged at both the between-person (self-esteem) and within-
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22 632 person levels (perfectionistic strivings and concerns). That is, when female dancers
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24 633 experienced heightened perfectionistic strivings and concerns in comparison to themselves,
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27 634 they also reported higher DEA scores. These findings extend literature regarding the
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30 635 (mal)adaptiveness of perfectionistic strivings. We also call for further theoretically grounded
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32 636 investigations into how learning environments may be related to DEA, given that our findings
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34 637 both concurred with and opposed theoretical reasoning based in Achievement Goal Theory.
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37 638 This would enable environmental risk factors to be better understood and managed.
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39 639 Additionally, our findings imply that dance teachers and sport coaches should not be given
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41 640 undue responsibility or critique as regards their role in performers' disordered eating
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44 641 development, when individual dispositions may be more suitable targets for intervention.
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46 642 Finally, future intervention efforts may need to be designed with different foci for males and
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49 643 females.

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849 Table 1. Means, Standard Deviations and Sample Sizes for Key Study Variables Across Time

Variables		Time 1		Time 2		Time 3		Time 4		Time 5	
		<i>M (SD)</i>		<i>M (SD)</i>		<i>M (SD)</i>		<i>M (SD)</i>		<i>M (SD)</i>	
		Female N =149	Male N =43	Female N =124	Male N =56	Female N =162	Male N =55	Female N =157	Male N =64	Female N =213	Male N =73
<i>Eating Attitudes Test - 26</i>	Total	5.29 (6.70)	5.26 (9.39)	5.91 (6.75)	4.41 (7.23)	5.12 (6.35)	3.55 (5.74)	6.06 (8.25)	3.55 (6.72)	5.10 (6.61)	3.56 (5.58)
	% Scoring above Cutoff	7.29 %	7.59%	7.74%	5.48%	7.94%	4.35%	7.23%	5.68%	5.65%	1.75%
<i>Perfectionism Inventory</i>	Perfectionistic Strivings	9.29 (1.66)	9.37 (1.90)	9.05 (1.49)	9.23 (1.99)	8.91 (1.57)	8.61 (1.60)	8.96 (1.61)	8.78 (1.62)	8.90 (1.53)	8.63 (1.80)
	Perfectionistic Concerns	11.20 (2.87)	11.54 (2.74)	10.97 (2.69)	11.30 (2.79)	10.96 (2.68)	10.70 (3.05)	11.29 (10.35)	10.35 (3.04)	10.96 (2.59)	10.81 (3.04)
<i>Self-Esteem Scale</i>		30.32 (3.85)	31.33 (3.43)	30.32 (4.58)	31.30 (4.92)	30.72 (4.35)	31.18 (4.75)	29.69 (4.69)	32.02 (4.29)	30.30 (4.61)	31.37 (4.17)
<i>PMCSQ-2</i>	Task-Involving	4.30 (.46)	4.30 (.54)	4.31 (.46)	4.28 (.47)	4.34 (.43)	4.27 (.45)	4.32 (.51)	4.34 (.52)	4.31 (.44)	4.24 (.57)
	Ego-Involving	2.02 (.71)	2.00 (.75)	2.15 (.71)	2.37 (.81)	2.16 (.66)	2.12 (.70)	2.26 (.68)	2.15 (.73)	2.17 (.74)	2.27 (.75)

850 *Note:* These descriptive statistics have been generated from the sample of 597 dancers who contributed data to the multilevel models, with one
851 exception: prevalence rates (% dancers scoring above cutoff for the EAT-26) were calculated from the entire sample of 752 dancers. This was
852 felt to give a more truthful representation because percentages are highly influenced by sample size, and there were relatively small numbers of
853 males at some time points. Scores range from 0-3 (EAT-26), 1-4 (Self-esteem scale) 1-5 (Perfectionism Inventory, PMCSQ-2). Data for the
854 EAT-26 is in raw form, because these are more readily interpreted than the log-transformed scores used in analyses. For the Perfectionism
855 Inventory, scores represent the summed averages of three (perfectionistic strivings) and four (perfectionistic concerns) subscales. PMCSQ-2 is
856 Perceived Motivational Climate in Sport Questionnaire – 2.

857 Table 2. *Number of participants providing complete data at 1-5 time points.*

Data points	Females		Males	
	N	Frequency	N	Frequency
1	227	51.83%	82	51.57%
2	105	23.97%	40	25.16%
3	68	15.53%	23	14.47%
4	26	5.94%	10	6.29%
5	12	2.74%	4	2.52%
Total	438	100%	159	100%

858 *Note.* These data points represent data having been collected in any order, so that a person
 859 contributing data at, for instance, two time points may have done so at time points 1 and 2, 2
 860 and 3, or indeed any combination, including having done so at non-consecutive times.

