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A systematic review of the intrapersonal correlates of motivational climate perceptions in sport and physical activity

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1 RUNNING HEAD: Intrapersonal Correlates of Motivational Climates

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14 **A Systematic Review of the Intrapersonal Correlates of Motivational Climate Perceptions**

15 **in Sport and Physical Activity**

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Abstract

Objectives: The purpose of this study was to systematically review and appraise the achievement goal literature (1990-2014) with a view to identifying the intra-individual correlates of motivational climate perceptions, and to identify research gaps and avenues in need for further development. **Method:** Four databases were searched, leading to 104 published studies being sampled (121 independent samples) that met inclusion criteria. Correlates were grouped into 17 categories and qualitative analysis focussed on identifying the associations predicted by achievement goal theory. Effect sizes were calculated using the Hunter-Schmidt method for correcting sampling error. **Results:** A total population size of 34,156 ($\chi = 316.3$, $\sigma = 268.1$) was sampled in the analysis, with the published mean ages ranging from 10.0 to 38.2 years ($\chi = 16.5$ years, $\sigma = 4.7$). Perceptions of a task or mastery climate were consistently associated with a range of adaptive motivational outcomes including perceived competence, self-esteem, objective performance, intrinsic forms of motivational regulation, affective states, practice and competitive strategies and moral attitudes, and the experience of flow. Perceptions of an ego or performance climate were positively associated with extrinsic regulation and amotivation, negative affect, maladaptive strategy use, antisocial moral attitudes and perfectionism, but negatively associated to positive affect and feelings of autonomy and relatedness. **Conclusions:** After reviewing the sum total of research in this topic area, the authors appraise the options for future research to make meaningful progress in developing understanding of the social determination of motivation in sport and physical activity settings.

Keywords: achievement goals, correlates, motivational climate, coach, parents, peers

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1 **A Systematic Review of the Intrapersonal Correlates of Motivational Climate Perceptions** 2 **in Sport and Physical Activity**

3 Over the past 30 years, research on achievement motivation within sport and physical
4 activity domains has received unprecedented attention, generating an extensive range of
5 publications. In developing Achievement Goal Theory (AGT), Nicholls (1984, 1989) proposed
6 that in achievement contexts the meaning of competence to any individual could be defined as
7 follows:

8 Achievement behaviour is defined as behaviour directed at developing or
9 demonstrating high rather than low competence. It is shown that competence can be
10 conceived in two ways. First, ability can be judged high or low *with reference to the*
11 *individual's own past performance or knowledge* [termed task goals]. In this context,
12 gains in mastery indicate competence. Second, ability can be judged as capacity
13 *relative to that of others* [termed ego goals]. In this context, a gain in mastery alone
14 does not indicate high competence. To demonstrate high capacity, one must achieve
15 more with equal effort, or use less effort than do others for an equal performance.
16 (Nicholls, 1984; p. 328 – italics added)

17 In subsequent research, these two definitions of competence have been applied at different
18 levels of analysis: (a) the state level (goal involvement); (b) the situational/contextual level
19 (climate); and (c) the dispositional level (goal orientation). Within AGT, participants' immediate
20 goals for achievement (a) are determined by the interaction between (c) their goal orientation (a
21 proneness in individuals towards adopting certain goals; cf. Duda, 1993) and (b) the situational
22 goal climate (defined as the specific situational and contextual circumstances in which the
23 achievement task is defined; cf. Ames, 1992a). Ames (1992b) asserted that the individual's
24 subjective perception of the motivational environment was the critical factor in predicting
25 subsequent psychological and behavioural responses. These developments led researchers to
26 define two types of motivational climate: a 'mastery' climate reflecting task goals, and a

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1 'performance' climate endorsing ego goals (Blumenfeld, 1992).

2 Notionally, any individual participating in sport and physical activity settings can
3 influence the motivational climate by differentially emphasising task-mastery or ego-performance
4 goals; through their visible attitudes and behaviours. In attempts to quantitatively capture such
5 social behaviour and its effects, several questionnaires have been developed to assess the
6 perceived influences of teachers, coaches, parents and peers separately. Following Ames' (1992b)
7 assertion that the subjective perceptions of the motivational environment were critical, these
8 questionnaires focussed on the perceived situational and contextual goal emphases in sport and
9 physical education settings. These questionnaires included: (1) *teacher focussed* scales, such as
10 the Learning and Performance Orientations in Physical Education Classes Questionnaire
11 (LAPOPECQ – Papaioannou, 1994; 1995; 1997), and its abridged version the Teacher-Initiated
12 Motivational Climate Questionnaire (Papaioannou, 1998). Likewise, the Physical Education
13 Class Climate Scale (PECCS – Goudas & Biddle, 1994), and L'Echelle de Perception du Climat
14 Motivational (EPCM - Biddle, Cury, Goudas, Sarrazin, Famose, & Durand, 1995); (2) *coach*
15 *focussed* inventories, such as the Perceived Motivational Climate in Sport Questionnaire
16 (PMCSQ - Seifriz, Duda & Chi, 1992), PMCSQ-2 (Newton & Duda, 1993) and the Motivational
17 Climate Scale for Youth Sports (MCSYS - Smith, Cumming & Smoll, 2008); (3) *parent focussed*
18 measures, such as the Parent Initiated Motivational Climate Questionnaire (PIMCQ-2 - White,
19 1996); and (4) *peer-focussed* instruments, such as the Peer Motivational Climate in Youth Sport
20 Questionnaire (PeerMCYSQ – Ntoumanis & Vazou, 2005). Many of these questionnaires, their
21 strengths, weaknesses and associated findings are reviewed in Harwood, Spray and Keegan
22 (2008) and Duda and Whitehead (1998). However, in succinctly summarising the sub-factors of
23 these scales: (i) effort, (ii) learning/skill-improvement, (iii) perceived important role, (iv)
24 cooperative learning and (v) 'mistakes-are-part-of-learning' are key themes of Perceived
25 Task/Mastery Climate questionnaire items (hereafter PTMC). In contrast, subscales which assess:
26 (i) interpersonal comparison (and rivalry); (ii) punishment/fear of mistakes; (iii) unequal

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1 treatment of players; and (iv) ‘achieving-without-effort’ are consistent themes of Perceived
2 Ego/Performance Climate questionnaire items (hereafter PEPC).

3 A great deal of research has focused upon the antecedents and consequences of athletes’
4 task and ego orientations as dispositional achievement tendencies in sport (see Biddle, Wang,
5 Chatzisarantis & Spray, 2003 for a systematic review, and Van Yperen, Blaga & Postmes, 2014
6 for a meta-analysis). This investment in goal orientation research has been paralleled by an
7 ongoing academic interest in perceived motivational climate. An abundance of research has
8 investigated the motivational, affective and behavioural correlates of PTMCs and PEPCs. In the
9 first narrative review of the area, Ntoumanis and Biddle (1999) appraised attempts to
10 experimentally manipulate motivational climate, and included a brief analysis of the correlates of
11 climate perceptions. Nine years later, Harwood et al. (2008) completed a qualitative review of the
12 theoretical associations between perceived motivational climate and outcomes such as perceived
13 competence, positive- and negative-affective states, beliefs about the purpose of sport (status
14 versus development) and also the causes of success in sport (effort/learning versus natural ability).
15 In both analyses, the same pattern was reported wherein PTMCs were associated with
16 positive/adaptive experiences but PEPCs either formed no association or were linked to
17 negative/maladaptive experiences.

