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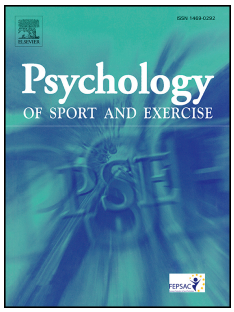

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Examining the interactive effects of coach-created empowering and disempowering climate dimensions on athletes' health and functioning.

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

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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

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

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

Empowering and disempowering coach-created motivational climates

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

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

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

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

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

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

Examining the interaction between empowering and disempowering climates

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

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

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

The Present Study

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

Methods

Participants

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

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

Measures

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

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

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

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

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

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

Procedures

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

Data analyses

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

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

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

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

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

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

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

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

PROCESS can implement the J-N technique and in doing so, produces one of three outputs (Hayes, 2013). The first output is a single J-N value within the range of *M* (empowering climate) which indicates that the conditional effect of *X* (disempowering climate) on *Y* is statistically significant when *M* is $\leq$ or $\geq$ the J–N value, but not both. That is, the region of significance of disempowering climate effect on *Y* is defined as either empowering climate score $\leq$ or $\geq$ the J–N value. The second output is when the region of significance of disempowering climate's effect on *Y* is either J–N value^1 $\leq$ empowering climate score $\leq$ J–N value^2 or empowering climate score $\leq$ J–N value^1 and empowering climate score $\geq$ J–N value^2. The former output indicates that the conditional effect of disempowering climate on *Y* is statistically significant when the empowering climate score is between the two J–N values. The latter output signifies that the conditional effect of a disempowering climate on *Y* is statistically significant when the empowering climate score is less than or equal to J–N value^1 and when the empowering climate score is greater than or equal to J–N value^2, but not between these two values. A final possibility is for no J–N value to be reported by PROCESS. No J–N value indicates that the effect of a disempowering climate on *Y* is statistically significant across the entire range of the empowering climate scores, or the effect is not statistically significant anywhere in the observed distribution of empowering climate scores (Hayes, 2013). It is also possible to plot the region of significance identified by the J–N technique along with confidence bands (see Bauer & Curran, 2005; Rogosa, 1980) using the syntax provided by the PROCESS output.

Results

Preliminary Analyses

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

Moderated Regression Analyses

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

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

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

Discussion

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

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

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

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

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

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

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

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

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

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

Limitation and Future Research Direction

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

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

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

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

Conclusion

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

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

	F	R^2	ΔR^2	Δf^2	*B*	*t*	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					-.11	-.99	-.34	.11
Devaluation	14.50***	.0977	.0013	.0013				
Predictor								
Empowering					-.22**	-2.84	-.38	-.07
Disempowering					.32***	5.09	.20	.44
Interaction					-.08	-.77	-.29	.13
Self-worth	9.37***	.0654	.0027	.0027				
Predictor								
Empowering					.24**	3.26	.10	.39
Disempowering					-.20**	-3.33	-.31	-.08
Interaction					.11	1.08	-.09	.31
Physical symptoms	6.92**	.0491	.0135*	.0135				
Predictor								
Empowering					-.08	-.92	-.25	.09
Disempowering					.27***	3.96	.14	.40
Interaction					-.28*	-2.39	-.51	-.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.

