

1 **A Review of Observational Instruments to Assess the Motivational**

2 **Environment in Sport and Physical Education Settings**

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19 **A Review of Observational Instruments to Assess the Motivational**
20 **Environment in Sport and Physical Education Settings**

21 **Abstract**

22 To date, the majority of research grounded in Achievement Goal frameworks (AGT) and
23 Self-determination Theory (SDT), which has examined the coach-created motivational
24 environment and its correlates, has relied exclusively on athletes' self-reported perceptions.
25 This limits progress in the field as objective data on real-life events could be used to further
26 identify what coaches and teachers do and say to 'motivate' their athletes and students to
27 influence their skill development, performance and well-being. Such information may help
28 inform how coaches and teachers should be trained to create more motivationally adaptive
29 environments and could help extend results derived from self-report measures. This review
30 outlines the observational systems that are currently available and the research related to
31 AGT and/or SDT-based objective assessments of motivational dimensions of the coaching
32 and physical education (PE) environment. Future research could utilise information in this
33 review to employ and/or amend one of the available observation systems to address important
34 questions related to the observed motivational environment in sport and PE.

35 **Keywords:** Achievement Goal, Self-determination, Observation, Coach, Teacher

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43 **Introduction**

44 Observation is considered to be a valuable methodology for obtaining objective data
45 on real life events (McCall, 1984). Observation is a process by which a trained individual
46 “follows stated guidelines and procedures to observe, record, and analyse interactions”
47 (Darst, Zakrajsek & Mancini 1989). For those observations to be considered reliable, it is
48 expected that other trained observers, who view the same events, will agree with the recorded
49 ratings. Since growing in popularity during the 1970’s, observation has been employed in a
50 variety of ways to examine the behaviour and interactional styles of coaches and teachers in
51 sport and physical education contexts (Cushion, Harvey, Muir & Nelson, 2012; Darst et al.,
52 1989; Smith & Smoll, 2007).

53 Two major social-cognitive theories of motivation that place importance on the type
54 of environment created by a significant other e.g., a coach or teacher, and the behaviours
55 elicited by that person, are achievement goal theory (AGT; Ames, 1992; Nicholls, 1989) and
56 self-determination theory (SDT; Deci & Ryan, 2000). During the past two decades,
57 researchers conducting studies based in AGT and/or SDT frameworks have consistently
58 called for the development of observational measures to objectively assess the motivational
59 environment operating in sport and physical education (PE) contexts (Duda, 2001; Duda &
60 Balaguer, 2007; Ntoumanis, 2012). Such measurement instruments could be used to tackle
61 issues of common method variance, be used to train individuals to create more motivationally
62 adaptive environments, and/or be utilised in the evaluation of intervention programmes (Duda
63 & Balaguer, 2007; Ntoumanis, 2012).

64 In this paper, we first provide a brief overview of AGT, SDT and identify key features
65 of the social environment relevant to the two theoretical perspectives. We then provide a
66 review of the observational systems that are currently available to researchers interested in

67 observing motivationally relevant dimensions of the social environment in sport and PE
68 settings.

69 While we acknowledge there are contextual differences between sport and PE
70 (discussed later in the paper), both are achievement settings where individuals seek to
71 demonstrate competence and require motivation to fulfil their potential (Roberts, 2001;
72 2012). In addition, the roles and behaviours of a PE teacher and coach have considerable
73 overlap where both figures aim to educate and engage their students and athletes in an
74 attempt to promote skill development, knowledge accrual and optimise performance. From a
75 theoretical perspective, the principles of adaptive and maladaptive motivational
76 environments, as highlighted by AGT and SDT, are considered to be applicable to both sport
77 and PE contexts (see Roberts & Treasure, 2012). Sport and PE-based research, grounded in
78 AGT or SDT frameworks, has typically focused on a number of key dimensions of the
79 perceived motivational environment and these environmental dimensions have been studied
80 within different age groups, across countries and at varying competitive levels (Mageau &
81 Vallerand, 2003; Ntoumanis & Biddle, 1999; Reeve & Jang, 2006). The environmental
82 dimensions relevant to AGT and SDT will be reviewed later in the paper. Given the overlap
83 between the types of environment likely to promote or undermine motivation in both sport
84 and PE contexts, observational systems developed in both settings were included in this
85 review. After identifying the AGT and SDT-based observational measures currently available
86 to researchers working in sport and PE contexts, considerations for future observational
87 research are discussed and directions for potentially fruitful avenues of research provided.

88 **Achievement Goal Theory**

89 According to AGT (Nicholls, 1989; Roberts, 2001) there are at least two major goal
90 states that reflect how an athlete construes and defines his/her competence. More specifically,
91 an individual could define their competence according to a task- and/or ego-involved goal.

92 When an individual is task-involved, competence is self-referenced and perceptions of
93 success relate to exerting effort, mastering skills and meeting the demands of a task. If an
94 individual is ego-involved, he or she focuses on other-referenced criteria for success such as
95 outperforming other athletes, demonstrating superior ability and being superior by exerting
96 minimal effort (Duda, 2001).

97 The extent to which an individual is task- and/or ego-involved in a specific activity is
98 believed to be dependent on two factors; 1) the person's goal orientation, which reflects
99 dispositional tendencies in how success is judged and competence construed, and 2) the goal
100 perspectives emphasised by the motivational climate at hand, which is created by a
101 significant other (Ames, 1992; Duda & Balaguer, 2007; Dweck & Leggett, 1988). The term
102 'motivational climate' refers to the way the psychological environment created by a leader
103 could encourage individuals to become more or less task- and/or ego-involved in an activity
104 by emphasising task- (mastery-focused) or ego-involving (performance-focused) cues (see
105 table 1 for climate definitions) (Ames, 1992).

106 Perceptions of the motivational climate in sport have been assessed using a variety of
107 self-report measures. In sport, the Perceived Motivational Climate in Sport Questionnaire
108 (PMCSQ; Seifrez, Duda & Chi, 1992) and the Perceived Motivational Climate in Sport
109 Questionnaire-2 (PMCSQ-2; Newton, Duda, & Yin, 2000) have been popular measurement
110 instruments used to assess task- and ego-involving dimensions of the motivational climate
111 Within PE settings, researchers have used measures such as the Learning and Performance
112 Orientations in Physical Education Classes Questionnaire (LAPOPECQ; Marsh,
113 Papaioannou, Martin, & Theodorakis, 2006; Papaioannou, 1994) and the Patterns of Adaptive
114 Learning Survey (PALS; Midgley et al., 1996; Midgley et al., 2000) to assess students'
115 perceptions of the motivational climate. Similar to the PMCSQ-2, both the LAPOPECQ and
116 PALS tap into mastery and performance dimensions of the teacher-created motivational

117 climate. For an earlier review of motivational climate research and measures used in sport
118 and physical education contexts readers should refer to Biddle and Ntoumanis (1999).

119 A considerable number of studies have examined the relationship between perceived
120 task- (i.e., mastery) and ego-involving (i.e., performance) motivational climates and athlete or
121 students responses to sport and PE (see Duda, 2005). Based on the plethora of research
122 conducted researchers have repeatedly emphasised that, regardless of context, a task-
123 involving (or mastery-focused) environment is associated with more adaptive responses and
124 ego-involving (or performance-focused) environments linked to more maladaptive
125 motivational responses (Ntoumanis & Biddle, 1999; Roberts, 2012).

