

Examining the Longitudinal Effects of the PE Class' Climate on Students' Goal Orientations and
Intrinsic Motivation to be Physically Active

BY

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E. Whitney G. Moore

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Chairperson, Dr. Mary D. Fry

Dr. Todd D. Little

Dr. David M. Hansen

Dr. Andrew C. Fry

Dr. J. Leon Greene

Date Defended: April 22, 2013

The Dissertation Committee for E. Whitney G. Moore
certifies that this is the approved version of the following dissertation:

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Intrinsic Motivation to be Physically Active

Chairperson, Dr. Mary D. Fry

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Abstract

Nicholls' Achievement Goal Perspective Theory (AGPT) research has been examined within the PE and sport domains (Roberts & Treasure, 2012). However, very limited longitudinal research has been conducted, particularly with youth and adolescents. Research is needed to examine the impact of the PE motivational class climate on students' goal orientations toward PE and intrinsic motivation to be physically active. The first study assessed a professional development (PD) session with a school district's PE teachers focused on maximizing their development of a caring and task-involving climate. The effect of this session was assessed by comparing the secondary students' perceptions of the motivational climate for two semesters prior to the PD with student perceptions the semester immediately after the PD. Three important findings were revealed by analyzing each teacher's (N=8) multi-group SEM: a) significant effects from the PD were not found, b) experienced, individual PE teacher's motivational climate development is very consistent over time, and c) 75% of the teachers' models showed no significant correlation between intrinsic motivation and ego-involving climate perceptions. Together these results suggest that future PD for current PE teachers should emphasize ways to enhance the caring and task-involving climate, because these aspects were consistently correlated with the students' reported intrinsic motivation to be physically active. The second study tracked sixth grade students into their first seventh grade semester. The purpose of this study was to examine the influence of the seventh grade PE class climate on students' goal orientations, competence, and effort in PE. Enrolled PE students (N=376) were surveyed twice in sixth grade, and twice the following fall semester (N=216). Importantly, significant, positive within time correlations were found between the students' perceptions of the caring climate and their PE competence, effort, and task goal orientation adoption. The majority of the within time correlations were constrainable across the four time-points. This preliminary finding suggests that when students perceive a caring climate, they are also more likely to report greater competence, effort, and task orientation in PE. The findings support that these outcome variables are uniquely related to caring climate above and beyond their relationships with the task-involving climate.

Keywords: Physical Education, motivation, climate, goal orientation, intervention, caring climate

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Dissertation Introduction

E. Whitney G. Moore

University of Kansas

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Introduction

The purpose of this dissertation is to extend Achievement Goal Perspective Theory (AGPT) research based in Physical Education (PE). AGPT has been the framework for prior multiple mono-theoretical research studies in PE. In the last decade, AGPT based half-longitudinal and intervention research has begun to appear more in the PE literature. These studies have provided evidence supporting AGPT relationships. However, questions still remain. Therefore, this introduction will describe AGPT constructs and relationships and prior research to illustrate relevance of the two studies included in this dissertation are highlighted.

Background to the Studies

Nicholls' developed AGPT to better understand students' motivation to learn (Nicholls, 1989). The aim was to provide guidance to teachers for optimizing all students' learning (Nicholls, 1989). His resulting AGPT has three components: (a) students' cognitive development and understanding of ability, (b) students' goal orientation or definition of success, and (c) students' perceptions of the class' motivational climate. Nicholls and later AGPT researchers have expanded the application of AGPT to PE, sport, and physical activity.

All three of these AGPT components and their related research will be presented in this literature review. The first AGPT component to be covered was Nicholls' unique contribution to the research in achievement motivation. His research, and that by researchers who followed in his footsteps, provided evidence for the developmental stages youth go through on the way to developing a differentiated view of ability. The age when the majority of youth attain this mature understanding of ability guided the population selection for the first of this dissertation's studies.

The second AGPT component is comprised of two orthogonal constructs—task and ego orientation, respectively (Nicholls, 1989). These orientations describe the two ways individuals'

can define success (Nicholls, 1989). Holding a high task orientation has been associated and predictive of more positive motivational outcomes than a high ego orientation. A good example, is task orientation's significant, positive relationship to effort and intrinsic motivation in the PE, sport, and physical activity domains (Chian & Wang, 2008; Newton & Duda, 1999; Seifriz et al., 1992; Standage et al., 2003). Conversely, the relationship between individuals' high ego orientation and intrinsic motivation has been shown to be a direct relationship, and an interaction with or moderation by perceived competence. Therefore, the orientation youth adopt toward physical activity (PA), and Physical Education (PE) in particular, represents how they define success in the physical domain, and is associated with their intrinsic motivation for both PE and PA.

The third AGPT component—motivational climate—is comprised of three constructs. These motivational climate constructs represent the participants' perceptions of what is emphasized in the target domain by both the instructor and their peers. The caring and task-involving climate constructs are positively correlated with each other, while negatively correlated with the ego-involving climate construct (Ntoumanis & Biddle, 1999). Research examining a task-involving climate alone, or with a caring climate, has consistently shown these personalized and supportive climates to have positive associations with adaptive motivational behaviors and responses. Alternatively, research has consistently reported positive associations between the presence of a high ego-involving climate and maladaptive behaviors. As the AGPT body of research has accumulated, more studies are beginning to incorporate half-longitudinal designs, interventions, and/or more advanced analytic techniques, such as structural equation models (SEM) or multilevel models (MLM). These studies have continued to provide supporting evidence for AGPT's constructs and relationships.

This progression in AGPT studies has illustrated the need for study designs that examine changes in individuals' goal orientations, perceived competence, and motivational climate over time. Currently, the most appropriate approach to explore these constructs' relationships is a longitudinal study design that is analyzed utilizing an MLM framework. Theoretically, the individuals' goal orientations are expected to be influenced to some extent by the perceived motivational climate. Intervention research manipulating PE motivational climates have supported this tenant of AGPT (Christodoulidis et al., 2001; Digelidis et al., 2003; Todorovich & Curtner-Smith, 2002b; Treasure & Roberts, 2001; Weigand & Burton, 2002). Although, the effect on students' effort when a high ego oriented person is in a high ego-involving climate has been theorized and evidenced by research to be affected by perceived competence, (Newton & Duda, 1999; Nicholls, 1984; Standage et al., 2003), all of these variables have not always been included in prior studies. Additionally, research studies with only two time points (e.g., pre-post or half-longitudinal designs) are unable to fully examine the effect that construct changes have on each other. Longitudinal research is needed to examine the nature of these relationships to determine if they are truly causal (Little, 2012). Therefore, the relationship between individuals' orientations, perceived competence, motivational climate, and effort over time is one of this dissertation's specific foci (e.g., Study 1).

Additionally, when interventions have been done with teachers in previously published research, the students' perceptions of their teachers' motivational climate development was not assessed prior to the intervention (Christodoulidis et al., 2001; Digelidis et al., 2003). This means that the researchers were unable to assess the intervention's influence on the teachers' PE motivational climate development, since prior motivational climate levels could not be controlled for. As the mission of PE is to develop the skills, knowledge, and motivation for lifelong

physically active adults, it is important to assess the PE aspects that teachers have control over and can use to promote this important mission. Standage et al. (2003) revealed that middle school students who perceived a task-involving PE climate were more intrinsically motivated; while individuals who perceived an ego-involving climate and had low perceived competence were more likely to report being either extrinsically motivated or amotivated towards PE. An additional, important finding from their study was that even the high ego oriented, high competence students reported greater intrinsic motivation when they perceived a low ego-involving climate. Therefore, PE teachers' motivational climate emphasis is an aspect that can be optimized to increase their students' likelihood to be intrinsically motivated toward PA. Therefore, how effective a professional development training can be at increasing PE teachers development of an optimal motivational climate (i.e., caring and task-involving) is a specific focus of this dissertation (e.g., Study 2).

Statement of the Problem

This dissertation is comprised of two studies to examine the relationships that lead to middle school PE students adopting a higher task orientation toward PE (Study 2) and more internalized motivation for physical activity (PA) in general (Study 1). Due to the decrease in youngsters' physical activity levels across their adolescent years, and the concurrent rising obesity rates (Division of Adolescent and School Health & CDC, 2010; Surgeon General, 1999), examining the influences on individuals' motivational profiles is important. Two studies have been designed to address these issues. The first study will assess the effectiveness of an intervention targeting the PE teachers' motivational climate development. The second study will model the relationships over time between individuals' goal orientations, perceived competence, and perceptions of the PE motivational climate. These analyses will be conducted tracking

student responses, pre- and post- an intervention designed to increase the PE teachers' intentional fostering of the caring and task-involving motivational climates.

The middle school age group is the focus of this dissertation's studies for three reasons. One, it is the age range when the majority of students are achieving a differentiated view of ability; which means their ability to adopt a high ego goal orientation is greater (Fry, 2000a, 2000b; Fry & Duda, 1997; Nicholls, 1989). Two, daily PE is required for elementary students in Kansas; however, upon entering secondary school, the PE requirement changes to completing a single year (i.e., two semester courses) by the end of high school (NASPE & AHA, 2010). This means that middle school is the first time these students are not required to attend daily PE. Three, the transition from elementary to middle school has been referenced in the literature as a difficult period for youth (Eccles et al., 1996; Eccles et al., 1993). Eccles, et al (1996) found that on average students' self-esteem decreased, while their teachers' classroom management style was more controlling in middle school. For these specific reasons, and others, the national trend is for middle school age students to report less physical activity participation. PE has been promoted as the primary vehicle already in place that could be used to positively influence all youth's development of lifelong physical fitness and wellness habits (NBPTS, October 2011).

Study Design

The data for these studies will be collected over 1.5 academic years at a single school district in the Midwest of the United States. The elementary surveying occurred approximately 6-8 weeks into the Fall 2011 and the Spring 2012 semesters. The secondary (e.g., 7th through 12th grade) surveying of students enrolled in PE classes will occur two times during each semester. The secondary surveying will be timed to allow for development of the motivational climate during the semester. Therefore, the semester's first surveying will be after approximately six

weeks, while the second surveying will occur approximately two weeks before the semester ends. The first study will analyze data that will be collected from surveying the sixth grade students in the district over three semesters of PE enrollment, including their first semester of seventh grade. The second study will analyze data that will be collected from surveying all secondary (i.e., 7th through 12th grade) students enrolled in the district's PE courses during the study. For every surveying session, after introducing the trained research team members, the PE teachers will exit the surveying area until the students had completed the surveys. The research team will emphasize that the surveys are anonymous and that the students' honest opinions are of most interest. Most students will be able to complete the survey in 15-20 minutes.

This study will implement a three-form planned missing survey design. Utilizing this approach will allow more measures of interest to be included, while decreasing the risk of over-taxing the student participants. The elementary students' three-form planned missing survey design will include 22 common items across all three surveys, followed by 47-48 of the remaining 68 items from the measures of interest. The secondary three-form planned missing survey design will include 25 common items across all three surveys. Then the secondary students will complete 57-58 of the remaining 86 items. Thus, rather than responding to over 100 items, students only responded to 69-83 items depending on their grade level. The students will record their responses on a scantron sheet, rather than directly on the survey form; and the survey code information will be pre-filled for the students to ensure that the survey version is accurate.

After the first full year of surveying is completed, a 2.5 hour professional development program was conducted by the lead researcher for the district's PE teachers. This professional development program emphasized strategies for the teachers to intentionally increase their development of the caring and task-involving motivational climates. The results from the current

year's data collection will be used to inform development of this training to target the areas open for the greatest improvement in caring and task-involving implementation strategies. The initial hour of training will include a brief introduction to AGPT, research supported relationships, and the past year's survey results. The purpose of this introduction is to provide the vocabulary and relational foundation for the rest of the training, while also grounding the research back into their own classroom findings of their strengths and weaknesses. Then, following adult learning practices, the remainder of the training session will focus on experiential learning opportunities for the teachers, so that they can practice implementing the caring and task-involving climate strategies within their PE class context.

Research Hypotheses

Each of the two studies comprising this dissertation are described below, followed by the specific purposes and related hypotheses. Since each proposed study is a longitudinal study with four measurement occasions, these occasions will be designated as T1 through T4. Relationships controlling for the variable's prior measurement occasion's value will be referred to as AR pathways for autoregressive. Similarly, the predictive regression pathways across the time lag between two consecutive measurement occasions will be referred to as CL pathways for cross-lag.

Study 1

The purpose of the second study is to examine the effects of an intervention designed to provide PE teachers with applied strategies for fostering the caring and task-involving climates' characteristics. Therefore, the students' perceptions of the caring, task- and ego-involving climates will be measured twice before the intervention and twice after the intervention. Specifically, pre-intervention measurement occasions occurred in the Fall 2011 (T1) and Spring

2012 (T2), and both post-intervention measurement occasions will occur in Fall 2012 (T3 and T4). Additionally, intrinsic motivation will also be measured across all four time points as an outcome variable. Latent means, ARs, and CLs can be assessed for significantly different values to examine the effectiveness of the intervention on the teachers' successful development of a more caring and task-involving climate, and a less ego-involving climate as perceived by their students.

Purpose 1 (T1 to T2 Relationships). One purpose of collecting the secondary students' climate perceptions during the two semesters preceding the intervention was to be able to control not just for the constructs' initial mean values, but also to compare the significance of pre- and post-intervention AR pathways. AGPT research has supported the theorized relationships between climate perceptions and intrinsic motivation (Christodoulidis et al., 2001; Digelidis et al., 2003). Specifically, caring and task-involving climate has positively predicted intrinsic motivation and continued PA participation. Conversely, an ego-involving climate negatively predicted individuals' intrinsic motivation and continued PA participation.

Hypothesis 1 (T1 to T2 Relationships). The Fall 2011 (T1) climate constructs are hypothesized to significantly predict (AR1) their corresponding Spring 2012 (T2) values. Additionally, it is hypothesized that the perceptions of the Fall 2011 climate as caring, task-involving, and ego-involving will predict Spring 2012 (T2) intrinsic motivation. Specifically, the caring and task-involving climates will have significant, positive CLs, while the ego-involving climate will have a negative CL.

Purpose 2 (Intervention Effectiveness from Latent Mean Significances). Due to the intervention between T2 and T3, assessing changes in latent mean values for these four constructs is important for assessing the effectiveness of the professional development training

intervention. Specifically, the purpose of this intervention is to increase the caring and task-involving climate development by the teachers at T3 and T4 compared to T1 and T2. Coinciding with these positive climate changes, a decrease in the ego-involving climate development by the teachers at T3 and T4 is also a goal of the intervention. Lastly, the ultimate goal of the teachers successfully fostering more caring and task-involving climates is to increase their classes' mean intrinsic motivation level. Two measurement occasions will be conducted in the Fall 2012 semester to examine how these variables' means change over that post-intervention semester.