18 On the one hand, the extensive body of research examining the correlates of perceived
19 motivational climate has contributed very meaningfully to our understanding of how these
20 perceptions are associated to psychosocial functioning in sport and physical activity settings. On
21 the other hand, findings can often be equivocal or inconsistent between studies, and the broad
22 pattern of associations has not been comprehensively, systematically, recorded at this time. As
23 such, there is a strong argument for conducting a systematic review of the correlates of perceived
24 motivational climate. Further, with research tending to focus on the meaning of achievement
25 contexts to the individual (as noted above), a review focussing on the intrapersonal correlates of
26 perceived motivational climate appears timely.

1 Systematic reviews aim to identify, evaluate and summarise the findings of all relevant
2 individual studies, thereby making the available evidence more accessible (Higgins & Green,
3 2011). When appropriate, combining the results of several studies gives a more reliable estimate
4 of an intervention's effectiveness than one study alone (Murtagh et al., 2007; Pope & Mays,
5 2006; Roen, Aray, Roberts & Popay, 2006). Systematic reviews adhere to a strict scientific design
6 based on transparent, pre-specified and reproducible methods and all the data they employ is
7 publically available for others to inspect (Higgins & Green, 2011). Because of this rigour, when
8 carried out well, systematic reviews provide reliable summaries of the current state-of-the-
9 literature, thus rendering any conclusions more defensible. As well as setting out what we know
10 about a particular topic, systematic reviews can also demonstrate where knowledge is lacking
11 (Giacomini & Cook, 2000; Dixon-Woods et al., 2006), which can then be used to inform future
12 research (Pawson, Greenhalgh, Harvey & Walsh, 2004). Further, systematic reviews can be
13 differentiated from meta-analyses, which seek to use quantitative methods to summarise overall
14 effect sizes and trends. For example, a systematic review can be purely qualitative if insufficient
15 quantitative data exist. However, where appropriate, systematic reviews can be informed by meta-
16 analytic techniques (Alderson & Green, 2008), as is the case in the present study.

17 With an ever-growing body of research using correlational designs to explore the
18 associations of motivational climate perceptions in sport and physical activity, this systematic
19 review was undertaken with three objectives. First, to uncover and examine the known
20 intrapersonal correlates of the achievement goals construct: perceived motivational climate.
21 Second, to capture and record the theoretical explanations for such correlations. Third, to
22 summarise the findings of published correlational studies within the sampling period January
23 1990 – January 2014. Likewise, this study set out to evaluate the value of correlational research in
24 examining the social and cognitive processes influencing motivation in sport and physical activity
25 – both to date and looking forwards to the future. From this robust platform, conclusions and
26 recommendations can subsequently be made relating to perceived limitations in current

1 knowledge and directions for future studies.

2 **Method**

3 **Search Strategy**

4 Published studies were selected for the systematic review through electronic searches of
5 four computer databases that were either sport specific (SPORTdiscus), psychology specific
6 (PsycINFO) or general (Web of Science and PubMed) – see Figure 1 for PRISMA diagram. To
7 assist with replication efforts, Google Scholar was not included as a database following the
8 establishment of inclusion criteria (c), below. This database did not offer any additional findings
9 and generated a substantial time cost from processing papers that did not meet the inclusion
10 criteria (cf. Higgins & Green, 2011). Further, additional searches were conducted by reviewing
11 article reference lists and the authors' personal archives. Key word combinations to locate studies
12 were based around the following Boolean search term: “(sport OR physical education OR
13 physical activity OR exercis*) AND (motivational climate) AND (correl* OR relat* OR assoc*),
14 which was developed through critical discussions between the authors.

15 **Eligibility Criteria**

16 Inclusion/exclusion criteria were employed to ensure that the boundaries of the review
17 were clearly defined, and that the search strategy would identify all literature relevant to the aims
18 of the review (CRD, 2009; Smith, 2010). The following inclusion and exclusion criteria were
19 deployed in this study, with criteria a-c being applied during the search process, by using the
20 advanced search options within the chosen databases: (a) papers must be published in the English
21 language between January 1990 and January 2014; (b) papers must be original articles, and not
22 dissertations, books, theses or conference proceedings; (c) with a view to creating a manageable
23 sample size (i.e., approx. 100 – cf. CRD, 2009), papers must be published in a peer reviewed
24 journal with an impact factor; (d) full text article available; (e) correlations must be between
25 perceived motivational climate and intrapersonal variables (i.e., cognitive, affective and
26 behavioural variables – cf. Dixon-Woods & Fitzpatrick, 2001; Morgan & Carpenter, 2002); (f)

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1 papers must report the raw correlation values between perceptions of motivational climate and the
2 associated correlate(s); (g) papers must pertain to populations from sport, physical activity or
3 physical education, but not other areas such as the workplace or academic classroom; (h) papers
4 must have gathered original empirical data; and (i) special populations such as those with mental
5 illness, psychiatric disorders, developmental delays and developmental co-ordination or eating
6 disorders, were excluded. Finally, on the grounds that three or more comparisons are necessary to
7 generate a meaningful summary (cf. Sallis et al., 2000), categories with fewer than three
8 independent samples were not subjected to quantitative analysis. For the application of these
9 criteria, three members of the research team reviewed all of the included papers separately, and
10 the second author also reviewed a sample of the papers rejected by colleagues. Where any queries
11 were raised, the analysts reviewed the paper together and applied the above criteria, making a
12 decision and recording the reasons for any rejections. There was good agreement in the first
13 instance, with discrepancies due to papers, upon closer examination, failing to report the raw
14 correlations between climate perceptions and the associated variable(s).

15 Data Extraction

16 The extracted data included: (a) authors; (b) country in which the study was conducted; (c)
17 sample characteristics (number/size, age, and gender); (d) questionnaires deployed to assess the
18 perceived motivational climate; (e) the reliability of climate perceptions measurement
19 (Cronbach's alpha); (f) the reliability of the associated correlates (either Cronbach's alpha or test-
20 retest for non-questionnaire data); and (g) year of publication. When details of mean age were not
21 available, an average was calculated from the age range provided. If a study reported multiple
22 analyses on correlates (i.e., longitudinal studies), priority was given to the measurement of the
23 correlate that took place closest, chronologically, to the measurement of climate perceptions.
24 Where relevant measures were taken at multiple time points, the first data-collection was used
25 (i.e., prior to any intervention). Where studies did not report the reliability of their measures, data
26 was inputted either from the original validation paper or, failing that (for example, where the

1 original validation was in another language), a more recent paper including reliability data. Where
2 single item measures or unique one-off measures were used, 0.70 was inputted as a conservative
3 yet acceptable measure of reliability (cf. Cohen & Cohen, 1983). The full table of extracted data
4 and a completed PRISMA 2009 checklist are available online in Supplementary Tables 1 and 2.

