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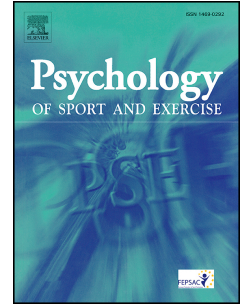
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Examining the interactive effects of coach-created empowering and disempowering climate dimensions on athletes' health and functioning.

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Keywords: motivational climate; moderated regression analyzes; well-being; ill-being; quality engagement; sport

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53**Abstract**

Based in Duda's (2013) hierarchical and multidimensional conceptualisation of the motivational climate, the purpose of this study was to examine whether a coach-created empowering motivational climate moderated the debilitating effects of a disempowering motivational climate on athletes' health and optimal functioning. Athletes (N = 406, M age = 23.1 years; 67% male) completed questionnaires assessing their perceptions of coach-created empowering and disempowering climates created in training and competition, enjoyment in sport, burnout symptoms, global self-worth, and symptoms of physical ill-health. Following the recommendations of Hayes (2013) and Dawson (2014), and using PROCESS (Hayes), moderated regression analyses showed that the interaction between disempowering and empowering climate dimensions was significant and predicted 1% unique variance in 3 outcome variables (i.e., enjoyment, reduced accomplishment, and physical symptoms). The Johnson-Neyman technique was employed to plot and probe the significant interactions, which revealed moderately strong to strong values of an empowering climate tempered the significant relationship between a disempowering climate and the three outcome variables. The findings from this study have implications for coach education and suggest programmes that train coaches to understand how to create empowering climates and avoid (or dramatically reduce) disempowering climates are warranted.

Keywords: motivational climate; moderated regression analyzes; well-being; ill-being; quality engagement; sport

54 A growing body of research has centred on coach-related factors that influence athletes'
55 functioning and health. In addition to coach's leadership style (see Riemer, 2007) and
56 coaching efficacy (see Myers, Vargas-Tonsing, & Feltz, 2005), the coach-created
57 motivational climate is a key predictor of athletes' welfare and the quality of their sport
58 engagement (Duda & Appleton, in press; Smith, Smoll, & Cumming, 2007; Smoll, Smith, &
59 Cumming, 2007). The motivational climate refers to the psychological environment in sport
60 and concerns what the coach does, says and how he/she structures the environment in training
61 and competitions (Duda, 2001).

62 Research investigating the relationship between the coach-created motivational
63 climate and athletes' functioning and health has been informed by achievement goal theory
64 (AGT; Ames, 1992a; Nicholls, 1989) and self-determination theory (SDT; Deci & Ryan,
65 1985, 2000; Ryan & Deci, 2007). More recently, Duda and colleagues (2013; Duda et al.,
66 2014; Duda & Appleton, in press) forwarded a hierarchical, multidimensional
67 conceptualisation of the motivational climate. This approach integrates climate dimensions
68 from AGT and SDT, which are considered as facets of 'empowering' or 'disempowering'
69 motivational environments. Guided by Duda's framework, this study sought to examine
70 whether the interaction between the overarching empowering and disempowering climate
71 dimensions predicted indicators of athletes' health and quality of their functioning in sport.

72 **Empowering and disempowering coach-created motivational climates**

73 Duda (2013) described the importance of pulling from AGT and SDT when
74 investigating the motivational climate. Within Duda's conceptualization, an empowering
75 climate is characterized by lower-order task-involving, autonomy-supportive and socially-
76 supportive features. Drawing from AGT (Ames, 1992a), a task-involving climate in sport is
77 characterized by the coach emphasising trying hard, skill development and cooperative
78 learning between teammates (Newton, Duda, & Yin, 2000). The extent to which coaches are

79 more or less autonomy-supportive has received considerable attention in SDT literature (Deci
80 & Ryan, 2000; Reeve, 2009). In an autonomy-supportive climate, a coach recognizes the
81 athletes' preferences and their perspectives are considered, athletes' feelings are
82 acknowledged and they are provided with meaningful choices, their input into decision
83 making is welcomed, and the coach provides a rationale when requesting a specific behaviour
84 from the athletes (Mageau & Vallerand, 2003). Finally, social-support (or interpersonal
85 involvement) is another climate dimension from SDT (see Skinner & Edge, 2002), in which
86 athletes feel cared for and empathized with by the coach, and are valued as a person separate
87 from his/her performance (Mageau & Vallerand, 2003; Reinboth, Duda, & Ntoumanis, 2004).
88 While AGT and SDT recognise separate facets of an empowering climate, a closer inspection
89 of the original literature for both theories suggest overlap between key features of the climate
90 dimensions. For example, in her writing on task-involving climates, Ames (1992b)
91 acknowledged important features of autonomy-support including helping individuals to
92 participate in the decision making, providing real choices, and encourage intrinsic interest in
93 activities. Likewise, SDT-based writing on autonomy-support (e.g., Mageau & Vallerand,
94 2003) acknowledges the importance of task-involving features.

95 In contrast, a disempowering climate is marked by lower-order ego-involving and
96 controlling characteristics (Duda, 2013). An ego-involving climate is emphasised within
97 AGT, and is characterised by athletes perceiving that mistakes are punished by their coach,
98 who also provides differential treatment based on athletes' ability levels and who encourages
99 intra-team member rivalry (Newton et al., 2000). A controlling climate is conceptualised
100 within SDT and is created when coaches pressurise, coerce and intimate their athletes
101 (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2010). The original writing on AGT and
102 SDT also recognised similarities between ego-involving and controlling climates. For
103 example, Bartholomew et al. described how a controlling coach demonstrates disappointment

104 and is less accepting of those athletes that have underperformed, which is similar to an ego-
105 involving coach who punishes mistakes. Ames (1992b) also acknowledged that a focus upon
106 normative standards and social comparison within an ego-involving climate can be perceived
107 as highly controlling for the individual.