Hypothesis 2 (Intervention Effectiveness from Latent Mean Significances). It is hypothesized that there will be a significant difference in latent means for the Fall 2012 (T3 & T4) values compared to the Spring 2012 (T2) and Fall 2011 (T1) values. Specifically, the caring, task-involving, and intrinsic motivation constructs' mean values are hypothesized to be significantly greater, while the ego-involving climate will significantly decrease.

Purpose 3 (Intervention Effectiveness from AR and CL Significances). The final purpose of this study's analyses is to assess the changes in the constructs AR and CL pathway values before and after the intervention. Since the intervention occurs between the T2 and T3 measurement occurrences, the strength of the latent relationships as measured through the AR and CL pathways for T1 to T2 will be compared to the corresponding pathways for T2 to T3. How the intervention effects develop over the Fall 2012 semester will be assessed by examining the T3 to T4 AR and CL pathways.

Hypothesis 3 (Intervention Effectiveness by Latent AR and CL Significance). It is hypothesized that the climates' T1 to T2 AR and CL pathways will be significantly more predictive than the climates' T2 to T3 AR pathways due to the intervention's effect.

Additionally, it is hypothesized that the within time correlations will be stronger at T3 and T4 due to the increased intentional focus of the teachers' on fostering a specific climate that is caring and task-involving.

Study 2

The first study follows 6th grade students during their final elementary year and their first semester in middle school (7th grade) PE. This sample was selected due to the students' cognitive development increasing the likelihood of them adopting not just a high task orientation, but also or only a high ego orientation. Therefore, this study is designed to monitor students' goal orientations, perceptions of the motivational climate, competence, and effort in PE over the middle school transition. A potential limitation on the ability to fully examine the following hypothesized relationships will be if the climates' values are not strongly differentiated, because these relationships are more difficult to examine in neutral environments.

Purpose 1 (PE Climate Accounts for Goal Orientation Changes). Prior intervention research has shown that students' goal orientations are influenced when a motivational climate is clearly emphasized (Carr, 2006; Smith et al., 2009; Standage et al., 2003; Todorovich & Curtner-Smith, 2002; Weigand & Burton, 2002). These studies have consistently revealed that the perceived climate increases the students' corresponding goal orientation. The influence of the perceived climate on the non-corresponding goal orientation has not been as consistent. Lastly, the influence of the caring climate on students' orientations has not been previously examined in the PE literature.

Hypothesis 1 (PE Climate Accounts for Goal Orientation Changes). It is hypothesized that the perceived motivational climate at T1 will increase the corresponding goal orientation at T2. Specifically, when students perceive a high caring and task-involving motivational climate,

then their task orientation will increase and their ego orientation will be decreased at T2. On the other hand, when students perceive a high ego-involving motivational climate, it is hypothesized that their task orientation will decrease, while their ego orientation will be increased or not significantly changed at T2. Further, it is hypothesized that these CL pathways will be significant for single lags.

Purpose 2 (Caring & Task-involving CLs to Effort Outcome). AGPT research has shown that in a high task-involving climate, individuals' report giving greater effort (Huddleston et al., 2012; Newton et al., 2000). Individuals' with a high task orientation have also reported giving high effort (Duda et al., 1995; Newton & Duda, 1999). Additionally, Brown and Fry (2009) found that when individuals perceived a high caring climate, they also reported giving high effort. However, the relationship between caring climate and effort has not been assessed with PE students. Lastly, the longitudinal design of this study will enable the assessment of a significant mediation for the task-involving climate (T1) on future effort (T3) through the students' increased task orientation (T2).

Hypothesis 2 (Caring & Task-involving CLs to Effort Outcome). It is hypothesized that when students perceive a high caring and task-involving climate at T1 that they will report increased effort at T2. Additionally, it is hypothesized that their competence level at T1 will not influence this relationship between the perceived caring and task-involving climates and their effort at T2. The caring and task-involving climates' CL pathways to effort are expected to be significant for single lags.

Purpose 3 (Ego-involving CL to Effort Outcome). AGPT research has shown that ego oriented individuals' competence influences their motivational response to being in a climate they perceive as ego-involving (Balaguer et al., 2002; Balaguer et al., 1999; Smith et al., 2006;

Standage et al., 2003). These studies did utilize a longitudinal design. For example, utilizing a cross-sectional design, Standage et al (2003) revealed a 3-way interaction between perceiving a high ego climate, ego orientation, and competence predicting intrinsic motivation. The longitudinal design of this study will enable specific analysis of the role of perceived competence with respect to the relationship between high ego orientation, effort, and perceiving a high ego-involving climate.

Hypothesis 3 (Ego-involving CL and Effort Outcome). Based on Nicholls' AGPT, it is hypothesized that when ego oriented students perceive a high ego-involving climate, their competence level will moderate the change in their effort level.

Limitations

While these two studies have strengths, they also have limitations that should be noted. The population sample for this project comes from a single school district. Although sample size is comparable to a typical US study in sport and exercise psychology, it is fully representative of this Midwestern school district's enrolled PE students. Therefore, the generalizability of these findings to other populations (e.g., urban or rural school districts, or more diverse student bodies) may be restricted. However, because the general principles and relationships of the AGPT constructs have been studied across various cultures and demographics, the confidence with which these studies' findings may be generalized is increased.

Specifically with respect to the first study, these students were surveyed over a 1.5 year time period, with the intervention occurring after the first year of data collection. The second study's emphasis was to determine the effectiveness of the intervention on teachers' climate development. Researchers' continued utilization of longitudinal research designs to examine the long-term effects of interventions with PE teachers and sports coaches is needed. In addition,

having more teachers to be able to conduct an MSEM analysis with the teachers being the L2 units would be an even stronger analytic technique. A MSEM would not use aggregate values for the climate constructs, which may confound the L2 relationships with individual-specific information (Preacher, 2011; Preacher et al., 2011; Preacher et al., 2010; Zhang et al., 2009). Lastly, conducting observations to enable a mixed methods model would decrease self-report measurement bias and would also strengthen the findings of future studies.

There are two additional, general limitations for both of the studies related to the nature of the grant that funded these studies as part of a larger project. This grant involved only surveying the students currently enrolled in PE, and not all students in the school district. Therefore, surveying of the students who did not enroll in secondary PE during our surveying time span was not achieved. Therefore, the results may not have provided a fully representative picture of secondary students' PA views. It would have been interesting to survey all of the school district's students to determine if there are commonalities among those who did participate in PE compared to those who did not. A related limitation is the lack of a control group, because the researchers were unable to find a matching population to sample for controls. The fact that the two studies in this dissertation employ a longitudinal design allows for the controlling of prior levels for the constructs possible, and MSEM was used in the first study to separate out individual from group effects are strengths which help minimize the limitation of not having a control group.

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Dissertation Study 1 Manuscript

Modeling Motivational Climate's Indirect Predicting of Intrinsic Motivation

E. Whitney G. Moore

University of Kansas

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Abstract

Purpose: Physical Education (PE) teachers have the opportunity to influence youth's intrinsic motivation for physical activity. According to Achievement Goal Perspective Theory, teachers can increase students' intrinsic motivation by fostering a highly task-involving climate. The purpose of this study was to provide a 2.5 hour professional development (PD) session for PE teachers emphasizing the importance of fostering a highly caring and task-involving climate.

Method: To assess the effectiveness of this session, the secondary PE students were surveyed twice during the two semesters before the PD session and twice the semester immediately following the PD. The students were surveyed about their perceptions of the caring, task-, ego-involving climates, and intrinsic motivation for physical activity. To determine the impact of the intervention on each PE teacher's climate development, a multi-group (i.e., group was semester) SEM was computed for each teacher (N=8). **Results:** Although the PD was not shown to have a significant impact on the motivational PE climate perceived by the students, interesting correlation patterns were revealed. **Conclusions:** First, that nearly all the teachers' climate means, variances, and correlations were not significantly different over time illustrates how consistently experienced PE teachers' develop their motivational climate. This also illustrates the challenge of significantly changing experienced PE teachers' motivational climate development. The eight teachers' models fell into three cross-sectional correlation patterns. For 75% of these teachers' only the caring and task-involving climates were significantly associated with students' intrinsic motivation to be physically active; therefore these are the climate aspects to emphasize in PD.

Keywords: PE, high school, middle school, intervention, motivational climate

Introduction

It is important to influence youth and adolescents while their views toward physical activity are being formed. Nearly 50% of 12-21 year olds in the U.S. lead sedentary lives (Swann, 2004). Despite increased publicity regarding the health risks associated with physical inactivity, no improvement in the percentage of youth achieving the NASPE physical activity standard (i.e., daily physical activity for 60 minutes) has been observed (Swann, 2004). Of added concern, Thøgersen-Ntoumani, Ntoumanis, & Nikitaras (2008) revealed that nearly half of inactive adults held negative feelings toward physical activity to such an extent that they were unconvinced a health threat would be enough to motivate them to engage in physical activity. If today's adolescents do not change their minds soon regarding physical activity, then they may likely grow up to be "unconvinced" inactive adults.

A suggested avenue for influencing youth physical activity attitudes is through their physical education (PE) experience (Sallis & McKenzie, 1991; Sallis et al., 1992; Segal & Gadola, 2008). As of the latest Youth Risk Behavior Survey results, on average, over half of high school age students across the U.S. are participating in weekly PE class (Division of Adolescent and School Health & CDC, 2010), which illustrates PE's natural reach and ability to influence a majority of U.S. youth and adolescents. Each state's graduation requirement for PE is different, however. For example, Kansas secondary students are required to complete one year (two semesters) of PE to graduate from high school (NASPE & AHA, 2010). Thus, over a five year (e.g., 10 semesters) secondary school span, Kansas students need only to complete two semesters of PE. PE's mission is to develop students' skills, knowledge, and interest in being physically active for a lifetime (NBPTS, October 2011). Ironically, compared to other required subjects (e.g., math, sciences, English, history), PE has the shortest period of time over these five years to

accomplish its goal, which is the development of students' appreciation for lifelong physical activity. Therefore, PE teachers must maximize students' desire to enroll in PE by optimizing the students' PE experience across the two required semesters of secondary PE. The latest Physical Education Standards (2011) support this goal by emphasizing the PE teacher's development of positive and supportive student interactions and class climate as key factors to help increase student motivation and engagement. This study examines the influence of a professional development training session on PE teachers' ability to create a caring and task-involving class climate, as perceived by their students, over the course of a semester.

Achievement Goal Perspective Theory (AGPT) Constructs

Research has shown that the motivational class climate leaders (e.g., teachers or coaches) promote can to influence participants' perspectives regarding physical activity (Smith, R. E., Smoll, & Cumming, 2007, 2009; Todorovich & Curtner-Smith, 2002; Weigand & Burton, 2002). Specifically, research utilizing achievement goal perspective theory (AGPT) has shown that when a task-involving climate is perceived by participants in the physical domain, they are more likely to report adopting a goal orientation (e.g., definitions of success) based on self-referenced improvement and personal effort (Newton, & Duda, 1993; Seifriz, Duda, & Chi, 1992; Walling & Duda, 1995; Walling, Duda, & Chi, 1993). Additional positive physical activity outcomes found to be at least correlated with, if not caused by, perceiving a task-involving climate include increased effort, enjoyment, and intrinsic motivation (Balaguer, Duda, & Crespo, 1999; Duda & Nicholls, 1992; Newton, Duda, & Yin, 2000; Seifriz et al., 1992). A task-involving climate is one characterized by an emphasis on high personal effort, self-referenced improvement, and cooperation among peers (Seifriz et al., 1992). Research that recently examined the correlates between leader behavior and perceived motivational climate revealed clear, significant, theory-

supported behaviors. Smith, et al., (2005) examined high school athletes' perceptions of their coaches' behaviors and found that athletes who perceived their coaches as providing positive feedback, informative feedback, and not ignoring mistakes, but rather using them as an educational opportunity, also perceived a greater task-involving climate on their teams. This study provided concrete examples of coaching behaviors associated with the development of a task-involving climate.

An alternative AGPT climate is the ego-involving climate. Task-involving and ego-involving climates are significantly, negatively correlated, because the characteristics of these two climates are not complementary (Newton et al., 2000; Seifriz et al., 1992; Walling et al., 1993). An ego-involving climate emphasizes normative or other-referenced comparison, praise only for the leader's favorites, and intra-group rivalry (Seifriz et al., 1992). High school athletes perceiving their coaches as not providing positive feedback, giving negative feedback, and punishing mistakes, also perceived a greater ego-involving climate on their teams (Smith, S. L. et al., 2005). Importantly, the lack of positive feedback was the top predictor of perceiving a more ego-involving climate. This highlights that a climate lacking in positive interactions is not necessarily neutral. Additionally, the outcomes associated with these two climates (e.g., ego- and task-involving) are very different. Specifically, perceiving an ego-involving climate is significantly, positively related to goal orientations based on comparison with others, winning through the bending or breaking of rules, and intra-group rivalry (Miller, Roberts, & Ommundsen, 2003; Ommundsen et al., 2003; Smith, A. L., Balaguer, & Duda, 2006; Treasure & Roberts, 2001). Additionally, perceiving an ego-involving climate is negatively related to individuals' sportspersonship, enjoyment, and intrinsic motivation (Gano-Overway et al., 2005; Miller et al., 2003; Newton, & Duda, 1993; Ommundsen et al., 2003; Seifriz et al., 1992;

Walling et al., 1993). Thus, both AGPT tenets and research do not support fostering an ego-involving climate to increase participants' intrinsic motivation to be active.

Recently, the caring climate, a third aspect of the motivational climate, has been added to the AGPT literature. Perceptions of a caring climate have been found to be significantly correlated to perceptions of a task-involving climate in a strong, positive direction, while also having a significant, negative correlation with perceptions of an ego-involving climate (Moore & Fry, 2009; Newton, Watson et al., 2007). In addition, sport or physical activity domain participants perceiving a caring climate, also report increased prosocial behavior, empathy, enjoyment, and exercise class ownership (Brown & Fry, 2009; Gano-Overway et al., 2009; Moore & Fry, 2009). These are expected relationships given that a caring climate is characterized as one in which individuals feel welcomed, valued, respected, and safe (Newton, Fry et al., 2007). Therefore, though not yet assessed with PE students, it is hypothesized that perceiving a caring climate will assist in students' intrinsic motivation development.

