

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

Abstract

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

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

Introduction

Observation is considered to be a valuable methodology for obtaining objective data on real life events (McCall, 1984). Observation is a process by which a trained individual "follows stated guidelines and procedures to observe, record, and analyse interactions" (Darst, Zakrajsek & Mancini 1989). For those observations to be considered reliable, it is expected that other trained observers, who view the same events, will agree with the recorded ratings. Since growing in popularity during the 1970's, observation has been employed in a

variety of ways to examine the behaviour and interactional styles of coaches and teachers in sport and physical education contexts (Cushion, Harvey, Muir & Nelson, 2012; Darst et al., 1989; Smith & Smoll, 2007).

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

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

While we acknowledge there are contextual differences between sport and PE (discussed later in the paper), both are achievement settings where individuals seek to demonstrate competence and require motivation to fulfil their potential (Roberts, 2001; 2012). In addition, the roles and behaviours of a PE teacher and coach have considerable overlap where both figures aim to educate and engage their students and athletes in an attempt to promote skill development, knowledge accrual and optimise performance. From a

theoretical perspective, the principles of adaptive and maladaptive motivational environments, as highlighted by AGT and SDT, are considered to be applicable to both sport and PE contexts (see Roberts & Treasure, 2012). Sport and PE-based research, grounded in AGT or SDT frameworks, has typically focused on a number of key dimensions of the perceived motivational environment and these environmental dimensions have been studied within different age groups, across countries and at varying competitive levels (Mageau & Vallerand, 2003; Ntoumanis & Biddle, 1999; Reeve & Jang, 2006). The environmental dimensions relevant to AGT and SDT will be reviewed later in the paper. Given the overlap between the types of environment likely to promote or undermine motivation in both sport and PE contexts, observational systems developed in both settings were included in this review. After identifying the AGT and SDT-based observational measures currently available to researchers working in sport and PE contexts, considerations for future observational research are discussed and directions for potentially fruitful avenues of research provided.

Achievement Goal Theory

According to AGT (Nicholls, 1989; Roberts, 2001) there are at least two major goal states that reflect how an athlete construes and defines his/her competence. More specifically, an individual could define their competence according to a task- and/or ego-involved goal. When an individual is task-involved, competence is self-referenced and perceptions of success relate to exerting effort, mastering skills and meeting the demands of a task. If an individual is ego-involved, he or she focuses on other-referenced criteria for success such as outperforming other athletes, demonstrating superior ability and being superior by exerting minimal effort (Duda, 2001).

The extent to which an individual is task- and/or ego-involved in a specific activity is believed to be dependent on two factors; 1) the person's goal orientation, which reflects dispositional tendencies in how success is judged and competence construed, and 2) the goal

perspectives emphasised by the motivational climate at hand, which is created by a significant other (Ames, 1992; Duda & Balaguer, 2007; Dweck & Leggett, 1988). The term 'motivational climate' refers to the way the psychological environment created by a leader could encourage individuals to become more or less task- and/or ego-involved in an activity by emphasising task- (mastery-focused) or ego-involving (performance-focused) cues (see table 1 for climate definitions) (Ames, 1992).

Perceptions of the motivational climate in sport have been assessed using a variety of self-report measures. In sport, the Perceived Motivational Climate in Sport Questionnaire (PMCSQ; Seifrez, Duda & Chi, 1992) and the Perceived Motivational Climate in Sport Questionnaire-2 (PMCSQ-2; Newton, Duda, & Yin, 2000) have been popular measurement instruments used to assess task- and ego-involving dimensions of the motivational climate. Within PE settings, researchers have used measures such as the Learning and Performance Orientations in Physical Education Classes Questionnaire (LAPOPECQ; Marsh, Papaioannou, Martin, & Theodorakis, 2006; Papaioannou, 1994) and the Patterns of Adaptive Learning Survey (PALS; Midgley et al., 1996; Midgley et al., 2000) to assess students' perceptions of the motivational climate. Similar to the PMCSQ-2, both the LAPOPECQ and PALS tap into mastery and performance dimensions of the teacher-created motivational climate. For an earlier review of motivational climate research and measures used in sport and physical education contexts readers should refer to Biddle and Ntoumanis (1999).