126 Although AGT-based research has tended to rely on athletes' self-reports of the
127 motivational climate, a number of observational systems have been developed to provide a
128 more objective assessment of the task- and ego-involving facets of the motivational climate
129 created by coaches and teachers (Boyce, Gano-Overway, & Campbell, 2009; Morgan,
130 Sproule, Weigand & Carpenter, 2005; Tessier et al., 2013). Compared to self-reported
131 assessments, these observational measures vary in how they have been operationalised and
132 are reviewed later in the manuscript.

133 **Self-determination Theory**

134 SDT is a social-cognitive theory of motivation that explains how and why individuals
135 are motivated when engaging in a particular context (Deci & Ryan, 2000). According to
136 SDT, the implications of the social environment, created by one or more significant others,
137 for the quality of an individual's motivation and optimal functioning is not direct. Rather, it is
138 assumed to occur as a result of the satisfaction or thwarting of the basic psychological needs
139 for autonomy, competence and relatedness (Ryan & Deci, 2000). Autonomy refers to the
140 extent to which individuals perceive they are the origin of their decisions and are acting
141 according to their own interests and preferences (Deci & Ryan, 1985). Competence is

142 fulfilled when individuals perceive themselves to be effective and experience a sense of
143 mastery (Deci & Ryan, 1985). Finally relatedness is realised when individuals' experience
144 security and attachment, and a sense of being respected and cared for by others (Deci &
145 Ryan, 1985).

146 Traditionally, SDT-based researchers focused heavily on the extent to which the
147 social environment created by a significant other, such as a coach, supported individuals'
148 basic psychological need satisfaction by being autonomy-supportive (see table 1 for climate
149 definitions) (Amorose, 2007; Bartholomew, Ntoumanis & Thogersen-Ntoumani, 2009;
150 Haggart, Chatzisarantis, Culverhouse & Biddle, 2003; Mageau & Vallerand, 2003; Standage,
151 Gillison & Treasure, 2007), Autonomy supportive environments have associated with a
152 variety of positive responses, such as increased enjoyment and satisfaction with the sport and
153 PE experience (see Ntoumanis, 2012; Standage et al., 2007 for summaries).

154 Although SDT based research on the social environment in sport and PE settings has
155 tended to focus more on autonomy support (Amorose, 2007; Bartholomew et al., 2009),
156 additional dimensions of the environment have been identified that are associated with
157 athletes' and students' perceptions of autonomy, competence and relatedness satisfaction
158 (Mageau & Vallerand, 2003; Reeve, Jang, Carrell, Jeon & Barch, 2004; Reinboth, Duda &
159 Ntoumanis, 2004; Skinner & Belmont, 1993). The extent to which the environment is
160 'structured' and 'interpersonally involving' (or relatedness supportive) has been linked to
161 athletes' and students' psychological need satisfaction (Curran, Hill & Niemic, 2012; Reeve
162 et al., 2004; Reinboth et al., 2004) and adaptive motivational responses such as engagement
163 in the learning process (Skinner & Belmont, 1993).

164 In addition to need supportive dimensions of the environment, SDT also asserts that
165 certain types of social environments are likely to thwart the basic psychological needs. Such
166 environments contribute to the active blocking or diminishing of an individuals' sense of

167 autonomy, competence and relatedness and are associated with a variety of maladaptive
168 responses (Bartholomew, Ntoumanis, Ryan & Thogersen-Ntoumani, 2011). These include
169 the extent to which the coach or teacher is controlling, hostile and creates a chaotic
170 environment (see table 1 for a description of each dimension) (Skinner & Edge, 2002).

171 Not dissimilar to AGT, sport and PE-based studies examining dimensions of the
172 social environment and their concomitants as emphasised within SDT have relied almost
173 exclusively on self-report measures. In both sport and PE settings, researchers have often
174 adapted items from the Health Care Climate Questionnaire (HCCQ; Williams, Grow,
175 Freedman, Ryan & Deci, 1996) and the Teacher as Social Context Questionnaire (TASCQ;
176 Wellborn, Connell, Skinner & Pierson, 1988) to provide ratings of autonomy support. A
177 variety of other self-report measures have been used to assess autonomy support in sport and
178 physical settings and these are included in table 1.

179 Within PE, the TASCQ (Wellborn et al., 1988) has also been used to provide ratings
180 of interpersonal involvement. Whilst in sport contexts, the Social Support Questionnaire
181 (SSQ6; Sarason, Sarason, Shearin, & Pierce, 1987) and Caring Climate Questionnaire (CCQ)
182 have been used to tap into the concept of relatedness support (Fry & Gano-Overway, 2010;
183 Reinboth et al., 2004). In terms of athletes' and students' perceptions of structure, the
184 Teacher as Social Context Questionnaire (Wellborn et al., 1988) has been used and modified
185 for application in sport (Curran et al., 2012). In contrast to examining need-supportive
186 features of the coaching or teaching environment, Bartholomew and colleagues
187 (Bartholomew, Ntoumanis & Thogersen-Ntoumani, 2010; Barthomolew et al., 2011)
188 developed and employed the Controlling Coaching Behaviour Scale (CCBS) in a series of
189 studies to assess the controlling dimensions of coach behaviour, finding positive relationships
190 with psychological need thwarting and outcomes such as burnout and negative affect. In PE,
191 the Psychologically Controlling Teaching (PCT; Soenens, Sierens, Vansteenkiste, Dochy &

192 Goossens, 2012) scale has also been developed and used to provide rating of controlling
193 teacher behaviour. At present there has been no attempt to directly examine dimensions of
194 hostility and chaotic coaching/teaching using self-report scales.

195 In terms of observational assessment, 2 studies have rated SDT-based coach
196 behaviours in sport (e.g., Webster, Wellborn, Hunt, LaFleche, Cribbs & Lineberger, 2013;
197 Mahoney, Ntoumanis, Gucciardi, Mallet & Stebbings, 2015). A number of attempts have
198 been made to observe SDT-based dimensions of teacher behaviour in classroom and PE
199 settings (e.g., Reeve et al., 2004; Sarrazin, Tessier, Pelletier, Trouilloud & Chanal, 2006).
200 Interestingly and unlike the self-report research conducted to date, ratings of chaos and
201 hostility have been taken using observational measures of coach/teacher behaviour (e.g.,
202 Haerens et al., 2013; Smith et al., 2015).

203 **Observing Motivationally-Relevant Dimensions of Coach and Teacher Behaviour**

204 In the past, and outside of AGT and SDT research, there have been many attempts to
205 observe and rate the behaviour of both coaches (Cushion et al., 2012; Darst et al., 1989;
206 Erickson, Cote, Hollenstein & Deakin, 2011; Kahan, 1999) and PE teachers (Darst et al.,
207 1989). The aim of this narrative review was not to discuss all of the observational research
208 conducted within sport and PE settings. Instead the focus was on those observational systems
209 that have been developed and used to rate the coach and teacher-created environment
210 drawing from AGT and SDT perspectives. Commensurate with the growing popularity of
211 both AGT and SDT and their application to the study of sport and exercise (Roberts &
212 Treasure, 2012), there have been several attempts to develop observational measures of the
213 coach or teacher-created motivational environment drawing from AGT or SDTs. Given the
214 availability of these different observational measures, it is important to synthesise the
215 literature and review the systems that are currently available. This will help inform
216 developments or adaptations needed to existing measures, as well as identify areas for

217 consideration in future research. The different motivation theory based observational systems
218 used to assess the motivational relevant facets of the environment created by coaches and
219 teachers in sport and PE settings are discussed in the following sections.