AGPT in PE Literature

The long-term effect of PE motivational class climate perceptions was assessed in a study by Spray (2000), who conducted a discriminate analysis to determine the profile differences between students who participated in noncompulsory physical activity their first year of college based upon their secondary PE perceptions. The students who continued to be physically active after completing their compulsory PE were found to have higher perceptions of a task-involving climate, competence, and enjoyment while in PE compared to those who were not active a year later. Spray's (2000) results evidenced the long-term effect that the perceived PE climate can have on students' noncompulsory physical activity participation. This provides additional support for the suggested focus on students' PE experience as a way to increase and develop students'

interest and ability to develop healthy and active lifelong habits (NBPTS, October 2011; Sallis & McKenzie, 1991; Sallis et al., 1992; Segal & Gadola, 2008).

In the last decade, AGPT intervention research in the PE domain has begun to appear. This research often compares the effects of a highly task-involving climate to a highly ego-involving climate and/or a neutral climate. The results of these studies have revealed a significant relationship between the PE class' motivational climate and the students' goal orientations with respect to PE (Carr, 2006; Cury et al., 1996; Todorovich & Curtner-Smith, 2002; Weigand & Burton, 2002). In two studies, participants' goal orientations have been significantly influenced after as few as ten PE classes (Todorovich & Curtner-Smith, 2002; Weigand & Burton, 2002). These results from the physical domain suggest that the goal orientation of PE students can be influenced by the motivational climate fostered by their PE teacher.

Motivational class climate interventions can be accomplished through two routes. One option is for the intervention to occur directly with students by using instructors brought in to develop specific target climates, as was done by (Todorovich & Curtner-Smith, 2002) and (Weigand & Burton, 2002). In the Todorovich and Curtner-Smith (2002) study, there were three experimental groups of students; each experienced one of the following climate manipulations: task-involving, ego-involving, or neutral. The first two experimental climates were implemented by the lead author, while the neutral climate was implemented by an assistant. Thus, even the neutral climate was not a true climate, but artificially developed. After 10 PE lessons in the ego-involving climate, those students reported significant increases in their ego orientation, while the other two climates' did not result in significant ego orientation changes. Conversely, the ego-involving climate experience, resulted in a significant decrease in the students' reported task

orientation; while being in the task-involving climate resulted in students reporting significantly greater task orientation levels. The neutral climate, again, had no significant impact on the students' reported task orientation. Weigand and Burton's (2002) results provided similar support for the positive effect of experiencing a task-involving PE climate. Specifically, they compared students' motivational response changes after being in either their regular PE class climate or an experimentally manipulated task-involving PE class climate. Examining the effect of an experimentally manipulated PE climate to the regular PE class climate was an important addition to the AGPT literature. Significant interaction effects (time by group) were found for all the outcome variables. Specifically, students' task orientation, perceived competence, and enjoyment/satisfaction were all significantly increased for the task-involving climate group over time; while the students' ego orientation and boredom were all significantly decreased (Weigand & Burton, 2002). Both studies provided research support for AGPT tenets and laid the foundation for future intervention research.

Todorovich and Curtner-Smith (2002) suggested future studies examine longer term effects on student goal orientations once such an intervention is removed, which highlights the limitation of this intervention approach. For although the research is done "in the field," the climates developed are not necessarily representative of true PE class' motivational climates. The strength is that the effects due to the climates of interest can be tested, as the lesson plans were intentionally designed to foster different climate experiences. Thus, other researchers have followed the second option for intervention studies, which is to directly influence the current instructors, as was done by Smith, Smoll, and Curtis (1979) and Smoll, Smith, and Cumming (2007). The strength of this professional training session approach is that it simulates how current teachers and coaches are reached, and thus potentially influenced. The limitation of this

approach is that the intervention is once removed from the target end population (e.g., students or sport participants). In other words, the intervention must go through the teacher's (e.g., direct intervention participant) filter before reaching the student (indirect intervention participant). This filtering of the intervention's impact occurs in two ways. First, by the amount of the intervention information each teacher elects to adopt. Second, by the effectiveness of the teachers implementing the climate aspects they selected to adopt (e.g., the first filter). Thus, being able to determine the strengths and weaknesses for each of these steps is important for a proper assessment of the intervention.

The two interventions mentioned above were with sport coaches. The results were measured from the youth participants' perspective, and significant changes in orientation and motivational outcome variables did occur compared to the reports by youth whose coaches did not complete the intervention training session. Specifically, results showed that athletes in the task-involving climates fostered by the coaches who had received the intervention training sessions reported increased desire to play for their coach the following season, intrateam attraction, self-esteem, and decreased somatic anxiety, concentration disruption, and worry (Smith, R. E. et al., 2007; Smith, R. E. et al., 1979). However, the intervention training sessions were voluntary and the low return rate by the coaches of their climate self-monitoring forms made it impossible to directly analyze the coaches' adoption of the intervention concepts. Smith, Smoll, and colleagues' intervention training studies have shown success across the measurement of different motivational outcomes in youth sports.

One published study focused on the effectiveness of a caring climate intervention. This intervention was conducted with one site for a nationwide summer sports' camp program. Newton, et al (2007)'s intervention consisted of a two-day training with the staff of a summer

sports camp serving nearly 100 youth. Campers participating at a separate site, which was following the organization's typical protocols, made up the comparison group (i.e., traditional group). The intervention resulted in increased perceptions of a caring climate compared to the traditional group. As expected, the perception of an ego-involving climate was also significantly less for the caring intervention group; as was the campers' perception of empathic concern by the camp staff (Newton, Watson et al., 2007). This intervention study illustrated the positive effects that are possible from training physical activity leaders.

Purpose/Hypotheses

Based upon the review of literature, the effectiveness of an AGPT-based professional development intervention with current PE teachers has not been done. Additionally, research examining the influence of a caring climate intervention specifically in the PE setting has not been published. Therefore, this study examines the short and long-term effectiveness of one, 2.5 hour teacher training session on students' perceptions of their PE class' motivational climate (caring, task-, and ego-involving) and their resultant intrinsic motivation.

Method

Participants

As this study occurred at the start of the final year of a three year Carol M. White PEP grant, the intervention (i.e., the teachers' motivational climate professional development session) was provided to all the teachers (N=17) of a single Midwest school district. These were experienced PE teachers, including eight with Bachelors and nine with Masters. Of the secondary teachers focused on in this study, four hold Bachelors and four hold Masters. The effect of the intervention on the teachers fostering a more caring and task-involved PE class climate was assessed based upon the secondary PE students' perceptions. The middle school

teachers (N=4) had daily class periods, each lasting approximately 50 minutes. The high school teachers (N=6) met with their classes for one, 45 minute class period and two more 90 minute class periods weekly. Two of these teachers started in the fall 2012 semester; therefore only four high school teachers' student reports were included in this longitudinal study. These secondary classes' average enrollment was 27 students per teacher.

General Intervention Design

The intervention session was a 2.5 hour session held during the district's regularly scheduled pre-service professional development training days before the fall 2012 semester. This session started by reviewing the results from the prior year's survey of the district's PE students to introduce the theoretical constructs measured and their meaning. Next, a reflective activity that focused on the behaviors of the teachers' favorite and least favorite PE teacher or coach during their youth, and their responses to those two experiences was facilitated by the lead researcher. This activity accomplished three important goals. One, this activity brought the motivational climate concepts to life for the teachers, which included sharing concrete examples and feelings from their own experiences. Two, it connected the teachers back with their experiences as a participant, rather than the leader. Three, for many teachers their favorite PE teacher and/or coach was the one who inspired them to become a PE teacher, which reminded them of why they wanted to be a PE teacher in the first place. The lead researcher then presented an overview of AGPT motivational climate outcome patterns, which nicely paralleled the responses described by the teachers. The remaining hour was targeted on how the teachers could effectively foster a high caring and task-involving climate. This hour started by presenting specific examples of how to build understanding for some of the climate aspects (e.g., what respect looks and sounds like), and ended with a full group discussion by the teachers in

response to targeted questions. For example, “what is one specific behavior you want to focus on this semester for creating a caring and task-involving climate?” Upon completion of the session, each teacher was given a laminated card with five reminder words/phrases to keep their focus on climate development while teaching.

Follow-up communications (i.e., primarily emails) were incorporated throughout the semester. The purposes of these follow-up communications were to provide tips, climate development reminders, challenges, and motivation to the teachers. Each email focused on a specific characteristic of the climate, such as encouraging effort. At the end of the professional development session, the teachers had been asked to provide feedback, including open ended questions regarding climate development (e.g., barriers and successes). The information from these questions and the group discussion at the end of the professional development session were used to help target the email topics, tips, and challenges. For example, one teacher shared her personal challenge was going to be to provide five kids with personalized praise feedback each class period. The teachers provided positive responses to receiving these weekly email messages.

General Student Survey Design

The secondary students were surveyed each semester that they were in PE over a three semester period (i.e., Fall 2011, Spring 2012, and Fall 2012). There were two pre-intervention semesters for all the teachers available to ensure that the values that we have for each semester pre-intervention were relatively consistent and their predictive relationships from one semester to the next were known for comparison purposes. Two survey sessions were conducted each semester approximately the seventh (T1) and fourteenth (T2) week of the semester, respectively. This allowed enough time for the students’ perceptions of the climate to fully develop. There were three student survey versions; which employed a three-from planned missing design, with

the all scale items divided into four portions: X, A, B, and C. The X (e.g., common) portion was comprised of the items that every student received. These items were selected as the most representative items for each scale or subscale. The rest of the scales' items were placed into one of the three remaining portions: A, B, and C. Therefore, a sub-scale's items were placed in all three of these remaining portions to ensure that every survey version will have items representing this subscale. Two of these portions were then combined and placed after the X items to make one survey version (e.g., X, A, and B). This has been shown to be the best approach to then recapture the variance-covariance matrix, in addition to the parameter point estimates and respective standard errors from the completed planned missing design surveys (Graham et al., 2006).

Measures

Perceived Motivational Climate in Exercise Scale (PMCEQ; Huddleston, Fry, & Brown, 2012). This 27-item questionnaire was developed to measure participants' perceptions of the task- and ego-involving climate constructs in an exercise setting. The item stem was "In this PE class, ..." and example items are "... the teacher encourages students to improve on skills they are good at" (task-involving), and "... the teacher gives most of his/her attention to only a few students (most fit, most popular, etc.)" (ego-involving). Participants answered with the 1-5 response scale (e.g., 1=strongly disagree to 5=strongly agree) for the task-involving climate subscale (14 items) and the ego-involving climate subscale (13 items).

The psychometrics (e.g., reliability and validity) of the two constructs measured by this questionnaire were assessed through confirmatory factor analysis (CFA) and structural equation modeling (SEM) assessment of its criterion validity (Huddleston, Fry, & Brown, 2012). The measurement model was found to have good model fit, attained strong invariance, and had

correlations with outcome variables in the expected direction and magnitude (Huddleston et al., 2012). Additional studies have continued to show strong reliability, model fit, and expected relationships with outcome variables, including ownership in exercise, enjoyment, commitment to continue exercising, autonomy, competence, relatedness, and empowerment in exercise (Brown & Fry, 2009; Huddleston et al., 2012; Moore, Brown, & Fry, 2011, September; Moore & Fry, 2009)

Caring Climate Scale (CCS; Newton et al., 2007). This 13-item questionnaire was developed to measure participants' perceptions of the caring climate characteristics in physical activity and exercise settings. Newton and colleagues (2007) showed this measure had strong reliability, plus the correlations with task-involving climate and ego-involving climate were of the expected magnitude and direction (Newton, Fry et al., 2007). Studies utilizing the CCS since, have also evidenced its strong reliability and criterion validity with other outcome variables, including prosocial behavior, antisocial behavior, empathy, exercise class ownership, and enjoyment (Brown & Fry, 2009; Gano-Overway et al., 2009; Moore & Fry, 2009).

Self-Regulation Questionnaire – Exercise (SRQ-E; Ryan & Connell, 1989). This questionnaire was developed to measure domain-specific motivation regulation. When first psychometrically tested by Ryan and Connell (1989), they targeted academic and prosocial behaviors. The SRQ showed moderate reliability and the constructs intercorrelated as was expected for constructs representing a spectrum scale with a “simplexlike pattern” (Ryan & Connell, 1989, p. 753). Additionally, the correlations with the motivational outcomes, such as enjoyment, effort, and cognitive anxiety, were in the expected directions and of differing magnitudes, which again supported that the SRQ constructs were different and distinct (Ryan & Connell, 1989). Later, Goudas, Biddle, and Fox (1994) conducted research in PE classes utilizing

the SRQ worded such that exercise (SRQ-E) was the target behavior. In the current study, the measure of interest was the students' perceived intrinsic regulation to be physically active. Therefore, only this construct was modeled as an outcome variable in the analysis model.

Plan of Analysis

The data met univariate and multivariate normality, since all of the Mahalanobis distance values were less than 14. Additionally, only three items were found to have skewness and kurtosis values outside of the normalcy range (-1 to +1). Thus, the items, overall, met normality standards. Following suggestions for preparing data collected utilizing a planned missing data design, each semester's data (i.e., two measurement waves) were imputed 100 times using the MICE program in R (van Buuren & Groothuis-Oudshoorn, 2012). The scales' Cronbach's alpha coefficient values were calculated for each measurement wave. The Fall 2011 and Spring 2012 climate reliabilities were all .80 or greater, while the intrinsic motivation reliabilities for these measurement waves ranged from .60-.67. The Fall 2012 mid-measurement reliabilities were the lowest values ranging from .56 to .63 for the climates and .23 for the intrinsic motivation subscale. The Fall 2012 post reliabilities for the climate constructs all met the .70 criterion, while the intrinsic motivation subscale's reliability did not (.44). The decreased reliability of the mid-measurement period may be due to the amount of surveying conducted with the students that semester. This requires cautious interpretation of the analyses described below.

A multi-group (3 groups: Fall 2011, Spring 2012, and Fall 2012) CFA was conducted with each teacher's data. This analysis enabled confirmation of the measurement model prior to analyzing the latent structure's values. Given the size of these models, the change in Chi-Square across the change in degrees of freedom was used to assess both the measurement model and the latent space relationships, because it is the strictest test of model fit available (Kline, 2011). A

significant change in chi-square for a nested model test was based upon an alpha value of .001 or less. The standardized root mean square residual (SRMR) and its change was also used to assess nested models. The Hu & Bentler (1999) finding that a SRMR less than .08 represented good model fit was used.