A considerable number of studies have examined the relationship between perceived task- (i.e., mastery) and ego-involving (i.e., performance) motivational climates and athlete or students responses to sport and PE (see Duda, 2005). Based on the plethora of research conducted researchers have repeatedly emphasised that, regardless of context, a taskinvolving (or mastery-focused) environment is associated with more adaptive responses and ego-

involving (or performance-focused) environments linked to more maladaptive motivational responses (Ntoumanis & Biddle, 1999; Roberts, 2012).

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

Self-determination Theory

SDT is a social-cognitive theory of motivation that explains how and why individuals are motivated when engaging in a particular context (Deci & Ryan, 2000). According to SDT, the implications of the social environment, created by one or more significant others, for the quality of an individual's motivation and optimal functioning is not direct. Rather, it is assumed to occur as a result of the satisfaction or thwarting of the basic psychological needs for autonomy, competence and relatedness (Ryan & Deci, 2000). Autonomy refers to the extent to which individuals perceive they are the origin of their decisions and are acting according to their own interests and preferences (Deci & Ryan, 1985). Competence is fulfilled when individuals perceive themselves to be effective and experience a sense of mastery (Deci & Ryan, 1985). Finally relatedness is realised when individuals' experience security and attachment, and a sense of being respected and cared for by others (Deci & Ryan, 1985).

Traditionally, SDT-based researchers focused heavily on the extent to which the social environment created by a significant other, such as a coach, supported individuals'

basic psychological need satisfaction by being autonomy-supportive (see table 1 for climate definitions) (Amorose, 2007; Bartholomew, Ntoumanis & Thogersen-Ntoumani, 2009; Hagger, Chatzisarantis, Culverhouse & Biddle, 2003; Mageau & Vallerand, 2003; Standage, Gillison & Treasure, 2007), Autonomy supportive environments have associated with a variety of positive responses, such as increased enjoyment and satisfaction with the sport and PE experience (see Ntoumanis, 2012; Standage et al., 2007 for summaries).

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

In addition to need supportive dimensions of the environment, SDT also asserts that certain types of social environments are likely to thwart the basic psychological needs. Such environments contribute to the active blocking or diminishing of an individuals' sense of autonomy, competence and relatedness and are associated with a variety of maladaptive responses (Bartholomew, Ntoumanis, Ryan & Thogersen-Ntoumani, 2011). These include the extent to which the coach or teacher is controlling, hostile and creates a chaotic environment (see table 1 for a description of each dimension) (Skinner & Edge, 2002).

Not dissimilar to AGT, sport and PE-based studies examining dimensions of the social environment and their concomitants as emphasised within SDT have relied almost

exclusively on self-report measures. In both sport and PE settings, researchers have often adapted items from the Health Care Climate Questionnaire (HCCQ; Williams, Grow, Freedman, Ryan & Deci, 1996) and the Teacher as Social Context Questionnaire (TASCQ; Wellborn, Connell, Skinner & Pierson, 1988) to provide ratings of autonomy support. A variety of other self-report measures have been used to assess autonomy support in sport and physical settings and these are included in table 1.

Within PE, the TASCQ (Wellborn et al., 1988) has also been used to provide ratings of interpersonal involvement. Whilst in sport contexts, the Social Support Questionnaire (SSQ6; Sarason, Sarason, Shearin, & Pierce, 1987) and Caring Climate Questionnaire (CCQ) have been used to tap into the concept of relatedness support (Fry & Gano-Overway, 2010; Reinboth et al., 2004). In terms of athletes' and students' perceptions of structure, the Teacher as Social Context Questionnaire (Wellborn et al., 1988) has been used and modified for application in sport (Curran et al., 2012). In contrast to examining need-supportive features of the coaching or teaching environment, Bartholomew and colleagues (Bartholomew, Ntoumanis & Thogersen-Ntoumani, 2010; Bartholomew et al., 2011) developed and employed the Controlling Coaching Behaviour Scale (CCBS) in a series of studies to assess the controlling dimensions of coach behaviour, finding positive relationships with psychological need thwarting and outcomes such as burnout and negative affect. In PE, the Psychologically Controlling Teaching (PCT; Soenens, Sierens, Vansteenkiste, Dochy & Goossens, 2012) scale has also been developed and used to provide rating of controlling teacher behaviour. At present there has been no attempt to directly examine dimensions of hostility and chaotic coaching/teaching using self-report scales.

