The influence of the TARGET motivational climate structures on pupil physical activity levels during year 9 athletics lessons

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ABSTRACT

School Physical Education (PE) is recognised as the key resource for promoting physical activity (PA) among young people (Trost, 2004; Department for Children, Schools & Families [DCSF] 2008). Unfortunately, physical activity levels during many PE lessons fall significantly short of national recommendations (Fairclough & Stratton, 2005). Ames (1992a) devised the ‘TARGET’ acronym, a model used by educators to manipulate the environment to create a ‘mastery motivational climate’. Evidence suggests that perceptions of a mastery climate can develop pupil’s perceived competence, enjoyment and intentions to be active (Ntoumanis, 2001a). The TARGET framework therefore provides support for the long-term development of young peoples’ activity levels. Unfortunately, PE physical activity interventions have largely ignored pupil motivation, focusing instead on increasing pupil’s lesson activity levels (Fairclough & Stratton, 2005). The purpose of the current study was to utilise the TARGET structures to identify how this model directly impacts on pupils’ perceptions of the climate and their lesson activity levels. Two female groups of Year 9 pupils participated in an athletics unit of work. The control group (n=14) followed a programme of athletic activities delivered using ‘teacher-centred’ (UK Athletics, 2005) strategies. The mastery group (n=18) followed an intervention consistent with Ames’ (1992b) mastery TARGET structures. Pupils in the mastery group were involved in approximately 9% more MVPA per lesson. The mastery TARGET structures of task, grouping and time appeared to have the greatest positive effect on pupil activity levels. Whilst research suggests that this has positive long-term benefits for pupils, this study would argue that lesson activity levels can also be enhanced through the creation of a mastery motivational climate.

Keywords: Achievement Goal Theory, motivational climate, physical activity levels, TARGET structures, track and field athletics

INTRODUCTION

School Physical Education (PE) is recognised as the key resource for promoting physical activity (PA) among young people (Trost, 2004; Chow, McKenzie & Louie, 2008; Department for Children, Schools & Families [DCSF] 2008). However, PE’s original and primary goals of increasing pupil’s participation in appropriate amounts of PA, whilst mastering the knowledge, skills and desire to be physically active throughout life (Simons-Morton, 1994) are being overlooked, claims Whitehead (2004), by the views that PE should also improve social, spiritual, cultural and moral development. This study argues for the restoration of the ‘physical’ nature of PE lessons, along with the enhancement of pupil’s desire and knowledge to participate in lifelong PA. These two elements are crucial, given that research has shown that PE classes alone are not sufficient to meet current physical activity recommendations (McKenzie, 2003). Therefore, interventions that aim only to increase PA levels in PE will have limited success if young people are not motivated to participate in physical activity outside of their regular PE lessons. The aim of this study was to pilot an intervention that has previously seen much success in enhancing pupils’ motivation and long term intentions to be active. The main goal was to determine if this intervention could also increase pupils’ activity levels within curriculum athletics lessons.
**Physical Activity Recommendations**

Physical activity guidelines were published for young people in the UK by the Health Education Authority (HEA) (Biddle, Cavill & Sallis, 1998). (The same recommendations have recently been re-emphasised by the DoH, 2004). The primary recommendation is that all young people should accumulate at least one hour of physical activity per day of at least moderate intensity (i.e. the equivalent of brisk walking) (Biddle et al, 1998). This could legitimately be attained through lifestyle activities such as in active transportation, work, recreation and play, as well as in more formal activity such as in PE, sport and structured exercise. A secondary recommendation was that at least twice a week some of these activities should help to develop and maintain muscular strength, flexibility and bone health (Biddle et al, 1998). A wide range of play and structured exercises would provide the necessary weight-bearing activities in order to fulfil this recommendation, including participation in the range of experiences provided within the PE national curriculum (NCPE) (Qualifications and Curriculum Authority [QCA], 2007).

Apart from the HEA (Biddle et al, 1998) and DoH (2004) guidelines for PA in young people, no other formal policy in the UK has been forthcoming as to how PE might contribute to the one-hour per day recommendation. The USA, in contrast, has provided a clear recommendation in the ‘Healthy People 2010’ strategy (US Department of Health & Human Services [USDHHS], 2000). Objective 22-10 of the strategy requires an increase in the proportion of adolescents who spend 50 percent of PE class time being physically active. Whilst no national ‘policy’ has been created in the UK for PE-related physical activity, valuable health-related PE (HRPE) ‘guidance’ has also adopted the American recommendation that pupils should be physically active for 50% of lesson time (Harris, 2000; recently reinforced in Cale & Harris, 2005).

**Physical Activity Levels in Young People**

The Health Survey for England in 2002 (Sproston & Primatesa, 2003) found that the majority of young children (70% of boys and 61% of girls) are meeting the current HEA guidelines but that the proportion, particularly in girls, significantly reduces as children move into adolescence. Unfortunately however, this suggests that around 30% of boys and 39% of girls are not meeting the primary HEA recommendation. The report also advises that there are large differences between the most and least active. This is important as the physical activity that young people accumulate in PE provides a greater proportion of their actual daily activity as they get older, particularly for the less ‘sporty’ children who do little other PA (Sproston & Primatesa, 2003). The importance, therefore, of engaging in meaningful PA and developing pupil motivation to be active during secondary school PE is crucial.