Eight multi-group CFAs, each comprised of three groups, were conducted. Each group model was comprised of the three climate constructs and the intrinsic motivation construct measured over two time periods for a given semester (Figure 1). The primary purpose of the multi-group CFA was to confirm that any measurement differences were nonsignificant across each semesters' set of students, and over time within each semester, which would support the comparison of the latent sufficient statistics across the groups (i.e., semesters). Although this study's measures had all shown strong psychometric properties across studies in a wide variety of research domains and with varied populations, this confirmatory step was done to meet modern statistical analysis best practice (Little, 2013). After each teacher's model passed strong invariance, each climate construct's items were parceled to decrease the overall degrees of freedom and increase measurement model parsimony (Figure 2) to simplify latent parameter testing (Little, 2013; Little et al., 2002; Little et al., 2012).

To examine the effectiveness of the intervention session, the Fall 2011 and Spring 2012 T1 and T2 latent variances, covariances, cross-time predictive regression relationships, and means were compared to those from the Fall 2012 for significant differences. This analysis was done as a multi-group structural equation model (SEM) in Mplus 7.0 (Muthen & Muthen, 1998-2012). The nested model test for significance (alpha level of .001) based upon the change in Chi-Square test was used to assess all these parameters for significance. The latent variance homogeneity test results provided further useful information regarding the differences between

semesters and changes over time. When homogeneity of the variances was not met, then phantom constructs for all latent variables were to the model to enable examination of the covariances and predictive regression paths for significance. Examining construct variances is not possible in manifest analyses (e.g., homogeneity of variances is one of the assumptions). It is important, however, because in this case, it tells us about the comparative consistency of student responses for a particular teacher over time.

Results

CFA Results for ALL Teachers' Models

All eight teachers' models attained strong invariance. The specific measurement invariance test results for each teacher's model are presented in Table 1. A summary of these results is provided here. All eight of the teachers' configural models fit the data better than the null model, as expected. All the models had CFI values of 1.0, and the SRMR ranged from .056 (Teacher 6 & 14) to .076 (Teacher 3). Thus, all SRMR values met the good model fit level of .08 or less (Hu & Bentler, 1999). The weak invariance model test (i.e., constraining factor loadings to equivalence over time and across group) was passed by all eight models based upon the change in Chi-square values (See Table 1). Attainment of weak invariance provided evidence that the items were not interpreted significantly differently across time or by different groups of students. All eight models also reached strong invariance (i.e., constraining factor intercepts to equivalence over time and across group) based upon the change in Chi-square test (See Table 1). As the results for each teacher differ in the latent space, each teacher's results are presented below (See Table 1 for nest model test results). The teachers' models fell into one of three patterns. The results are grouped by these overarching patterns: a) six cross-sectional

correlations, b) five cross-sectional correlations, and c) three cross-sectional correlations. An illustration of each teacher's final, pruned SEM model is presented in Figure 3.

SEM Results

Six Cross-sectional Correlations. Teacher 2's and Teacher 4's models comprised this group. First, the construct variances were constrained to be equivalent over time and across semester grouping for the homogeneity of variances test. Teacher 2's variances were found to be equivalent (i.e., homogeneous) over time and across semesters (See Table 1); as were Teacher 4's variances. This meant that there were no significant differences in the variability of student responses regarding the class climate or their intrinsic motivation to be physically active over the measurement periods within or across semesters. Second, the correlations were constrained to be equivalent over time and across semester grouping to test their homogeneity. The homogeneity of covariances test was also found to be tenable for both teachers. Thus, each model's correlations did not significantly differ over time or across semester grouping.

Given that homogeneity of variances and correlations was found, the next step was to test the within time correlations for significance. Figure 3 illustrates each teacher's standardized correlation values, and Table 2 presents the values and nested model test results. All of the within time correlations were found to be significant for both of these teachers' models. Specifically, the students' perceptions of the teacher's caring class climate was significantly, positively correlated with their perceptions of the teacher's task-involving class climate, with the students' own intrinsic motivation to be physically active, and negatively correlated with their perceptions of the ego-involving class climate. Additionally, the students' perceptions of the class' task-involving climate was also significantly, negatively correlated with their perceptions of this teacher's ego-involving class, and the students' own intrinsic motivation to be physically active.

Lastly, the students' perception of this teacher's ego-involving class climate was significantly, negatively correlated with their intrinsic motivation to be physically active. Nested model testing was then used to assess the significance of the constructs' predictive latent pathways (e.g., across time regressions). None of the Teacher 2 regression pathways were found to be significant. One autoregressive pathway, students' self-reported intrinsic motivation from T1 to T2, was significant ($b^* = .42, p < .001$). The strength of the within time correlations accounting for a large proportion of the constructs' variance may have been partially the cause for more of the regression pathways nonsignificant results. The cross-sectional correlations were all in AGPT-hypothesized directions, though the caring and task-involving correlation was stronger than has been previously reported (Roberts & Treasure, 2012).

Finally, the constructs' latent means were equated over time and across grouping. This constraint was also found to be tenable for Teacher 2 (See Table 1). This meant that none of the latent means for this teacher were significantly different from each other over time. Thus, the intervention did not appear to significantly impact how the students' responded regarding this PE teacher's class climate or their own intrinsic motivation for physical activity. Overall, the students reported Teacher 2's climate as more caring ($\bar{x} = 3.59$ to 3.95) and task-involving climate ($\bar{x} = 3.54$ - $3.3.85$) than ego-involving ($\bar{x} = 2.61$ to 2.94); and they were at least somewhat intrinsically motivated to be physically active ($\bar{x} = 3.59$ to 4.04). The constraints on Teacher 6's latent means for homogeneity were not tenable (See Table 1). On average, the Fall 2012 students reported significantly lower caring and task-involving climate ($\bar{x} = 3.55$ and 3.53) than in prior semesters ($\bar{x} = 3.84$ to 3.95); lower intrinsic motivation for physical activity at T1 ($\bar{x} = 3.50$) compared to all other measurement periods ($\bar{x} = 3.59$ to 4.05); and a more ego-involving climate at T2 ($\bar{x} = 3.04$) than at any other measurement period ($\bar{x} = 2.58$ to 2.87). Given the low

reliability coefficients for this measurement time period, interpretation of these results was limited.

Five Cross-sectional Correlations. This pattern was illustrated by the models for Teachers 1, 3 and 5. First, the construct variances were constrained to be equivalent over time and across semester grouping for the homogeneity of variances test. All three teachers' variances were found to be equivalent (i.e., homogeneous) over time and across semesters (See Table 1 for values). This meant that there were no significant differences in the variability of student responses regarding the class climate or their intrinsic motivation to be physically active over the measurement periods within or across semesters. Second, the correlations were constrained to be equivalent over time and across semester grouping to test homogeneity. The homogeneity of covariances test was also found to be tenable for all three of these teachers. Thus, each model's correlations did not significantly differ over time or across semester grouping.

Given these homogeneity of variances and covariances results, the next step was to test the within time correlations for significance. Five of the six within time correlations were found to be significant for all three of these teachers' models (See Figure 3 and Table 2). Specifically, the students' perceptions of the teachers' caring class climate was significantly, positively correlated with their perceptions of the teachers' task-involving class climate, their own intrinsic motivation to be physically active, and negatively correlated with their perceptions of the teachers' ego-involving class climate. Additionally, the students' perceptions of the class' task-involving climate was also significantly, negatively correlated with their perceptions of the class' ego-involving class climate, and positively correlated with their own intrinsic motivation to be physically active. Nested model testing was then used to assess the significance of the constructs' predictive latent pathways (e.g., across time regressions). For Teacher 1, the only significant

predictive pathways were three of the autoregressive pathways. Specifically, the pathways that significantly controlled for T1 values were for the task-involved climate ($b^* = .35, p < .001$), the ego-involved climate ($b^* = .33, p < .001$), and the students' self-reported intrinsic motivation ($b^* = .39, p < .001$). On the other hand, Teacher 3's model revealed only one significant predictive pathway: ego-involved climate's autoregressive path ($b^* = .28, p < .001$); while none of the predictive pathways in Teacher 5's model attained significance. That the strong within time correlations accounted for a large proportion of the constructs' variance may have been partially the cause for some of the nonsignificant regression pathway results. The cross-sectional correlations were all in AGPT-hypothesized directions, though the caring and task-involving correlation was stronger than has been previously reported.

Finally, the constructs' latent means were equated over time and across grouping. This constraint was found to be tenable for all three teachers' models (See Table 1). This meant that the means for these teachers did not significantly differ over time. Thus, the intervention did not significantly impact how the students' perceived these PE teachers' class climates or the students' own intrinsic motivation for physical activity. Teacher 1 and Teacher 3's class climates were perceived as more caring ($\bar{x} = 3.57$ to 4.01 and $\bar{x} = 3.49$ to 3.85 , respectively) and task-involved ($\bar{x} = 3.56$ to 3.91 and $\bar{x} = 3.61$ to 3.75 , respectively) than ego-involved ($\bar{x} = 2.59$ to 3.04 and $\bar{x} = 2.57$ to 3.01 , respectively); and the students' reported being more than somewhat intrinsically motivated to be physically active ($\bar{x} = 3.58$ to 4.06 and $\bar{x} = 3.53$ to 4.02 , respectively). Overall, the students' reported perceptions seemed most consistent for Teacher 5: caring climate ($\bar{x} = 3.59$ to 3.87), task-involving climate ($\bar{x} = 3.52$ to 3.73), ego-involving climate ($\bar{x} = 2.80$ to 3.03), and intrinsic motivation for physical activity ($\bar{x} = 3.56$ to 3.72). These teachers' means illustrated

well that the greater the students' perceptions of a caring and task-involving climate, the greater the students' reported intrinsic motivation for physical activity.

Three Cross-sectional Correlations. The models for Teachers 6, 7, and 8 presented this relational pattern. First, the construct variances were constrained to be equivalent over time and across semester grouping. This constraint on the variances was found to be tenable for both Teacher 6 and Teacher 8. This meant that there were no significant differences in the variability of student responses regarding the climate or their intrinsic motivation to be physically active over the measurement periods within or across semesters for these teachers. However, Teacher 7's variances did not pass the omnibus homogeneity test. Follow-up nested model testing revealed that three variances from the mid-Fall 2012 semester surveying (T1) were significantly lower compared to other measurement periods: caring climate (var = .23, $p < .001$), task-involving climate (var = .27, $p < .001$), and ego-involving climate (var = .33, $p = .0006$). This meant that the students' responses for all three class climate characteristics were varied significantly less compared to the other measurement periods.

Second, the correlations were constrained to be equivalent over time and across grouping. This constraint was also found to be tenable, so none of the correlations were significantly different over time or across semester grouping. Next, the cross-sectional correlations were tested for significance. Three correlations were found to be significant for Teachers 6 and 8. In particular, the students' perceptions of the caring class climate was significantly, positively associated with their perceptions of the task-involving climate, and the students' reported intrinsic motivation for physical activity; which was also significantly, positively correlated with the students' perceptions of a task-involving class climate. Next, the cross-time predictive pathways were individually tested for significance. None of the regressive pathways were

significant in either Teacher 6's or Teacher 8's model; while the autoregressive pathway from ego-involved T1 to T2 was significant ($b^* = .26, p < .001$). The pattern of cross-sectional relationships for these three teachers were distinctly different from the prior two patterns, in that the ego-involving climate construct was not significantly correlated with any other construct. The models' three significant correlations, however, were similar in magnitude and direction as those represented in the prior to correlational patterns.

Finally, the constructs' latent means were equated over time and across grouping. This constraint was found to be tenable for Teachers 6, 7, and 8. This meant that none of the means for these teachers were significantly different over time. Thus, the intervention did not significantly impact how the students' perceived the PE teacher's class climate or the students' own intrinsic motivation for physical activity. On average, the class climate perceived by these three teachers' students was rather similar and consistent over time: caring climate ($\bar{x} = 3.55$ to 3.74 , $\bar{x} = 3.52$ to 3.63 , and $\bar{x} = 3.38$ to 3.66 , respectively), task-involving climate ($\bar{x} = 3.45$ to 3.67 , $\bar{x} = 3.40$ to 3.67 , and $\bar{x} = 3.33$ to 3.55 , respectively), and ego-involving climate ($\bar{x} = 2.87$ to 3.02 , $\bar{x} = 2.95$ to 3.06 , and $\bar{x} = 2.83$ to 3.05 , respectively). Additionally, students reported being somewhat intrinsically motivated to be physically active ($\bar{x} = 3.41$ to 3.67 , $\bar{x} = 3.31$ to 3.70 , and $\bar{x} = 3.26$ to 3.59 , respectively). Based upon these mean values, these three teachers' students do not seem to recognize having a distinct class climate compared to the previous teachers' students. This less distinct motivational climate is also associated with the students' reporting only being somewhat intrinsically motivated to be physically active.

Discussion

The purpose of this study was to assess the effectiveness of a professional development intervention with secondary PE teachers focusing on how to enhance their caring and task-

involving climate development. The intervention's effectiveness was assessed by measuring the students' perceptions of the PE class motivational climate and the students' reported intrinsic motivation for being physically active. The teachers' PE class students were surveyed regarding these constructs twice in the fall and spring semester preceding the intervention, and then again during the semester after the intervention. These three semesters of responses were then modeled for each teacher as a three-group CFA. Following SEM analysis steps, the latent variances, means, covariances, and across time regressions were then assessed for significant differences. These tests did not reveal that the students perceived the teachers' development of a caring and task-involving motivational climate to have been significantly increased in the semester after the intervention. There were interesting patterns to the results, however, which may add to the current AGPT literature. This study also proved informative regarding future professional development intervention research approaches.

All of the teachers' models passed strong invariance, supporting that the scales' items were not significantly different in their measurement across the different groups of students. Additionally, the within time correlations were all in the AGPT expected directions (Brown, Fry, & Little, 2013; Newton, Fry et al., 2007; Roberts & Treasure, 2012). One correlation's magnitude, however, was of interest. Specifically, the magnitude of the correlation between the students' perception of the caring and task-involving climates was greater than has been reported in any studies incorporating both constructs (Brown et al., 2013; Newton, Fry et al., 2007). Thus, it garnered specific attention. One potential explanation is that most research presents results across different leaders, while this study analyzed a model for each teacher. This may be reflective of the students' perceiving the fostering of these two climates together consistently by their teacher. The means for these two climates were also very similar over the three semesters.