In terms of observational assessment, 2 studies have rated SDT-based coach behaviours in sport (e.g., Webster, Wellborn, Hunt, LaFleche, Cribbs & Lineberger, 2013; Mahoney, Ntoumanis, Gucciardi, Mallet & Stebbings, 2015). A number of attempts have

been made to observe SDT-based dimensions of teacher behaviour in classroom and PE settings (e.g., Reeve et al., 2004; Sarrazin, Tessier, Pelletier, Trouilloud & Chanal, 2006). Interestingly and unlike the self-report research conducted to date, ratings of chaos and hostility have been taken using observational measures of coach/teacher behaviour (e.g., Haerens et al., 2013; Smith et al., 2015).

Observing Motivationally-Relevant Dimensions of Coach and Teacher Behaviour

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

Literature Search Methodology

Databases (MEDLINE, Web of Science) were used to identify published research articles regarding AGT and SDT-based observation in sport and PE. Specific terms that were

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

The focus of this review was on observational measurement of coach and PE teacher behaviour specifically focusing on research grounded in AGT and SDT frameworks. The theories of AGT and SDT were selected due to their prolific application in research on coaching and teaching environments during the past 20 years. To our knowledge, we have included all of the published AGT and SDT-based observational measurement systems that have been used to examine the coach or PE-teacher created environment (see table 2 for measures included). Based on the literature search and examination of reference lists, 35 papers were identified. After removing duplicates, and on a further screening of titles and abstracts, 19 papers fulfilled the criteria and were included in the review; 5 in sport and 14 in PE (see Figure 1 for overview of the review process). Following article identification, two reviewers independently assessed the suitability and quality of the 19 articles. Reviewers agreed to retain all articles within the review. The different observational systems identified are now discussed and similarities and differences between the measures are articulated.

Observation from an AGT Perspective

Within sport settings, there has been a limited attempt to observe and rate AGT-based dimensions of the coaching environment in sport. Research by Boyce et al., (2009) represents

a laudable step in assessing task- and ego-involving dimensions of the motivational climate in school-sport athletes by using a novel observation checklist approach.

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

Consistent across all three of the AGT-based observational systems identified, is the reliance on the TARGET (Task, Authority, Recognition, Grouping, Evaluation, & Time) framework proposed by Epstein (1989). The TARGET framework was initially developed to support teachers or coaches to create more mastery-focused (or task-involving) teaching environments. While TARGET is useful as a guide, it is important to also remember that the extent to which an environment is task-involving (mastery-focused) and ego-involving (performance-focused) relies on several important appraisals. Duda and Balaguer (2007) suggest that the extent to which the motivational climate is more or less task- or ego-involving is based on 1) how is success defined by the creator of the climate? 2) what aspects of performance are reinforced? 3) how individuals are evaluated in that setting with regard to the criteria of success? and 4) the basis of recognition?. It is this focus on how a leader

defines success and judges competence that has underpinned the development of popular self-report assessments of the motivational climate (e.g., the PMCSQ-2) and should also be considered when developing AGT-based observation rating systems of coach or teacher behaviour.

Observation from a SDT Perspective

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

In PE contexts, multiple SDT-based studies have been conducted employing observational measures of teacher behaviour. As previously mentioned, Reeve and colleagues (Reeve et al., 2004; Jang, Reeve & Deci, 2010) drew from a SDT perspective to develop an observation rating system to assess the extent to which a teacher is autonomy supportive versus controlling, interpersonally involved versus hostile, and provides structure versus chaos (see table 2 for list of strategies). Since being developed, 2 studies have employed the qualitative rating scale in PE settings (Cheon, Reeve & Moon, 2012; Tessier, Sarrazin & Ntoumanis, 2010).