108 Duda (2013) considered that empowering climates will satisfy athletes' basic
109 psychological needs (i.e., autonomy, relatedness, and task-focused competence; Deci &
110 Ryan, 2000), and will thus promote their overall health (and prevent ill health) and quality of
111 engagement in sport. In support of this assumption, empowering climate dimensions have
112 been positively associated with athletes' enjoyment (e.g., Jaakkola, Ntoumanis, & Liukkonen,
113 in press; Cheon, Reeve, Lee, & Lee, 2015) and global self-worth (e.g., O'Rourke, Smith,
114 Smoll & Cumming, 2014; Quested & Duda, 2011), and negatively correlated with athlete
115 burnout (Balaguer et al., 2012; Lemyre, Hall, & Roberts, 2008) and physical ill-health
116 (Reinboth et al., 2004). More recently, the overarching empowering climate dimension was a
117 positive predictor of athletes' self-efficacy (Zourbanos et al., 2015), and was positively
118 correlated with athletes' autonomous motivation and enjoyment in sport, and negatively
119 associated with controlled motivation (Fenton, Appleton, Duda, & Barrett, in press).

120 Conversely, disempowering motivational climates hold implications for psychological
121 need dissatisfaction and thwarting, and thus will undermine athletes' overall well-being and
122 functioning (Duda, 2013). Previous research has demonstrated that ego-involving and/or
123 controlling climates dimension are positively associated with symptoms of athlete burnout
124 (e.g., Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011; Isoard-
125 Gauthier, Guillet-Descas, Duda, 2013) and physical ill-health (Reinboth et al., 2004), as well
126 as negatively associated with athletes' enjoyment in sport (Black & Weiss, 1992; Leo,
127 Sánchez, Sánchez, Amado & García Calvo, 2009) and self-esteem (O'Rourke et al., 2014).

128 **Examining the interaction between empowering and disempowering climates**

129 An important assumption within Duda's (2013) framework is that empowering and
130 disempowering climates are not situated at either end of a continuum. Rather, coaches can
131 create empowering and disempowering climates. Initial support for this presumption was
132 provided by Tessier and colleagues (2013) and Smith et al. (2015a) who objectively
133 measured lower-order empowering and disempowering climate dimensions during soccer
134 coaches' training sessions. The findings presented by Tessier et al. and Smith et al. revealed
135 mean scores ranging between .49 – 1.77 for empowering and .50 – 1.78 for disempowering
136 climates, suggesting the coach-created climate was to some degree both empowering *and*
137 disempowering during training. Appleton, Ntoumanis, Quested, Viladrich and Duda's (2016)
138 study provided further support via small, yet significant correlations between the lower-order
139 empowering dimensions with the lower-order disempowering dimensions in junior athletes.

140 Given that empowering and disempowering coach-created climates may co-exist, it is
141 important that researchers examine whether the two higher-order climate dimensions interact
142 in sport to predict important outcomes in athletes (e.g., indicators of health and functioning)
143 and if so, to understand the climate conditions that promote or undermine desired outcomes.
144 For example, the undesirable consequences of a disempowering coach-created motivational
145 climate may be buffered when the climate is also empowering. Although no studies have
146 examined the interaction between the overarching empowering and disempowering climate
147 dimensions, a number of studies have considered the interplay between the aforementioned
148 lower-order dimensions. In AGT-related research, Ommundsen, Roberts, Lemyre, and
149 Treasure (2003) provided indirect evidence for the correlates of various combinations of task-
150 and ego-involving climates. When the coach-created climate was perceived as high in task-
151 and low in ego-involving features, athletes reported more positive moral attitudes and self-
152 reported behaviours. Conversely, athletes reported stronger approval of amoral behaviour,
153 less approval of respect for rules and officials, and lower commitment to continued

154 participation in response to failure when the climate was low in task- and high in ego-
155 involving features. In addition, a recent SDT-based study (Amorose & Anderson-Butcher,
156 2015) revealed that athletes' positive motivational responses (i.e., integrated and identified
157 motivation, competence and autonomy psychological need satisfaction) were highest when
158 perceptions of autonomy-support were high and coach controlling behaviours were low.

159 **The Present Study**

160 Based on Duda's (2013) assumptions and the evidence from previous studies, there is
161 reason to expect that the overarching empowering and disempowering climate dimensions
162 will interact to predict both positive and negative indicators of athletes' functioning and
163 health. The purpose of this study was to test this hypothesis with specific reference to
164 indicators of athletes' quality of engagement in sport (i.e., enjoyment, athlete burnout) and
165 their general health (i.e., global self-worth, physical ill-health). We predicted the interaction
166 would account for unique variance in the outcome variables beyond the variance explained
167 by the conditional effects of empowering and disempowering climates. Specifically, we
168 hypothesised that the debilitating effects of a disempowering climate would be tempered
169 when athletes' perceived a strong empowering climate. Conversely, we expected that the
170 relationships between a disempowering climate and the targeted outcomes would be
171 pronounced when empowering climate scores were low(er).

172 **Methods**

173 **Participants**

174 406 athletes (274 males and 132 females) from England, aged between 13 and 53
175 years old ($M = 23.1$; $SD = 8.3$) from a variety of individual ($N = 61$) and team ($N = 345$)
176 sports participated in this study. Athletes' competitive standard ranged from "club" ($N =$
177 254), "county" ($N = 50$), to "national" ($N = 102$). Mean number of years playing their main

178 sport was 11.0 years ($SD = 7.45$) and the mean number of years with their current team was
179 4.35 years ($SD = 4.60$).

180 Measures

181 **Empowering and disempowering motivational climates.** Participants' perceptions
182 of coach-created empowering (17 items) and disempowering (17 items) features of the
183 motivational climate were assessed with the EDMCQ-C (Appleton et al., 2016). The
184 empowering climate items measure task-involving (e.g., “My coach encouraged athletes to
185 try new skills”), autonomy-supportive (e.g., “My coach gave athletes choices and options”) and
186 socially-supportive (e.g., “My coach really appreciated athletes as people, not just as a
187 sport participants”) coaching. The disempowering climate items measure ego-involving (e.g.,
188 “My coach yelled at athletes for messing up”) and controlling (e.g., “My coach paid less
189 attention to athletes if they displeased him or her”) climate dimensions. Participants were
190 instructed to “think about what it has usually been like on *this* team/club *during the last 3-4*
191 *weeks*” when providing their responses, which were measured on a 5-point scale (i.e., 1 =
192 *strongly disagree*, 5 = *strongly agree*). Initial evidence regarding the psychometrics of the
193 EDMCQ-C in samples of younger athletes were reported by Appleton et al. (2016), and the
194 psychometric properties of the original scales used in the development of the EDMCQ-C
195 have been established in children through to adult athletes (e.g., Adie, Duda, & Ntoumanis,
196 2008; Bartholomew et al., 2010; Newton et al., 2000).