McKenzie (2001) also claims that although PE classes provide a considerable amount of physical activity, most PA is accrued beyond this setting. Furthermore, the contribution of PE classes to daily PA recommendations increases as students’ progress through school. Research has also determined that children do not compensate for a sedentary school day by increasing their leisure-time PA (Dale, Corbin & Dale, 2000). In fact, activity levels during the evening were higher.
following more active school days (Dale et al., 2000). These studies suggest that opportunities to be active outside of PE lessons should be a focus for intervention.

**Physical Activity Levels in Physical Education**

A recent review of forty studies reporting on physical activity during secondary school PE found that the mean percentage of lesson time spent in moderate-to-vigorous PA (MVPA) from all studies (including those with interventions) was $40.4 \pm 13.8\%$ for studies using heart rate monitors and $27.7 \pm 14.9\%$ for observation (Fairclough & Stratton, 2005). Accelerometer-assessed MVPA was found to be $46.8 \pm 13.9\%$ across the studies. These results clearly show that most lessons do not meet the recommendations for achieving 50% of lesson time in MVPA (Harris, 2000; USDHHS, 2000).

Fairclough & Stratton (2005) discovered that ‘athletics’, in addition to ‘striking and fielding’ games and ‘movement’ activities are the least active. A closer review of the studies reporting MVPA during track and field lessons shows that PA varied depending on the lesson focus (Curtner-Smith, Chen & Kerr, 1995; Curtner-Smith, Kerr & Clapp, 1996; Babiarz, Curtner-Smith & Lacon, 1998; Fairclough, 2003). Where PA in athletics lessons were reported, MVPA during throwing lessons ranged from around 7-25% of lesson time, whereas jumping lessons ranged from around 8-16% (Curtner-Smith et al., 1995, 1996; Babiarz et al., 1998). During running lessons, MVPA ranged from approximately 12% of lesson time to 24% (Curtner-Smith et al., 1995, 1996). Finally, one study measured the activity levels of pupils in a ‘multi-athletics’ lesson and found that MVPA was around 20% of lesson time (Babiarz, 1998). Fairclough (2003) reported that only 28% of athletics lessons were spent in MVPA, although a large standard deviation of $\pm 17\%$ indicates considerable differences between lessons. This athletics-based data compares to an average of 48% in fitness lessons and 46% in invasion games (Fairclough & Stratton, 2005). The findings support the rationale for this study in that as well as being one of the most popular areas of activity within the PE curriculum, athletics is also one of the least active.

**Interventions to increase Physical Activity in PE**

Fairclough & Stratton (2005) suggest that every intervention study reviewed in their paper increased pupil PA levels in their PE lessons. An analysis of a sample of studies found that whilst some increased pupil physical activity levels through ‘intensified exercises’ (Baquet, Berthoin & Van Praagh, 2002) or through other ‘planning and teaching strategies’ (Fairclough & Stratton, 2006; Schuldheisz & van der Mars, 2001), the most effective interventions were through the provision of CPD and teacher support (McKenzie, Sallis, Prochaska, Conway, Marshall & Rosengard, 2004).

Despite the positive physical effects of these interventions, they have largely ignored the effects of pupil motivation. For example, Fairclough (2003) and Goudas & Biddle (1993) found that students who demonstrated the highest levels of MVPA in PE reported the lowest levels of enjoyment. This could indicate that the physical demands of lessons are a common reason for pupils disliking PE, an attitude that could influence later participation. Given that Carroll & Loumidis (2001) also found that the
pupils who were most active ‘out of school’ had the highest levels of PE enjoyment, this fact should not be ignored in PA interventions.

**Motivation and Physical Education**

The original literature on ‘Achievement Goal Theory’ (AGT) suggests that it represents a significant framework for research on student motivation in a variety of achievement contexts, including PE and sport (Nicholls, 1989; Ames, 1992b). The two most important constructs of the theory are ‘achievement goals’ and the ‘perceived motivational climate’. The major theoretical assumption of AGT is that in achievement settings, individuals strive to demonstrate competence and avoid showing incompetence (Nicholls, 1989). Individuals have therefore been found to endorse two different ways of defining success and failure, and of judging their competence – termed achievement goals. These two goals were first referred to in the literature as *task* and *ego* (Nicholls, 1984) orientations.

A task orientation is characterized by the desire to develop new skills, to value the process of learning, and to believe that effort leads to success or improvement (Nicholls, 1984). On the other hand, an ego orientation is characterized as doing well by outperforming others, placing value on ability, and believing success is achieved through minimal effort (Nicholls, 1984). The characteristics of task and ego orientations have been used to reflect the tendency of an individual to be task or ego involved (or both).

More recent evidence has found that in the PE setting, the situational climate is more important than goal orientations in determining student motivation (Cury, Biddle, Famose, Goudas, Sarrazin & Durand, 1996; Spray, 2000). Two environmental climates have been identified in the literature. A mastery involving climate is characterised by cooperative learning and a focus on individual improvement (Ames, 1992a). Alternatively, a performance-involving climate is characterised by normative competition, students’ worries about mistakes and an orientation to succeed with little effort.