Taking a slightly different approach to Reeve et al., (2004), Sarrazin et al., (2006) developed an observation instrument grounded in SDT to assess both the type and nature of teacher-student interactions. For each verbal interaction, observers identified the type of behaviour used by the teacher (e.g., organisational communication, technical and tactical

hints, and questions) as well as the nature of the behaviour (i.e., was it autonomy supportive vs. controlling vs. neutral). Following development, the measure was modified and used by Tessier, Sarrazin and Ntoumanis (2008) to assess autonomy supportive, neutral and controlling teacher behaviours in PE settings before and after a teacher-training intervention.

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

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

Observation from an Integrated AGT & SDT Perspective

A recent study published by Smith et al., (2015) reports the development and validation of the Multidimensional Motivational Climate Observation System (MMCOS), which draws from an integrated AGT and SDT perspective (Duda, 2013). Unlike previous measures, the MMCOS includes features of the environment from both theories resulting in 2 higher order factors (i.e., empowering and disempowering), 7 environmental dimensions (autonomy support, controlling, task-involving, ego-involving, relatedness support, relatedness thwart and structure), and 32 lower-order behavioural strategies that are believed

to hold implications for athlete need satisfaction/thwarting, motivation and related outcomes.

Considerations for Future Research

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

Motivational Environment as a Group or Individual Construct

An interesting question arising from observational research in sport and PE settings is whether the motivational environment should be considered a group or individual level construct (Duda, 2001; Papaioannou, Marsh & Theodorakis, 2004). Typically teachers and coaches are observed and coded while delivering to a whole cohort of students or athletes. This results in what can be considered a group-level rating i.e., one teacher/coach rating for the whole class/team. The most appropriate approach for analysing observational data, rated at a group-level, alongside individuals' perceptions, such as reports of the motivational environment, is still not clear. Haerens et al., (2013) observed and rated teachers' need supportive behaviours (autonomy support, relatedness support, structure before during structure during PE) and used a multi-level analysis approach to predict students' reports of the same environment. While a number of significant associations emerged between the group level observations and student reports of the environment, these remained relatively weak in magnitude. When summarising the findings, Haerens et al., (2013) indicated that the

majority of variance in students' reports of the motivational teaching environment was situated at the individual rather than class (or group) level. This finding was also replicated in a PE-based study conducted by De Meyer et al., (2013). As a result, it was suggested that rating the individual teacher-student interactions might lead to stronger associations between the two reports of the environment. In sport settings, Smith et al., (2015) offer a similar finding when using ratings made with the MMCOS to predict athletes' psychological need satisfaction. Smith and colleagues found that the majority of variance in athletes' reports of need satisfaction was situated at the individual level and a very small amount of variance was associated to the grouping of athletes in teams. Given the majority of variance in athletes' reports of different motivational variables appears to be at the individual rather than class or team level, it is not surprising that a group-based rating such as a teacher or coach observation results in relatively weak predictive utility.

In contrast to the aforementioned findings, Boyce et al., (2009) adopted a different approach when associating observations made with their checklist to coaches' and athletes' perceptions of the motivational climate. They found that there was a good degree of agreement between athletes in each of the teams, as calculated by the within group inter-rater agreement (*r_{wg}*) (James, 1982). As a result, athletes' reports on each team were aggregated to the group level and correlations were used to examine the relationships between observations, coaches' and athletes' perceptions of task-involving and ego-involving dimensions of the environment. Adopting this approach resulted in moderate positive associations between coaches' and observers' reports on task-involving ($r = 0.39$) and ego-involving ($r = 0.46$) dimensions, and moderate positive association between observers' and athletes' reports of a task-involving ($r = 0.38$) but no association for the ego-involving dimension ($r = 0.11$).