197 **Enjoyment.** The enjoyment subscale from the Intrinsic Motivation Inventory
198 (McAuley, Duncan, & Tammen, 1989) was employed to gauge the degree of enjoyment
199 athletes felt when participating in their sport during the last 3-4 weeks. Athletes responded to
200 four items (e.g., “I enjoyed the activities in my sport”) on a 7-point Likert scale ranging from
201 1 = *strongly disagree* to 7 = *strongly agree*. Previous research (e.g., McAuley et al., 1989;

202 Vazou, Ntoumanis, & Duda, 2006) supports the validity and reliability of younger and older
203 athletes' scores on this scale.

204 **Athlete Burnout.** The 15-item Athlete Burnout Questionnaire (ABQ; Raedeke &
205 Smith, 2009) was used to measure participants' self-reported reduced sense of athletic
206 accomplishment (e.g., "I am not achieving much in my sport"), perceived emotional and
207 physical exhaustion (e.g., "I am exhausted by the mental and physical demands of my sport"),
208 and sport devaluation (e.g., "I have negative feelings towards my sport"). Each subscale
209 contains five items and is scored on a 5-point Likert scale ranging from 1 (*almost never*) to 5
210 (*almost always*). Raedeke and Smith provide a summary of the acceptable psychometric
211 properties associated with the ABQ, including internal consistency, test-retest reliability, and
212 convergent and discriminant validity.

213 **Global self-esteem.** A 5-item global self-esteem measure was obtained from the Short
214 Version of the Physical Self Description Questionnaire (Marsh, Martin, & Jackson, 2010)
215 with 3 positively (e.g., "Most things I did, I did well") and 2 negatively (e.g., "Overall, I was
216 no good") worded items. A 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree)
217 employed in Papaiaonnou et al's (2013) study with athletes was adopted in the current study,
218 and participants were instructed to "think about what it has usually been like in their every
219 day life *during the last 3-4 weeks*". Marsh et al. and Papaiaonnou et al. provided support for
220 the acceptable psychometric properties of the global self-esteem subscale.

221 **Symptoms of Physical Ill-Health.** Participants' experiences of physical ill-health
222 symptoms (e.g., leaking nose, cough, fever, headache, sleep disorders) were measured using
223 the 18-item Physical Symptom Checklist (Emmons, 1991). Responses were rated on a 7-point
224 Likert scale with anchors of 1 (*never*) and 7 (*almost always*). The internal reliability of
225 athletes' scores on this checklist have been established in previous research with younger and
226 older athletes (Ho, Appleton, Cummings, & Duda, 2015; Reinboth & Duda, 2006)

227 Procedures

228 Ethical approval for the study was granted from the authors' university. Contact was
229 made with sport teams/clubs to obtain their permission to approach athletes regarding
230 participating in this study. Parents of the athletes 16 years or younger were provided with
231 details of what participation would involve, both verbally and in writing. An opt-out
232 approach to parental informed consent was adopted, in which parents could choose to exclude
233 their child from the project by signing and returning a form. The athletes were subsequently
234 invited to participate, and they received verbal and written information regarding the nature
235 of their voluntary involvement in the study. Athletes completed the questionnaire before,
236 during or after a training session in a location away from their coach and/or parents. The
237 questionnaire took approximately 20 minutes to complete. Trained research assistants were
238 present to address any questions and support questionnaire completion.

239 Data analyses

240 Following data screening procedures and descriptive analyses, the hypotheses were
241 tested using moderated regression analyses using the PROCESS custom dialog box (Hayes,
242 2013) for SPSS and guided by Hayes (2013) and Dawson's (2014) recommendations (also
243 see Ntoumanis & Appleton, 2016). Hayes and Dawson identified shortcomings to the
244 traditional approach to conducting moderated regression analysis which has dominated the
245 psychology (including sport and exercise) literature. One shortcoming concerns the "myth of
246 centring" (i.e., subtracting the mean from the value of the original variable so that it has a
247 mean of 0) the predictor (X) and moderator (M) variables. Hayes suggested that previous tests
248 of moderation have claimed centring is required to prevent multi-collinearity between X and
249 M with the interaction variable (i.e., XM) (for an example from sport psychology, see
250 Kavussanu, 2006). Hayes explained that centring is not a necessary step to overcome multi-
251 collinearity for tests of moderation. Rather, centring ensures that when zero is not included in

252 the response system of X and/or M , the coefficient values for X and M are meaningful. As
253 zero was not a possible response in the EDMCQ-C, we chose to mean centre (done
254 automatically in PROCESS) the participants' scores on the empowering and disempowering
255 subscales.

256 A second shortcoming concerns hierarchical moderated regression analysis (HRMA).
257 HRMA involves X and M being entered into the regression equation in model (also called
258 "step") one, followed by XM (i.e., the interaction variable) in model (step) two (for examples
259 in sport and exercise psychology, see Amorose & Anderson-Butcher, 2015; Appleton, Hall,
260 & Hill, 2009). A significant XM interaction, as well as a significant increase in the R^2 value
261 from model one to model two, lends support to model two (and thus support for moderation).
262 However, Dawson (2014) argued there is limited statistical rationale for adopting HRMA
263 because it makes little sense to interpret versions of the model (i.e., model one) that do not
264 include XM if the interaction is significant. Therefore, in this study we did not employ
265 HRMA but rather employed the PROCESS macro, which automatically calculates the unique
266 variability accounted for by XM in Y .

267 The PROCESS output produces a regression coefficient (unstandardized) for the XM
268 variable and an associated p value. This coefficient quantifies how the effect of
269 disempowering climates on the outcome variable changes as empowering climates scores
270 changes by one unit, and whether the interaction is significant (i.e., $p < .05$). Significant
271 interactions generally have a small effect size (Dawson, 2014) and thus consistent with
272 Dawson's recommendation, we did not focus on the size of the effect per se, but rather the
273 practical relevance of significant interactions.