5 **Analysis**

6 **Quantitative analysis.** We used the analytical procedures proposed by Hunter and
7 Schmidt (2004) to correct for sampling and measurement errors. This method adopts a random-
8 effects model, which allows population effect sizes to vary across studies and provides estimates
9 of these variations. For each effect size, an estimate of the true population correlation (ρ) was
10 calculated. Using the criteria suggested by Cohen (1977), correlations above 0.50 are considered
11 large; those between 0.30 and 0.50 are considered moderate; and those between 0.10 and 0.30 are
12 considered small. The 95% confidence interval (CI) of each estimate was constructed around the
13 true score correlation. If a CI encompassed zero, then we determined that there was no relation
14 between the two constructs. We calculated total variances of the correlations, as well as those
15 attributed only to sampling and measurement errors. Consistent with the recommendations of
16 Hunter and Schmidt (2004), effect sizes were considered homogenous if 75% or more of the total
17 variances were attributed to corrected artefacts (i.e., sampling and measurement errors). Failure to
18 reach this criterion would imply moderation by such factors as study design (sample size or type,
19 measures used) or even other variables - for example the effect of perceived motivational climate
20 on affective states is proposed to be moderated by the individual's goal orientation (Wang, Liu,
21 Chatzisarantis, & Lim, 2010).

22 **Qualitative analysis.** Once the final 104 studies had been identified, the relevant sections
23 in each were repeatedly read by the second author, an experienced qualitative analyst, in order to
24 become familiar with, and immersed in, the data to fully appreciate its significance (see Maykut
25 & Morehouse's [1994] concept of *indwelling*). In the first instance, as correlations were sampled
26 and recorded, the analyst coded them into semantically similar categories – for example clustering

1 enjoyment, satisfaction and interest under ‘positive affect’. Secondly, theoretical explanations
2 were developed to explain linkages between each perceived climate (PTMC and PEPC) and the
3 coded correlate categories. Thirdly, trends and patterns in the presentation and interpretation of
4 findings were recorded and reviewed, with a view to informing the critical discussion and
5 recommendations to accompany the main results (presented in the Discussion section).

6 **Results**

7 **General Results**

8 Table 1 provides a summary of the sampling characteristics across the studies, including
9 121 independent samples (104 articles – See Table 1) with a total population size of 34,156 ($\chi =$
10 316.26, $\sigma = 268.07$). Papers reported an average of 6.5 correlations each, between climate
11 perceptions and related variables. The published mean ages ranged from 10.0 to 38.2 years ($\chi =$
12 16.46 years, $\sigma = 4.73$) with 77.8% of those sample means being under the age of 20 years
13 (absolute upper to lower limits were 9 years to 64 years, respectively). In total, 14,109 (41.3%)
14 participants were female, 18,051 (52.6%) were male, and for 1,996 participants (5.8%) gender
15 was not specified.

16 Of the 104 studies, the majority were from the USA ($k = 33$, 31.7%), UK ($k = 17$, 16.4%),
17 Spain ($k = 13$, 12.5%), and Norway ($k = 11$, 10.6%), with the remainder being drawn from
18 Canada (3), Estonia (2), Finland (3), France (4), Greece (5), Italy (4), Japan (1), the Netherlands
19 (1), Poland (1), Singapore (3), South Korea (2), and one cross national study (Kristiansen,
20 Roberts & Abrahamsen, 2008). Motivational climate has been studied in a range of physical
21 activity contexts: the largest proportions representing participants in PE ($k = 34$, 32.7%), and in
22 team sports ($k = 34$, 32.7%). Only 12.5% ($k = 13$) of the articles sampled exclusively from
23 participants in individual sports, and 15.4% ($k=16$) recruited from both team and individual
24 sports. Five studies (4.8%) pertained to exercise classes, two were drawn from dance classes, and
25 one employed a motor skill acquisition task (Hogue, Fry, Fry & Pressman, 2013). Finally, to
26 assess the perceived motivational climate, the majority of studies either used the PMCSQ-2 ($k =$

1 40, 38.5%) or the PMCSQ ($k = 24$, 23.1%) with the LAPOPECQ ($k = 8$, 7.7%), PECCS ($k = 5$),
 2 PeerMCYSQ ($k = 5$) and PIMCQ-2, EPCM and TIMCQ (all $k = 3$) being selectively employed.

3 **Summary of Correlates of Perceived Motivational Climate**

4 Seventeen categories emerged to describe the intrapersonal correlates of perceived
 5 motivational climate (See Tables 2 and 3). For ease of presentation, these categories have been
 6 distilled into six higher order themes deemed representative of each category. In these six
 7 subsequent thematic sections, each category of correlates is explained, its theoretical links are
 8 specified, and the quantitative findings are reviewed.

9 **Goal orientations and adoptions.** Individual differences in goal orientation or goal
 10 adoption emerged as an extensively studied correlate of PMC. Theoretical and empirical literature
 11 generally predicts that there should be positive associations between a PTMC and task
 12 orientation, and also PEPC and ego-orientation. There are no clear theoretical reasons to posit
 13 correlations between PTMC and ego-orientation or PEPC and task-orientation. Mechanisms may
 14 include the ‘socialisation’ effect of climates influencing goal-orientation, the ‘gravitation’ of
 15 athletes with a particular achievement goal towards activities where that climate prevails, or goal
 16 orientations may cognitively bias the athlete’s perception of the motivational climate (cf.
 17 Harwood et al., 2008).

18 In relation to task orientations, 67 correlations were sampled, with a total population of
 19 20,302 ($\chi = 303.1$). Overall there was a moderate positive effect size between PTMC and task-
 20 orientation ($\rho_c = 0.46$, CI = 0.42-0.51), with acceptable homogeneity of variance. In contrast,
 21 there was no notable association between PEPC and task-orientation (see Table 3). In relation to
 22 ego-orientation, 61 correlations were sampled, with a total population of 17,789 ($\chi = 291.6$).
 23 There was a moderate positive association between PEPC and ego-orientation ($\rho_c = 0.36$, CI =
 24 0.32-0.39), but no association between PTMC and ego-orientation (see Table 2).

25 Elliot and colleagues expanded the dichotomous model of achievement goals, by
 26 proposing the bifurcation of ego/performance goals into performance-approach (PApp) and

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1 performance-avoidance (PAv) goals (Elliot & Church, 1997). This was closely followed by the
 2 division of mastery goals into mastery-approach (MApp) and mastery-avoidance (MAv - Elliot &
 3 McGregor, 2001). Several studies have also correlated perceptions of the motivational climate
 4 with these more recent forms of goal adoption (NB: not conceptualised as dispositions, as with
 5 goal orientation - cf. Elliot, 1999). Five samples, totalling 1,345 participants ($\chi = 269.00$),
 6 correlated climate perceptions with MApp and MAv goals, whereas eight samples totalling 2,473
 7 participants ($\chi = 309.1$) correlated climate perceptions with PApp and PAv goals. PTMC
 8 demonstrated a moderate positive association with MApp goals, a small positive correlation with
 9 MAv goals, and a small positive association with PApp goals. PEPC demonstrated moderate
 10 positive associations with both PApp and PAv goals, and a small positive association to MAv
 11 goals (for details see Table 3).

12 **Self perceptions and performance.** A range of outcomes associated with self
 13 perceptions and performance in achievement contexts have been associated with PMC. For
 14 example, perceived competence represents an individual's belief in their ability to accomplish a
 15 given task or skill, and can be separated from self-esteem (one's overall appraisal of the self as a
 16 person) and physical self-perception (the appraisal of one's own physical fitness and body
 17 attractiveness; Dweck, 1986). Theory predicts that a PTMC is more likely to foster high
 18 perceptions of competence, whereas a PEPC creates an increased likelihood of diminishing
 19 competence perceptions - because only winning is good enough (see Duda, 1992). As an
 20 additional consideration, three studies broke down perceived competence into norm-referenced
 21 and self-referenced forms (Boixadós, Cruz, Torregrosa & Valiante, 2004; Eys et al., 2013;
 22 MacDonald, Côté, Eys & Deakin, 2011), which presumably would correlate positively with
 23 PEPC and PTMC, respectively.