220 **Literature Search Methodology**

221 Databases (MEDLINE, Web of Science) were used to identify published research
222 articles regarding AGT and SDT-based observation in sport and PE. Specific terms that were
223 used were ‘observation’/’observed’ AND ‘motivational environment’/’motivational
224 climate’/’need support’/’need thwarting’ AND ‘self-determination’/’achievement
225 goal’/’physical education’/’sport’/’teacher’/’coach’. Articles were included in the review if
226 they fulfilled the following criteria: (a) employed observation to measure coach/teacher
227 behaviour; (b) grounded in AGT/SDT or both frameworks, and (c) observational system has
228 been used to examine coach/teacher behaviour in sport and/or PE settings. Reference lists of
229 the retrieved articles were also scrutinised to identify relevant research papers. These
230 procedures are consistent with guidelines for preparing and writing a narrative review of
231 research (Gasparyan, Ayvazyan, Blackmore & Kitas, 2011).

232 The focus of this review was on observational measurement of coach and PE teacher
233 behaviour specifically focusing on research grounded in AGT and SDT frameworks. The
234 theories of AGT and SDT were selected due to their prolific application in research on
235 coaching and teaching environments during the past 20 years. To our knowledge, we have
236 included all of the published AGT and SDT-based observational measurement systems that
237 have been used to examine the coach or PE-teacher created environment (see table 2 for
238 measures included). Based on the literature search and examination of reference lists, 35
239 papers were identified. After removing duplicates, and on a further screening of titles and
240 abstracts, 19 papers fulfilled the criteria and were included in the review; 5 in sport and 14 in
241 PE (see Figure 1 for overview of the review process). Following article identification, two

242 reviewers independently assessed the suitability and quality of the 19 articles. Reviewers
243 agreed to retain all articles within the review. The different observational systems identified
244 are now discussed and similarities and differences between the measures are articulated.

245 **Observation from an AGT Perspective**

246 Within sport settings, there has been a limited attempt to observe and rate AGT-based
247 dimensions of the coaching environment in sport. Research by Boyce et al., (2009) represents
248 a laudable step in assessing task- and ego-involving dimensions of the motivational climate in
249 school-sport athletes by using a novel observation checklist approach.

250 Within PE settings, there have been several attempts to develop and employ
251 observational measures of the motivational teaching environment (Curtner-Smith &
252 Todorovich, 2002; Morgan et al., 2005). Curtner-Smith and Todorovich (2002) developed the
253 Physical Education Climate Assessment Instrument (PECAI) and subsequently used the
254 PECAI to rate the environment created by PE teachers in two follow-on studies (Todorovich
255 & Curtner-Smith, 2003). Morgan et al., (2005) also developed an observational measure of
256 PE teacher behaviour drawing from an AGT perspective. The computer-based observational
257 measure of TARGET behaviour was initially employed to rate the frequency and duration of
258 different teacher behaviours and create a profile of the motivational climate created by PE
259 teachers (Morgan et al., 2005). Since its inception the measure developed by Morgan et al.,
260 (2005) has also been used as a self-reflection tool to support teachers in creating more
261 mastery-focused environments (Morgan & Kingston, 2010).

262 Consistent across all three of the AGT-based observational systems identified, is the
263 reliance on the TARGET (Task, Authority, Recognition, Grouping, Evaluation, & Time)
264 framework proposed by Epstein (1989). The TARGET framework was initially developed to
265 support teachers or coaches to create more mastery-focused (or task-involving) teaching
266 environments. While TARGET is useful as a guide, it is important to also remember that the

267 extent to which an environment is task-involving (mastery-focused) and ego-involving
268 (performance-focused) relies on several important appraisals. Duda and Balaguer (2007)
269 suggest that the extent to which the motivational climate is more or less task- or ego-
270 involving is based on 1) how is success defined by the creator of the climate? 2) what aspects
271 of performance are reinforced? 3) how individuals are evaluated in that setting with regard to
272 the criteria of success? and 4) the basis of recognition?. It is this focus on how a leader
273 defines success and judges competence that has underpinned the development of popular self-
274 report assessments of the motivational climate (e.g., the PMCSQ-2) and should also be
275 considered when developing AGT-based observation rating systems of coach or teacher
276 behaviour.

277 **Observation from a SDT Perspective**

278 Not dissimilar to research grounded in AGT; to date there has been a relative dearth
279 of studies employing observation methods to rate SDT-based dimensions of coach behaviour
280 in sport. In a notable first attempt, Webster et al., (2013) developed the MPOWER autonomy
281 support observation system that specifically focuses on several distinct autonomy supportive
282 behaviours used by coaches in sport. In a recent extension, researchers have observed SDT-
283 based coaching behaviour using a measurement system initially developed by Reeve et al.,
284 (2004) in classroom setting (Mahoney et al., 2015).

285 In PE contexts, multiple SDT-based studies have been conducted employing
286 observational measures of teacher behaviour. As previously mentioned, Reeve and colleagues
287 (Reeve et al., 2004; Jang, Reeve & Deci, 2010) drew from a SDT perspective to develop an
288 observation rating system to assess the extent to which a teacher is autonomy supportive
289 versus controlling, interpersonally involved versus hostile, and provides structure versus
290 chaos (see table 2 for list of strategies). Since being developed, 2 studies have employed the

291 qualitative rating scale in PE settings (Cheon, Reeve & Moon, 2012; Tessier, Sarrazin &
292 Ntoumanis, 2010).

293 Taking a slightly different approach to Reeve et al., (2004), Sarrazin et al., (2006)
294 developed an observation instrument grounded in SDT to assess both the type and nature of
295 teacher-student interactions. For each verbal interaction, observers identified the type of
296 behaviour used by the teacher (e.g., organisational communication, technical and tactical
297 hints, and questions) as well as the nature of the behaviour (i.e., was it autonomy supportive
298 vs. controlling vs. neutral). Following development, the measure was modified and used by
299 Tessier, Sarrazin and Ntoumanis (2008) to assess autonomy supportive, neutral and
300 controlling teacher behaviours in PE settings before and after a teacher-training intervention.

301 In a recent development in the literature, which pulls specifically from Basic Needs
302 Theory (Deci & Ryan, 2000), a sub-theory within the SDT framework, Haerens et al., (2013)
303 and Van den Berghe et al., (2013) have developed an observational instrument to examine the
304 need-supportive and need-thwarting behaviours used by teachers in PE settings. Their
305 observational measure of teacher behaviour includes separate dimensions for autonomy
306 supportive, interpersonal involving, structure before, structure during the learning process,
307 controlling, cold and chaotic teaching behaviours.

308 There is evidence of diversity in the SDT-based observational systems developed and
309 used in sport and PE-settings. While several measures focus on specific dimensions of the
310 motivational coaching environment (Webster et al., 2013), others adopt a broader perspective
311 and consider multiple dimensions of the social environment emphasised within SDT (Reeve
312 et al., 2004; Van den Berghe et al., 2013).

313 **Observation from an Integrated AGT & SDT Perspective**

314 A recent study published by Smith et al., (2015) reports the development and
315 validation of the Multidimensional Motivational Climate Observation System (MMCOS),

316 which draws from an integrated AGT and SDT perspective (Duda, 2013). Unlike previous
317 measures, the MMCOS includes features of the environment from both theories resulting in 2
318 higher order factors (i.e., empowering and disempowering), 7 environmental dimensions
319 (autonomy support, controlling, task-involving, ego-involving, relatedness support,
320 relatedness thwart and structure), and 32 lower-order behavioural strategies that are believed
321 to hold implications for athlete need satisfaction/thwarting, motivation and related outcomes.