274 To aid in interpreting the practical relevance of a significant interaction, we
275 graphically plotted and subsequently probed the interaction (Bauer & Curran, 2005). The
276 traditional approach to plotting and probing interactions has been to graphically plot a

277 significant interaction using the sample mean value plus one SD above and below the mean
278 of M . This graphical representation is followed by probing the interaction to determine where
279 in the distribution of M X has an effect on Y that is different from zero (Hayes, 2013).
280 Likewise, the standard approach has been to probe the interaction via a simple slopes
281 analysis, where the researcher conducts an inferential test (and associated confidence
282 intervals) of the conditional effect of X on Y at the mean value plus one SD above and below
283 the mean of M (for examples from sport and exercise psychology, see Hannan, Moffitt,
284 Neumann, & Thomas, 2015; Smith, Ntoumanis, Duda, & Vansteenkiste, 2011). Hayes and
285 Dawson (2014) have cautioned against this approach, however, because the mean, and one
286 SD above and below the mean of M , are somewhat arbitrary values for plotting and probing
287 an interaction. That is, these values are derived from a specific sample and may be different
288 in other samples. Instead, Hayes has suggested that when specific values of a continuous
289 moderator have been universally accepted as “high” and “low”, they are employed to plot and
290 probe the interaction. However, when there are no universally agreed values for “high” and
291 “low”, Hayes and Dawson proposed that researchers adopt the Johnson-Neyman (J-N)
292 technique (Bauer & Curran, 2005; see Hayes, 2013, for a detailed discussion) to plotting and
293 probing the interaction.

294 The J-N technique describes the variability about the estimate produced by the
295 regression analysis via confidence bands around the simple slope. The confidence bands are
296 interpreted in a similar manner to confidence intervals associated with a regression
297 coefficient (Dawson, 2014) and thus allow a researcher to identify points in the range of M
298 where the effect of the X on Y transitions from being statistically significant to non-
299 significant. This is achieved by finding the value of M for which the ratio of the conditional
300 effect to its standard error is equal to the critical t score (Barnhofer, Duggan, & Griffith,
301 2011). By adopting the J-N technique in this study, we are able to provide specific

302 empowering climate values at which the negative effects of a disempowering climate on the
303 targeted outcomes are buffered in the recruited sample of athletes.

304 PROCESS can implement the J-N technique and in doing so, produces one of three
305 outputs (Hayes, 2013). The first output is a single J-N value within the range of M
306 (empowering climate) which indicates that the conditional effect of X (disempowering
307 climate) on Y is statistically significant when M is \leq or \geq the J-N value, but not both. That is,
308 the region of significance of disempowering climate effect on Y is defined as either
309 empowering climate score \leq or \geq the J-N value. The second output is when the region of
310 significance of disempowering climate's effect on Y is either J-N value¹ \leq empowering
311 climate score \leq J-N value² or empowering climate score \leq J-N value¹ and empowering
312 climate score \geq J-N value². The former output indicates that the conditional effect of
313 disempowering climate on Y is statistically significant when the empowering climate score is
314 between the two J-N values. The latter output signifies that the conditional effect of a
315 disempowering climate on Y is statistically significant when the empowering climate score is
316 less than or equal to J-N value¹ and when the empowering climate score is greater than or
317 equal to J-N value², but not between these two values. A final possibility is for no J-N value
318 to be reported by PROCESS. No J-N value indicates that the effect of a disempowering
319 climate on Y is statistically significant across the entire range of the empowering climate
320 scores, or the effect is not statistically significant anywhere in the observed distribution of
321 empowering climate scores (Hayes, 2013). It is also possible to plot the region of
322 significance identified by the J-N technique along with confidence bands (see Bauer &
323 Curran, 2005; Rogosa, 1980) using the syntax provided by the PROCESS output.

324 Results

325 Preliminary Analyses

326
327

328 All participants provided complete data. The internal consistency estimates (α) for all
329 the measures ranged from .74 to .91, indicating acceptable reliability. The mean scores
330 demonstrated that the sample perceived moderately high empowering climates and
331 moderately low disempowering climates. Mean scores also revealed relatively high
332 enjoyment and global self-esteem scores, and moderately low burnout and physical ill-health
333 symptoms (see Table 1). Bivariate correlations revealed that athletes' perceptions of
334 empowering climates were positively related to athletes' enjoyment and global self-esteem
335 scores, and negatively related to the reduced accomplishment, devaluation and physical
336 symptoms of ill-health. Disempowering climates were negatively correlated with enjoyment
337 and self-esteem, and positively correlated with all three burnout symptoms and physical
338 symptoms of ill-health. Consistent with Duda's (2013) framework, the correlation between
339 empowering and disempowering climates was negative (see Table 1).

340 **Moderated Regression Analyses**

341 First, we evaluated key assumptions for multiple regression (e.g., normality,
342 linearity, homoscedasticity of residuals; absence of multicollinearity and singularity, and
343 multivariate outliers (Tabachnick & Fidell, 2013). As no violations were noted, we proceeded
344 to test the hypotheses with moderated regression analyses using PROCESS (Hayes, 2013).

345 The PROCESS outputs showed that the interaction in 3 of the 6 analyses (see Table 2)
346 predicted additional variance in certain targeted outcomes, beyond the conditional effects of
347 the disempowering and empowering climate dimensions. Consistent with Dawson's (2014)
348 conclusions regarding effect size, the significant interactions accounted for a small amount of
349 unique variance (1.03-1.35%) in the outcome variables. Despite the small effect size, these
350 results indicate that the combination of disempowering and empowering climates added to
351 the prediction of enjoyment, reduced accomplishment and physical symptoms.

352 For enjoyment, one J-N value emerged; only when the empowering climate score was
353 < 3.47 was the conditional effect of a disempowering climate on enjoyment statistically
354 significant ($p < .05$) (see Figure 1). For reduced accomplishment, one J-N value was
355 produced; only when the empowering climate score was < 4.47 was the conditional effect of
356 a disempowering climate on reduced accomplishment statistically significant ($p < .05$) (see
357 Figure 2). For physical ill-health symptoms, there was also one J-N value; only when the
358 empowering climate score was < 4.32 was the conditional effect of a disempowering climate
359 on physical symptoms statistically significant ($p < .05$) (see Figure 3).