Importantly, these two climates rarely averaged greater than 4.0 (i.e. the “agree” response). This means that the students did not strongly perceive an emphasis on either of these two aspects of the class climate to exist, which may also partially explain the high magnitude of this particular correlation. Importantly, the students did not perceive an emphasis on the ego-involving aspect of the class climate; and the latent correlations of the ego-involving climate with the caring and task-involving climates were in the ranges seen in prior research. This discriminant validity evidence lends support to interpretation that the magnitude of the caring and task-involving climate correlation was due to neither being strongly developed, and thus, not clearly distinguishable to the students.

The second finding of interest was that the teachers’ models fell into one of three correlational patterns. In the first correlational pattern the students’ perceptions of all three motivational climates were significantly associated with each other, and with the students’ reported intrinsic motivation to be physically active. The second correlational pattern was the students’ perceptions of the climate all being correlated, but the ego-involving climate not correlating significantly with the students’ reported intrinsic motivation to be physically active. The third correlational pattern only had significant correlations for the caring climate with the task-involving climate, and both of them with the students’ reported intrinsic motivation to be physically active. All three of these correlational patterns are consistent with prior research.

The first correlational pattern aligned with prior research that has reported it is not just the task-involving climate that correlates with participants’ views of the current activity and motivational responses to it, but also their perceptions of the caring and ego-involving climate (Brown, et al., 2013; Newton, Duda, & Yin, 2000; Roberts & Treasure, 2012; Vazou, Ntoumanis, & Duda, 2006). This study’s correlational patterns suggests that students would report increased

intrinsic motivation when perceiving a caring and task-involving climate, while reporting less intrinsic motivation to be physically active when an ego-involving climate is perceived. The second and third correlational patterns suggests that students would report decreased intrinsic motivation in association with a de-emphasis of the caring and task-involving climates rather than in association with an emphasis on the ego-involving climate. This is an interesting pattern that seems to align with research conducted with British secondary PE students, which found that the majority of the significant correlations with multiple intrinsic motivation categories were with the students' perception of the task-involving climate, not the ego-involving climate (Standage, Duda, & Ntoumanis, 2003). This may also provide support for Smith, et al.'s (2005) research on the coaching behaviors adolescent athletes associated with their team's motivational climate. The lack of positive feedback was the primary predictor of reporting an ego-involving climate, while the presence of positive feedback was the greatest predictor of reporting a task-involving climate (Smith, et al., 2005). It seems that these teachers would be able to have the greatest effect on their students by focusing on increasing the caring and task-involving climate characteristics of their PE classes, because they have already developed a teaching-style that strongly associates these motivational climates with their students' intrinsic motivation to be physically active.

Limitations

There were some limitations that should be mentioned regarding this study and its findings. One clear limitation is the measurement reliabilities, particularly for the Fall 2012 mid-semester time period. Although the normality checks were met for the data, the responses still did not meet minimal reliability criterion values. However, these analyses were conducted in a

SEM framework, which only includes true score variance in the latent construct. Therefore, the impact of the low reliabilities was accounted for through the SEM approach (Little, 2013).

A second limitation was the length of the professional development intervention (i.e., 2.5 hours). This was shorter than the originally planned length of the intervention (i.e., 6 hours), but was the only window available of professional development time to the researchers to work with the teachers during the pre-service period prior to the start of the Fall semester. The researchers felt working with the teachers prior to them meeting students for the first time was important for the teachers to have the opportunity to present a cohesive and consistent message to their students regarding the motivational climate and their expectations. One potential interpretation of the results is that having a longer time period to work with the teachers at the start of the semester and/or having a follow-up session part-way through the semester could have increased the intervention's effectiveness.

A third limitation is that at this point there is not much guidance on the appropriate measurement window for being able to appropriately capture the change in student perceptions of the motivational climate. These changes have been recorded in as few as four weeks when the students are in an experimental motivational climate intervention. This, however, was done with current, experienced Physical Education teachers. Therefore, there are two important steps that have to occur to be able to capture measured, significant change in student perceptions of the motivational climate. One, the teachers must choose to foster a more caring and task-involving climate in their Physical Education classes. Two, the teachers must be able to successfully implement a more caring and task-involving climate. In this study, the success of the teachers' climate implementation was from the students' perspective. Although, the students' perception of

the motivational climate is arguably the most important perspective to assess the motivational class climate, it also is likely to take the longest to present itself statistically.

These limitations are also informative for future research that examines intervention effectiveness with teachers and coaches. This is a population that is different from amateur or volunteer coaches (Smith, R. E. et al., 1979; Smoll et al., 2007), because as professional teachers they hold degrees in pedagogy. However, based on international research, the motivational climate experienced by youth in sport and Physical Education can often be enhanced. This study examined if a 2.5 hour intervention would impact teachers sufficiently in their motivational climate development that a significant positive change could be perceived by their students 8-14 weeks later. The results tentatively suggest that a single 2.5 hour session may not be sufficient to effect change within this period of time.

Further research examining other professional development designs, more “contact” time with teachers/coaches, and other approaches to assessing motivational climate development are necessary. Professional development approaches that were not utilized in the present study, include video examples of motivational climate development, experiential motivational climate activities to put the teachers into the different motivational climates, and each teacher completing a “contract” of what they were going to do to maximize their students’ experiencing a caring and task-involving climate in PE. Having the administration demonstrate the value placed on students experiencing a highly caring and task-involving climate by including subsequent PE teacher meetings throughout the semester’s professional development days to bolster the intervention’s message and provide in-person support to the teachers’ caring and task-involving climate development would likely increase the effectiveness of a future intervention. Lastly, including other, more objective measures of the motivational climate and its effect on students

could capture motivational climate changes occurring prior to the students' perceptions. For example, teacher observations could track the type and frequency of caring, task-involving, and ego-involving behaviors displayed by teachers; while measuring students physical effort during class (e.g., heart rate monitors or accelerometers) could reveal changes in effort in response to motivational climate prior to the students' consciously becoming aware of the motivational climate changes. This study is an important, initial step in determining the characteristics of a successful professional development approach to increasing the number of students who experience a caring and task-involving PE class climate.

The presence of these patterns for specific teachers in this study suggests that there was consistency in the correlations for an individual teacher's motivational class climates, at least when a more caring and task-involving motivational climate was emphasized. (Papaioannou, Marsh, & Theodorakis, 2004), in a study with Greek PE students, found that when the students reported a greater emphasis on the task-involving climate, then the students attributed this to the teacher; while students attributed a greater emphasis on the ego-involving climate to their peers. The current study's findings seem to add support to the student perception that the teacher has the greatest influence on fostering a caring and task-involving climate. In summary, professional development designed for enhancing the caring and task-involving climate fostered by experienced, professional teachers may need to take a more in-depth and comprehensive approach. This study's findings also highlights that incorporating AGPT concepts and practical implementation strategies will likely be most influential when incorporated into the education of future and early career PE teachers.

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Dissertation Study 2 Manuscript
Middle School PE Students' Goal Orientations, Motivational Climates,
& Competence Over Time
E. Whitney G. Moore
University of Kansas
Dissertation Defense, Spring 2013

Abstract

Nicholls' Achievement Goal Perspective Theory (AGPT) research revealed the importance of the motivational class climate to increase students' positive motivational responses (e.g., competence and effort) and influence students' goal orientations (i.e., task and ego; Nicholls, 1989). Relationships among these variables have been shown in both Physical Education (PE) and sport settings; however, these studies' designs have been primarily cross-sectional. The purpose of this study was to examine the relationships of the students' perceptions of the motivational climate, goal orientations, competence, and effort. Students were surveyed twice during their sixth grade year, and then twice during their seventh grade fall semester. To examine these relationships over time, a longitudinal SEM path analysis was conducted. The majority of the within time correlations were found to be significant in the expected directions, and homogeneous across the four measurement periods. The caring climate's significant relationships with the outcome variables aligned with the AGPT-based hypotheses.

Keywords: elementary, middle school, transition, caring climate, goal orientations

Introduction

Today's proportion of U.S. youth and adolescents who are overweight or obese is three times greater than in 1980 (CDC, 2011; U.S. Department of Health and Human Services, 2010). This significant increase in the proportion of adolescents and youth who are overweight or obese has paralleled the significant decrease in youngsters' regular physical activity levels (Brownson, Boehmer, & Luke, 2005). To address this obesity and sedentary epidemic, both researchers and policy makers have recommended focusing on the impact physical education (PE) classes can have on youth and adolescents' active lifestyle development (Sallis & McKenzie, 1991; Sallis et al., 1992; Swann, 2004). One reason PE has been promoted as a primary venue to increase physical activity levels is because it already exists within society's structure (e.g., it is not a new structure to develop, promote, and implement) and over 50% of students are enrolled in PE classes (Division of Adolescent and School Health & CDC, 2010). In fact, structured PE helps youth develop the skills and knowledge necessary to have "lifelong physical activity and wellness" (NBPTS, October 2011). Achievement goal perspective theory (AGPT) is one framework that was developed to better understand how to maximize student motivation. The purpose of this study was to examine the longitudinal relationships between PE students' goal orientations, perceived competence, and motivational class climate perceptions across the transition from elementary school into middle school.

Achievement Goal Perspective Theory Research

Goal Orientations. Nicholls' developmental work (1989) to systematically assess children's cognitive understanding of ability helps to illustrate the importance of experiencing a positive motivational transition to middle school. Nicholls found that by the age of 12, the majority of children understand the distinction between ability, skill, luck, and effort in

intellectual domains (Nicholls, 1989). Fry also found that by the age of 12, the majority of children have reached this mature understanding of ability with respect to physical activities (Fry, 2000a, 2000b). Until children develop this mature understanding of ability, however, their default goal orientation is task orientation (Nicholls, 1989). Individuals high in task orientation define success as working toward mastering or learning a task. Thus, the act of learning, no matter their level of competence, is the focus for highly task oriented individuals. Individuals high in ego orientation define success by their normative performance and ability (Duda, Chi, Newton, Walling, & Catley, 1995; Duda & Nicholls, 1992; Nicholls, 1989). Therefore, highly ego oriented individuals' perceptions of success are not independent of their skill competence (Jagacinski & Nicholls, 1984; Standage, Duda, & Ntoumanis, 2003). Task and ego orientations are orthogonal, so individuals' level of one goal orientation is not related to their level of the other goal orientation (Duda & Nicholls, 1992). Nicholls maintained that children were naturally task oriented until they develop the cognitive capacity to adopt a high ego orientation (i.e., by middle school), at which time they may become high and/or low in task and ego orientations.

AGPT research has revealed that a high task orientation is associated with many more adaptive outcomes compared with an ego orientation (Jagacinski & Nicholls, 1984, 1987; Nicholls, 1984, 1989; Standage et al., 2003). Specifically, a high task orientation has been associated with increased effort and persistence, and believing that success is due to effort (Duda et al., 1995; Nicholls, 1989). Individuals high in task orientation employ a less differentiated view of ability, and they view increased effort as aligning with increased ability. Alternatively, highly ego oriented individuals view giving full effort as revealing their maximal capability, which they would prefer to do only when they can achieve a positive normative performance. If these individuals fear their skill capability is not going to produce the performance they desire,

then the fall back position is to “avoid demonstrating low ability” (Nicholls, 1984, pg 328). This pressure to be a high achiever brought on by a high ego orientation is positively correlated with viewing cheating, manipulation, and rule bending as acceptable avenues toward success (Jagacinski & Nicholls, 1984, 1987; Nicholls, 1984, 1989). In other words, it follows that if achieving high normative performances is valued (i.e., an ego orientation) over effort and improvement (i.e., a task orientation), then individuals high in ego orientation will be more likely to use any means (e.g., legal or illegal) possible to achieve their goals. In line with the tenants of AGPT, studies have consistently found across a variety of populations and domains that adopting a high task orientation is positively associated with adaptive outcomes, while a high ego orientation is positively associated with maladaptive outcomes (Roberts & Treasure, 2012).

Motivational Climate. AGPT research suggests that individuals’ goal orientation expression is influenced by the perceived motivational climate they experience in specific settings (e.g., school, PE, sport) (Jagacinski & Nicholls, 1987). There are two traditional aspects, and a third proposed aspect, of the AGPT motivational climate: task-, ego-involving, and caring. A caring climate is characterized as one which individuals perceive to be safe, welcoming, and where individuals are respected and valued (Newton, Fry et al., 2007). A task-involving climate emphasizes personal effort, self-referenced improvement, and peer cooperation (Seifriz, Duda, & Chi, 1992). Perceiving the climate as caring and/or task-involving has been associated with increased effort, interest in continuing physical activity, and intrinsic motivation (Huddleston, Fry, & Brown, 2012; Newton, Fry et al., 2007; Seifriz et al., 1992; Walling, Duda, & Chi, 1993). Alternatively, an ego-involving climate emphasizes interpersonal competition, values ability over effort, and promotes the view that mistakes warrant punishment (Seifriz et al., 1992). Individuals perceiving the climate as ego-involving have also reported decreased effort and enjoyment, plus

increased maladaptive outcomes, such as tension/anxiety (M. Newton & Duda, 1993). These climate associations have been found across various populations in PE, sport, and physical activity settings.

In 2003, Standage et al. assessed the theoretically driven direct and indirect effects of perceived motivational climate, competence, and goal orientations on intrinsic motivation with a middle school aged PE student population. Consistent with AGPT predictions, task orientation directly predicted individuals' intrinsic motivation, regardless of their perceived competence. The perception of a highly task-involving climate was also directly related to individuals' greater intrinsic motivation. Additionally, the interaction between individuals' task orientation and perceptions of a task-involving climate had a significant, positive directed pathway to their intrinsic motivation. Thus, having a high task orientation, and perceiving a high task-involving climate had positive effects on individuals' intrinsic motivation independently and together. This finding supports the significant impact that developing a task-involving PE climate can have on students' intrinsic motivation to be active. Alternatively, when an ego-involving climate was perceived, individuals' levels of intrinsic motivation were significantly predicted by the three-way interaction between their perceptions of the climate as ego-involving, their ego orientation, and perceived competence. This three-way interaction illustrated that students who perceived a higher ego-involving climate, had a higher ego goal orientation, and lower PE competence reported decreased intrinsic motivation. In fact, even the higher ego oriented, higher competence students experienced their greatest level of intrinsic motivation when they perceived a low ego-involving climate. Standage et al.'s predictive relationships were determined using hierarchical linear regression analysis. This is a most appropriate analysis given that the data is naturally

hierarchical (e.g., students nested within classrooms). However, the cross-sectional nature of the study's data limited the authors' causal inference ability (Standage et al, 2003).