322 **Considerations for Future Research**

323 Although all grounded within the motivational theories of AGT and SDT, the
324 observational measures introduced in the previous section are varied in nature (e.g., Boyce et
325 al., 2009; Reeve et al., 2004; Sarrazin et al., 2006) and have been employed in a variety of
326 different ways (e.g., Cheon et al., 2012; Morgan & Kingston, 2010). Consequently, attempts
327 to observe and rate motivational features of the coaching and teaching environment have
328 raised a number of questions and offer interesting avenues for future research. Considerations
329 for observational research conducted in sport and PE settings grounded in AGT and SDT
330 frameworks will now be discussed.

331 *Motivational Environment as a Group or Individual Construct*

332 An interesting question arising from observational research in sport and PE settings is
333 whether the motivational environment should be considered a group or individual level
334 construct (Duda, 2001; Papaioannou, Marsh & Theodorakis, 2004). Typically teachers and
335 coaches are observed and coded while delivering to a whole cohort of students or athletes.
336 This results in what can be considered a group-level rating i.e., one teacher/coach rating for
337 the whole class/team. The most appropriate approach for analysing observational data, rated
338 at a group-level, alongside individuals' perceptions, such as reports of the motivational
339 environment, is still not clear. Haerens et al., (2013) observed and rated teachers' need
340 supportive behaviours (autonomy support, relatedness support, structure before during

341 structure during PE) and used a multi-level analysis approach to predict students' reports of
342 the same environment. While a number of significant associations emerged between the
343 group level observations and student reports of the environment, these remained relatively
344 weak in magnitude. When summarising the findings, Haerens et al., (2013) indicated that the
345 majority of variance in students' reports of the motivational teaching environment was
346 situated at the individual rather than class (or group) level. This finding was also replicated in
347 a PE-based study conducted by De Meyer et al., (2013). As a result, it was suggested that
348 rating the individual teacher-student interactions might lead to stronger associations between
349 the two reports of the environment. In sport settings, Smith et al., (2015) offer a similar
350 finding when using ratings made with the MMCOS to predict athletes' psychological need
351 satisfaction. Smith and colleagues found that the majority of variance in athletes' reports of
352 need satisfaction was situated at the individual level and a very small amount of variance was
353 associated to the grouping of athletes in teams. Given the majority of variance in athletes'
354 reports of different motivational variables appears to be at the individual rather than class or
355 team level, it is not surprising that a group-based rating such as a teacher or coach
356 observation results in relatively weak predictive utility.

357 In contrast to the aforementioned findings, Boyce et al., (2009) adopted a different
358 approach when associating observations made with their checklist to coaches' and athletes'
359 perceptions of the motivational climate. They found that there was a good degree of
360 agreement between athletes in each of the teams, as calculated by the within group inter-rater
361 agreement (*rwg*) (James, 1982). As a result, athletes' reports on each team were aggregated to
362 the group level and correlations were used to examine the relationships between observations,
363 coaches' and athletes' perceptions of task-involving and ego-involving dimensions of the
364 environment. Adopting this approach resulted in moderate positive associations between
365 coaches' and observers' reports on task-involving ($r = 0.39$) and ego-involving ($r = 0.46$)

366 dimensions, and moderate positive association between observers' and athletes' reports of a
367 task-involving ($r = 0.38$) but no association for the ego-involving dimension ($r = 0.11$).

368 From a methodological perspective, Papaioannou et al., (2004) suggest that the
369 motivational climate is inherently a group-based variable and as such multi-level analyses
370 should almost always be applied to data that include individuals nested within groups i.e.,
371 students in PE classes or athletes within sports teams. Furthermore, Hox (2010) suggests that
372 it is appropriate to employ a multi-level approach when the variance attributed to the
373 grouping of individuals exceeds an intra-class correlation coefficient of 5%. Therefore, even
374 when the majority of variance in students' or athletes' reports of motivation-related variables
375 such as the motivational environment are at the individual level, a multi-level approach
376 would still be appropriate. However, the reality of conducting observational research and the
377 time consuming nature of coding hours of video footage (Kavussanu, 2008) does not always
378 offer the quantity of data needed to run sophisticated statistical models. Therefore,
379 understanding alternative ways of analysing observational data, such as the approach used by
380 Boyce et al., (2009) is useful.

381 To gain a better understanding of how to rate and then analyse observational data to
382 provide meaningful information it may be necessary to compare different rating procedures.
383 When the resources are available, observational measures could be employed to rate both the
384 overall environment created by the teacher or coach (i.e., group level), as well as individual
385 interactions (i.e., individual level). The predictive utility of ratings made at the individual and
386 group level could then be compared utilising a multi-level approach. This would contribute to
387 a better understanding of what a coach or teachers is observed to say and do, and how that
388 impacts upon the larger group as well as the individuals within that group.

389 *Content of Observational Measures*

390 Another important consideration for researchers aiming to conduct observational
391 research in AGT and SDT, are the dimensions included within the different observational
392 systems. Of course, the measure that is ultimately selected will be dependent on the aims of
393 the research. However, it is important to consider that certain observational systems will offer
394 different information and a well-informed selection is important.

395 Consistent with literature on the motivational climate, observational measures
396 developed from an AGT perspective have included assessments of both task- and ego-
397 involving behaviours (Boyce et al., 2009; Morgan et al., 2005). The checklist developed by
398 Boyce et al., (2009) adopts a simpler rating procedure compared to the systems developed by
399 Morgan et al., (2005) and Curtner-Smith and Todorovich (2002). This rating process may
400 make it more appealing to prospective researchers interested in conducting observational
401 research from an AGT standpoint. In addition, the MMCOS (Smith et al., 2015) offers a
402 rating of both task- and ego-involving dimensions of the environment, which closely aligns to
403 the dimensions within the widely used PMCSQ-2.

404 Within SDT frameworks, there has been more variety in terms of the dimensions
405 included as well as how these have been operationalised. The MPOWER (Webster et al.,
406 2013), specifically focuses on autonomy supportive coaching and identifies six types of
407 behaviours representative of an autonomy supportive climate. Within education settings,
408 Sarrazin et al., (2006) focused specifically on autonomy supportive and controlling teaching
409 and the pedagogical behaviours used by those leading sessions in the classroom and in PE.
410 Taking a broader approach, Reeve et al., (2004) included the six key dimensions of the social
411 environment relevant to SDT-based work (Skinner & Edge, 2002). The observational rating
412 system developed by Reeve et al., (2004) included autonomy support and controlling,
413 interpersonal involvement and hostility, and structure and chaos. However, the three pairs of
414 environment dimensions were situated at opposite ends of continuum, and therefore a high

415 score on autonomy support precludes a high score on controlling teaching. Developments in
416 the SDT literature suggest that the dimensions of the environment are not considered opposite
417 and should be seen as independent constructs (Bartholomew et al., 2009; 2010). In line with
418 this view, Haerens et al., (2013) and Van den Berghe et al., (2013) developed an
419 observational measure of PE teacher behaviour that includes seven dimensions, autonomy
420 support, controlling, relatedness support, hostile, structure before, structure during and chaos.
421 A particular advantage of this approach is that a more holistic understanding of the
422 environment created and behaviours used by coaches or teachers in sport and PE can be
423 gained.

424 In general, when analysing observational data with the aforementioned measures,
425 researchers tend to aggregate scores from a series of individual behavioural strategies to
426 create an overall score for broader dimensions of the environment e.g., autonomy support,
427 controlling and so on. To inform future intervention research and understand where efforts
428 could be made to promote more adaptive motivational environments, it would be useful if
429 researchers reported on both the types of behavioural strategies teachers or coaches used as
430 well as the overall environment created.