From a methodological perspective, Papaioannou et al., (2004) suggest that the motivational climate is inherently a group-based variable and as such multi-level analyses

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

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

Content of Observational Measures

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

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

Within SDT frameworks, there has been more variety in terms of the dimensions included as well as how these have been operationalised. The MPOWER (Webster et al., 2013), specifically focuses on autonomy supportive coaching and identifies six types of behaviours representative of an autonomy supportive climate. Within education settings, Sarrazin et al., (2006) focused specifically on autonomy supportive and controlling teaching and the pedagogical behaviours used by those leading sessions in the classroom and in PE. Taking a broader approach, Reeve et al., (2004) included the six key dimensions of the social environment relevant to SDT-based work (Skinner & Edge, 2002). The observational rating system developed by Reeve et al., (2004) included autonomy support and controlling, interpersonal involvement and hostility, and structure and chaos. However, the three pairs of environment dimensions were situated at opposite ends of continuum, and therefore a high score on autonomy support precludes a high score on controlling teaching. Developments in the SDT literature suggest that the dimensions of the environment are not considered opposite and should be seen as independent constructs (Bartholomew et al., 2009; 2010). In line with this view, Haerens et al., (2013) and Van den Berghe et al., (2013) developed an

observational measure of PE teacher behaviour that includes seven dimensions, autonomy support, controlling, relatedness support, hostile, structure before, structure during and chaos. A particular advantage of this approach is that a more holistic understanding of the environment created and behaviours used by coaches or teachers in sport and PE can be gained.

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

Observation Recording Process

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

Although also representing an assessment of frequency, Haerens and colleagues (De Meyer et al., 2013; Haerens et al., 2013; Van den Berghe et al., 2013) used a different approach and applied a rating scale to indicate the extent to which a motivational behaviours within SDT were used 'not at all' or 'all of the time'. These observational reports of teacher

behaviour have since been used to examine the relationship with students' perceptions of the environment (Haerens et al., 2013), motivation to participate in PE (De Meyer et al., 2013) and teachers' own motivation (Van den Berghe et al., 2013). Reeve et al., (2004) opted for a similar rating scale when measuring key dimensions of the environment relevant to SDT and has repeatedly used the measure to examine relationships with other motivational variables (Jang et al., 2010) and test the effectiveness of teacher-intervention programmes (Cheon et al., 2012). In a recent development in sport, Smith et al., (2015) used a potency rating scale to capture the psychological meaning of the environment created by coaches working with young athletes and predict athletes' psychological need satisfaction. This differs from a frequency-type assessment of behaviour in that a high potency score can be achieved when behaviour is used infrequently, but is emphasised to a high intensity. This approach offers a novel assessment of the overt motivational environment from an AGT and SDT-based perspective.

There are still many questions that remain to be answered with regards to the best type of rating approach. While it seems to be a popular option for observational research in general (Darst et al., 1989; Lacy & Darst, 1984; Smith et al., 1977), a frequency rating of leader behaviour may not be the most appropriate assessment of the environment rated in AGT and SDT. Frequency ratings suggest that more behaviour reflects higher quality. However both AGT and SDT would propose that it is the quality of the environment and message delivered by a coach or teacher that is important (Duda, 2001; Smith et al., 2015) not necessarily how many times a behaviour is used. However if researchers choose to employ a rating-scale system, they should be prepared to discuss issues of objectivity. Although coders tend to follow standardised training packages (e.g., Smith et al., 2015) and are given detailed marking guidelines, it is inevitable that they will rely on their own experiences and perceptions when rating on a scale system. This may explain why lower levels of reliability

are sometimes reported when employing this more subjective rating approach (e.g., Haerens et al., 2013). In future studies, researchers may choose to examine the personal characteristics (e.g., motivation, goal orientation) of coders and examine the impact this has on the type of ratings given. This will prove useful when selecting individuals to rate observational data using these types of measures. Ultimately, within AGT and SDTbased research, the degree to which the different type of rating approach are predictive of athlete or student outcomes should determine the type of rating method that is most suitable.

Relationship between Observed and Perceived Measures

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

However, even when matched to the same level researchers (Haerens et al., 2013; Van den Berghe et al., 2013) have still found relatively weak associations between observations of the motivational environment and perceptual responses. It is possible that students or athletes are more 'in tune' to particular parts of a sport session or PE class (e.g., the very beginning or end), and that their perceptions of the environment are informed by critical parts of the session. Within the context of AGT or SDT, there has been a limited attempt to examine variability of the environment created during the different phases of a training session or PE

class. In a notable approach, Haerens et al., (2013) examined observed autonomy support, relatedness support and structure according to the beginning, middle and end of PE classes. Associating temporal observations with individuals' perceptions of the environment would provide further information on whether individuals' reports of the environment are influenced by key moments in that session. An alternative suggestion is that when reporting on the situational motivational environment, individuals continue to refer to more general perceptions of the environment created (Haerens et al., 2013; Smith et al., 2015). Collecting observations and perceptions from teachers/coaches and students/athletes during a series of repeated assessments would enable this proposition to be explored further.