360 Discussion

361 Drawing from AGT (Ames, 1992a; Nicholls, 1989) and SDT (Deci & Ryan, 1985,
362 2000; Ryan & Deci, 2007), and Duda's (2013) conceptualisation of the motivational climate,
363 the current study examined whether empowering and disempowering climate dimensions
364 interacted to predict indicators of athletes' well- and ill-being and quality of engagement in
365 sport. We hypothesised that disempowering and empowering climates would interact to
366 explain unique variance in the outcome variables, and that the debilitating effects of a
367 disempowering climate would be buffered when athletes' perceptions of an empowering
368 climate were stronger. Using Hayes (2013) and Dawson's (2014) procedures, we were able to
369 identify specific empowering climate values at which disempowering climates transition from
370 a significant to non-significant predictor of the targeted outcome variables. The moderated
371 regressions analyses revealed support for forwarded hypotheses for 3 outcomes, and thus
372 highlight the importance of considering the interactions between disempowering and
373 empowering climate dimensions when predicting positive and negative indicators of athletes'
374 health and functioning.

376 Our hypotheses regarding the interaction between disempowering and empowering
377 climates received support in 3 out of 6 regression analyses. Consistent with the findings of

378 Ambrose and Anderson-Butcher (2015), the interaction accounted for unique variance in a
379 range of outcomes, including sport-specific and psychological (i.e., enjoyment and reduced
380 accomplishment) versus global and physical (i.e., general physical symptoms), and positive
381 (i.e., enjoyment) versus negative (i.e., reduced accomplishment and general physical
382 symptoms) indicators. Although the interaction was non-significant for 3 additional outcomes
383 (i.e., exhaustion, devaluation, global self-worth), the study's findings suggest an empowering
384 climate moderates the debilitating effects of a disempowering climate for certain outcomes.

385 The amount of unique variance accounted for by the significant interactions was small
386 across the regression analyses, and this is consistent with previous research. For example, in
387 the management and applied psychology literature, Aguinis et al. (2005) reported a median f^2
388 value of just .002 across 30 years of research. Similar effect sizes for interactions have also
389 been reported in the sport psychology literature including Ambrose and Anderson-Butcher's
390 (2015) study of the interaction between autonomy-support and controlling coaching
391 behaviours which accounted for 1-2% of variance in their targeted outcome variables. One
392 interpretation of the small amount of unique variance accounted for by the interaction
393 between disempowering and empowering climate dimensions is that, in terms of
394 understanding athletes' functioning and health, it has limited meaning beyond the conditional
395 effects of each climate dimension (also see Duda, 2001). However, as Ambrose and
396 Anderson-Butcher proposed in discussing their findings, it is likely that while the influence of
397 the interaction is limited in a cross-sectional design, it becomes more meaningful overtime
398 (e.g., over months and seasons) as the athlete is continually exposed to the coach-created
399 motivational climate. That is, the amount of variance accounted for by the interaction
400 between disempowering and empowering may increase when examined longitudinally
401 (Ambrose & Anderson-Butcher, 2015; also see Abelson, 1985).

402 A second explanation for the small amount of variance accounted for by the
403 interactions in this study (and other studies) concerns unavoidable design and measurement
404 artifacts, such as negatively biased variance associated with the predictor variables, which are
405 often commonplace when conducting moderated regression analyses (Aguinis & Gottfredson,
406 2010). Evidence from several Monte Carlo based studies (e.g., Aguinis, 1995; Aguinis &
407 Stone-Romero, 1997) has confirmed that such artifacts decrease the observed effect sizes
408 (Aguinis, Beaty, Boik, & Pierce, 2005). Thus, future studies examining the interaction
409 between motivational climate dimensions should take heed of Aguinis et al.'s
410 recommendation that researchers pay closer attention to research design and measurement
411 issues associated with moderation analyses, which will ultimately increase the observed
412 effect size. In particular, sport psychologists may benefit from Aguinis and Gottfredson's
413 specific recommendations concerning planning studies concerning (and subsequently testing
414 for) moderated effects.

415 Regarding buffering the negative effects of disempowering climates, J-N analyses
416 revealed that, when significant, the nature of the interaction between the two climate
417 dimensions was consistent. The results suggest that in order to temper the effects of
418 disempowering climates for athletes' enjoyment, reduced accomplishment, and physical
419 health, coaches also need to create (or at least be perceived to create by their athletes) an
420 empowering climate. More specifically, the relationship between a disempowering climate
421 and the three outcome variables was moderated when empowering climate scores were
422 moderately strong (i.e., 3.47 for enjoyment) to strong (i.e., 4.32 for physical symptoms and
423 4.47 for reduced accomplishment). Identifying specific empowering climates values at which
424 the effects of a disempowering climate are tempered, albeit limited to one sample, is a
425 strength of this study and overcomes a limitation of previous sport and exercise research
426 (e.g., Amorose & Butcher-Anderson, 20015; Appleton et al., 2009; Hannan et al., 2015;

427 Kavussanu, 2006; Smith et al., 2011) that has plotted and probed interactions using arbitrary
428 values (e.g., mean, one SD plus and minus the mean). This finding also offers initial support
429 for the hypothesis that the debilitating effects of a disempowering climate would be buffered
430 when empowering climate scores were stronger. However, the findings also imply that even
431 strong perceptions of an empowering climate (e.g., mean of 4 – 4.5) may be insufficient to
432 prevent a disempowering climate from undermining athletes' health and optimal functioning.