Purpose/Hypotheses

Thus, the purpose of the current study was to replicate and extend the work of Jagacinski and Nicholls (1987), and more recently Standage, Duda, and Ntoumanis (2003), by surveying American middle school students across multiple time points. This enabled modeling these constructs' theory-driven pathways across time to assess their causal strength. To do this, students completed four surveying periods. Specifically, the sixth grade students were surveyed approximately eight weeks into the Fall 2011 (T1) and Spring 2012 (T2) semesters; and then twice during their middle school PE experience. The first surveying during middle school was conducted approximately six weeks into the Fall 2012 semester (T3), while the second surveying was conducted two weeks before the end of the Fall 2012 semester (T4). This surveying scheme had two benefits of interest for the current study. One, the T1 sufficient statistics were used as the control values for the later time periods. Additionally, the strength of the autoregressive (AR) and cross-lag (CL) pathways from T1 to T2 (CL1) were compared to those from T3 to T4 (CL1) to track the students' transition to middle school PE.

Prior AGPT researcher informed our initial hypotheses for the variable relationships from T1 to T2. Students who perceive a high task-involving climate at T1 were hypothesized to have increased task orientation and competence, and decreased ego orientation at T2. On the other hand, students who perceive a high ego-involving climate were hypothesized to have an increased ego orientation at T2. Plus, the relationship between perceiving a high ego-involving climate, high ego orientation, and low competence negatively predicting effort at T2 were

assessed. Lastly, we compared the T1 and T2 variable values and relationships with the corresponding T3 and T4 responses, as four data points have not been reported previously.

Methods

Participants

Sixth grade students (N=376) were surveyed twice (e.g., once in Fall 2011, T1, and once in Spring 2012, T2) and then the following year, seventh grade students (N=216) were surveyed two more times while enrolled in a Fall 2012 middle school PE class. The elementary surveying took place approximately eight weeks into each semester to ensure time for the students' perceptions of the PE class climate to develop. The seventh grade surveying sessions took place eight weeks into the middle school's semester long PE class (T3), and again during the second to last week of the semester (T4), approximately six weeks later.

This study was part of a larger, three-year grant supported project that had received University IRB and school district approval. Parents were given an opportunity to opt their child out of participation in the surveying along with other grant-related PE activities. A research team was trained to administer the surveys. After the PE teachers introduced the research team, the PE teachers would leave the surveying area. Surveyors provided instructions, which included emphasizing the student's anonymity, response confidentiality, and that the right answer to any survey item was always the student's honest opinion. The survey took approximately 20 minutes of the PE class for students to complete. The students recorded their survey responses on scantron sheets, which were pre-coded for the teacher, class period, and survey version being completed. The surveys were read to the elementary students in groups of 5-10 students by a member of the research team; while at the middle school, students were provided with individual

printed, copies of the survey to read. The scantron had five response options (e.g., A-E), and, all of the scales were anchored with 1=Strongly Disagree and 5=Strongly Agree.

General Survey Design

A three-form planned missing survey design was implemented in this study to decrease the total number of items each student had to respond to, while maximizing the total number of scales that could be included. This also has the benefit of diminished practice and fatigue effects on response quality. The items from each scale were partitioned into one of four categories: Common, A, B, or C. Each survey version started with the common category items first. Then, the items from two of the remaining three categories followed (e.g., AB, BC, or AC). Thus, any two survey forms had at least a 67% item overlap. When handled with modern missing data techniques post data collection, all the survey items' relationships are "captured" utilizing multiple imputation (Graham, 2009). This is possible because the items not included on any one survey version were missing completely at random (MCAR), which is the type of missing data that can be best "recaptured" through modern missing data techniques, such as multiple imputation (Graham, 2009).

Measures

Task and Ego Orientation in Sport Questionnaire (TEOSQ; Duda & Nicholls, 1992).

This questionnaire assessed students' ego goal orientation (6 items) and task goal orientation (7 items). The stem's wording for each item was "I feel most successful in this PE class" Other studies with PE student populations utilizing these subscales have consistently revealed good psychometric properties (Goudas, Biddle, & Fox, 1994; Moore et al., 2009; Standage et al., 2003). Sample items include, "I feel most successful in PE class when I learn a new skill and it

makes me want to practice more” (task) and “I feel most successful in PE class when I’m the only one who can do a skill” (ego).

Competence and Effort Subscales of the Intrinsic Motivation Inventory (IMI; McAuley & Tammen, 1989). The IMI subscales can be used to measure stand-alone constructs. For this study, the six-item competence and the four-item effort subscales were used. A sample item of the competence subscale is “I am pretty skilled at PE activities.” A sample item is “I tried very hard while in this PE class.” Each subscale assessed the students’ perceptions specifically with respect to their PE class experience. Both subscales had one reverse coded item. These subscales revealed good psychometric properties when used previously with youth across different target activities when used independently or as part of the full IMI (McAuley & Tammen, 1989; Newton, Duda, & Yin, 2000).

Perceived Motivational Climate in Exercise Questionnaire (PMCEQ; Huddleston et al., 2012). The PMCEQ was developed to assess participants’ perceptions of the extent to which the motivational climate in exercise and physical activity settings was task- (14 items) and ego-involving (13 items). The PMCEQ’s psychometric properties were shown to be adequate in published CFA results (Huddleston et al., 2012). These two constructs were modeled by loading the task-involving climate parcels (i.e., effort, improvement, and cooperation) or ego-involving climate parcels (i.e., ability, rivalry, and punishment for mistakes) on their respective constructs (Little, Cunningham, Shahar, & Widaman, 2002; Newton et al., 2000). The stem for the items was “In this PE class . . .” and sample items include: “. . . the teacher encourages students to improve on skills they are good at” (task-involving), and “. . . the teacher gives most of his/her attention to only a few students (most fit, most popular, etc.)” (ego-involving).

Caring Climate Scale (CCS; Newton et al., 2007). This 13-item scale was developed by Newton and colleagues to measure participants' perceptions of the physical activity climate as caring (Newton, Fry et al., 2007). This scale showed good psychometric properties with youth ranging from 9-17 years of age in physical activity settings (Gano-Overway et al., 2009; Newton, Fry et al., 2007; Newton, Watson et al., 2007). The stem for the items were "In this PE class . . ." and a sample item is: "In this PE class, the teacher is kind to the students."

Plan of Analysis

Due to the planned missing data collection approach and the missing observations inherent in students being absent or not enrolled in PE in secondary school, the multiple imputation technique was used (Graham, 2009). The longitudinal analyses were conducted in Mplus 7.0 (Muthen & Muthen, 1998-2012). Due to the naturally nested nature of this data (i.e., students within classroom), the cluster analysis option was used in Mplus.

Longitudinal Confirmatory Factor Analysis (CFA)

Invariance testing consisted of assessing the maintenance of the CFA model's fit as progressively more constraints were placed upon the measurement model. The configural model represented the theory-predicted measurement model. Its model fit was assessed with the following fit statistics: CFI, TLI, RMSEA, and SRMR. CFI and TLI values of .90 or greater suggest that the proposed model adequately represents the data's covariance matrix, while values of .08 or lower have been recommended for the RMSEA and SRMRM (Cheung & Rensvold, 2002). Once the fit statistics supported that the configural model represented the observed data adequately, weak and strong invariance were tested.

Weak invariance tested that matched factor loadings were equatable across the four measurement time periods. The weak invariance fit statistics' values were compared to the

configural model's fit statistics to confirm that the weak invariance model's constraints were tenable (i.e., did not significantly diminish model fit). To assess the constraints' tenability, a change in CFI of .01 or less was used as recommended (Kline, 2011; Little, Card, Slegers, & Ledford, 2007; Muthen & Muthen, 2011). After the weak invariance model's constraints were supported, the minimum requirement for continuing with longitudinal analyses of the variance and covariance structures would be met. The variance and covariance relationships were of primary interest to examine how the PE class motivational climate was related to the student motivational outcomes, and how the students' goal orientations were related to their competence and effort in PE.

Prior to conducting regression analyses, the homogeneity of the latent variance and covariance structures were assessed. The ability to test the assumption of homogeneity of variances is an important benefit of using an SEM approach. Significant differences in variances over time would mean that the students' perceptions become either more or less homogeneous. In other words, the students' perception of the climate, for example, may have become significantly more similar or more varied over time. When heterogeneous variances are present, best practice is to include phantom constructs for all latent constructs to put the covariances into a standardized metric with homogeneous variances, and would allow the correlations and regressions to be compared for significant differences over time.

Longitudinal SEM Analysis

The longitudinal, panel model from the CFA was the starting model for the latent regression analysis. The model's across time covariances were now modeled as directed paths, so that the constructs' predictive effects could be assessed. The theory based hypotheses drove the regressive pathway tests. These regressive pathways were either autoregressive (i.e., AR) or

cross-lag (i.e., CL) in nature. The AR pathways control for the construct's previously measured levels; therefore, even non-significant AR pathways were kept in the longitudinal model (Cole & Maxwell, 2003; T.D. Little, 2013; T.D. Little, Schnabel, & Baumert, 2000). The AR and CL pathways were tested for significance utilizing the nested model approach, which tested the tenability of constraining the pathway of interest to zero compared to allowing it to be freely estimated. The tenability of such pathway constraints was tested by the Chi-square difference test (e.g., the change in the Chi-square value over the change in model degrees of freedom). When the Chi-square difference value meet or exceeded the appropriate degrees of freedom criterion value at an alpha level of .001 (i.e., $\Delta\chi^2 = 10.83$), then the pathway(s) predicted a significant amount of the dependent variable's variance. Pathways not found to be significant were pruned (i.e., removed from the model). The final, pruned model was interpreted.

Results

The data met the Mahalanobis-distance test for multivariate normality using a criterion value of 14.0. The scales' Cronbach's alpha coefficient values were calculated for each measurement wave. The T1 climate reliabilities met the acceptable criterion, while the outcome variables ranged from .45 to .60. The T2 reliabilities were poor, with the ego-involving climate and PE competence subscale values of .68 being the largest. The T3 and T4 reliabilities were better than T2, however, the caring climate's .69 was the strongest reliability. The analyses were conducted with all constructs kept in the model, as each latent construct represented true score variance, and to assess the invariance testing constraint tenability. The low reliabilities, particularly at T2, require caution in interpretation.

Invariance Results

CFA Results. The longitudinal configural model fit the data significantly better than the appropriately modeled null model (See Table 1). However, the overall model fit could potentially be improved, based upon the relative model fit statistics (CFI=.85, NNFI=.84, RMSEA=.027, and SRMR=.048). Although the RMSEA and SRMR values met the good model fit criteria, examination of specific item's factor loadings suggested slight pruning would improve the model's fit. After removing ten items (See Table 1 note) from the configural model, the overall model's fit improved significantly (CFI=.88, NNFI=.85, RMSEA=.026, and SRMR=.048). This model was the best fitting model, and so used as the base model for the rest of the analyses. The weak invariance equality constraints on the factor loadings were tenable ($\Delta CFI=0.00$, $\Delta\chi^2_{65} = 66.13$, $p=.44$).

Homogeneity of Latent Variances & Covariances. Since attaining weak invariance is all that is necessary to test for homogeneity of variances and covariances, the weak invariance model was used as the base for the homogeneity of variances, covariances, regression path analyses (Little et al., 2007). First, the homogeneity of the latent variances across the four measurement periods was tested. Variance homogeneity was not met ($\Delta\chi^2_{21} = 213.64$, $p<.001$). The significantly heterogeneous variances were: T2 caring climate ($\Delta\chi^2_1 = 148.35$, $p<.001$), T2 task-involving climate ($\Delta\chi^2_1 = 142.30.37$, $p<.001$), T2 effort ($\Delta\chi^2_1 = 185.16$, $p<.001$), T3 ego-involving climate ($\Delta\chi^2_1 = 83.10$, $p<.001$), and T4 caring climate ($\Delta\chi^2_1 = 17.37$, $p<.001$), ego-involving climate ($\Delta\chi^2_1 = 36.03$, $p<.001$), ego orientation ($\Delta\chi^2_1 = 130.86$, $p<.001$), and competence ($\Delta\chi^2_1 = 128.93$, $p<.001$). The T2 variances were understandably smaller. Specifically, the variances decreased to .42 for the caring climate, .37 for task-involving climate, and .13 for effort. Additionally, the T3 variance decreased to .58 for the ego-involving climate

and .57 for the ego orientation. Lastly, the T4 variances decreased to .49 for caring climate, .46 for ego-involving, and .44 for competence. Therefore, a phantom variable was regressed upon each latent variable, so that all the constructs' variances would be on the same, standardized metric.

Next, the homogeneity of the covariances across time was tested. Covariance homogeneity was not met ($\Delta\chi^2_{180} = 353.43, p < .001$). Figure 2 presents all significant within time correlations at T1, and then only the T2, T3, and T4 correlations that were significantly different from the first measurement period's correlations. There are a few within time correlations illustrated multicollinearity that primarily presented in T2 (spring semester of sixth grade), which may be attributable to that time period's lower reliabilities.

SEM Results

Autoregressive (AR) Pathways. Each autoregressive path was tested for significance. Since AR pathways control for the constructs' prior measurement, all ARs were kept in the model regardless of their significance level. The standardized regression coefficients and their respective significance values are presented in Figure 2.

Cross-lag (CL) Pathways. Each CL pathway was tested for significance, and only the significant ones were in the final, pruned model (see Figure 2). An omnibus test of the CL pathways covering more than a single lag (e.g., Caring Climate T1 to Caring Climate T3) was found to be nonsignificant ($\Delta\chi^2_{102} = 71.113, p = .99$). Therefore, this constraint was maintained throughout the regression analyses. There were no significant CL pathways predicting T2 or T3 constructs. One explanation for this is the low reliabilities of the T2 constructs. Other important factors was the T2 measurement occurring approximately 5 months after the T1 measurement; while the T3 measures of students' motivational outcomes in PE were measured in a new PE

environment. There were also no significant CL pathways predicting T4 constructs, although many neared significance.

Lastly, the hypothesis that students' competence level would moderate the relationship between their ego orientation and their effort in PE class could not be properly tested. The pathway from the students' ego orientation was not found to significantly predict students' effort in PE across any of the cross-lags. Since the moderation could have been the cause for this non-significant finding, the interaction between ego orientation and competence was still tested directly at each lag, and none were significant.

Discussion

The purpose of this study was to examine students' perspectives toward PE as they transitioned from sixth grade (i.e., elementary school) to seventh grade (i.e., middle school). It was hypothesized that the seventh grade PE class' motivational climate would play an important role in predicting students' task goal orientation, competence, and effort in PE. Specifically, this study examined the covariance relationships over four measurement periods. These hypotheses were not supported by this study's analyses. However, there are important limitations, which must be taken into consideration. There were some new findings of note that come from this study, along with continued support for prior cross-sectional relationships.