24 Fifty-three samples with a total of 14,143 participants ($\chi = 266.6$) correlated PTMC with
 25 perceived competence, returning an overall positive association that was small and homogeneous
 26 ($\rho_c = 0.24$, CI = 0.21-0.28). Fifty-one studies ($\Sigma n = 12,935$, $\chi = 253.6$) examined PEPC's

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1 relationship with perceived-competence, demonstrating no overall association (see Table 3). For
2 the specific examination of whether competence was self- or norm-referenced, three studies ($\Sigma n =$
3 $1,979$, $\chi = 659.7$) examined these relationships, with PTMC showing a moderate positive
4 homogeneous association to self-referenced perceived competence ($\rho_c = 0.48$, $CI = 0.38-0.58$),
5 but no association to norm-referenced competence perceptions. In contrast, PEPC returned a
6 moderate positive homogeneous association to norm-referenced perceived competence ($\rho_c = 0.39$,
7 $CI = 0.21-0.56$), but no association to self-referenced competence perceptions.

8 Regarding confidence and self-esteem, five samples ($\Sigma n = 1,105$, $\chi = 221$) examined
9 perceptions of self-esteem and confidence with reference to the self, as opposed to the specific
10 task or skill. Following the same logic as perceived competence, the properties of a PTMC should
11 promote self-esteem and confidence, whereas a PEPC should either show no association or a
12 negative association. In support of these predictions, the analysis suggested a moderate, positive
13 and homogeneous association to PTMC ($\rho_c = 0.40$, $CI = 0.28-0.53$), and a small, negative
14 homogeneous association to PEPC ($\rho_c = -0.14$, $CI = -0.42- -0.15$).

15 Physical self-perceptions refer to specific beliefs about one's physical conditioning,
16 fitness, and body attractiveness, and can be separated from perceived competence (task specific)
17 and global self-esteem. Where studies included the sport competence subscale of the PSPP
18 questionnaire, this was coded under perceived competence. The same theoretical tenets as
19 deployed above predict that a PTMC should link to enhanced physical self-perceptions, whereas
20 PEPC is not conducive to supporting physical self-perceptions. However, 13 studies ($\Sigma n = 2,477$,
21 $\chi = 190.5$) correlated physical self-perceptions with perceptions of the motivational climate, with
22 the analysis suggesting no associations to either PTMC or PEPC (see Tables 2 and 3).

23 Turning away from self-perceptions to objective performance measures, a total of 11
24 studies ($\Sigma n = 2,975$, $\chi = 270.5$) reported associations between the perceived motivational climate
25 and objective indices of performance. Measures of performance included win:loss percentage

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1 (Cumming, Smoll, Smith & Grossbard, 2007), cardiovascular fitness (Brown & Fry, 2013; Wang
2 et al., 2010), teacher- or coach-evaluated skill level (Bortoli et al., 2011; Yoo, 1999), and one-
3 mile run time (Xiang, Bruene & McBride, 2004). Following the theoretical logic of perceived
4 competence, a PTMC may be proposed to promote performance, whereas, a PEPC may
5 demonstrate either no relationship or a negative relationship (cf. Harwood et al., 2008). Overall,
6 PTMC demonstrated a small, positive and homogeneous association to objective performance (ρ_c
7 = 0.25, CI = 0.15-0.35), whereas PEPC showed no relationship (see Table 3).

8 Perceived autonomy refers to the degree to which athletes “engage in the activity for their
9 own valued reasons and feel that they have freely chosen to be involved” (Allen & Hodge, 2006;
10 p. 267). A total of 14 samples ($\Sigma n = 4,233$, $\chi = 302.4$) reported associations between the
11 perceived motivational climate and the perception that one’s psychological need for autonomy
12 was satisfied. Ames’ (1992) TARGET framework and the task-mastery items in many of the
13 questionnaires clearly assume that a PTMC should include, and so positively correlate with,
14 perceived autonomy. The same reasoning suggests that a PEPC should either be negatively
15 correlated or show no association. Supporting these predictions, PTMC demonstrated a moderate,
16 positive and homogeneous relationship with perceived autonomy ($\rho_c = 0.32$, CI = 0.20-0.45),
17 whereas PEPC demonstrated a small negative and homogenous association ($\rho_c = -0.18$, CI =
18 0.28-0.08 - see Table 3).

19 Perceived relatedness refers to “a concern about connections with others and the quality
20 of our interpersonal relationships” (Allen & Hodge, 2006; p.268). A total of 11 studies ($\Sigma n =$
21 3,416, $\chi = 310.8$) reported associations between the perceived motivational climate and the
22 perception that one’s psychological need for relatedness was satisfied. Theoretically, a PTMC
23 may promote feelings of relatedness, whereas a PEPC should undermine such feelings (cf. Duda,
24 2001; Ntoumanis, 2001). Supporting these predictions, PTMC demonstrated a large, positive and
25 homogeneous relationship with perceived relatedness ($\rho_c = 0.55$, CI = 0.46-0.64), whereas PEPC
26 demonstrated a moderate negative and homogenous association ($\rho_c = -0.36$, CI = -0.47-0.25 - see

1 Table 3).

2 **Motivational regulation processes.** Self-determination theory (Deci & Ryan, 1985)
3 posits a spectrum of types of motivational regulation, based around the amount of external
4 inducement required/perceived in order to complete a given task, or participate in a certain
5 activity (Vallerand & Fortier, 1998). At one end of the spectrum is *intrinsic motivation* (IM),
6 which can be defined as the impetus to perform an activity for its own sake – for the pleasure and
7 satisfaction inherent in participating in a task (Deci, 1975; Deci & Ryan, 1985) – i.e., no external
8 inducement is required (or perceived). At the other end of the spectrum, *extrinsic motivation* (or
9 more specifically, *external regulation* - ER) refers to engaging in an activity as a means-to-an-end
10 (Vallerand & Fortier, 1998), or for instrumental behaviours, which are motivated by expected
11 outcomes or inducements (Ryan & Deci, 2008). In between these two extremes are several
12 different levels/types of extrinsic motivation, including: *introjected* (avoiding external
13 disapproval, seeking external approval); and *identified* (relating to internally held but learned
14 values/contingencies). In addition, SDT conceptualises a state of *amotivation* – a state of not
15 having any intention or energy directed towards action; characterised by a belief that success is
16 not possible and the task is not valuable.