Ames & Archer (1988) have provided a number of useful constructs which identify the characteristics of mastery and performance-involving climates. These include: a) **definition of success** (improvement vs normative performance); b) **value** (on effort and learning vs normative high ability); c) **reasons for satisfaction** (hard work vs outperforming others); d) **teacher orientation** (learning vs performing); e) **view of errors** (part of learning vs performing normatively well); f) **attention** (on learning processes vs normative performance); g) **reasons for effort** (learning new material vs performing normatively well); and h) **evaluation criteria** (progress vs normative).

The multi-dimensional nature of the motivational climate was first proposed by Epstein (1989) using the TARGET model, an acronym for aspects of the learning environment which impact on motivation (namely tasks, authority, recognition, grouping, evaluation and time). Later, Ames (1992a) added the strategies within the TARGET framework that would create a mastery-oriented climate. In such an environment, pupils work at their own level on a variety of tasks. They are involved in decision making, working in small mixed ability cooperative groups. Effort, knowledge and skill development are privately recognised and evaluated in relation to
self-referenced criteria. Opportunities are provided for maximum practice time, offering flexibility for pupils individual needs. Research by Morgan, Sproule, Weigand and Carpenter (2005) suggests that the relationship between the TARGET structures is additive, with recognition and evaluation structures having the greatest impact on perceptions of the climate. This would suggest that one weak structure can be compensated for by strengths in another.

An extensive body of literature suggests that the perceptions of a mastery climate have positive and adaptive results. For example, students who perceive a climate as mastery-oriented have demonstrated the following characteristics: Plans to be active in the future, and higher activity levels than those who perceive a low autonomy experience (Ntoumanis & Biddle, 1999; Parish & Treasure, 2003); increased self-determined motivation (Ntoumanis, 2001b; Jaakkola, 2002; Standage, Duda & Ntoumanis, 2003); increased persistence and preference for challenging tasks (Treasure, 1993; Solmon, 1996; Morgan & Carpenter, 2002); high perceived competence and beliefs that effort and ability lead to success (Cury et al, 1996; Papaioannou, 1997, 1998); and higher enjoyment and satisfaction during the experience (Ntoumanis & Biddle, 1999; Weigand & Burton, 2002). The potential benefits of creating mastery-oriented environments with students are therefore considerable.

**Physical Activity in a Mastery Climate**

Recent motivational climate interventions have had positive results for physical activity research. A large PE intervention study identified that pupils’ perceptions of a mastery motivational climate and perceived ability were positively related to their lesson activity levels (Parish & Treasure, 2003). More recent work has also discovered that the environment created through a mastery motivational climate impacts on participants’ activity levels (Parish, Rudisill & St. Onge, 2007). The findings reported that a mastery motivational play environment (in a toddler day care class) led to significant increases in heart rate over a ‘free play’ setting. Utilising the TARGET structures Parish et al (2007) found that over the six sessions, participants in the mastery class had an average heart rate 15bpm higher than the free play environment.

Following data analysis, Parish and colleagues (2007, p.176) could only ‘speculate’ on the reasons for their findings as they failed to utilise any formal methods to determine how the environment impacted on PA levels. However, they suggest that the TARGET structures allowed children to engage in a range of challenging, developmentally appropriate tasks and activities. The teachers encouraged the children to develop a self-reward system and acted as facilitators and models to the children’s learning. Although this study provides a start-point for the use of mastery-oriented environments to increase PA levels during learning, further analysis of the contribution of each TARGET structure is worthwhile.

**Teaching Track & Field Athletics Lessons**

Compared to all other activities within the NCPE, there is a dearth of published literature in the area of teaching athletics – another justification for the development of research in this area. The most recent studies suggest that the teaching behaviours
in athletics lessons were ‘marginally more mastery than performance oriented’ (Morgan et al., 2005, p.94). Earlier research into athletics lessons found that teachers spend the overwhelming majority of their time employing teacher-centred teaching styles (Curtner-Smith, Todorovich, McCaughty & Lacon, 2001). Moreover no episodes of differentiation or of students working independently were observed. One conclusion for these findings was that

Allowing pupils prone to misbehaviour to make a great many decisions in the teaching-learning process, as teachers must in Mosston’s later reproductive (style C, D and E) and productive (style F, G and H) styles may have been considered too risky, particularly given the time constraints within which most PE programmes must operate (Curtner-Smith et al., 2001, p.186).

However, despite both O’Neil (1993) and Evans, Davies & Penny (1996) discovering very similar results in teaching style during track & field athletics lessons, it is suggested that the historic nature of teaching athletics through ‘events’ (O’Neil, 1993) and teacher’s training and socialisation (Evans et al. 1996) could also be determinants of these limitations in pedagogy. It is disappointing that track and field lessons have not become more pupil-centred, especially since a curriculum athletics intervention as long ago as 1995 resulted in increased intrinsic motivation and task-goal orientation (Goudas, Biddle, Fox and Underwood, 1995).

Reflecting on the substantial research, it appears that mastery motivational climates can enhance pupils’ intentions and their physical activity behaviour. Studies have also shown that perceptions of the motivational climate can be affected in a relatively small number of lessons. Mastery motivational climates could also have the effect of directly increasing PA during PE lessons through enhanced student enjoyment, effort, preference for more challenging tasks and other psychological determinants, which encourage them to be more ‘energetic’ in their pursuits. Finally, of considerable importance to this study was the finding that the structure of a mastery motivational climate (utilising the TARGET structures) can increase participants’ physical activity levels over a ‘free play’ environment. Given the lack of innovative teaching strategies used to teach athletics, these results provide considerable argument for the development of alternative approaches to teach this activity.