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

A final consideration related to the recording process is how the different dimensions of the motivational environment interact (Treasure, 2001). When discussing the motivational climate in AGT, Ames (1992) posed the question as to whether the task- and ego-involving dimensions of the motivational environment interact in an additive or multiplicative manner. If dimensions are additive then these would complement one another and this means that a

compensatory effect can take place. For example, if a coach uses controlling strategies they could still overcome this by being highly autonomy supportive. However, this compensation would not be able to take place if the dimensions of the environment interacted in a multiplicative way. At present, research would suggest that dimensions of coach and teacher behaviour interact in an additive manner (Morgan et al., 2005). Indeed, Smith et al., (2015) found that empowering and disempowering environment dimensions of the motivational environment positively and negative predicted athletes' psychological needs respectively when included in the same model. This is consistent with suggestions that dimensions of the motivational environment should be considered as independent constructs (Bartholomew et al., 2009; 2010). However, the relationship between different dimensions of the environment needs to be explored further. Similar to research using self-reports (Curran et al., 2013; Jang et al., 2010; Sierens et al., 2009), it may prove fruitful to examine the interaction between different dimensions of the observed environment and the resulting impact on athlete or student responses.

Contextual Differences in Sport and PE

Whilst there are a number of similarities between sport and PE contexts, and measurement systems are often adapted to be used in both settings (e.g., checklist developed by Reeve et al., 2004), there are also important distinctions that need to be made. Within education contexts, teachers are employed by the school and are generally working towards an established curriculum with the expectation of meeting defined targets. However in sport settings the context is incredibly varied. Although coaching is becoming more professionalised (Gray, 2011), there are still many coaches working part time or as volunteers. It has been suggested that the context teachers/coaches are operating in will influence the type of environment they create (Mageau & Vallerand, 2003). Indeed, Van den

Berghe et al., (2013) examined PE teachers' perceptions of their own motivational orientation in relation to their observed teaching practices. They found that when a teacher reported a more controlled motivational orientation, perhaps due to contextual pressures placed upon them, they engaged in more controlling teaching behaviour. Given the possibility that coaches' motivation and the pressures experienced (Mahoney et al., 2015; Stebbings et al., 2011) are likely to be different to that of teachers, it would be valuable to observe the types of behaviour utilised by coaches whilst considering their own motivations as well as the context they are operating in. For example, Smith, Appleton, Quested and Duda, (2012) observed the type of strategies employed by youth sport coaches in both training and competitive settings. The findings suggest that under the pressure of competition coaches created a more disempowering and less empowering motivational environment, thereby highlighting the importance of considering contextual factors.

In addition to coach/teacher differences, athletes/students in PE and sport settings are likely to be marked by different reasons for participating. Typically PE is a compulsory subject and therefore the motivation of the young people taking part would be expected to range from those who are more amotivated to those who are self-determined in their motives (Taylor & Ntoumanis, 2007). In sport, athletes tend to be relatively volitional and whilst they are still influenced by extrinsic factors, reports of amotivation tend to be lower (Gillet, Vallerand, Amoura & Baldes, 2011; Lonsdale, Hodge & Rose, 2011). Given the difference in the audience coaches and teachers are working with, the types of strategies they use and the effectiveness of these strategies at maintaining and promoting quality forms of motivation may differ. Observational approaches such as the interactional analysis used by Erickson et al., (2011) could be adopted to examine how the lower-order strategies employed by coaches and teachers relate to athletes' and students' psychological need satisfaction (and thwarting), and whether the effectiveness of these strategies is dependent on factors such as motivational

and goal orientation. Utilising this type of approach and observing one-on-one scenarios will provide detailed information on the type and combination of motivational strategies used by both coaches and teachers. This information will prove valuable when designing context-specific intervention programmes to help foster quality motivation via the leader-created environment.