17 With questionnaire items tapping a perceived emphasis on personal improvement and
18 effort, a PTMC should be more closely associated to pursuing personally meaningful goals (at
19 one's own pace, for one's own reasons) than a PEPC (see also Kavussanu & Roberts, 1996;
20 Sproule et al., 2007). The results of this analysis were broadly supportive of the theoretical
21 predictions (see Tables 2 and 3). Nineteen samples correlated PTMC with intrinsic motivation
22 ($\Sigma n = 5,966$, $\chi = 303.5$), generating an overall corrected correlation that was large and
23 homogenous ($\rho_c = 0.55$, $CI = 0.48-0.62$). Seventeen samples correlated PEPC with intrinsic
24 motivation ($\Sigma n = 4,896$, $\chi = 288$), demonstrating no consistent pattern (see Table 3). PTMC also
25 demonstrated positive associations with IM to know, IM for stimulation; IM for accomplishment,
26 and identified regulation – but no consistent associations with introjected regulation, ER or

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1 amotivation (see Table 2). In contrast, PEPC demonstrated no consistent associations with IM
 2 (any type); identified or introjected regulation, but moderate, and homogeneous positive
 3 associations with ER and amotivation (see Table 3).

4 As a final consideration, eight studies constructed compound functions of motivation,
 5 using equations to calculate an overall 'relative autonomy index' or overall self-determined
 6 motivation. The way the scores are calculated puts a strong emphasis on more intrinsic forms of
 7 motivation and so, in line with the above reasoning, PTMC should be positively associated with
 8 these scores, and PEPC should not. Once again, this prediction was supported, with PTMC
 9 generating a large, positive and homogeneous association with compound motivation ($k = 58$, Σn
 10 $= 2,296$, $\chi = 287.0$, $\rho_c = 0.51$, $CI = 0.38-0.64$) and a small, negative and homogeneous association
 11 between PEPC and compound motivation ($\rho_c = -0.10$, $CI = -0.20-0.002$).

12 **Emotions, cognitions and affect.** Affective states in achievement goal research have
 13 generally been used to refer to emotions and moods (e.g., distress, anxiety, pressure, fatigue,
 14 boredom), although occasionally a cognitive component can also be detected (e.g., worry). As
 15 reviewed by Harwood et al. (2008), a PTMC should be less likely to produce these feelings
 16 because of the emphasis on personal development/growth, with mistakes or failures being viewed
 17 as part of the learning process. In contrast, the emphasis of a PEPC on competition, rivalry, and
 18 an intolerance for mistakes may increase the likelihood of negative emotions being experienced.
 19 In this review, 34 samples correlated the perceived motivational climate with *negative affect* (Σn
 20 $= 7,334$, $\chi = 215.7$). The analysis suggested an overall small, negative and homogeneous
 21 association with PTMC ($\rho_c = -0.17$, $CI = -0.23-0.12$), but an overall small, positive and
 22 homogeneous association with PEPC ($\rho_c = 0.25$, $CI = 0.19-0.31$).

23 In this investigation it was possible to separate *negative cognitions, thoughts and worries*
 24 from affective states. Following the same logic as above, PTMCs should hold either no
 25 association or a negative association to cognitive worries, whereas PEPCs should demonstrate a
 26 positive correlation. In this review, 17 samples correlated the perceived motivational climate with

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1 negative thoughts and worries ($\Sigma n = 2,285$, $\chi = 134.41$). The analysis suggested an overall small,
2 negative and heterogeneous association with PTMC ($\rho_c = -0.19$, $CI = -0.26-0.11$), but an overall
3 small, positive and homogeneous association with PEPC ($\rho_c = 0.19$, $CI = 0.05-0.34$).

4 Whereas negative affect (above) refers to negative moods and emotions, *positive affect*
5 refers to positive experiential states such as enjoyment, satisfaction, interest, and vigour (cf. Duda,
6 1998). As reviewed by Harwood et al. (2008), a PTMC should be more likely to promote these
7 latter feelings, whereas a PEPC should demonstrate either no relationship or a negative
8 relationship with such a construct. In this review, 39 samples correlated the perceived
9 motivational climate with positive affect ($\Sigma n = 9,746$, $\chi = 249.9$). The analysis suggested an
10 overall moderate, positive and homogeneous association with PTMC ($\rho_c = 0.47$, $CI = 0.42-0.53$),
11 but an overall small, negative and homogeneous association with PEPC ($\rho_c = -0.11$, $CI = -0.18-$
12 0.37).

13 **Beliefs, values and strategies.** Research has comprehensively investigated the links
14 between PMC and a range of beliefs, personal values and strategies adopted by athletes. A total
15 of 29 analyses ($\Sigma n = 6,646$, $\chi = 229.2$) correlated perceived motivational climate with factors
16 such as *attitudes towards sport or exercise* (including perceived norms and expectations of
17 cost/benefit), intentions to be active, self-reported adherence to exercise, and desire to attend
18 future activities. Theoretically, PTMC may be more likely to promote positive attitudes and
19 intentions towards participation, whereas a PEPC may only appeal to a small number of highly
20 competitive individuals. Accordingly, the analysis produced an overall small, positive and
21 heterogeneous association with PTMC ($\rho_c = 0.27$, $CI = 0.23-0.32$), but no association with PEPC
22 (see Table 3).

23 A number of studies have investigated associations between perceptions of motivational
24 climate and the *use of learning/practice and competitive strategies*. A range of different
25 psychological and behavioural strategies have been measured and these were divided into

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1 adaptive and maladaptive categories. Adaptive strategies included: persistence; increased effort;
 2 self-regulation; learning from practice; seeking help; co-operation; and adaptive coping (e.g.,
 3 solution focussed). Maladaptive strategies included: self-handicapping; maladaptive coping (e.g.,
 4 avoidance); exercise dependence; and avoiding practice/training. Consistent with Roberts and
 5 Treasure's (1992) predictions regarding goal orientations, we predicted that a PEPC would be
 6 positively associated with maladaptive strategies but not adaptive ones. Accordingly, a PTMC
 7 should correlate with adaptive learning and competitive strategies, but not maladaptive strategies.

8 In support of these predictions, 17 samples ($\Sigma n = 4,457$, $\chi = 262.2$) correlated perceived
 9 motivational climate with adaptive strategies, which demonstrated a moderate, positive and
 10 homogeneous association with PTMC ($\rho_c = 0.47$, $CI = 0.36-0.57$), but no association with PEPC
 11 (see Table 3). Likewise, eight analyses ($\Sigma n = 1,767$, $\chi = 220.9$) correlated perceived motivational
 12 climate with maladaptive strategies, which demonstrated a small, negative and heterogeneous
 13 association to PTMC ($\rho_c = -0.13$, $CI = -0.22-0.05$), and a small, positive and heterogeneous
 14 association to PEPC ($\rho_c = 0.28$, $CI = 0.21-0.35$).

15 *Moral functioning* relates to the principles for how individuals ought to treat one another,
 16 with respect to justice, others' welfare, and rights. In sport, this relates to striving to play well
 17 and/or win without taking an unfair advantage over the opponent (Lemyre, Roberts &
 18 Ommundsen, 2002). Studies attempting to examine moral functioning have generally
 19 distinguished between *pro-social* (e.g., respect for the leader, officials, or opponents, and staying
 20 disciplined) versus *antisocial* attitudes (e.g., intimidation, intentional attempts to injure, cheating,
 21 deception, and lack of discipline). Theoretically, a PEPC is likely to accompany attitudes
 22 endorsing cheating, deception or injurious acts in order to win 'at all costs', and not pro-social
 23 attitudes (Ommundsen et al., 2003). In contrast, a PTMC should be associated with pro-social,
 24 and not antisocial, attitudes.