**Purpose and Aims**

The purpose of the study was for the researcher to support a PE teacher (through a form of assisted action research) to create a ‘mastery’ (Ames, 1992a) motivational climate for an athletics unit of work. It was hypothesised that manipulation of the TARGET structures (Ames, 1992b) to create a mastery environment will lead to more active lessons than ‘traditional’ athletics sessions. Therefore, rather than a reliance on short term increases in physical activity, the study utilised a model that has found much success in increasing motivation, enjoyment and long term intentions to be active, and will now report how teaching utilising this model directly impacts on pupil physical activity levels during girls’ athletics lessons. The study is particularly significant given that, to date, no study has focused specifically on how each TARGET structure directly impacts on pupil physical activity levels in PE. Furthermore, as has been argued, teachers need support in developing the teaching approaches to deliver interventions that will promote lifelong PA (Chase, Vealey,
Evers, Galli, Klug, Reichert, 2006). The study sought to answer the following questions: How active are pupils in ‘mastery’ and ‘traditional’ athletics lessons? How does the presence of the TARGET structures impact on pupils’ activity levels? What are pupils’ perceptions of the motivational climate following either a ‘mastery’ or ‘traditional’ athletics unit of work?

**METHOD**

**Participants**

For the purposes of the intervention, two female Year 9 classes (aged 13-14 years) from a Sports College in Bedfordshire participated in track and field athletics lessons in their established groups over a period of the school’s unit of work (four lessons). Both groups participated in the same athletic activity each week and were taught by the same class teacher. The group who had the first PE lesson in the week were assigned to the ‘traditional’ (control) group (n=14) and the second class to the ‘mastery’ (intervention) group (n=18).

**Intervention**

The traditional group followed a programme of athletic activities delivered in the normal way by the class teacher. Through prior discussion and observation of the PE teacher, this was expected to contain the characteristics of athletics lessons that researchers have deemed ‘traditional’ (O’Neil, 1993), ‘formal’ (Evans, Davis & Penney, 1996), ‘direct’ (Curtner-Smith et al., 2001) and ‘ego-oriented’ (Morgan & Carpenter, 2002; Morgan et al, 2005). The mastery group, however, followed an intervention consistent with Epstein’s (1989) and Ames’ (1992b) TARGET structures.

The teacher utilised the six TARGET mastery structures in planning and teaching the intervention group. The ‘tasks’ were designed for inclusion, variety and progression, including multiple-tasks that develop skills and give opportunities for self-referenced targets and improvement. Pupils were given the ‘authority’ to make some decisions and choices within lessons such as in designing activities, taking on leadership roles and in managing their own progression. Pupil’s effort and improvement was ‘recognised’ through individual praise and feedback where possible. Verbal encouragement was contingent on effort and improvement, making it available to all pupils. Pupils were ‘grouped’ into small, mixed-ability cooperative groups where teamwork was encouraged through the achievement of combined group scores. ‘Evaluation’ of pupil achievements was self-referenced – based on effort, improvement and performance scores. Pupils were also encouraged to evaluate their own improvements. Pupils received ‘time’ to have multiple attempts at different activities, so instead of waiting for their ‘go’ in a throwing activity, they participated in a related activity. Pupils were given the flexibility to progress at their own pace and to take extra time should they wish to use it.

The class teacher planned the control lessons independently, submitting the plans to the researcher before the intervention commenced. The teacher was also requested to teach the control lessons as per the lesson plans, which reduced the chances of the teacher implementing mastery strategies with this group. In contrast, ‘mastery’ lesson
plans for each of the intervention lessons were designed collaboratively between the researcher and teacher, immediately following the delivery of the control lessons. This was to ensure that accurate reflections on the presence of the TARGET structures can be made and so that the teacher had ownership of the activities. This also acted as an opportunity for the researcher to support the teacher to gain valuable knowledge of how to create a mastery climate. All lessons were taught independently by the class teacher whilst the researcher acted as observer.

**Measures**

**Assessment of Pupil Physical Activity:** Pupils physical activity levels were measured using ‘Suunto memory belt’ heart rate monitors (HRM’s). These have shown to provide an objective and reliable measure of heart rate in children (Welk, Corbin & Dale, 2000). Pupil sensitisation and familiarisation with the HRM’s was developed through a series of pilot lessons (see Piloting the Instruments below). During the intervention, pupils developed a routine of fitting their ‘numbered’ monitor whilst changing into their PE kit, which automatically collected heart rates every 2 seconds for the duration of the lesson. For accurate analysis, lesson start and finish times were recorded so that data collected outside of these times could be discarded. Immediately, following each lesson the monitors were interfaced with a computer and the data downloaded for analysis.

For this study MVPA was defined as activity which caused heart rates to rise above 154 beats per minute. Heart rate reserve (HRR) was estimated from predicted resting and maximal heart rates. HRR reduces inter-subject variability associated with age, physical fitness and gender (Janz, 2002) and allows the calculation of %HRR thresholds that are a key method for promoting heath and fitness in participants.