431 *Observation Recording Process*

432 A variety of rating procedures have been employed to observe and code the
433 motivational environment created by coaches or teachers in sport and PE. Not surprisingly,
434 an event-recording, or frequency based rating approach has proved popular (Curtner-Smith &
435 Todorovich, 2002; Morgan et al., 2005; Webster et al., 2013) and has been used to provide
436 descriptive information on the motivational environment created by coaches and teachers.
437 This is perhaps the most objective rating approach where coders are provided with rigid and
438 well-defined behavioural categories and asked to rate each time a behavioural strategy is
439 observed.

440 Although also representing an assessment of frequency, Haerens and colleagues (De
441 Meyer et al., 2013; Haerens et al., 2013; Van den Berghe et al., 2013) used a different
442 approach and applied a rating scale to indicate the extent to which a motivational behaviours
443 within SDT were used ‘not at all’ or ‘all of the time’. These observational reports of teacher
444 behaviour have since been used to examine the relationship with students’ perceptions of the
445 environment (Haerens et al., 2013), motivation to participate in PE (De Meyer et al., 2013)
446 and teachers’ own motivation (Van den Berghe et al., 2013). Reeve et al., (2004) opted for a
447 similar rating scale when measuring key dimensions of the environment relevant to SDT and
448 has repeatedly used the measure to examine relationships with other motivational variables
449 (Jang et al., 2010) and test the effectiveness of teacher-intervention programmes (Cheon et
450 al., 2012). In a recent development in sport, Smith et al., (2015) used a potency rating scale to
451 capture the psychological meaning of the environment created by coaches working with
452 young athletes and predict athletes’ psychological need satisfaction. This differs from a
453 frequency-type assessment of behaviour in that a high potency score can be achieved when
454 behaviour is used infrequently, but is emphasised to a high intensity. This approach offers a
455 novel assessment of the overt motivational environment from an AGT and SDT-based
456 perspective.

457 There are still many questions that remain to be answered with regards to the best
458 type of rating approach. While it seems to be a popular option for observational research in
459 general (Darst et al., 1989; Lacy & Darst, 1984; Smith et al., 1977), a frequency rating of
460 leader behaviour may not be the most appropriate assessment of the environment rated in
461 AGT and SDT. Frequency ratings suggest that more behaviour reflects higher quality.
462 However both AGT and SDT would propose that it is the quality of the environment and
463 message delivered by a coach or teacher that is important (Duda, 2001; Smith et al., 2015)
464 not necessarily how many times a behaviour is used. However if researchers choose to

465 employ a rating-scale system, they should be prepared to discuss issues of objectivity.
466 Although coders tend to follow standardised training packages (e.g., Smith et al., 2015) and
467 are given detailed marking guidelines, it is inevitable that they will rely on their own
468 experiences and perceptions when rating on a scale system. This may explain why lower
469 levels of reliability are sometimes reported when employing this more subjective rating
470 approach (e.g., Haerens et al., 2013). In future studies, researchers may choose to examine
471 the personal characteristics (e.g., motivation, goal orientation) of coders and examine the
472 impact this has on the type of ratings given. This will prove useful when selecting individuals
473 to rate observational data using these types of measures. Ultimately, within AGT and SDT-
474 based research, the degree to which the different type of rating approach are predictive of
475 athlete or student outcomes should determine the type of rating method that is most suitable.

476 *Relationship between Observed and Perceived Measures*

477 A persistent finding in many observational studies is the lack of association between
478 observed and perceived reports of the environment (Curtis et al., 1979; Haerens et al., 2013;
479 Smith et al., 2015). Clearly this warrants further attention and is important if observations are
480 to be used to test principles embedded within AGT and SDT frameworks. There are a number
481 of ways in which researchers could examine this issue further. Within their study on PE
482 teachers, Haerens et al., (2013) highlight the importance of ensuring observational reports
483 and perceptions are considered within the same time frame. Ensuring that both the
484 observations and perceptions are referenced to the same point in time will help avoid a
485 context by measurement confound (Lorenz, Melby, Conger & Xu, 2007), and should improve
486 the likelihood of finding agreement between the different ratings.

487 However, even when matched to the same level researchers (Haerens et al., 2013; Van
488 den Berghe et al., 2013) have still found relatively weak associations between observations of
489 the motivational environment and perceptual responses. It is possible that students or athletes

490 are more 'in tune' to particular parts of a sport session or PE class (e.g., the very beginning or
491 end), and that their perceptions of the environment are informed by critical parts of the
492 session. Within the context of AGT or SDT, there has been a limited attempt to examine
493 variability of the environment created during the different phases of a training session or PE
494 class. In a notable approach, Haerens et al., (2013) examined observed autonomy support,
495 relatedness support and structure according to the beginning, middle and end of PE classes.
496 Associating temporal observations with individuals' perceptions of the environment would
497 provide further information on whether individuals' reports of the environment are influenced
498 by key moments in that session. An alternative suggestion is that when reporting on the
499 situational motivational environment, individuals continue to refer to more general
500 perceptions of the environment created (Haerens et al., 2013; Smith et al., 2015). Collecting
501 observations and perceptions from teachers/coaches and students/athletes during a series of
502 repeated assessments would enable this proposition to be explored further.

503 An interesting and consistent finding from previous observational studies is the
504 convergence between observational ratings and perceptual responses on more maladaptive
505 dimensions of coach or teacher behaviour (Curtis et al., 1979; De Meyer et al., 2013; Smith et
506 al., 2015). It has been suggested that individuals monitor and pay more attention to negative
507 feedback (Gottman & Krokoff, 1989; Graziano, Brothen, & Berscheid, 1980) and are
508 therefore more likely to report when this happens. For positive dimensions of leader
509 behaviour, these are likely to become established over time. As a result, individuals may pay
510 less attention to such positive behaviours thereby relying on more general reports of the
511 environment. Adopting an event-by-event analysis and coding key behavioural events,
512 similar to the approach used by Curtner-Smith and Todorovich (2002), would help explore
513 this issue further.

514 A final consideration related to the recording process is how the different dimensions
515 of the motivational environment interact (Treasure, 2001). When discussing the motivational
516 climate in AGT, Ames (1992) posed the question as to whether the task- and ego-involving
517 dimensions of the motivational environment interact in an additive or multiplicative manner.
518 If dimensions are additive then these would complement one another and this means that a
519 compensatory effect can take place. For example, if a coach uses controlling strategies they
520 could still overcome this by being highly autonomy supportive. However, this compensation
521 would not be able to take place if the dimensions of the environment interacted in a
522 multiplicative way. At present, research would suggest that dimensions of coach and teacher
523 behaviour interact in an additive manner (Morgan et al., 2005). Indeed, Smith et al., (2015)
524 found that empowering and disempowering environment dimensions of the motivational
525 environment positively and negative predicted athletes' psychological needs respectively
526 when included in the same model. This is consistent with suggestions that dimensions of the
527 motivational environment should be considered as independent constructs (Bartholomew et
528 al., 2009; 2010). However, the relationship between different dimensions of the environment
529 needs to be explored further. Similar to research using self-reports (Curran et al., 2013; Jang
530 et al., 2010; Sierens et al., 2009), it may prove fruitful to examine the interaction between
531 different dimensions of the observed environment and the resulting impact on athlete or
532 student responses.