433 The suggestion that a strong empowering climate may be insufficient to prevent the
434 debilitating effects of a disempowering climate has practical implications for coach
435 education. The known benefits of facets of an empowering climate, as well as the overarching
436 empowering climate dimension, are well established in the literature (see Duda et al., 2014;
437 Duda & Appleton, in press), and thus attempts to work with coaches to create and implement
438 strategies to enhance task-involving, autonomy-supportive and socially supportive
439 environments in training and competition are important (for examples, see Cheon, Reeves,
440 Lee & Lee, 2015; Smoll, Smith, & Cumming, 2007). Yet the creation of an empowering
441 climate does not guarantee the absence of, or diminished levels of, a disempowering climate
442 (Duda & Appleton, in press). As a result, the assumed benefits of such coach education for
443 athletes' health and functioning may be limited if coaches continue to create disempowering
444 climates. In addition to programmes that educate coaches on how to create more empowering
445 climates, it is therefore imperative that coaches are equipped with an understanding of how to
446 avoid (or dramatically reduce) disempowering climates (Duda & Appleton, in press).

447 To our knowledge, few programmes exist that simultaneously educate coaches on
448 how to be empowering and avoid being disempowering. However, one such workshop that is
449 informed by AGT and SDT, and has been empirically evaluated in a multinational study is
450 *Empowering Coaching*TM (see Duda, 2013). Via the Promoting Adolescent Physical Activity
451 (PAPA) project (see Duda et al., 2013), Duda and colleagues revealed that football coaches

452 from 5 European countries that attended *Empowering Coaching*TM were perceived by their
453 athletes to create less disempowering climates compared to coaches who did not attend the
454 workshop (Quested et al., 2015). In addition, objectively assessed empowering climate
455 dimensions significantly improved from baseline to 1-2 months post workshop, as well as
456 significant decreases in objectively assessed disempowering climate dimensions post
457 workshop and at end of the season (i.e., 7 months post workshop), for coaches who attended
458 *Empowering Coaching*TM (Smith et al., 2015b). The benefits of *Empowering Coaching*TM
459 also extended to the athletes; findings from the PAPA project revealed that players whose
460 coaches attended the *Empowering Coaching*TM training reported decreased intentions
461 to drop-out of football during the season (compared to players whose coaches did not receive
462 the training) (Quested et al., 2015). Given the results of the present study, we suggest many
463 more athletes would benefit from coaches attending programmes such as *Empowering*
464 *Coaching*TM.

465 **Limitation and Future Research Direction**

466
467 A cross-sectional design was adopted in this study and thus longitudinal and
468 experimental designs are required to offer conclusions regarding the causal effects of the
469 climate dimensions on the targeted outcomes. Longitudinal designs using structural equation
470 modelling will account for measurement error, which was not possible in the current study. In
471 addition, this study was limited to indicators of athletes' well- and ill-being and functioning
472 in a rather homogenous sample. Future research should therefore include alternative
473 outcomes (e.g., motivation, psychological needs) in a multinational sample to determine the
474 robustness of the interaction between the climate dimensions.

475 The small effects sizes reported in this study also have implications for future
476 research concerning the interaction between climate dimensions. Sport psychologists have
477 traditionally adopted Cohen's (1988) recommendations for small (i.e., .10), medium (i.e., .30)

478 and large (i.e., .50) effect sizes, yet based on this study's findings (and other studies; e.g.,
479 Amorose & Anderson-Butcher, 2015), Cohen's values may not be appropriate when
480 interpreting interactions between motivational climate dimensions and when subsequently
481 conducting power analyses for future studies. Regarding the latter, Aguinis et al. (2005)
482 argued that one's choice for a targeted effect size in a power analysis should not be informed
483 by broad-based convention but rather the specific research situation at hand. Thus, when
484 planning future studies, sport psychologist may wish to conduct power analyses using the
485 smaller (and more realistic) effect sizes reported in this study, as opposed to Cohen's values.

486 A second point regarding the effect sizes in this study that may inform future research
487 is that, although the interactions account for only 1% of the variance in the targeted
488 outcomes, this small effect may be meaningful in practice (Aguinis et al., 2010). To
489 determine the practical importance of this interaction, Aguinis and colleagues recommended
490 that qualitative methods are adopted to probe the importance of the results for specific "stake
491 holders". In this case of the interaction between the climate dimensions, stakeholders may
492 include athletes (and their coaches), who could be interviewed to understand the implications
493 of a motivational climate that is high in empowering and disempowering features compared
494 to one that is only moderately high in empowering and high disempowering features.

495 **Conclusion**

496 It is well established the sub-dimensions of a disempowering coach-created
497 motivational climate are negatively related, and facets of an empowering climate positively
498 correlated, to indices of athletes' health and optimal functioning. The findings from this study
499 provide some evidence to suggest the implications of a disempowering climate may be
500 moderated when the coach is also empowering. However, this study also reveals that even a
501 strong empowering climate may be insufficient to offset the negative consequences of

502 disempowering climates for certain outcomes. Thus, attempt to promote athletes' health and
503 quality of engagement in sport may benefit by educating coaches on how to create a
504 motivational climate that is dominated by empowering behaviours and language, as well as
505 low in disempowering strategies.

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Table 1. *Descriptive Statistics, Bivariate Correlations, and Internal Reliability Coefficients for Athletes' Perceptions of Coach-Created Empowering and Disempowering Motivational Climates and Indicators of Health and Functioning*

Variable	1	2	3	4	5	6	7	8	<i>M</i>	<i>SD</i>
1. Empowering climate	.87								3.87	0.48
2. Disempowering climate	-.22***	.86							2.82	0.62
3. Enjoyment	.29***	-.09*	.89						6.21	0.87
4. Reduced accomplishment	-.27***	.25***	-.41***	.75					2.32	0.70
5. Exhaustion	-.03	.29***	-.21***	.45***	.84				2.45	0.84
6. Devaluation	-.20***	.28***	-.35***	.65***	.51***	.76			2.09	0.79
7. Global self-worth	.20***	-.19***	.33***	-.56***	-.32***	-.42***	.76		4.69	0.74
8. Symptoms of physical ill-health	-.09*	.18**	-.29***	.30***	.41***	.29***	-.36***	.91	1.96	0.84

Note. *** $p < .001$, ** $p < .01$, * $p < .05$. Internal reliability coefficients on the diagonal.