25 In support of these predictions, 15 samples ($\Sigma n = 4,601$, $\chi = 306.7$) correlated pro-social
 26 attitudes with PTMC, which demonstrated a small, positive and homogeneous association ($\rho_c =$

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1 0.24, CI = 0.12-0.36), but no association with PEPC. In contrast, 11 ($\Sigma n = 3,980$, $\chi = 361.8$)
 2 samples correlated antisocial attitudes with perceived motivational climate, wherein PTMC
 3 showed a small negative and homogeneous association ($\rho_c = -0.23$, CI = -0.34 - -0.12) and PEPC
 4 returned a moderate positive and homogeneous association ($\rho_c = 0.33$, CI = 0.25-0.42).

5 **Dispositions and Traits.** Several of the correlations identified in this review represented
 6 relatively stable demographic, dispositional or personality characteristics. Thirteen samples ($\Sigma n =$
 7 3,563, $\chi = 274.1$) correlated *age or playing experience* to perceptions of motivational climate.
 8 With age and progression, athletes may experience an increased emphasis on winning and
 9 competition as they progress towards higher levels (i.e., with age). However, neither PTMC nor
 10 PEPC demonstrated a relationship with age or experience (see Tables 2 and 3). Notably, the
 11 majority of sample used narrow age ranges (closely aligned to those at the beginning of the
 12 Results section) and none of the studies examining age or experience sampled participants over
 13 the age of 21 years.

14 *Perfectionism* is a personality trait characterised by a person's striving for flawlessness:
 15 setting excessively high standards for oneself and being overly self-critical if these standards are
 16 not met (Flett & Hewitt, 2002; Stoeber & Childs, 2010). Theoretically, both task- and ego-
 17 oriented approaches to defining success offer opportunities for individuals to set unrealistically
 18 high standards. In this analysis, eight samples ($\Sigma n = 4,843$, $\chi = 605.4$) correlated perceived
 19 motivational climate with perfectionism, suggesting no association with PTMC (See Table 2) but
 20 a moderate positive and homogeneous association to PEPC ($\rho_c = 0.49$, CI = 0.39-0.58).

21 Six samples ($\Sigma n = 3,858$, $\chi = 643.0$) correlated perceived motivational climate with trait
 22 flow: the general *tendency of the individual to experience flow*. Flow describes subjective
 23 experiences of intense, deeply involved concentration, loss of self-consciousness, and a feeling of
 24 total control that are often associated with peak performance (Csikszentmihalyi, 2002; Jackson &
 25 Csikszentmihalyi, 1999). Theoretically, PTMCs are likely to be more positively associated with
 26 reports of dispositional flow, whereas, PEPCs appear likely to undermine many of the conditions

1 necessary for flow (Kowal & Fortier, 2000). In support of these predictions, PTMC demonstrated
2 a moderate positive and homogeneous association to dispositional flow ($\rho_c = 0.45$, CI = 0.39-
3 0.51), but no association was evident for PEPC (details in Table 3).

4 **Correlates below threshold.** Two studies examined the correlations of perceived
5 motivational climate to beliefs about the purpose of sport (Ommundsen et al., 1998; Wang et al.,
6 2008), suggesting a positive association between PTMC and beliefs that sport fosters mastery, life
7 skills or citizenship. In contrast, PEPC was linked to the belief that sport is an opportunity to gain
8 status. Likewise, two studies examined the association of perceived motivational climate to the
9 beliefs about the causes of success in sport (Cury et al., 2002; Chian & Wang, 2008), suggesting
10 an association between PTMC and effort/learning beliefs versus an association between PEPC
11 and ability beliefs. Finally, one study correlated climate perceptions with sources of satisfaction,
12 linking PTMC to mastery as the source of satisfaction and superior ability as the source of
13 satisfaction when a PEPC was reported (Ommundsen et al., 1998).

14 **Risk of Bias Assessment**

15 Inter-rater reliability indicated adequate percentage of agreement (96.2%) for the 520
16 checked items (Supplementary Table 1). No studies undertook a random sampling process, with
17 all studies using either purposive or opportunistic sampling. Ninety-four studies (90.4%) provided
18 an adequate description of the study sample, 97 studies (93.3%) provided valid measurements of
19 the perceived motivational climate, and 88 studies (84.6%) provided evidence of acceptable
20 validity for correlates. Fifty studies (48.1%) adjusted for covariates, and eight studies (7.7%)
21 included data on the correlations of motivational climate subscales.

22 **Discussion**

23 This systematic review set out to detail the intrapersonal correlates of perceived
24 motivational climate, the theoretical explanations for these associations, and the overall findings
25 in relation to each correlate. With a focus on research within sport and physical activity between
26 1990-2014, the findings enable not only a summary of the extant literature, but a critical review of

1 current methodologies and paradigms in this field of research.

2 **Summary of Findings**

3 Overall, PTMCs demonstrated positive associations to a range of highly adaptive
4 constructs, including: perceived competence (overall and self-referenced); confidence/self-
5 esteem; feelings of autonomy and relatedness; more intrinsic forms of motivational regulation;
6 positive affect; attitudes and intentions; objective performance measures; adaptive
7 practice/competitive strategies; pro-social moral functioning; and dispositional flow. Likewise,
8 PTMCs showed small negative associations to several maladaptive constructs, such as: negative
9 affect; maladaptive practice/competitive strategies; and antisocial moral functioning. However,
10 PEPCs were positively associated to: norm-referenced competence evaluations; external and
11 amotivated forms of motivational regulation; negative affect; negative thoughts/worries;
12 maladaptive practice/competitive strategies; and antisocial moral functioning. Further, PEPCs
13 demonstrated negative associations with several adaptive outcomes such as feelings of autonomy
14 (small), relatedness (moderate) and positive affect (small). Clearly, when considering the average-
15 of-averages, those perceiving a task-mastery motivational climate engage in sport and physical
16 activity more favourably. These findings are consistent with both theoretical predictions and
17 previous reviews (e.g., Ntoumanis & Biddle, 1999; Harwood et al., 2008). PTMCs were
18 associated with 24 intrapersonal correlates, including four large effect sizes (intrinsic motivation,
19 compound motivation, IM to seek stimulation, and perceived relatedness). PEPCs were
20 associated with 15 correlates, with no large effect sizes. This pattern is consistent with the
21 narrative review of Harwood et al. (2008) wherein PEPCs offered fewer concrete hypotheses due
22 to the moderation effects of perceived competence.

23 **Critical Issues and Opportunities for Progress**

24 A broad overview of the data from this review reveals several noteworthy trends. First,
25 there is a clear discrepancy in the number of studies examining different correlates, with goal-
26 orientations, perceived competence and affective states receiving disproportionate attention. A

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1 fraction of the number of studies published examining these correlates would have been sufficient
2 to demonstrate an association worthy of further exploration. However, in the broader literature,
3 very few studies have attempted to establish the direction of causality in these relationships. In
4 contrast, some important correlates have received relatively sparse attention. For example,
5 objective measurements were rare – having to be combined into one category of objective
6 performance measures. The pragmatic difficulties of making large-scale measurements of
7 objective performance/behavioural data, as well as the theoretical emphasis on the subjective
8 meaning of achievement contexts (cf. Ames, 1992b; Treasure et al., 2001) may be responsible for
9 this trend. However, in order for research findings to produce meaningful recommendations about
10 the objective determinants (and outcomes) of climate perceptions, it may be necessary to
11 introduce some more ambitious and innovative measurement techniques.