533 *Contextual Differences in Sport and PE*

534 Whilst there are a number of similarities between sport and PE contexts, and
535 measurement systems are often adapted to be used in both settings (e.g., checklist developed
536 by Reeve et al., 2004), there are also important distinctions that need to be made. Within
537 education contexts, teachers are employed by the school and are generally working towards
538 an established curriculum with the expectation of meeting defined targets. However in sport

539 settings the context is incredibly varied. Although coaching is becoming more
540 professionalised (Gray, 2011), there are still many coaches working part time or as
541 volunteers. It has been suggested that the context teachers/coaches are operating in will
542 influence the type of environment they create (Mageau & Vallerand, 2003). Indeed, Van den
543 Berghe et al., (2013) examined PE teachers' perceptions of their own motivational orientation
544 in relation to their observed teaching practices. They found that when a teacher reported a
545 more controlled motivational orientation, perhaps due to contextual pressures placed upon
546 them, they engaged in more controlling teaching behaviour. Given the possibility that
547 coaches' motivation and the pressures experienced (Mahoney et al., 2015; Stebbings et al.,
548 2011) are likely to be different to that of teachers, it would be valuable to observe the types of
549 behaviour utilised by coaches whilst considering their own motivations as well as the context
550 they are operating in. For example, Smith, Appleton, Quested and Duda, (2012) observed the
551 type of strategies employed by youth sport coaches in both training and competitive settings.
552 The findings suggest that under the pressure of competition coaches created a more
553 disempowering and less empowering motivational environment, thereby highlighting the
554 importance of considering contextual factors.

555 In addition to coach/teacher differences, athletes/students in PE and sport settings are
556 likely to be marked by different reasons for participating. Typically PE is a compulsory
557 subject and therefore the motivation of the young people taking part would be expected to
558 range from those who are more amotivated to those who are self-determined in their motives
559 (Taylor & Ntoumanis, 2007). In sport, athletes tend to be relatively volitional and whilst they
560 are still influenced by extrinsic factors, reports of amotivation tend to be lower (Gillet,
561 Vallerand, Amoura & Baldes, 2011; Lonsdale, Hodge & Rose, 2011). Given the difference
562 in the audience coaches and teachers are working with, the types of strategies they use and
563 the effectiveness of these strategies at maintaining and promoting quality forms of motivation

564 may differ. Observational approaches such as the interactional analysis used by Erickson et
565 al., (2011) could be adopted to examine how the lower-order strategies employed by coaches
566 and teachers relate to athletes' and students' psychological need satisfaction (and thwarting),
567 and whether the effectiveness of these strategies is dependent on factors such as motivational
568 and goal orientation. Utilising this type of approach and observing one-on-one scenarios will
569 provide detailed information on the type and combination of motivational strategies used by
570 both coaches and teachers. This information will prove valuable when designing context-
571 specific intervention programmes to help foster quality motivation via the leader-created
572 environment.

573 *Theoretical Advancements*

574 Since the evolution of several of the observational measures discussed in this review,
575 there have been theoretical advances to both AGT and SDT. One key development has been
576 the expansion of traditional achievement goal frameworks, initially to trichotomous and 2 x 2
577 model (Elliot & Thrash, 2001), and later to a 3 x 2 achievement framework (Elliot,
578 Murayama & Pekrun, 2011). Although there is debate in the literature regarding these
579 developments (Papaioannou, Zourbanos, Krommidas & Ampatzoglou, 2012), the promotion
580 of mastery- and performance-avoidance goals has received a considerable degree of attention
581 (Roberts, Treasure & Conroy, 2007). At present, there has been a limited attempt to examine
582 the specific motivational strategies that are likely to promote the different types of approach
583 or avoidance goals. It is possible that observational ratings of coach or teacher behaviour can
584 be used to disentangle the relationship between particular motivational strategies and
585 athletes' or students' goal adoption. For example, within the PMCSQ-2 punishing mistakes is
586 considered to be an ego-involving motivational strategy (Newton et al., 2000) and would be
587 expected to contribute to an ego-involved goal focus. However, it might be expected that
588 punishing mistakes would promote the adoption of a performance-avoidance rather than

589 performance-approach goal. Using an observational system such as the MMCOS would allow
590 researchers to further examine the link between specific motivational strategies and
591 individuals' goal adoption, offering a more detailed understanding of the motivational climate
592 in AGT.

593 There have also been a number of developments within SDT frameworks and
594 understanding the types of coaching or teaching strategy that constitute a need-supportive and
595 need-thwarting environment should be studied further. In particular, the behaviours that
596 represent competence thwarting and hostile (or relatedness thwarting) dimensions of the
597 environment are deserving of attention (Haerens et al., 2013; Smith et al., 2015; Van den
598 Berghe et al., 2013).

599 *Establishing the Validity and Reliability of Observational Measurement Systems*

600 Schutz and Park (2004) emphasised the importance of establishing validity and
601 suggested that to determine the “value, applicability and generalizability” (p. 78) of research
602 findings, it is critical that measures be valid. Brewer and Jones (2002) proposed a set of
603 criteria to establish validity and reliability when using observational measurement systems,
604 which includes (a) training observers, (b) amending an instrument to be context specific, (c)
605 establishing face validity, (d) establishing inter-observer reliability, and (e) confirming intra-
606 observer reliability. Although the steps proposed by Brewer and Jones (2002) have been
607 employed by different sport-based researchers (e.g., Cushion et al., 2012; Webster et al.,
608 2013), there are a number of additional procedures that can be taken to psychometrically
609 evaluate the validity of data collected using observational measures. Yoder and Symons
610 (2010) provide an explanation on the types of validation specifically focusing on observation-
611 based research. In total, 5 types of validation were identified dependent on the purpose and
612 use of the observational measure in question. Typically these procedures mirror the generic
613 validation steps used to establish the psychometric properties of self-report scales in sport and

614 exercise psychology research (Duda, 1998; Schutz & Park, 2004). The validation steps
615 include establishing (a) content validity, (b) sensitivity to change, (c) treatment utility, (d)
616 criterion related, and (e) construct validity.

617 In brief, content validity refers to whether the definitions and scale descriptors are
618 representative of the variable(s) being observed. Sensitivity to change is related to the extent
619 to which a measure changes following the administration of a treatment or intervention.
620 Similarly, treatment utility deals with the extent to which a measure taps change in an
621 assessed variable. However, compared to sensitivity to change, treatment utility provides
622 information on whether a targeted outcome changes over and above other assessed variables
623 e.g., in an intervention designed to enhance autonomy supportive coaching, coach autonomy
624 support should demonstrate greater change when compared to other assessed dimensions of
625 the coaching environment (e.g., structure). Criterion-related validity is established by
626 comparing the association between one variable and a known gold standard. Evidence for
627 criterion-related validity can be either concurrent (measured at the same time) or predictive
628 (measured at different times). Finally, construct validity is established using correlational
629 (nomological) or experimental (discriminative) methods to test relationships based on
630 theoretical assumptions (Cronbach & Meehl, 1955).

631 Information on the validity of each of the observational measures discussed is
632 included in table 2. All of the observational measures reviewed demonstrate a degree of
633 content validity as they were developed based on solid theoretical foundations. Several of the
634 instruments have been used to rate the motivational environment before and after
635 interventions (Curtner-Smith & Todorovich, 2002; Morgan et al., 2005; Reeve et al., 2004)
636 and demonstrate sensitivity to change. Perhaps most importantly for future research in the
637 context of AGT and SDT, is that observational measures demonstrate good criterion-related
638 and predictive validity. At present, there have been relatively few studies linking observations

639 of the motivational environment with different perceptual measures (Boyce et al., 2009; De
640 Meyer et al., 2013; Jang et al., 2010; Smith et al., 2015). Of those studies that have, the
641 findings have been varied. More research linking observations with different perceptual
642 responses is needed to evaluate the validity of existing and newly developed observational
643 systems to assess the motivational environment.