The within time correlations were in the expected direction and magnitude based upon prior AGPT research (Roberts & Treasure, 2012). For example, there were strong, positive correlations between the task-involving climate and task orientation, competence, and effort. On the other hand, the ego-involving climate was negatively correlated with the task-involving climate, competence, and effort, as expected. In addition, it was negatively correlated with the caring climate and task-involving climate. The task orientation had significant, positive

correlations with the students' reported competence and effort in PE; while the ego orientation had no significant correlations with these outcome variables. The task and ego orientations were not significantly correlated with each other, which supports their orthogonal nature (Nicholls, 1989; Standage, Duda, and Ntoumanis, 2003). In addition to being consistent with prior research, these within time correlations were also consistent over time. Only a few correlations were significant at later time points with magnitudes that were significantly different from the first time period. This supports the consistency of these constructs in relation to each other.

An addition to the motivational climate literature is how the caring climate related to AGPT's task and ego goal orientations, as these constructs have not been in the same analytic model before. This study preliminarily supports a positive relationship existing between students experiencing a caring class climate and holding a task goal orientation; while no significant relationship was found with adopting an ego goal orientation. That experiencing a caring climate was positively correlated with holding a task goal orientation is in line with AGPT tenants, since a caring climate emphasizes individuals feeling they are a valued member of the group, and feel safe to be themselves, and being task oriented means experiencing success through learning. The safety students perceive in a caring climate may increase students comfort at attempting tasks that are appropriately challenging, and making mistakes as they learn to master those challenging tasks. This safety and comfort with one's current skill level and learning pace also appears to be revealed in the positive correlations between the students' perceptions of the climate as caring, and their competence and effort in PE. Thus, this study's cross-sectional correlations may illustrate that students who experience a climate where they feel safe to try new skills and comfortable with improving at their own pace, also feel more competent and give greater effort in PE class.

The nonsignificant finding for student competence moderating the relationship between students' ego goal orientation and their effort in PE does not align with AGPT tenants (Nicholls, 1989; Roberts & Treasure, 2012). For example, Standage, Duda, and Ntoumanis' (2003) cross-sectional results showed that students' competence moderated the relationship between their ego orientation level and their intrinsic motivation to experience stimulation as the outcome variable. The current study's low reliabilities make drawing generalizable conclusions unwise. Although this interaction was tested across all three cross-lags, the length of time between the first two (i.e., 5 months and 6 months, respectively) may have been too long to capture this relationship. The six weeks between T3 and T4 was the best opportunity to test for this moderation, however, the reliabilities of the effort construct were still not good. Thus, future research aimed at testing for this moderated relationship would likely benefit from more frequent measurements and perhaps a different measure of effort (e.g., different scale or objective measure, such as heart rate during PE class).

Limitations

This study has limitations that necessitate cautious interpretation of the results. One important limitation is that the standard error estimates are likely to be biased, which explains the lack of significance for some of the parameters that would be expected to be significant, such as the CL from task-involving climate T3 to effort T4 ($\mathbf{b}^* = .45, p = .012$). Research into the best ways to analyze data collected through planned missing designs may suggest alternative approaches to handling the missingness that was present. Recent findings suggested that standard errors are biased when a 3-form design is utilized with longitudinal data and similarly small sample sizes. Although this study's sample size was greater than 300, the analysis model was also larger than the longitudinal model that simulation study examined (Jia, et al, under review).

A second limitation of this study was that students absent on the day of surveying were missed for that measurement time. In addition, some students' survey responses did not include enough demographic information that matched the known demographic information (i.e., birthdate, gender, and grade) for students comprising a particular class period to be matched over all four measurement periods. This limitation was an inherent result of the anonymous and confidential data collections methods employed. Students frequently voiced the view that their data could be tracked back to them despite the minimal demographic data collected. Given the increased concern of releasing personal information today, developing research methods that are able to provide participants with a way to be surveyed and matched longitudinally without collecting such information may be warranted.

Conclusion

Given the limitations of this study mentioned above, future research is still needed before longitudinal generalizations can be made regarding the nonsignificant mediation and moderation relationship findings. Although how the climate predicts students' goal orientations was not answered from this study's results, the students' task orientation did not drop during their first semester of middle school PE, and remained strongly correlated with their perceptions of a caring and task-involving climate. The magnitude of the positive correlation between the students' perceptions of a caring climate and their task goal orientation was an important initial finding. It supports the importance of measuring the caring climate, in addition to the task- and ego-involving climates, because of the caring climate's unique relationships with other constructs. Additionally, the caring climate was also found to be strongly, positively correlated with students' perceived competence and effort in PE. Practically, these findings support the importance of teachers fostering a PE class climate that is both task-involving and caring.

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APPENDICES

Literature Review
E. Whitney G. Moore
University of Kansas
Dissertation Defense, Spring 2013

Overview

This literature review focuses on research employing Achievement Goal Perspective Theory (AGPT) in the physical domain. AGPT falls under the broader work in achievement motivation to which many researchers have contributed (Ames & Archer, 1988; Duda & Nicholls, 1992; Eccles, 2004). In Nicholls' AGPT work, achievement behavior is defined "as that behavior in which the goal is to develop or demonstrate – to self or to others – high ability, or to avoid demonstrating low ability (Nicholls, 1984, pg. 328)." Nicholls spent tremendous time researching and developing the AGPT's three components: a) cognitive development, b) goal orientation, and c) motivational climate. These three components and their relationships with each other will be the focus of this literature review's first section.

The second section will focus on the pertinent measures' development and interpretation. First, the development of the goal orientation measure for the physical domain by Nicholls' and Duda will be presented. Second, the developmental progression of the motivational climate measures for the physical domain is covered. This portion of the literature review will also introduce the theoretical tenants behind the development of a third aspect of the motivational climate—caring climate—and its measure developed by Newton and colleagues. Third, measures used for variables commonly included in AGPT research will be introduced. More specifically, this portion will consist of the scales used in this dissertation's studies to measure perceived competence, effort, and intrinsic motivation for physical activity (PA).

The third and concluding section will summarize the AGPT variables employed in this dissertation and their research supported relationships with each other and outcome variables of interest. This will concisely illustrate the existing foundation upon which the dissertation's proposed

studies were built. As well as reveal the directions that future AGPT research needs to go. Finally, how the studies proposed for this dissertation meet those needs will be addressed.

Achievement Goal Perspective Theory (AGPT)

Introduction

Nicholls thoughtful and thorough conceptual development and innovative methodical research designs enabled him to systematically build evidence for AGPT's developmental aspect, the acquisition of a mature understanding of ability. This developmental research examined the process children experience as they learn to distinguish key achievement behavior concepts—difficulty, luck, and effort—with respect to ability. To build these distinctions, Nicholls methodology utilizes very specific scenarios designed to tap into children's understanding of critical concepts. His approach minimized adults' inadvertently projecting adult meaning or understanding upon children's understanding and interpretation. This methodology enabled Nicholls to explain what otherwise appeared to be discrepancies between researchers' findings by using children's own words to illustrate their understanding of depicted relationships across multiple scenarios and outcomes (Nicholls, 1979, 1984, 1989; Nicholls & Miller, 1984).

Nicholls methodical AGPT research continued with the goal orientation component and perceived motivational climate components. Nicholls used the term goal orientation to describe individuals' personal definitions of success (Nicholls, 1989). Two differing goal orientations emerged from this research – task and ego. The final AGPT component developed was the perceived motivational climates. According to Nicholls, achievement motivation environments could be more task- or ego-involving depending on the way leaders (e.g., teacher, coach, or instructor) structured the environment. The significantly different impact these two climate types had on individuals in the academic and physical domains will be presented in due order. Lastly, the theory-predicted

interactions between goal orientations and perceived motivational climates, plus their implications, will be provided. Nicholls' work clearly presented each component is manifested,--individuals' cognitive development, goal orientation, and perceptions of the motivational climate--and how the constructs interact. The remainder of this section summarizes Nicholls' original work and the findings of those who have followed in his AGPT researching footsteps.

Cognitive Development Component

The cognitive developmental component of Nicholls' AGPT was the most unique and time consuming aspect for Nicholls over the 20 years he dedicated to AGPT research and theory development. Nicholls indicated that achieving a mature understanding of ability involves developing a differentiated view of the following: (a) ability and difficulty, (b) ability and luck, and (c) ability and effort. The normative understanding of task difficulty is the first aspect of cognitive development to occur, and for most children is reached around age eight. The differentiated view of ability from effort, and luck, however, takes a longer time to fully develop, and is typically evident in the majority of youth as they enter into their teenage years (e.g., around age 12 or 13). Although each individual progresses through these stages of cognitive development at different rates, research in different domains (e.g., educational; physical) has found the age when the majority of adolescents reach this mature understanding of ability to be relatively consistent (Fry, 2000a; Fry & Duda, 1997; Nicholls, 1984, 1989; Nicholls & Miller, 1983; Walling & Duda, 1995). The developmental progression of children's cognitive development with respect to the three aspects (e.g., task difficulty, ability vs. luck, and ability vs. effort) of a mature understanding of ability is described in detail.

Nicholls' identified task difficulty as the first aspect children develop as they begin to attain a mature understanding of ability. At a very young age children determine task difficulty based upon their own ability at the task. Thus, tasks children found to be difficult, they would think are difficult

for all children; while tasks found to be easy, are thought to be easy for all children. This task difficulty level is appropriately named “egocentric,” because children’s understanding of task difficulty is purely self-referenced (Fry, 2000a; Nicholls, 1989). At the next level children develop an objective understanding of task difficulty. Children holding this objective view take some contextual information into account when determining the task’s difficulty. An example is children’s ability to objectively recognize that a puzzle with 100 pieces is easier than a puzzle with 500 pieces. Although an objective measure of difficulty has been incorporated into children’s conceptual understanding, they have still not differentiated between the task’s difficulty level and their ability level. Then, by the age of seven or eight, most children develop a normative view of task difficulty. With a normative view, children are able to recognize that a puzzle only a few children can do is more difficult than a puzzle many children can do. Individuals who attain this mature understanding of ability with respect to task difficulty have reached an important cognitive developmental stage. It does not mean, however, that they will always employ this most differentiated view of ability and task difficulty in the future. Developing the normative relationship between ability and difficulty is the first step in arriving at a mature understanding of ability.

Typically by age 12, youth have developed distinct views of luck, effort, ability, and their relationships with each other (Fry, 2000b; Nicholls, 1989). These distinct views of ability compared with effort and luck develop at different rates among individuals. For the majority of children, it is not until age 12 that they fully understand and are able to articulate the difference between skill and luck tasks (Fry, 2000b). This understanding is represented by their ability to recognize and consistently state that individuals' effort can influence the outcome on a skill task, but not a luck task (Fry, 2000b; Nicholls, 1989). Understanding this relationship between effort and skill/luck task outcomes is revealed in the persistent and/or high effort put forth by children engaged in work on activities

recognized as skill tasks. Thus, understanding that increased effort can improve the outcomes on the task skill can result in children putting their time and effort into skill development (Nicholls, 1989). Alternatively, when children recognize a task as being determined by luck, they are able to elect not to continue putting high, persistent effort into the task, because that effort will not result in improved outcomes (Nicholls, 1989). Thus, differentiation between skill and luck tasks enhances children's ability to more effectively direct their effort, while also protecting them from frustration related to disappointing outcomes on luck tasks.

Individuals who regard ability as capacity have attained the differentiated view of effort and ability. According to Nicholls and other researchers, the initial point of view by children is that individuals' effort is equivalent to their ability (Fry & Duda, 1997; Nicholls, 1989). In other words, young children perceive that if they try hard, they must have high ability, and vice versa. This undifferentiated view holds as the predominant view for the majority of children until about age nine, at which point children start to progress through higher levels of differentiation (Nicholls, 1989; Fry & Duda, 1997). However, it is not until age 13 that the majority of children have an understanding of ability that has matured to the fully differentiated view of ability as capacity. This full differentiation enables adolescents to be more adult-like in their recognition that individuals who perform well on a task without giving high effort must possess high ability (Nicholls, 1989; Fry & Duda, 1997).

While the benefit for children differentiating between luck and skill tasks may be decreased frustration with luck tasks—and potentially increasing their effort to accomplish higher outcomes on skill tasks—the differentiation between effort and ability can result in negative outcomes. In the fully differentiated view, ability is perceived as capacity, and people are seen to have maximal capability levels. When children start to identify a skill activity as a task they do not have the capacity to accomplish, and cannot develop the ability to attain a desired outcome, then they are more likely to

stop putting forth high effort. In place of high effort, they may engage in maladaptive behaviors, such as cheating, manipulation, or rule bending, or they may re-direct that high effort toward other, higher capacity ability skill sets (Jagacinski & Nicholls, 1984, 1987; Nicholls, 1984, 1989). Fry and Duda's (1995, 1997, 2000) work shows this mature understanding of ability exists in the physical, as well as the academic domain. This differentiated view of ability can, therefore, be held by many adults with respect to exercise. Thus, it seems reasonable to expect future research to examine the impact of adults' goal orientation on the effectiveness of adult exercise adherence programs.

It is also important to realize that attaining the differentiated view of effort and ability does not mean individuals will only interpret high effort as illustrating low ability. Individuals with a differentiated view of ability may potentially view effort and ability independently; it does not guarantee that they will. If individuals engaged in a skill task, view their effort as able to increase their ability, or that high effort is the key to attaining improved skill, then they are more likely to continue exerting high effort (Nicholls, 1984). Conversely, if individuals engaged in a skill task view their effort as being limited by their ability capacity, they may be less likely to persist with high effort or any positive effort toward the skill task. Therefore, when programs are able to maintain individuals' focus on their effort, versus their ability capacity, AGPT would predict participants continued high levels of effort as they work on appropriately challenging skill tasks.

AGPT's cognitive development component brings to light the significantly different ways individuals may perceive the same task. Once individuals can differentiate between luck and skill tasks, they should then be able to appropriately recognize tasks which they can improve through continued high effort practice. From adolescence on, individuals also have two ways of looking at the relationship of effort and ability with respect to skill tasks. Individuals employing the differentiated view have a tendency to see success with high effort as an expression of low ability capacity, while

success with low effort as an expression of high ability capacity. This is not the tendency for individuals who adopt the undifferentiated view. These individuals tend to focus on their effort level as their path toward improved ability. These differentiated and undifferentiated views lay the foundation for adolescents' development of the two different goal orientations (e.g., ego and task) discussed next.