12 Linked to this first point, only five out of 54 (total) correlates (or put differently, $k = 80$
13 out of 525, or 15%) were related to behaviour and behavioural intentions: objective performance,
14 practice and competitive strategies (adaptive or maladaptive), and moral functioning (prosocial or
15 antisocial behaviour). One, age/experience, was demographic, but the remaining 48 correlates
16 were cognitive or affective. In effect, this current body of research permits the conclusion that
17 those perceiving a PTMC may think or feel more adaptively, but information regarding important
18 behavioural outcomes is much less evidenced. Further, 42% of effect sizes focussing on
19 behaviour were heterogeneous, versus 30% of the cognitive and affective correlates (including
20 non-significant). This difference may indicate moderation effects such as methodological issues
21 or more complex causal chains. Of the 12 effect sizes calculated for behavioural correlates, four
22 were below 0.1, six were small and two were moderate. None were large. Future research may
23 contribute meaningfully to current understanding by continuing to explore the behavioural
24 associations of perceived (and objective) motivational climates.

25 Second, the vast majority of the current research focuses on perceptions of the climate
26 exclusively ‘created by’ the coach (59) or teacher (34) (although it is debated as to whether the

1 PMCSQ-2 items truly refer to the coach or the more general level of ‘on this team’ – cf. Harwood
2 et al., 2008; Keegan et al., 2010a). Only five papers examined perceptions of the ‘peer created’
3 climate, and three measured perceptions of the ‘parent created’ climate. This raises the issues of
4 both an under-emphasis on parents and peers, as well as the more integrated matter of failing to
5 comprehend the concurrent or interactive influence of these social agents. Only three papers
6 examined such perceptions concurrently (Morris & Kavussanu, 2008; Vazou et al., 2006; White,
7 Kavussanu & Guest, 1998), and whilst other papers have also attempted such analyses (Carr &
8 Weigand, 2001; Chan, Lonsdale & Fung, 2012), the issues remains unresolved, largely due to the
9 use of different questionnaires for each social agent (cf. Keegan et al., 2009; 2010b; 2014a; b).
10 Athletes may experience the motivational ‘pull and push’ from the varying social agents who,
11 together, contribute to an overall motivational climate. Therefore, examining the interactive
12 effects of different social agents would advance knowledge on how sensitive athletes may be to
13 specific aspects of the motivational climate. Such research is important where social agents
14 promote conflicting messages: a common situation yet one where the current literature would not
15 be able to predict what outcomes to expect. Thirteen years after having been identified by Duda
16 (2001), it is increasingly important that issues such as this are addressed so that interventions can
17 focus on specific messages, and from specific social agents, that are perceived to be most
18 influential.

19 Thirdly, from a demographic perspective, the samples were relatively homogeneous in
20 terms of using school and college participants tightly concentrated around the mean age of 16.5
21 years. Only 20 studies (19.2%) reported average ages outside one standard deviation of this mean
22 (eight below, and 12 over), with only two studies examining groups over 30 years of age
23 (Huddleston, Fry & Brown, 2012; Kowal & Fortier, 2013). There may be important questions left
24 unanswered by neglecting to examine groups outside this age-range. Further, there has been a
25 relative lack of research into higher-level performers (only 4.8% of research examined adult
26 national, international, and professional athletes). Yet at higher competitive levels the contextual

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1 behaviour of coaches and peers may have more critical personal, financial and organisation-
2 related impacts than the youth or student-athlete.

3 Fourth, the vast majority of the studies sampled were cross-sectional in nature, and even
4 those that repeated their measures did so within a relatively short time (e.g., the same season). The
5 perceived (and objective) motivational climate may change substantially as one progresses and
6 matures through childhood into youth, and from recreation to competition to retirement. Further,
7 there is good reason to propose that the key influences on climate perceptions change as the
8 career develops (Carr, Weigand & Hussey, 1999; Keegan et al., 2014b). As noted in the prior
9 paragraph, only five studies recruited samples that would truly be considered elite (i.e., not
10 counting high-performing youth athletes), and yet studying the differences between levels and
11 career stages may well advance current understanding.

12 Finally, there was a relative lack of papers examining individual sports (12.5%; e.g.,
13 tennis participants, track and field athletes, dancers, Winter Olympics athletes) as opposed to
14 team sports, mixed samples, and PE. There is reason to believe that different socio-motivational
15 environments may exist in team-versus-individual sports, and that an individual athlete's support
16 network will differ as a result (e.g., the 'team' around an athlete). Accurate measurement of
17 perceived motivational climate would therefore necessitate the development of instrumentation
18 that is grounded in an understanding of individual sport settings. In the current review, a
19 questionnaire developed from, and designed for, team sport populations (PMCSQ-2), has been
20 the prominent measure of choice. However, none of these existing studies offer a clear
21 justification of the measure's validity to examine individual sports performers. Alongside the
22 recently developed PeerMCYSQ (Ntoumanis & Vazou, 2005) - also developed using team sports
23 - there is need for future research to consider more valid and appropriate assessments of athletes
24 in individual sports, as well as more research in these contexts overall.

25 **Subjective-objective tensions.** In relation to subjective-versus-objective issues with the
26 measurement (and interpretation) of perceived motivational climate, Treasure et al. (2001) were

1 relatively clear in stating that:

2 It is true that Nicholls [1989] speaks of the objective characteristics of achievement
3 contexts which “set the stage,” or increase the tendency for task or ego involvement to be
4 invoked. However, this does *not* mean that Nicholls suggests the objective reality always
5 equates to the individual’s subjective reality (pp.319 – italics original).

6 Keegan et al. (2010; 2014b) have critiqued the issue of making recommendations to
7 coaches or teachers on the basis of subjective perceptions, which can vary substantially even
8 when players have the same coach/teacher (Papaioannou, 1994; Cumming et al., 2007). Further
9 still, Sproule et al. (2007; p.1047) concluded: “There is a need to examine the discrepancy
10 between teachers’ and pupils’ perceptions of motivational climate compared to the behaviourally
11 measured structures. Understanding the differences in perception and behaviour may help to
12 guide more effective interventions.” In spite of these issues, 57 studies (54.8%) made explicit
13 recommendations that coaches, teachers, parents or practitioners should change their behaviour
14 after measuring participants’ subjective perceptions of the motivational climate (summary Table
15 available on request). Justifying such recommendations requires care when objective
16 measurements of coach/teacher/parent/peer behaviours were not taken. This issue is particularly
17 problematic when the direction (and, for that matter, the *presence*) of causality between perceived
18 climate and the desired ‘outcomes’ can never be established through correlational (and largely
19 cross-sectional) studies (cf. Aldrich, 1995). Correlation is a necessary but not sufficient condition
20 for establishing causality. Research establishing exactly how social agents are able to influence
21 participants’ perceptions of the motivational climate would be valuable for informing the
22 development of motivational climate interventions and evidence-based behavioural
23 recommendations. As such, the objective instruments currently being developed also show
24 promise (Morgan & Kingston, 2010; Tessier et al., 2013), notwithstanding the issue below related
25 to ‘constrained/selective measurement’. **Recent educational interventions and field-based
26 experiments have demonstrated that both climate perceptions and associated motivational and**

1 emotional indices can be influenced at the same time, suggesting a level of causal connectedness
2 not offered by correlational studies (e.g., Smith, Smoll & Cumming, 2007; Smoll, Smith &
3 Cumming, 2007; Standage, Treasure, Hooper, & Kuczka, 2007). Further fine grained analyses
4 of how climate perceptions are influenced (a) by certain behaviours and language, (b) in
5 certain situations/contexts, and (c) in certain combinations, may add to this growing body of
6 applied research.