**Pupils’ Perceptions of the Motivational Climate:** Ames (1992b) argued that pupil’s perceptions of the environment are the critical factor in predicting their cognitive and affective behaviours. For this study, the ‘Teacher Initiated Motivational Climate in Physical Education Questionnaire’ (TIMCPEQ, Papaioannou, 1998) was used to determine pupils’ perceptions. The questionnaire was administered to both groups after the end of their respective units of work. Pupils completed the questionnaire in a quiet room during a school break time, where the researcher was available to answer any questions that they had.

**TARGET Behavioural Measure:** As Yelling, Penney and Swaine (2000) identify, unless data regarding activity levels is ‘mapped’ against an observational notation of the lesson, it will fail to identify the specific lesson components and activities that are most effective in promoting PA. Therefore, Video data collected in each ‘mastery’ and ‘control’ lesson was examined by the teacher and researcher using the ‘Physical Education Climate Assessment Instrument’ (PECAI, Curtner-Smith & Todorovich, 2002). The PECAI is used in systematic observation and is designed to quantify factors associated with ego-involving, task-involving, or neutral motivational climates. For each lesson episode, the coder decided whether the task, authority, rewards, grouping, evaluation and time elements indicate a task- or ego-involving climate, or was neutral. The validity of the PECAI instrument has been confirmed by Todorovich & Curtner-Smith (2001).
Once data had been collected for all lessons, mean percentages of mastery, performance and neutral codings for each of the TARGET structures gave an indication of which lessons were more mastery and which were more ego-oriented. A deeper analysis also allowed the researcher to evaluate which specific TARGET structures, such as the teacher giving authority to the pupils or making all decisions for them, was apparent within each lesson. As no published research has been conducted into the direct relationship between the TARGET structures and pupil activity levels in PE, this analysis provides potentially innovative suggestions.

**Piloting the Instruments**

All pupils had the opportunity to become familiar with the HRM’s in order that the ‘novelty’ factor was reduced. Training in the use of the PECAI instrument was conducted using video data gathered in these pilot lessons in order to prevent inter-observer reliability issues (Curtner-Smith & Todorovich, 2002). To check inter-observer reliability, an independent observer not experienced in mastery-oriented research coded one lesson, precisely following the instructions of the PECAI (Curtner-Smith & Todorovich, 2002). The reliability check found 100% agreement for this lesson.

**Analysis of Data**

The quantitative methods of data collection enabled patterns to be observed in relation to the TARGET structures and pupil physical activity levels. However, only qualitative reflections on these forms of data will provide meaningful suggestions as to how the individual TARGET structures are related to PA levels. Mean averages and standard deviations were calculated for average MVPA, MVPA in control and intervention groups as well as for running, jumping and throwing activities. Absolute timings have also identified how many minutes pupils were involved in MVPA and can therefore establish the lesson’s contribution to current physical activity recommendations.

**PRESENTATION AND ANALYSIS OF RESULTS**

By the end of the data collection period, a total of six lessons had been observed by the researcher. The school’s original athletics unit of work was four lessons long, but poor weather and a clash with pupil exams meant that one lesson was cancelled for each group. This left data from three control and three intervention lessons, on the activities of sprinting (200m), jumping (long jump) and throwing (javelin). Over the control and intervention units of work, the mean lesson activity time was 49.7 minutes (min). A total of 64 data sets from pupil’s heart rate were available to analyse from a possible 96 (66.6%). The attrition rate resulted from loss of HRM data during lessons and from pupil absence. Questionnaires were completed by a total of 27 pupils from a possible 32 (84.4%). Once more, pupil absence was the cause for the lower than expected questionnaire completion rate.

**Overall physical activity levels**
Each lesson accounted for, on average 14.9 min (± 9.0) of MVPA per lesson, around one quarter of a young person’s recommended daily physical activity (Biddle et al, 1998) (Table 1). Relative MVPA, however, is also an important determinant in establishing the percentage of the available lesson time that pupils were active. Over the study MVPA accounted for 30.9% (± 20.6) of lesson activity time. In addition to falling some way short of Harris’ (2000) recommendation that lessons should achieve around 50% of lesson activity time in MVPA, this is nearly 10% lower than the overall findings of Fairclough & Stratton (2005). They concluded that the average MVPA for non-intervention and intervention PE lessons combined is 40.4% (± 13.8) of lesson activity time. Their data did, of course, include the more active areas of PE such as games and fitness activities. However, the large standard deviations for MVPA identify the differences in physical activity between the control and intervention groups, as well as signalling the contrasting nature of pupil activity during the different athletic activities (see below).