644 Questions of reliability for more objective measures of the environment typically
645 relate to the extent to which inter- and intra-observer reliability can be demonstrated. Inter-
646 observer reliability is established by comparing the ratings made by 2 or more coders. In
647 contrast, intra-observer reliability relates to whether an individual can rate reliably over time.
648 This is usually determined by asking an observer to code the same footage on 2 separate
649 occasions with a time-lag between ratings (Brewer & Jones, 2002). A number of different
650 statistics are used to determine the extent to which 2 or more ratings are reliable. The most
651 popular tests include examining percentage agreement (Siedentop, 1977) or using coefficients
652 such as Cohen's Kappa (Dijkstra, 2014) or an Intraclass Correlation Coefficient (Portney &
653 Watkins, 2009).

654 Within observational research, it is often reported that coders worked independently
655 and then came together to discuss ratings (Morgan et al., 2005; Webster et al., 2013). This
656 inevitably leads to agreement of 100% but is not necessarily reflective of how the behaviour
657 was initially observed and coded. Indeed, when this discussion does not take place reports of
658 the environment observed and coded do not always surpass what is considered an acceptable
659 level (Edmunds et al., 2008; Haerens et al., 2013). In the future more rigorous training
660 procedures and detail on how and where coding took place is needed. It would also be
661 appropriate for researchers to report on the initial levels of reliability before coders met to
662 discuss ratings and come to a consensus.

663 ***Directions for Future Research***

664 Throughout the previous section a number of directions for future research were
665 signposted. In general, more research examining the relationship between observational
666 reports of behaviour and athletes' (students') or coaches' (teachers') perceptions of different
667 motivational processes such as need satisfaction/thwarting and achievement goal adoption is
668 needed. This would provide information on the extent to which individuals identify and code
669 specific dimensions of the environment and internalise those behaviours into responses when
670 completing perceptual measures. Using observational measurement systems to code the
671 environment at the interactional level (i.e., one-to-one), and comparing these reports to
672 individuals' perceptions of the environments, would offer more information on the agreement
673 between observed and perceived reports. Perhaps focusing on an individual sporting context
674 such as golf or tennis would be a good first step in this regard.

675 Studies that compare the psychometric properties, such as the construct validity and
676 predictive capabilities, of the different observational measures would also be valuable as
677 AGT and SDT-based research moves forward. These types of studies would ensure that
678 researchers are well informed when selecting measurement instruments to use in future
679 observational and mixed-methodological studies.

680 Overall, providing more detail on the specific overt behavioural strategies used and
681 the dimensions of the environment emphasised by coaches and teachers working in sport and
682 PE, would be useful in the development and delivery of intervention programmes aimed at
683 optimising the motivational environment for all involved.

684 **Conclusions**

685 The aim of this paper was to review the measurement instruments and research
686 literature based on observing motivational dimensions of the coaching and teaching
687 environment in sport and PE settings. A descriptive overview of dimensions of the
688 environment relevant to AGT and SDT research was given and the observation systems that

689 have been used to observe dimensions of the coaching and PE teaching environment relevant
690 to AGT and/or SDT were identified and discussed (e.g., Boyce et al., 2009; Tessier et al.,
691 2013; Webster et al., 2013). Considerations for future research employing observational
692 measures of the motivational environment were then provided.

693 In summary, there are a number of potential options for researchers who are
694 interested in observing features of the coaching or teaching environment relevant to AGT
695 and/or SDT in sport and PE. In upcoming research, it will continue to be important to adopt
696 observational methods to address key research questions relevant to the study of the
697 motivational environment in the distinct contexts of sport and PE. Of course, establishing the
698 validity and reliability of observational systems will contribute to addressing the
699 considerations outlined earlier in the paper. Although directions for future research were
700 provided, there are many other interesting and valuable research questions that can be
701 assessed using observational methodologies. As the number of motivation-based intervention
702 studies grow (Roberts, 2012), the application of observation systems will become ever more
703 important and provide another way of evaluating the effectiveness of intervention
704 programmes that seek to impact upon athletes or students by encouraging coaches or teachers
705 to create more adaptive motivational environments.

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1000 Table 1

1001 Questionnaires to assess AGT and SDT-based dimensions of the motivational environment in sport and PE

	Climate Dimension	Subcomponents	Questionnaires Used	Key Reference(s)
	Task-involving (Mastery-focused)	Emphasis on effort/improvement Focus on cooperative learning Task-referenced feedback Explaining role importance	Perceived Motivational Climate in Sport Questionnaire (PMCSQ); Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2); Empowering and Disempowering Motivational Climate Questionnaire-Coach (EDMCQ-C); Learning and Performance Orientations in Physical Education Classes Questionnaire (LAPOPECQ); Patterns of Adaptive Learning Survey (PALS)	Newton, Duda, & Yin, 2000; Seifrez, Duda & Chi, 1992; Appleton et al., 2015; Marsh, Papaioannou, Martin, & Theodorakis, 2006; Papaioannou, 1994
Achievement Goal Theory	Ego-involving (Performance focused)	Emphasis on inferiority/superiority Encourages inter-/intra-team rivalry Punishes mistakes	Perceived Motivational Climate in Sport Questionnaire (PMCSQ); Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2); Empowering and Disempowering Motivational Climate Questionnaire-Coach (EDMCQ-C); Learning and Performance Orientations in Physical Education Classes Questionnaire (LAPOPECQ); Patterns of Adaptive Learning Survey (PALS)	Newton, Duda, & Yin, 2000; Seifrez, Duda & Chi, 1992; Appleton et al., 2015; Marsh, Papaioannou, Martin, & Theodorakis, 2006; Papaioannou, 1994 Midgley et al., 1996

Self-determination Theory	Autonomy Support	Provides meaningful choices Explains decisions (offers rationale) Encourages initiative taking Asks for input Values intrinsic interests Acknowledges perspective	Health Care Climate Questionnaire (HCCQ); Teacher as Social Context Questionnaire (TASCQ); Sport Climate Questionnaire (SCQ); Perceived Autonomy Support for Exercise Settings Scale (PASES); Autonomy Supportive Coaching Questionnaire (ASCQ)	Williams, Grow, Freedman, Ryan & Deci, 1996; Wellborn, Connell, Skinner & Pierson, 1988; Hagger, Chatzisarantis, Culverhouse & Biddle, 2003; Hagger, Chatzisarantis, Hein et al., 2007; Conroy & Coatsworth, 2007
	Interpersonal Involvement (Relatedness Support)	Creates a ‘warm’ environment Is close to students/athletes Shows care and concern Invests personal resources Seems to know students/athletes	Teacher as Social Context Questionnaire (TASCQ); Social Support Questionnaire (SSQ6) Caring Climate Questionnaire (CCQ)	Wellborn et al., 1988 Sarason, Sarason, Shearin, & Pierce, 1987; Fry and Gano-Overway, 2010
	Structure	Provides clear instructions and organisation Displays strong leadership Provides a challenging environment Scaffolds information appropriately Provides information, skill-building feedback	Teacher as Social Context Questionnaire (TASCQ);	Wellborn et al., 1988
	Controlling	Use of tangible rewards Controlling language Excessive personal control Intimidation behaviours Promotion of ego-involvement Use of conditional regard	Controlling Coaching Behaviour Scale (CCBS); Psychologically Controlling Teaching (PCT)	Bartholomew et al., 2010; 2011 Soenens et al., 2012