7 **Measurement choices: Levels and constraints.** Following from the above, it is worth
8 noting that, conceptually, a motivational climate - in its broader objective sense - can influence
9 many more factors than task- or ego-goals. Further, the behaviours, exchanges, perceptions and
10 attitudes that may contribute to the perceptions of either a PTMC or PEPC are likely constantly
11 changing and interacting. Indeed, the goal-related cues, structures, expectancies and
12 reinforcement behaviour that can comprise a motivational climate may change moment-to-
13 moment, between sessions, and between practice and competition. However, to date, motivational
14 climate research has almost exclusively measured: (a) very generalised (or 'contextual level' - cf.
15 Vallerand, 1997) perceptions of the climate; (b) relatively infrequently (either once or at the
16 beginning and end of a season); (c) using questionnaires that only assess (or at least only analyse)
17 higher order perceptions of PMTC or PEPC (only 7.7% of the papers samples examined the
18 lower-order climate subscales); and (d) without analysing the effects of individuals being 'nested'
19 within teams or clubs (cf. Harwood, Beauchamp & Keegan, 2014). Further still, questionnaire
20 design processes invariably attempt to minimise cross loading and interactivity, even though these
21 properties may be at the heart of a real motivational climate. This heavy dependence on
22 questionnaire methodology, and analyses predicated chiefly on correlation, may be significantly
23 constraining the ability of researchers to detect and account for other important influences.
24 Influences that might only be discoverable via different methodologies and theoretical approaches
25 (Biddle, 2000; Brustad, 1999; Culver et al., 2003). Attempts to progress research in this area may
26 wish to examine more situational and short-term perceptions of the climate. Further still, future

1 research may wish to deploy analytic categories other than task- and ego-involving, which may be
2 unduly constraining our observations to guarantee that research only finds climate characteristics
3 consistent with these two categories. Recent attempts to develop measures assessing ‘caring
4 climate’ (Newton et al., 2007) and ‘empowering climate’ (Sarrazin et al., 2013) represent
5 progress, without necessarily addressing all of the above-described issues.

6 **Risk of bias considerations.** In reviewing the risk-of-bias assessment, it is notable that
7 none of the studies deployed random sampling from the target populations, but rather
8 opportunistic or purposive sampling. Such a strategy at the broad level of a research programme
9 may introduce a risk of bias, which is reinforced when considering the age-range issues discussed
10 above. Whilst the absence of ages was the main reason for insufficient population details, over
11 half the studies sampled did not clearly attempt to manage covariates such as age, gender,
12 ethnicity and socio-economic status. Whilst these issues were not the focus of such studies, they
13 are some of the most common confounding variables in scientific research (Weiner, Schinka &
14 Velicer, 2012) and should arguably be examined as standard practice. A small proportion of
15 studies either failed to report reliability values for all relevant variables or continued the analysis
16 using variables with inadequate reliability. In discussing this issue, Chatzisarantis and Stoica
17 (2009) were clear that such reporting practices should generally be discouraged in order to
18 facilitate subsequent research syntheses. Following criticisms of ‘failsafe N’ procedures (Becker,
19 2005; Evan, 1996) and the recommendation not to use the procedure in Cochrane reviews
20 (Higgins & Green, 2011); this calculation was not included in the current systematic review.

21 **Limitations**

22 The current study attempted to systematically review a thriving and complex literature on
23 the correlations of motivational climate perceptions in sport and physical activity. In establishing
24 a manageable sample (of approximately 100 papers) and a coherent analysis, two key issues are
25 notable. First, there remain additional unpublished papers not included in this analysis, although
26 the very aims of the study were not to correct for publication bias so much as to accept it as

1 unavoidable and critically analyse the resultant literature. Further, the use of a conservative
2 analysis technique should partly ameliorate such concerns. Second, the current analysis did not
3 include interpersonal correlates, such as feelings towards the coach/teacher, team cohesion or
4 parental pressure. While such considerations may also interact with or moderate the intrapersonal
5 correlations of climate perceptions, such an analysis would have been beyond the scope of a
6 single paper. As such, the title, aims and analysis all focus on intrapersonal correlates, but future
7 research should include the consideration of interpersonal factors given that the literature on
8 intrapersonal correlations is relatively established.

9 **Charting Avenues for Future Research**

10 Overall, the literature examining the intrapersonal correlates of perceived motivational
11 climate has tended to progress by: a) finding new correlates of perceived climate, or new
12 contexts/populations in which such correlations can be found. This approach might be considered
13 progress through *expanding the applicability* of the perceived motivational climate construct; b)
14 using deductive and complex statistical procedures – such as structural equation modelling and
15 multiple regression – to achieve progress through *mapping patterns* of associations between
16 climate perceptions and their correlates. The *a priori* specification of which variables are
17 ‘predictors’ or ‘determinants’ in such models, and the creation of diagrams with arrows flowing,
18 for example, from left to right can often give the impression of causal relationships. However, the
19 acceptance of such directionality in correlational relationships depends on the acceptance of the
20 theory and hypotheses as true in advance – an issue which warrants critical examination and
21 reflection across this field-of-research.

22 Neither of the above strategies permit the strict testing of a theory, nor do they attempt to
23 falsify the theory, but rather they are strategies aimed at expanding and ‘fleshing out’ our
24 understanding of AGT as applied to motivational climates in sport and physical activity. Even
25 despite their very different viewpoints, both Kuhn (1962) and Popper (1969) agreed that, overall,
26 the most substantial scientific progress is made when attempts are made to find out where, how

1 and why theories fail, and where modifications are needed. Ultimately, the most significant
2 advances in scientific progress are achieved through the development of new explanatory theories
3 that offer new hypotheses for testing – even though they are often initially criticised for being
4 unusual/different, too complex, unpalatable or ‘too new’ (i.e., unheard of, cf. Trafimow & Rice,
5 2009).

6 In response to the specific issues identified in the above discussion there are, of course,
7 opportunities to further explore any correlates where insufficient data currently existed, or where
8 moderation was suggested by heterogeneous variances. Likewise, there are opportunities to expand
9 the age-ranges sampled; to sample more from elite sport; and to sample a wider variety of activities
10 beyond PE and team sports (particularly individual sports). Further still, there is clear scope to
11 examine social influences other than the coach or teacher, and to examine concurrent influences, as
12 well as to take a developmental or transitional perspective by exploring the long-term changes to
13 climate perceptions with age and experience. As immediate opportunities identified by this review,
14 such studies might represent small incremental advances. However, as new methodologies and
15 techniques are developed, it may become possible to move from the occasional (or one-off) and
16 highly abstract measurement of climate perceptions to a more situational and fine-grained analysis.
17 It may also become possible to analyse the precise interactions between objectively observable
18 behaviours/attributes and the way they are subjectively perceived, thus influencing the thoughts,
19 feelings and behaviours of the perceiver. We hope that this review serves as an impetus to devote
20 targeted resources to a field-of-study a substantive legacy, and to continue the momentum in
21 advancing our understanding of optimal motivational environments.

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