Table 1: Means (± SD) for lesson duration, heart rate, time spent in MVPA, relative contribution of MVPA to lesson and contribution to the current PA recommendations for young people

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Lesson duration (min)</th>
<th>HR</th>
<th>Min MVPA</th>
<th>% MVPA</th>
<th>% daily recomm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control 200m</td>
<td>48</td>
<td>134.3</td>
<td>21.7</td>
<td>45.2</td>
<td>36.2</td>
</tr>
<tr>
<td>Mastery 200m</td>
<td>41</td>
<td>144.9</td>
<td>24.0</td>
<td>58.5</td>
<td>40.0</td>
</tr>
<tr>
<td>Control LJ</td>
<td>51</td>
<td>121.1</td>
<td>14.8</td>
<td>29.0</td>
<td>24.7</td>
</tr>
<tr>
<td>Mastery LJ</td>
<td>55</td>
<td>131.6</td>
<td>20.7</td>
<td>37.6</td>
<td>34.5</td>
</tr>
<tr>
<td>Control Javelin</td>
<td>50</td>
<td>108.3</td>
<td>2.4</td>
<td>4.7</td>
<td>4.0</td>
</tr>
<tr>
<td>Mastery Javelin</td>
<td>53</td>
<td>114.5</td>
<td>5.6</td>
<td>10.6</td>
<td>17.7</td>
</tr>
<tr>
<td>Average</td>
<td>49.7</td>
<td>125.8</td>
<td>14.9</td>
<td>30.9</td>
<td>26.2 (13.6)</td>
</tr>
</tbody>
</table>

**Physical Activity during Athletics Activities**

Activity trends during different the track and field activities (running, jumping and throwing) were generally in line with the previous studies that have reported PA in these contexts. The data found that pupils were involved in MVPA for 7.7% (± 4.2) of throwing lessons, for 33.3% (± 6.1) of jumping lessons and for 51.9% (± 9.4) of running lessons. A similar trend was found by Curtner-Smith et al (1996) and Babiarz et al (1998) who observed that throwing lessons were the least active and that jumping lessons were less active than running.

**Control vs Intervention Physical Activity Levels**

An important element of this study was to compare activity levels between control and intervention groups to see if a mastery-oriented climate would enhance pupils’ PA. When data were analysed across the two conditions, considerable increases in physical activity were evident during the intervention lessons. The extent of the increase is similar to the conclusions of Fairclough & Stratton (2005) that interventions generally increased the percentage of lesson time MVPA time by around 10%. The mean percentage of lesson time spent in MVPA was 26.3% in control lessons compared to 35.6% during intervention lessons. This has led to the conclusion that lessons under intervention conditions involved the pupils in 9.3% (± 3.7) more MVPA than control lessons (Figure 1). This equates to an increase of 9 bpm between groups, which although slightly less positive, is similar to the findings of Parish et al’s
(2007) intervention which claimed that heart rates were around 15 bpm during intervention conditions. It is clear from the data that the intervention running lesson had the biggest effect, increasing MVPA by over 13%. However, the throwing intervention lesson more than doubled the % MVPA from control conditions, showing real encouragement for those wishing to enhance PA levels during these lessons. The only lesson observed over the course of the study to achieve the recommendation of 50% MVPA in lesson activity time was the intervention running lesson.

Figure 1: MVPA (% of lesson time) for control and intervention athletics lessons

A comparison of the physical activity levels during this study’s control lessons with previous studies (Table 2) shows that the pupils in this study were more active during running and jumping lessons, but less active than in the average throwing lesson. The running and jumping lessons produced around half of the MVPA that the current study’s control lessons did. In contrast, the current study’s control throwing lessons were far less active than those observed by Curtner-Smith et al (1995, 1996) and Babiarz et al (1998), the teacher acknowledging fear of accidents as the key cause of her direct teaching styles. This acknowledgement by the teacher is typical of the suggestion by those in Curtner-Smith et al’s (2001) study for selecting less mastery-oriented teaching styles. Overall however, the finding by Fairclough (2003) that the average athletics lesson yielded 28% (± 17) MVPA is remarkably similar to the control lessons in this study, which averaged 26.3% (± 20.4).

Table 2: Mean percentage of lesson (± SD) that pupils engaged in MVPA during different athletics activities

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Running</td>
<td>45.2 (15.7)</td>
<td>12.48 (8.7)</td>
<td>23.62 (7.70)</td>
<td>19.97* (multi)</td>
</tr>
<tr>
<td>Jumping</td>
<td>29.0 (17.7)</td>
<td>8.00 (5.13)</td>
<td>16.26 (11.49)</td>
<td>11.17 (7.41)</td>
</tr>
<tr>
<td>Throwing</td>
<td>4.7 (3.4)</td>
<td>7.24 (4.07)</td>
<td>25.54 (13.92)</td>
<td>11.15 (5.39)</td>
</tr>
</tbody>
</table>

* One lesson utilised a multi-athletics focus where pupils practiced running, jumping and throwing at a number of stations

The data presented thus far has provided much promise for the use of a mastery motivational climate to increase PA in physical education. Such an experimental study (even without the consideration of its potential long-term effects on pupil
intentions to be active) would appear to have as much merit as other interventions that have aimed to increase only lesson activity levels (Fairclough & Stratton, 2006; McKenzie et al, 2004). However, what is now of importance for the future of this intervention is an analysis of the lesson’s motivational climates to identify how each of the TARGET structures impacts on the girls’ physical activity levels during their PE lessons.