Theoretical Advancements

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

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

Establishing the Validity and Reliability of Observational Measurement Systems

Schutz and Park (2004) emphasised the importance of establishing validity and suggested that to determine the “value, applicability and generalizability” (p. 78) of research findings, it is critical that measures be valid. Brewer and Jones (2002) proposed a set of criteria to establish validity and reliability when using observational measurement systems, which includes (a) training observers, (b) amending an instrument to be context specific, (c) establishing face validity, (d) establishing inter-observer reliability, and (e) confirming intraobserver reliability. Although the steps proposed by Brewer and Jones (2002) have been employed by different sport-based researchers (e.g., Cushion et al., 2012; Webster et al., 2013), there are a number of additional procedures that can be taken to psychometrically evaluate the validity of data collected using observational measures. Yoder and Symons (2010) provide an explanation on the types of validation specifically focusing on observationbased research. In total, 5 types of validation were identified dependent on the purpose and use of the observational measure in question. Typically these procedures mirror the generic validation steps used to establish the psychometric properties of self-report scales in sport and exercise psychology research (Duda, 1998; Schutz & Park, 2004). The validation steps include establishing (a) content validity, (b) sensitivity to change, (c) treatment utility, (d) criterion related, and (e) construct validity.

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

Information on the validity of each of the observational measures discussed is included in table 2. All of the observational measures reviewed demonstrate a degree of content validity as they were developed based on solid theoretical foundations. Several of the instruments have been used to rate the motivational environment before and after interventions (Curtner-Smith & Todorovich, 2002; Morgan et al., 2005; Reeve et al., 2004) and demonstrate sensitivity to change. Perhaps most importantly for future research in the context of AGT and SDT, is that observational measures demonstrate good criterion-related and predictive validity. At present, there have been relatively few studies linking observations of the motivational environment with different perceptual measures (Boyce et al., 2009; De Meyer et al., 2013; Jang et al., 2010; Smith et al., 2015). Of those studies that have, the findings have been varied. More research linking observations with different perceptual

responses is needed to evaluate the validity of existing and newly developed observational systems to assess the motivational environment.

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

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

Directions for Future Research

Throughout the previous section a number of directions for future research were signposted. In general, more research examining the relationship between observational reports of behaviour and athletes' (students') or coaches' (teachers') perceptions of different

motivational processes such as need satisfaction/thwarting and achievement goal adoption is needed. This would provide information on the extent to which individuals identify and code specific dimensions of the environment and internalise those behaviours into responses when completing perceptual measures. Using observational measurement systems to code the environment at the interactional level (i.e., one-to-one), and comparing these reports to individuals' perceptions of the environments, would offer more information on the agreement between observed and perceived reports. Perhaps focusing on an individual sporting context such as golf or tennis would be a good first step in this regard.

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

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

Conclusions

The aim of this paper was to review the measurement instruments and research literature based on observing motivational dimensions of the coaching and teaching environment in sport and PE settings. A descriptive overview of dimensions of the environment relevant to AGT and SDT research was given and the observation systems that have been used to observe dimensions of the coaching and PE teaching environment relevant to AGT and/or SDT were identified and discussed (e.g., Boyce et al., 2009; Tessier et al.,

2013; Webster et al., 2013). Considerations for future research employing observational measures of the motivational environment were then provided.

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

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Table 1

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

	Climate Dimension	Subcomponents	Questionnaires Used	Key Reference(s)
Achievement Goal Theory	Taskinvolving (Masteryfocused)	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 QuestionnaireCoach (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
	Egoinvolving (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 QuestionnaireCoach (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 Wellborn et al., 1988
	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)	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	-