Table 2. *Moderated regression analyses: Interaction between athletes' perceptions of disempowering and empowering coach-created motivational climates predicting indicators of well- and ill-being and optimal functioning.*

	<i>F</i>	<i>R</i> ²	ΔR^2	Δf^2	<i>B</i>	<i>t</i>	LLCI	ULCI
Enjoyment	14.10***	.0952	.0117*	.0118				
Predictor								
Empowering					.49***	5.68	.32	.66
Disempowering					-.08	-1.13	-.21	.06
Interaction					.27*	2.27	.04	.50
Reduced Accomplishment	18.49***	.1212	.0103*	.0104				
Predictor								
Empowering					-.32***	-4.60	-.45	-.18
Disempowering					.25***	4.61	.14	.36
Interaction					-.20*	-2.17	-.39	-.02
Exhaustion	13.01***	.0885	.0022	.0022				
Predictor								
Empowering					.06	.71	-.11	-.22
Disempowering					.41***	6.15	.28	.54

Interaction					-0.11	-0.99	-0.34	.11
Devaluation	14.50***	.0977	.0013	.0013				
Predictor								
Empowering					-0.22**	-2.84	-0.38	-0.07
Disempowering					.32***	5.09	.20	.44
Interaction					-0.08	-0.77	-0.29	.13
Self-worth	9.37***	.0654	.0027	.0027				
Predictor								
Empowering					.24**	3.26	.10	.39
Disempowering					-0.20**	-3.33	-0.31	-0.08
Interaction					.11	1.08	-0.09	.31
Physical symptoms	6.92**	.0491	.0135*	.0135				
Predictor								
Empowering					-0.08	-0.92	-0.25	.09
Disempowering					.27***	3.96	.14	.40
Interaction					-0.28*	-2.39	-0.51	-0.05

Note. *B* = unstandardized beta coefficient. LLCI = 90% lower limit confidence interval; ULCI = 90% upper limit confidence interval.

*** $p < .001$. ** $p < .01$. * $p < .05$.

Figure 1. The conditional effect of disempowering coach-created motivational climate on athletes' enjoyment as a function of empowering coach-created motivational climate.

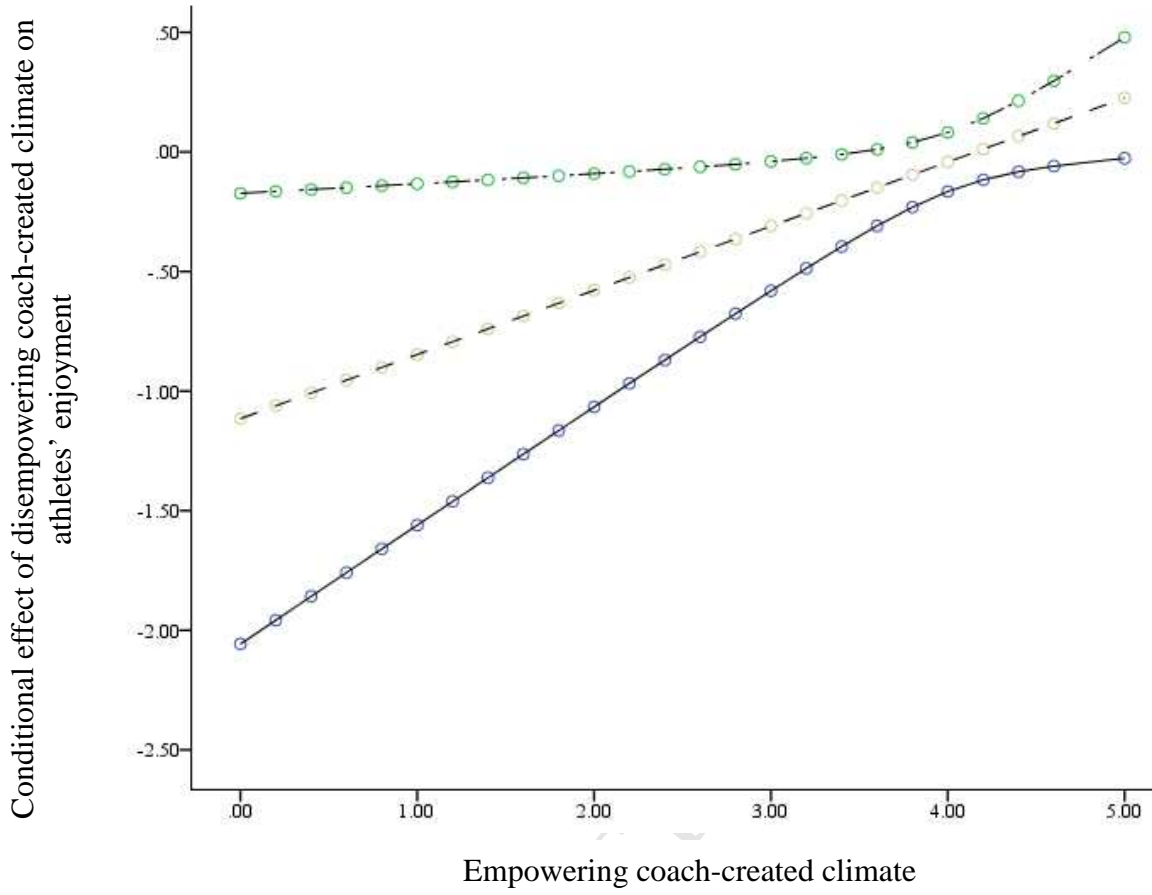


Figure 2. The conditional effect of disempowering coach-created motivational climate on athletes' reduced accomplishment as a function of empowering coach-created motivational climate.