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863 Table 3. *Estimates Obtained from Multilevel Model Predicting Disordered Eating Attitudes*
 864 *for Females*

<i>Fixed Part</i>		Estimates			
		Coefficient	SE	<i>z</i>	<i>p</i>
Time		-.001	.011	-0.86	0.39
Age at time 1		-.014	.013	-1.13	0.26
<i>Dummy variables</i>	< 12 months in CAT	-.066	.061	-1.08	0.28
	12-24 months in CAT	-.021	.005	0.45	0.67
	<6 years in dance	.048	.060	0.80	0.43
	6-11 years in dance	.014	.044	-0.32	0.75
	CAT centres				ns*
<i>Training hours weekly</i>	Between-person	.003	.005	0.62	0.53
	Within-person	.002	.004	0.45	0.65
<i>Perfectionism</i>	Strivings, between-person	.013	.016	.85	.40
	Strivings, within-person	.048	.017	2.79	< 0.01
	Concerns, between-person	.049	.010	4.72	< 0.01
	Concerns, within-person	.035	.011	3.04	< 0.01
<i>Self-Esteem</i>	Between-person	-.021	.005	-3.80	< 0.01
	Within-person	-.005	.006	-0.86	.39
Intercept		.724	.286		
<i>Standard Deviation of Random Effects</i>					
Intercept		.076	.016		
Residual: AR(1)		.411	.099		
Var(e)		.094	.014		
<i>Overall</i>					
Log-likelihood		-378.60		Observations	805
				Individuals	438
Multilevel vs. linear regression		$\chi^2 = 193.84, p < .01$			

865 *Note.* *Because complete reporting on 7 dummy variables is highly space-consuming, the
 866 results of these calculations have been omitted. However, none were significant.

869 Table 4. *Estimates Obtained from Multilevel Model Predicting Disordered Eating Attitudes*
 870 *for Males*

<i>Fixed Part</i>		Estimates			
		Coefficient	SE	<i>z</i>	<i>p</i>
Time		-.008	.017	-0.44	0.66
Age at time 1		.003	.018	0.19	0.85
<i>Dummy variables</i>	< 12 months in CAT	.004	.092	0.05	0.96
	12-24 months in CAT	-.114	.072	-1.59	0.11
	<6 years in dance	.023	.078	0.30	0.77
	6-11 years in dance	.071	.078	0.91	0.36
	Contemporary centre 1*	-.523	.142	-3.67	< 0.01
	Contemporary centre 2*	-.398	.116	-3.43	< 0.01
<i>Training hours weekly</i>	Between-person	-.008	.006	-1.33	0.18
	Within-person	.001	.006	0.12	0.90
<i>Perfectionism</i>	Strivings, between-person	-.000	.023	-.00	0.99
	Strivings, within-person	.022	.023	0.92	0.36
	Concerns, between-person	.041	.015	2.68	< 0.01
	Concerns, within-person	.013	.017	0.77	0.44
<i>Self-Esteem</i>	Between-person	-.014	.009	-1.66	0.10
	Within-person	.002	.009	0.20	0.84
<i>Motivational Climate</i>	Task, between- person	.169	.070	2.42	< 0.05
	Task, within-person	.052	.063	0.83	0.41
	Ego, between-person	.166	.052	3.18	< 0.01
	Ego, within-person	-.075	.048	-1.57	0.12
Intercept		-.395	.482		
<i>Standard Deviation of Random Effects</i>					
Intercept		.067	.021		
Residual: AR(1)		.307	.174		
Var(e)		.067	.016		
<i>Overall</i>					
Log-likelihood		-134.81		Observations	291
				Individuals	159
Multilevel vs. linear regression		$\chi^2 = 54.33, p < .01$			

871 *Note.* *Because complete reporting on 7 dummy variables is highly space-consuming, only
 872 the significant results of these calculations have been included. For motivational climate,
 873 “task” denotes task-involving climate perceptions and “ego” denotes ego-involving climate
 874 perceptions.

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06 July 2016

Reviewer 1

1. Intro and title - seems like the focus is on Intrapersonal and "Environmental" (not really Interpersonal) factors...suggest changes in how it's referred to throughout.
 - a. This has been changed throughout, as suggested.
2. Intro - although technically female (and male) also are considered nouns, their use, particularly in scientific writing should be as adjectives (e.g., "female dancer"). Thus, I encourage the authors to make corrections throughout their paper to make their writing more closely aligned with current uses of the terms (e.g., substituting "women" for "females" if they are discussing individuals 18 and above or perhaps "girls and women" if the age range is reflective of that).
 - a. When seeking to address this, 73 instances of these terms were found throughout the paper. Given the age range studied, "young women" and "young men" (or "girls and women" and "boys and men") would need to be used each of these 73 times. As this would make the language far more cumbersome and less concise, we have opted not to make this otherwise reasonable suggested change.
3. Intro - in discussing the findings with male athletes, there are some other articles from PSE's special issue in 2014 that might be relevant. Also, incorrect use of "and colleagues" on line 193.
 - a. Thank you for this recommendation. After consideration of the two articles therein which were most directly focused on males, we have opted to add a reference to Busanich et al. (lines 63-64). The article by Petrie et al. was certainly also relevant, but was not felt to build the rationale for our particular study beyond the papers already cited.
 - b. The "and colleagues" has been altered to "et al." on line 193.
4. Discussion, lines 447 to 450. To add empirical support to the authors' interpretation, they may want to cite Anderson, Petrie, and Neumann (2012) who longitudinally demonstrated that sport pressures predict increases in body dissatisfaction among female athletes.
 - a. Cited as recommended.