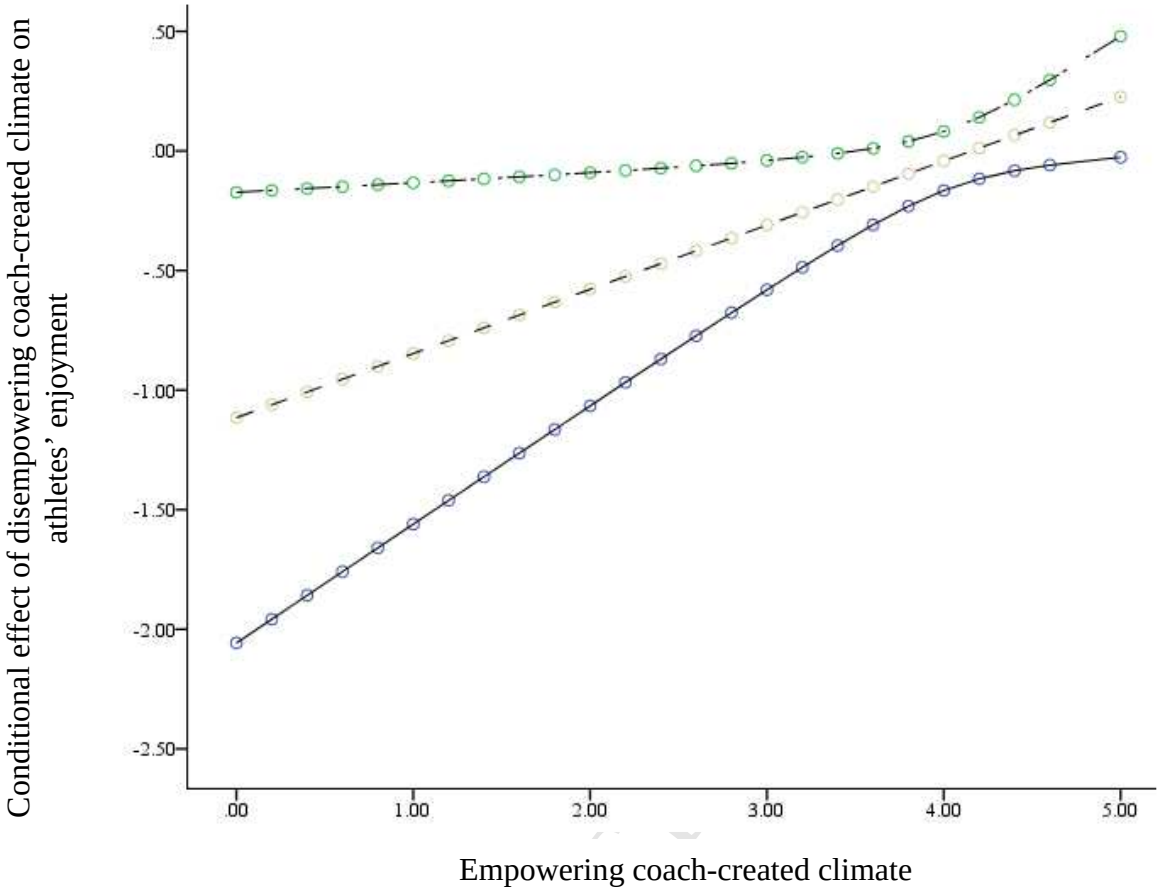


Figure 2. The conditional effect of disempowering coach-created motivational climate on athletes' reduced accomplishment as a function of empowering coach-created motivational climate.