Hostility	Cold and critical Withholds attention and time Physically distant Does not know students/athletes Belittles students/athletes Shows a lack of care and concern	None used in sport/PE	
Chaos	Confusing and unclear direction Low challenge Little or no scaffolding to support learning None or ambiguous feedback Poor leadership	None used in sport/PE	-

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1012 Table 2

1013 Observation systems used to assess AGT and SDT-based dimensions of the environment in sport and PE

Measure Name	Context	Theoretical Perspective	Content of the Measure	Reliability Evidence	Validity Evidence	Research Published
Observational Checklist of the Motivational Climate	Sport	Achievement Goal Theory	5 categories based on TARGET structure (task, authority, recognition/evaluation, grouping, time) 28 yes/no behavioural strategies across the 5 TARGET categories	Inter-observer Intra-observer	Content Criterion-related	Boyce et al., 2009
MPOWER Autonomy Support Observation System	Sport	Self-determination Theory	6 autonomy supportive coaching strategies moves decision making; prompts for questions and feelings; opts to use player idea; withholds information to guide response; empathises with negative affect; rationalises)	Inter-observer Intra-observer	Content	Webster et al., 2013
Multidimensional Motivational Climate Observation System (MMCOS)	Sport	Achievement Goal Theory & Self-determination Theory	2 higher order factors (empowering & disempowering) 7 environmental dimensions (autonomy support, task-involving, relatedness support, structure, controlling, ego-involving, relatedness thwarting) 32 lower order behavioural strategies across the 7 environment dimensions	Inter-observer	Content Criterion-related Construct	Tessier et al., 2013; Smith et al., 2015

Physical Education Climate Assessment Instrument	Education	Achievement Goal Theory	6 categories based on TARGET structure (task, authority, recognition, grouping, evaluation, time) 2 statements for each of the 6 categories (12 overall) – 6 task-involving, 6 ego-involving	Inter-observer Intra-observer	Content Sensitivity-to-change Treatment-Utility Construct	Curtner-Smith & Todorovich, 2002 Todorovich & Curtner Smith, 2002; 2003
Computer-based Observational Measure of Target	Education	Achievement Goal Theory	6 categories based on TARGET structure (task, authority, recognition, grouping, evaluation, time)	Inter-observer Intra-observer	Content Sensitivity-to-change Construct	Morgan et al., 2005 Morgan & Kingston, 2010
Qualitative Assessment of the Teacher-Created Social Environment	Education/Sport	Self-determination Theory	3 dimensions (autonomy support, interpersonal involvement, structure) 13 bipolar rating scales across the 3 dimensions	Inter-observer Intra-observer	Content Sensitivity-to-change Treatment-utility Construct	Reeve et al., 2004 Jang, Reeve & Deci, 2010 Cheon et al., 2012 Tessier et al., 2010 Mahoney et al., 2015
Observational Grid of Instructional Type and Nature	Education	Self-determination Theory	8 teaching behaviours (organisational communication, technical/tactical hints, questions asked, praises, encouragements, perspective-taking statements, negative communications, criticisms) 3 behaviours rated on whether	Inter-observer Intra-observer	Content Sensitivity-to-change Construct	Sarrazin et al., 2006 Tessier et al., 2008

Observed Need-Supportive and Need-Thwarting Teaching Behaviours	Education	Self-determination Theory	they were autonomy supportive, controlling or neutral (organisational communication, technical/tactical hints, questions asked) 6 environment dimensions (autonomy support, relatedness support, structure, controlling, cold, chaotic) 36 behavioural strategies across the 6 dimensions	Inter-observer Intra-observer	Content Criterion-related Construct	Haerens et al., 2013 De Meyer et al., 2013 Van den Berghe et al., 2013
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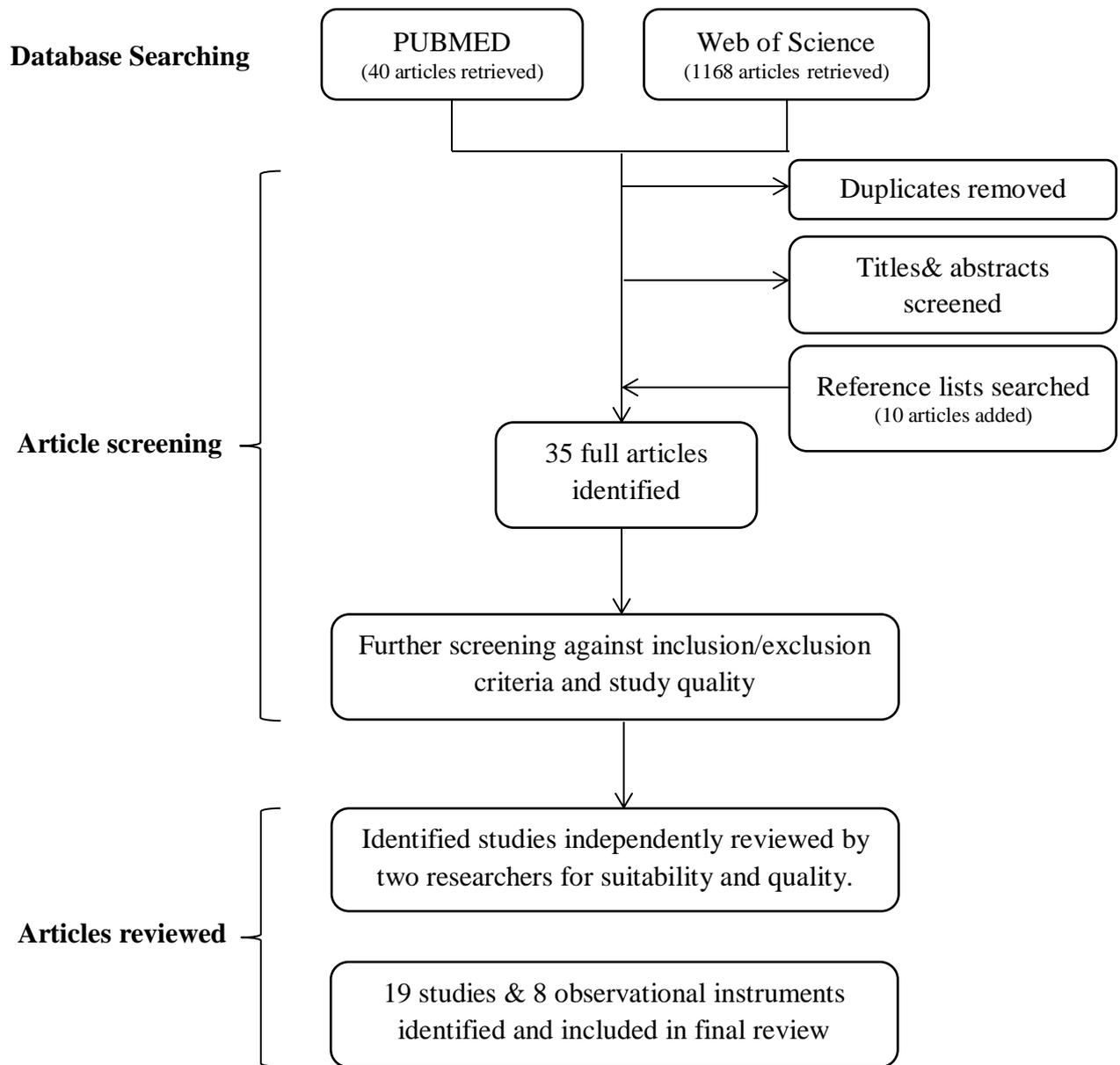


Figure 1

Process followed for systematic review of AGT & SDT-based observational measures used in sport and PE