Table 2

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	Interobserver Intraobserver	Content Criterionrelated	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, taskinvolving, relatedness support, structure, controlling, ego-involving, relatedness thwarting) 32 lower order behavioural strategies across the 7 environment dimensions	Inter-observer	Content Criterionrelated 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 taskinvolving, 6 ego-involving	Inter-observer Intra-observer	Content Sensitivity-tochange 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-tochange 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-tochange 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-tochange 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 Criterionrelated Construct	Haerens et al., 2013 De Meyer et al., 2013 Van den Berghe et al., 2013
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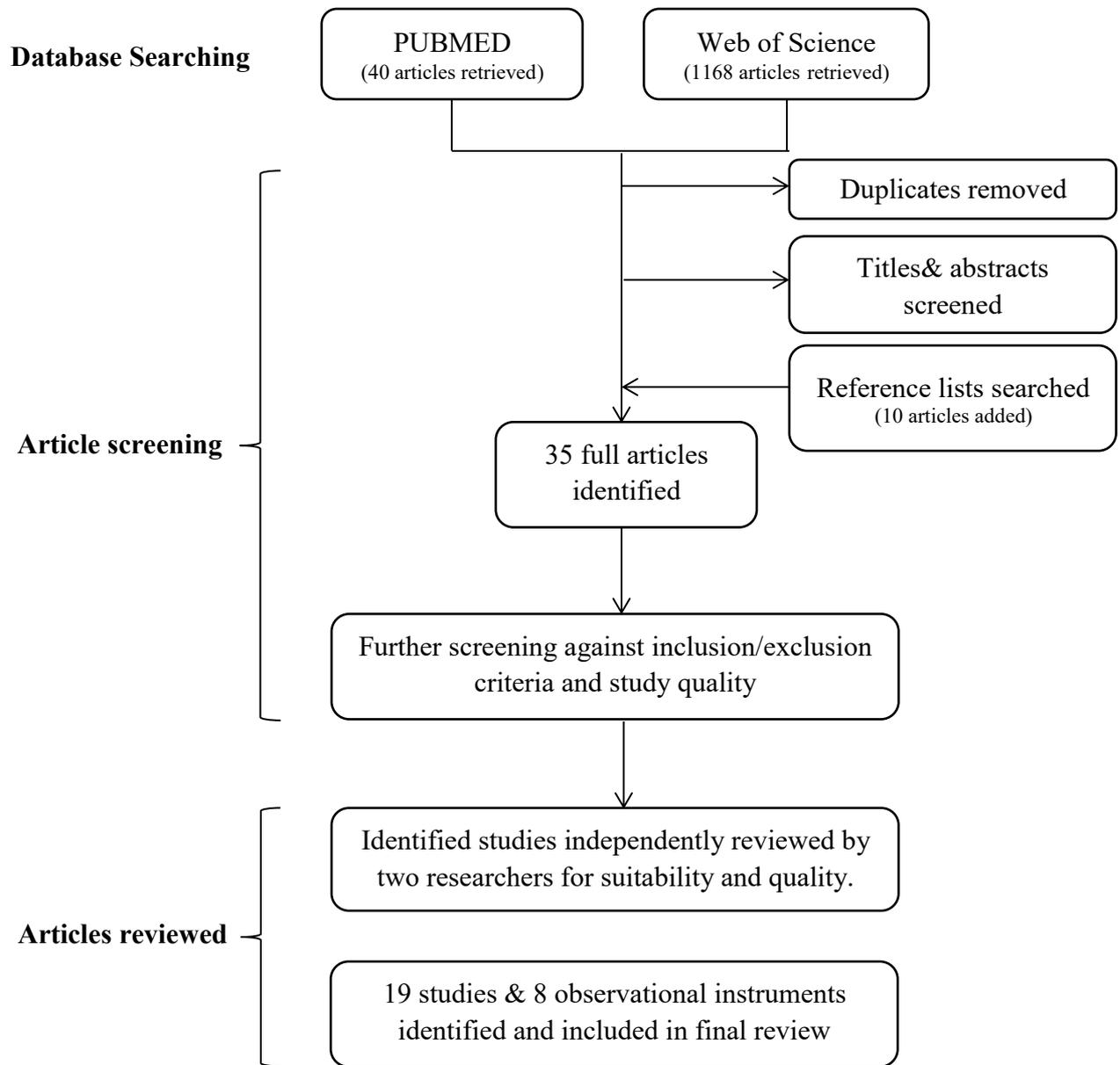


Figure 1

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