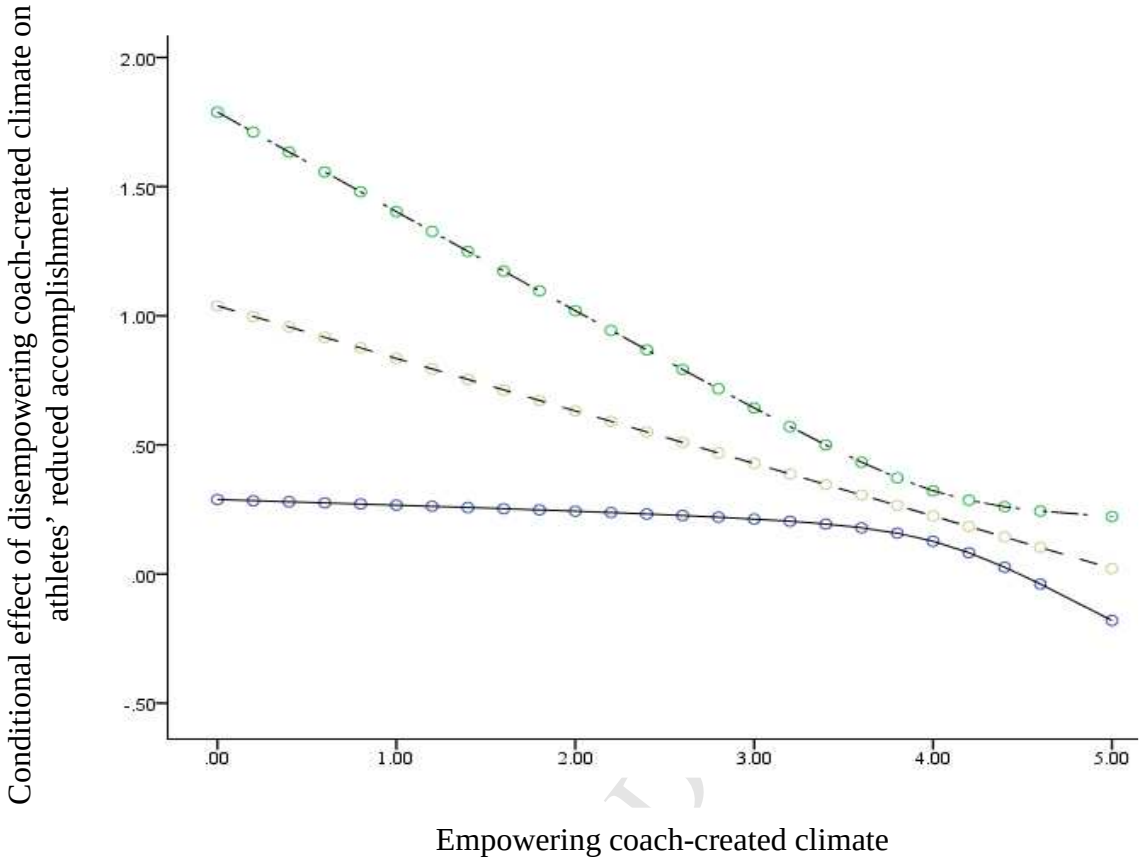
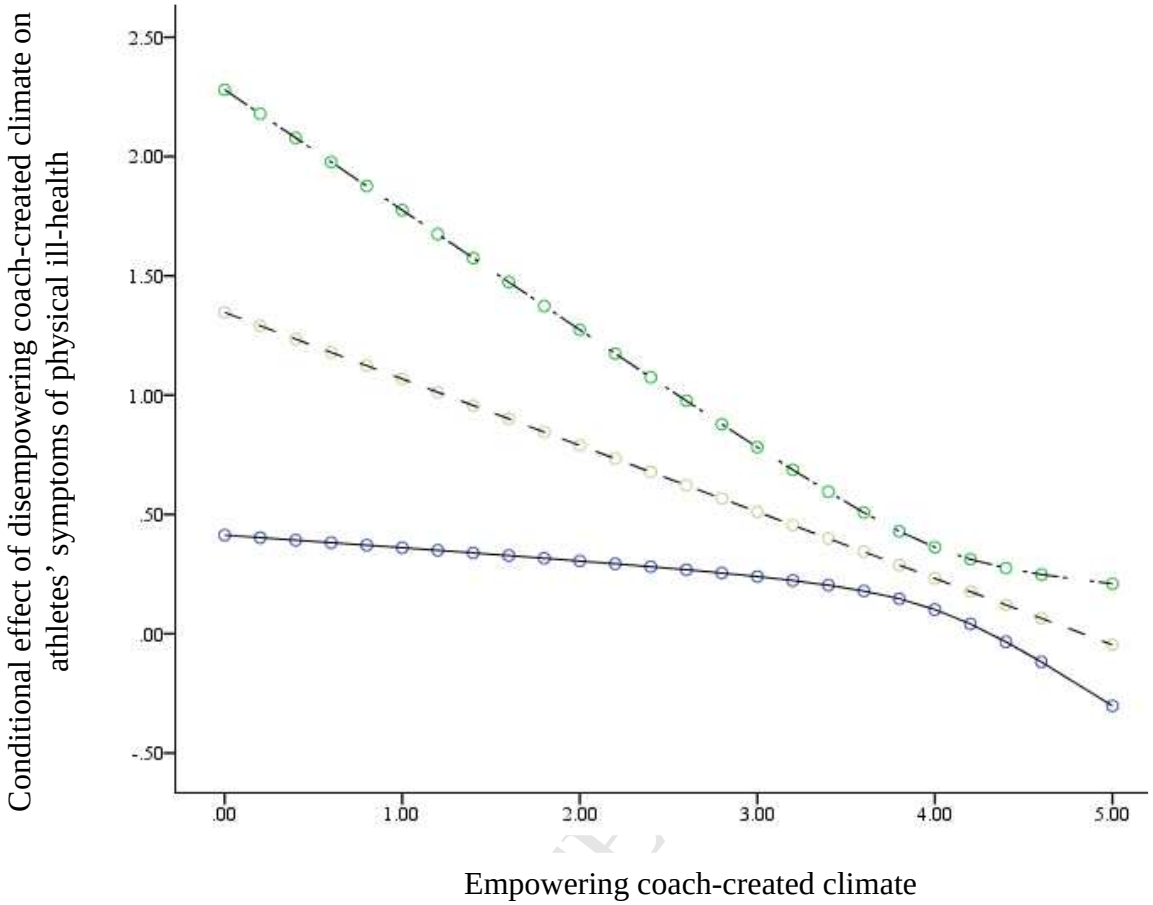


Figure 3. The conditional effect of disempowering coach-created motivational climate on athletes' symptoms of physical ill-health as a function of empowering coach-created motivational climate.



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