The impact of the TARGET structures on pupils’ activity levels

The observation data from the PECAI (Table 3) shows that the mean percentage of ‘ego’ codings for the three ‘control’ lessons were 73.6 (± 17.3), whilst the percentage of codings for ‘task’-oriented behaviour was just 1.4 (± 2.4). This finding was predicted at the outset of the study, given the researcher’s extensive experience in teaching and observing athletics lessons. It is also in line with research on athletics teaching that suggests that these lessons are predominantly ‘traditional’ (O’Neil, 1993), ‘formal’ (Evans, Davis & Penney, 1996), ‘direct’ (Curtner-Smith et al, 2001) and ‘ego-oriented’ (Morgan & Carpenter, 2002; Morgan et al, 2005).

Data also shows that the intervention lessons were delivered using far more ‘mastery-oriented’ behaviours (the PECAI uses the term ‘task’ rather than ‘mastery’). In the intervention lessons, the majority of codings (48.6% ± 14.7) were of a mastery nature, whilst ego codings reduced from an average of 73.6% during control lessons to 20.5% (± 25.6) during intervention (Figure 2). Unfortunately, because of the teacher’s insistence to still collect times and measurements for her pupils, many codings during the intervention lessons were also labelled as ‘neutral’ (30.9% ± 15.1).

Parish et al (2007) recently suggested that the mastery environment impacted on the activity levels of toddlers, but were only able to ‘speculate’ (p.176) on the
TARGET motivational climate and pupils’ lesson physical activity levels

contributing factors as they failed to utilise any formal methods to determine how the environment impacted on PA levels. The data collected in the current study has specifically enabled the researcher to identify how the presence of the TARGET structures impact on activity levels. Observation of lessons has established a number of subjective patterns which suggest that aspects of the structures can both enhance and inhibit pupil PA.

When lesson ‘Tasks’ provided variety and individual challenge, pupils were most active. For example, comparing the control and mastery running lessons, when pupils were offered a variety of activities to perform they appeared considerably more active than when all pupils followed the rigid instructions of the teacher and completed the same task. The same finding occurred in jumping lessons, where pupils were offered more than one activity to perform, practicing at different jumping stations into the side of the pits. Finally, although throwing lessons did not offer a variety of activities, the use of modified equipment to allow more frequent practice of tasks ensured that pupils were more active. This finding was also found by Parish et al (2007, p.176) who suggest that the participants were most active when they were involved in a range of challenging, developmentally appropriate tasks and activities. In contrast, tasks in this study in which the whole group participated together, although frequently being organised quicker, led to frequent stop-start activities which prevented sustained activity within the lesson.

Although mastery ‘Authority’ behaviours were seldom evident in the control lessons, a large increase in this structure was seen across all intervention lessons. This is very positive for the development of a mastery motivational climate, although in this study it actually inhibited opportunities to be active. The involvement in leadership roles, for example, when timing and measuring activities, led to pupils being less active than the performing students. Each intervention lesson also involved groups of pupils in leading their own warm-up, which in all cases were less active than the respective teacher-led warm-ups had been.

‘Recognition’ of individual progress and improvement was achieved less effectively by the teacher. Despite recognition being one of the most influential dimensions on pupils’ perceptions of the motivational climate (Morgan et al, 2005) the teacher in the current study found this structure hard to demonstrate. Conversation with the teacher, however, suggests that, like those in Morgan and Carpenter’s (2002) study, they thought that recognition of attainment is an integral part of PE and should be highlighted within lessons. It was also felt that they failed to see the benefits of one-to-one contact and differentiation of activities with pupils. This was shown in the traditional nature of the teacher’s ‘whole-class’ teaching strategies, which meant that the entire group was frequently stopped in order that common faults and teaching points were given. In the rare episodes that one-to-one feedback was provided, pupils seemed to respond more positively as well as maintain an enhanced level of activity when returning to practice through an increased ‘focus’. One-to-one feedback, it appears, also had the additional benefit of allowing the rest of the class to maintain their activity levels, although it is acknowledged that individual feedback to every pupil is difficult in every lesson.

Mastery ‘Grouping’ of pupils was another structure that the teacher was able to utilise with some success in the intervention lessons. However, this led to increases in the
activity levels of some pupils whilst suppressing the activity of others. Evidence for this claim was observed in all three intervention lessons where pupils were either working hard to complete an activity or had become ‘off-task’. The nature of the pupils is therefore an important consideration when considering groupings. It was also observed that pupils were grouped into pairs for certain tasks that could have been achieved quicker and with higher activity levels individually. A closer look at the ‘Grouping’ recommendations by Ames (1992a) identifies that mastery grouping is achieved when pupils are in small mixed ability co-operative groups, or when working on an individual task. This latter form of grouping was not a strategy suggested by the researcher to the teacher, but would seem to have an equal mastery-oriented effect whilst offering greater activity for pupils during some tasks.

‘Evaluation’ utilising the mastery suggestions was not achieved in the vast number of lesson episodes. Instead, much evaluation included both private and whole class feedback. In addition, it was rare to observe evaluations that focused solely on effort and individual improvement, hence the large number of ‘neutral’ codings. Evaluations made to the whole class, like in the ‘recognition’ examples, frequently had the effect of decreasing pupil activity as they were required to stop practicing in order to listen to the teacher. However, it is suggested that evaluation impacts very little on activity levels if it is given whilst groups are still working. The main problem with providing public evaluations, however, is that pupils’ perceptions of the environment will be more ego-oriented (Morgan et al, 2005).