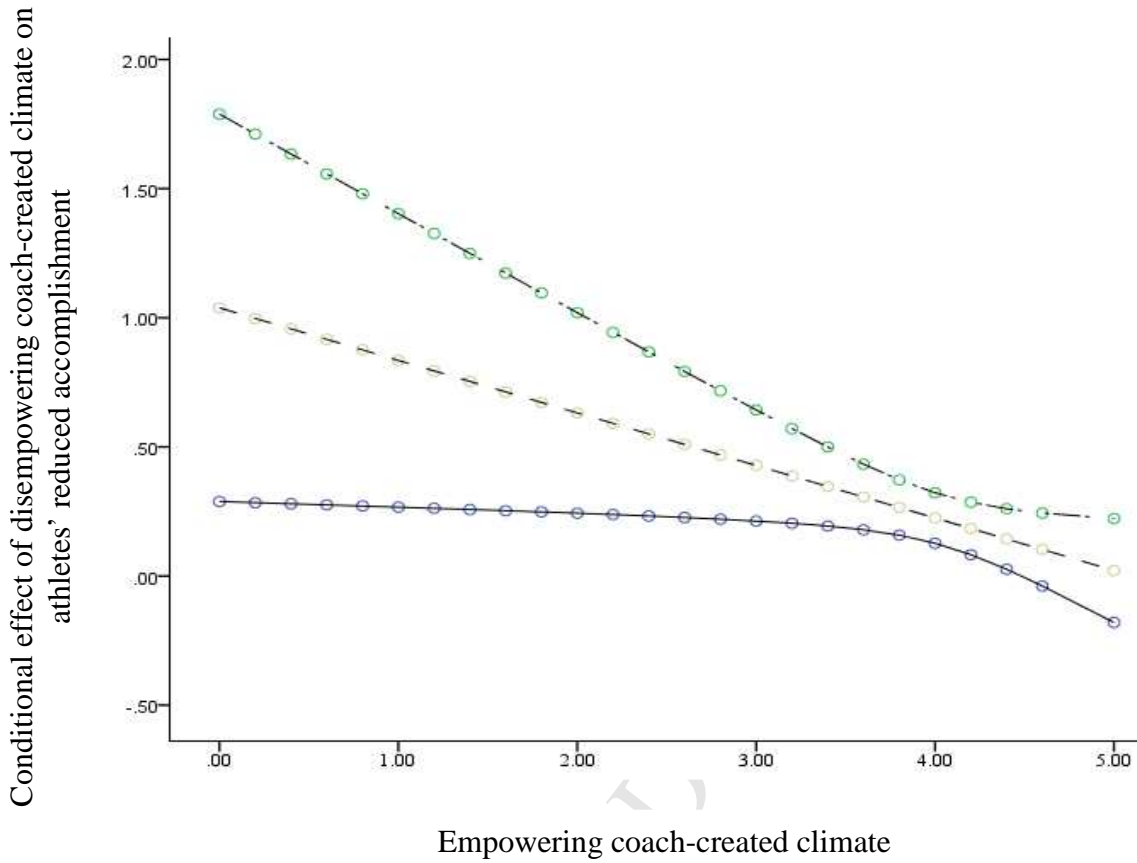
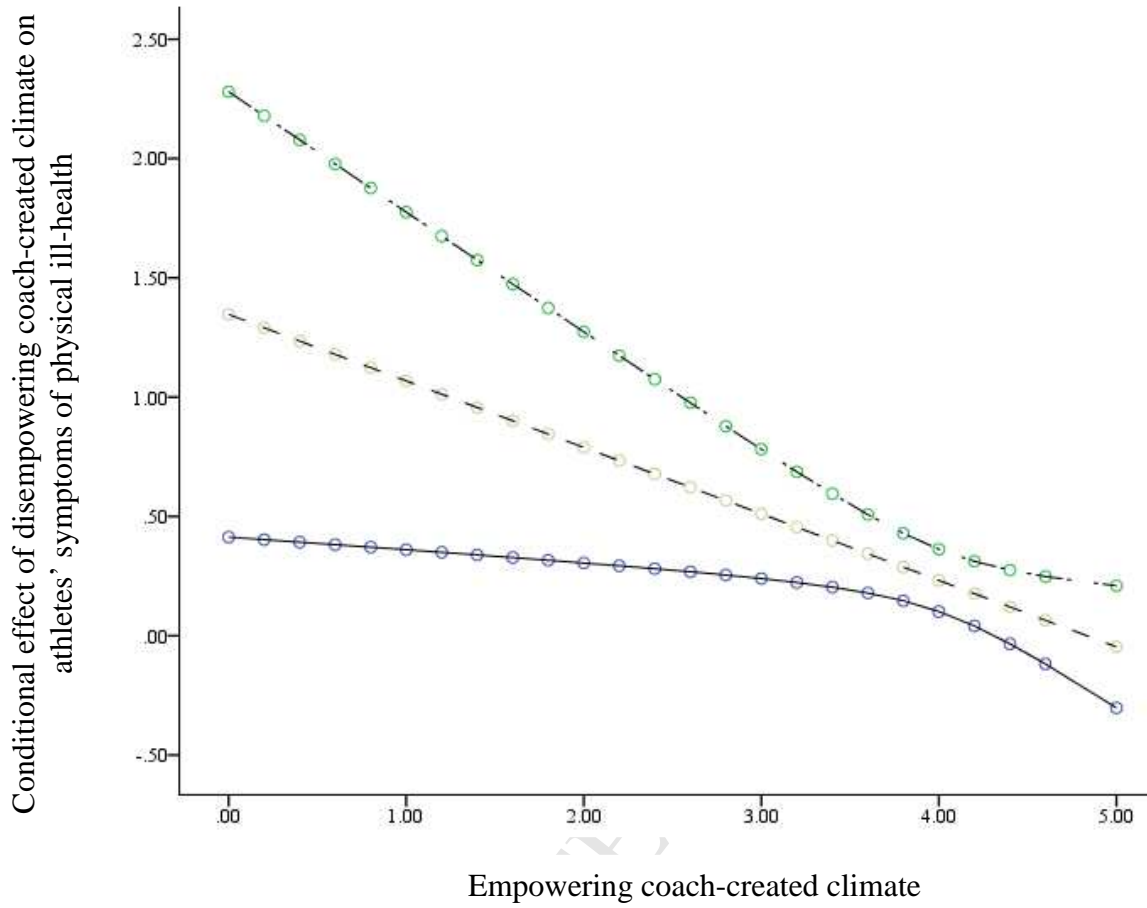


Figure 3. The conditional effect of disempowering coach-created motivational climate on athletes' symptoms of physical ill-health as a function of empowering coach-created motivational climate.



Highlights

Interaction between disempowering and empowering coach-created motivational climates examined

Limitations of previous tests of moderation in sport psychology addressed

Moderately strong to strong empowering scores buffered negative effects of disempowering climate for 3 (out of 6) outcomes

ACCEPTED MANUSCRIPT