The ‘Timing’ dimension across all lessons shows a range of task, ego and neutral codings. However, when the teacher was able to offer flexible time to practice, as in the throwing and jumping lessons, it seemed that she demonstrated greater one-to-one recognition and evaluation of pupils. It is also clear that she could focus her time on a specific individual or group of pupils who needed her help, or who were ‘off-task’. The researcher suggests that this enhances pupils activity levels generally, although flexibility of time almost inevitably creates some down time for participants who are waiting for the other pupils. The key aspect of this dimension is that pupils must be offered sufficient opportunities and time to practice and improve, which will most effectively be achieved if the tasks and grouping are correct and minimum time is wasted between lesson transitions and in management of pupils. The underlying conclusion is that although the timing structure is important for creating a mastery-oriented environment, and that time to practice is essential, the impact that flexibility of timing can have on activity levels is minimal.

**Pupils’ perceptions of the motivational climate**

Whilst the teacher had considerable success in increasing the proportion of mastery TARGET structures, Ames (1992b) suggests that pupil’s perceptions of the environment are the critical factor in predicting their cognitive and affective behaviours. This corresponds with the substantial literature that indicates that perceptions of a mastery-oriented environment enhance feelings of self-competence, self-determination, intentions to be active and higher enjoyment (Cury et al, 1996; Standage, Duda & Ntoumanis, 2003; Parish & Treasure, 2003; Weigand & Burton, 2002). An intervention that aims to enhance these characteristics must therefore measure pupils’ perceptions of the motivational climate.
Following the unit of work, pupils in the control and intervention groups completed the ‘Teacher Initiated Motivational Climate in Physical Education Questionnaire’ (TIMPCQ, Papaioannou, 1998). The results (Table 4) for the control group indicate that the pupils perceived their previous three athletics lessons as moderately performance- (3.1 ± 0.9) and mastery-oriented (3.0 ± 0.9). This is surprising given the findings that the actual teaching behaviours were mostly ego-oriented (73.6% ± 17.3) and the codings for mastery-oriented behaviour were just 1.4% (± 2.4). It is also less positive than the findings of Morgan et al (2005) who suggested that observed lessons were moderately more mastery-oriented than ego-oriented. The response from pupils within the intervention group, however, was very positive, with the average grade for a mastery perception of 4.0 (± 0.8) and for perceptions of a performance environment far lower at 2.5 (± 2.1). These findings would point to the successfulness of the intervention in enhancing pupils’ perceptions of a mastery environment. It is expected that these perceptions would lead individuals to enjoy the activity more, to have higher perceived competence and to have greater intentions to be active in the future (Parish & Treasure, 2003).

<table>
<thead>
<tr>
<th>Lesson Conditions</th>
<th>Performance</th>
<th>Mastery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group</td>
<td>3.1 (0.9)</td>
<td>3.0 (0.9)</td>
</tr>
<tr>
<td>Intervention Group</td>
<td>2.5 (1.1)</td>
<td>4.0 (0.8)</td>
</tr>
</tbody>
</table>

* Based on a 5-point Likert scale: 1=strongly disagree, 2=disagree, 3=unsure, 4=agree, 5=strongly agree.

CONCLUSION

Physical education has an important dual role to play in teaching young people to be physically active. The subject should foster a positive attitude towards participation in lifelong activity as well as delivering physically active lessons that will contribute towards a child’s daily recommended physical activity. This study created an intervention that enhanced both of these goals, through the promotion of a mastery-oriented motivational climate. Although substantial research has considered the role of Achievement Goal Theory in developing long-term intentions to be active, to date, no study has concluded in any detail how the TARGET structures directly impact on physical education activity levels. The data presented has shown how each of the TARGET structures might positively or negatively impact on pupils’ lesson activity levels.

Recent evidence has suggested that an additive relationship exists between the TARGET structures, and that the recognition and evaluation structures have the greatest impact on pupils’ perception of the climate (Morgan et al, 2005). If this is true, then perceptions of a mastery climate would occur if one or more structures were perceived, particularly recognition and evaluation. The evidence discovered in this study complement these findings, in that both mastery recognition and evaluation appear to enhance pupils’ activity levels over ego-oriented feedback. Furthermore, just as recognition and evaluation have been suggested as the most effective structures for enhancing perceptions of the climate, then this study would suggest that the task, grouping and time structures are most pertinent for increasing pupil PA. In addition, because certain aspects of the authority structure have been found to inhibit activity levels, the teacher must consider very closely how they utilise this dimension.
Although a number of conclusions and recommendations have been drawn from the evidence provided in this report, it must be acknowledged that this was a relatively small pilot study, utilising a convenience sample. A greater number of lessons, utilising more teachers and pupils would determine if the initial patterns observed in this study are common. A methodological limitation of the study is that whilst perceptions of the motivational climate were collected, a measure of pupils’ actual achievement goals was not assessed. Although initial research has shown that perceptions of a mastery climate can enhance perceived competence and PE activity levels (Parish & Treasure, 2003), further work should include achievement goal measures in order to determine if pupils’ orientations can be effected over a unit of work. Finally, more research into the effects of each of the TARGET structures on pupil’s activity levels must be conducted to determine their relative importance. This will support practitioners in the creation of a mastery motivational climate with the dual aim of enhancing pupils’ lesson activity levels and their cognitive and affective responses to PE.
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