Goal Orientation Component

Nicholls' goal orientation descriptions and interactions make up the second AGPT component. Goal orientations represent how individuals define success. According to Nicholls, there are two primary orientations: task and ego. Highly task oriented people define success based upon their effort level and self-referenced improvement; while highly ego oriented people define success based upon how their performance compares to others (e.g., normative or other-referenced) (Jagacinski & Nicholls, 1984, 1987; Nicholls, 1989). Research has revealed that these two goal orientations are orthogonal (i.e., independent; Duda (1989). Specifically, individuals can adopt any combination of orientations: high or low in both, high in one and low in the other, or high in one and moderate in the other (e.g., high ego with moderate task) (Duda & Nicholls, 1992; Jagacinski & Nicholls, 1984; Nicholls, 1989). Individuals who view the world through high task orientation lenses define success through mastery or learning (Duda et al., 1995; Duda & Nicholls, 1992; Nicholls, 1989); while individuals who view the world through high ego orientation lenses define success through normative or other person referenced outcomes (Duda et al., 1995; Duda & Nicholls, 1992; Nicholls, 1989). Whichever goal orientation predominates influences a wide variety of motivational, social, and developmental outcomes.

The interaction between individuals' goal orientation and their perceived ability is emphasized by Nicholls (Jagacinski & Nicholls, 1984; Nicholls, 1989). Prior to differentiating ability and effort, children are predominantly going to have a high task orientation. Nicholls points out that children

being naturally highly task oriented is developmentally important, because they feel successful at tasks based upon their effort level and self-referenced improvement (Jagacinski & Nicholls, 1984; Nicholls, 1989). This means that regardless of ability, individuals high in task orientation are expected to give high effort, regardless of their perceived ability. In other words, because highly task oriented individuals view success as improving their ability (i.e., employ self-referenced standards), they will give high effort. Thus, starting life with a high task orientation means all children are capable of striving to maximize their potential during childhood. However, once their mature understanding of ability is developed, adolescents are capable of developing high ego orientations (Jagacinski & Nicholls, 1984; Nicholls, 1989). Highly ego oriented people view ability as capacity; which implies there is a finite or limited ability level they are capable of achieving. The interaction between perceived ability and high ego orientation is important for understanding high ego oriented individuals' responses to different challenge levels (Nicholls, 1984). Highly ego oriented individuals realize giving full effort will reveal their current maximal ability capacity, which they would only tend to do if their performance would put them at the top normatively or among the group (Nicholls, 1984, 1989). If these individuals fear their ability capacity is not going to produce the performance they desire, then the fall back position is to “avoid demonstrating low ability” (Nicholls, 1984, pg 328). When success is influenced by the fear of displaying a low ability performance, individuals high in ego orientation tend to think they can save their image by either performing better than others with equal effort or performing as well as others while giving less effort (Duda, 1989; Nicholls, 1984). In this light, when faced with a high challenge level, the low-ability, high ego oriented individuals' strategy is to put forth minimal effort in an attempt to avoid failure, and leave doubt among others regarding the cause for this low performance level. When given the option of trying hard and displaying a poor normative performance in front of peers, or withholding effort and avoiding demonstrating low ability, the latter

option may be preferred for those with a high ego orientation. Nicholls' diligent and creative research illuminated this important interaction between individuals' perceived ability, their mature understanding of ability, and their goal orientation.

Researchers have also examined whether goal orientations generalize across context (e.g., academic and physical domains). Nicholls' theorized that individuals' goal orientation reflect a world-view. In other words, individuals have a general, default goal orientation; however the specific environment or experiences in a given arena could move individuals away from their general tendency to be task- or ego-oriented. To test this aspect of AGPT, Duda and Nicholls (1992) completed research with high school students (mean age=15.1 years). Factor analysis revealed the adolescents similarly defined success (e.g., item-factor structure) across the academic and physical domains. In other words, Duda and Nicholls found that the goal orientation scale was consistently measuring the same two goal orientations across the academic and physical domains. Additional analyses found goal orientations to be significantly, positively correlated across these two domains. For example, they found a .67 correlation between academics' and sports' task-orientation levels. Thus, knowing people's goal orientation in one arena would enable a leader to anticipate the individuals' probable goal orientation tendency in another arena. This research also supported that adolescents can adopt different levels of both task and ego orientation levels, which are dispositional and therefore somewhat stable across contexts.

Research has found, however, that people's goal orientation can be influenced by the situation-specific contextual factors (e.g., perceived motivational climate). When individuals are in a task-involving motivational climate (e.g., focused on personal effort and self-referenced improvement, and cooperation), they are more likely to report having a high task orientation (Jagacinski & Nicholls, 1984; Nicholls, 1989; Smoll et al., 2007). Additionally, individuals are more likely to have a higher

ego orientation level when they are in a highly ego-involving motivational climate (e.g., focused on superior outcome performance, superior ability, and intra-group rivalry) (Jagacinski & Nicholls, 1984; Nicholls, 1989; Smoll et al., 2007). To this point, the focus has been on two, personal AGPT components—mature conception of ability and goal orientation—and their interaction.

Motivational Climate Component

AGPT originally consisted of two motivational climate constructs: task- and ego-involving, respectively. In a task-involving climate, the emphasis is on individual-referenced improvement, high effort, and cooperation (Nicholls, 1989; Seifriz et al., 1992). Thus, people's absolute performance is not the focus in a task-involving climate; rather their effort level and relative performance improvement are recognized and valued. Conversely, in an ego-involving climate, the emphasis is on the individuals' normative, outcome-based performance. In an ego-involving climate, individuals perceive that only the most talented and highest ability individuals receive praise and informative feedback, mistakes are punished, and intra-group (e.g., team or classroom peers) rivalry is promoted (Nicholls, 1989; Newton, Duda & Yin, 2000). In an ego-involving climate, ability is performance-based and publically evaluated by comparing individuals' performance to either normative standards or others' performance within the same group (Nicholls, 1989). In research studies, participants complete climate measures rating the environment on both its task-involving and its ego-involving characteristics.

These climates are not orthogonal, like the goal orientations; rather, in research they are typically found to be significantly, negatively correlated (Huddleston et al., 2012; Newton et al., 2000; Seifriz et al., 1992; Walling et al., 1993). Task-involving and ego-involving climates moderately, negative correlation is logical and predicted by the theory, given the opposite characteristics of these two climates. Fostering an ego-involving climate via intra-group rivalry, the leader favoring

individuals, and punishing mistakes would counteract developing a task-involving climate, which emphasizes personal effort, improvement, and cooperation. Research has often considered the simple correlations between outcome variables with task- and ego-involving climate constructs independently. In addition, canonical correlation analysis has been employed to examine the relationship between perceptions of the outcome variables with perceptions of both climate constructs, simultaneously. Compared to bivariate correlations, the canonical results better illustrate the true multi-dimensional relationships that individuals experience in the real world (e.g., non-experimentally manipulated).

Climate research started in the educational domain, and later moved to the physical education and sport domain (Duda & Nicholls, 1992; Seifriz et al., 1992). The magnitude and direction of the relationship between the climate constructs with outcome variables in the educational domain are similar to values found in the physical domain. This provides additional support for the validity of these constructs across different achievement domains.

AGPT research has examined the relationship of the perceived motivational climate with adaptive and maladaptive responses within the physical domain. Individuals perceiving a high task-involving climate consistently report higher adaptive motivational response levels and lower maladaptive response levels. Specifically, individuals perceiving a high task-involving climate have reported greater effort, sport enjoyment, practice satisfaction, team satisfaction, sportspersonship, self-referenced view of success, intrinsic motivation, and commitment to continue in sport and with their current coach (Boixadós et al., 2004; Gano-Overway et al., 2005; Newton et al., 2000; Olympiou et al., 2008; Ommundsen et al., 2003; Seifriz et al., 1992). Additionally, individuals perceiving a high task-involving climate have also reported lower rates of rough play or cheating, valuing winning over enjoyment, determining ability through teammate comparison, and experiencing tension/pressure

(Boixadós et al., 2004; Newton et al., 2000). Alternatively, a high ego-involving climate has either been significantly related to lower levels of or had no significant correlation with the following adaptive responses: effort, enjoyment, practice satisfaction, team satisfaction, sportspersonship, self-esteem, and intrinsic motivation (Boixadós et al., 2004; Gano-Overway et al., 2005; Newton et al., 2000; Ommundsen et al., 2003; Walling et al., 1993). Additionally, with respect to maladaptive responses, a high ego-involving climate has been positively correlated with self-reported higher levels of rough play, cheating, determining ability through teammate comparison, feeling tension/pressure, and valuing winning over enjoyment (Boixadós et al., 2004; Newton et al., 2000). Thus, findings in the physical domain have been consistent with research findings in the educational domain, supporting AGPT's use within the physical domain (Nicholls, 1989).

Jagacinski and Nicholls (1984, 1987) provided initial research support quantifying the relationship between motivational climate and goal orientation in the education domain. In these scenario based studies, they found that college undergraduates put in a high task-involving climate employed a higher task orientation (Jagacinski & Nicholls, 1984). Moreover, when the college undergraduates were put into a high ego-involving climate, they employed a higher ego orientation (Jagacinski & Nicholls, 1984, 1987). In these studies college students were provided with scenarios written to describe either a task-involving or ego-involving situation. A wide variety of different scenarios were used in these studies. In general, the task-involving climate was emphasized through the instructor focusing on individual learning and effort and/or on the activity being something that the individual enjoyed. Conversely, the ego-involving climate added social comparison, excuses for the individuals' effort levels, and/or importance of the class material for the individuals' career goals. These studies were the first to clearly illustrate the relationship between the perceived motivational climate, and its influence on the goal orientation expressed.

The relationship between climate and goal orientation has since been supported in the physical domain as well. In Seifriz, et al's study (1992), varsity high school basketball players who perceived a task-involving climate on their team also reported a "belief that effort leads to achievement" (Seifriz et al., 1992, pg 375). Similarly, Newton, et al (2000) found that athletes who perceived a high task-involving climate were more likely to report being intrinsically motivated to participate in their sport. Smith et al. (2005) found that when high school athletes reported that their coaches gave significantly more frequent positive feedback, informative feedback, and did not ignore mistakes, then they were more likely to have perceived a high task-involving climate. Moreover, when they reported their coaches giving significantly less positive feedback and more negative feedback, then they perceived a high ego-involving climate. These coaching behaviors align with each climate's respective characteristics.

Recently, Smith et al. (2007) examined the impact of an intervention with coaches to promote a high task-involving climate. Results from this multi-level, half-longitudinal study revealed that when coaches emphasized a task-involving climate, their athletes reported decreased sport anxiety over the course of the sport season (Smith et al., 2007). Thus, whether the goal is to increase individuals' intrinsic motivation for exercise or their effort during a specific activity, AGPT motivational climate research consistently illustrates the importance for individuals to perceive a high task-involving climate. The physical domain research suggests that the group leaders and participants are able to influence how members define success, and thereby influence each other's task difficulty selection and effort (Nicholls, 1984). Additionally, Smith, et al (2007) illustrated that a short intervention may effectively help coaches cultivate a high task-involving climate. Currently, more longitudinal research is needed to quantify this motivational climate impact and mechanism within the physical domain.

Most recently AGPT's motivational climate research has moved into the exercise setting. The initial research in the last five years applying AGPT's climate constructs to the exercise domain has found similar relationships to those in the sport domain (Brown & Fry, 2009; Huddleston et al., 2012). This extension of AGPT research is timely given the increasing obesity epidemic and decreasing physical activity trend occurring both in the United States and internationally (Surgeon General, 1999; US Department of Health and Human Services, 1996; World Health Organization, 2003). AGPT and caring climate exercise research has found that individuals who perceive a high task-involving climate also report an increased enjoyment of exercise and likelihood to continue their exercise participation (Huddleston et al., 2012). Furthermore, AGPT would predict that individuals perceiving a task-involving climate and having moderate to high task-orientation would be more likely to choose more challenging tasks in an attempt to increase skill mastery, plus give more effort in the task attempted (Nicholls, 1978, 1984; Nicholls & Miller, 1984). This relationship between motivational climate and goal orientation could explain why individuals perceiving a high task-involving climate are more likely to continue participating in exercise. Examining the relationship between perceived motivational climate and goal orientation in the exercise setting is important for better explaining the connection between exercise motivational climate experiences and continuing exercise participation.

The past decade has seen motivational climate manipulation studies beginning to be published from the physical education setting. These intervention studies typically have confederate teachers implement specific climates—task- or ego-involving, respectively—in different PE classes (Todorovich & Curtner-Smith, 2002; Weigand & Burton, 2002). Results from these studies support that the PE motivational climate affects students' PE goal orientations. These studies consistently found students' task orientation to increase when they are in a task-involving climate, while only one study found students' ego orientation to decrease (Digelidis et al., 2003; Todorovich & Curtner-Smith, 2002;

Weigand & Burton, 2002). However, other studies conducted in sport settings have found youth participants' ego orientation to decrease after being in a task-involving climate (Smith et al., 2009). When students were in an ego-involving climate, Todorovich and Curtner-Smith (2002) found students' ego orientation increased, which has also been found in the sports setting (Smith et al., 2009). More longitudinal and intervention studies in the PE setting are clearly needed.

AGPT Measurement Development

Task and Ego Orientation Measure Development

Nicholls and colleagues originally developed a measure of task and ego orientations for the academic setting, which Duda then modified to be sport-specific. This measure is the Task and Ego Orientation in Sport Questionnaire (TOESQ; Duda, 1989). Principal-components factor analysis supported this scale having two, clearly independent subscales—task and ego orientation, respectively (Duda, 1989). This analysis was conducted on two subsets of the sample surveyed as an additional check for the factor structure and reliability values, which were adequate (e.g., task orientation, .82 and .62; ego orientation, .89 and .85). On average, female sport participants were found to report a higher task orientation than males; while males averaged a higher ego orientation compared to females (Duda, 1989). Additionally, the zero-order correlations and canonical correlations with the outcome variables included in the study were in the hypothesized direction and magnitude, overall. Specifically, Duda (1989) found that having a high task orientation with a low to moderate ego orientation was significantly associated with the belief that social status should be increased by sport (negative) and that personal mastery and cooperative skills are fostered through sport participation (positive). Additionally, Duda (1989) found a significant canonical correlation between individuals having a high ego orientation with a low to moderate task orientation and their belief that sport participation increased self-esteem endorsement, competitiveness, and social status (positive), plus that sport was

less likely to foster being a good citizen (negative). These results provided criterion validity evidence for the TEOSQ's measurement of these two distinct goal orientations.

Nicholls worked with Duda (Duda & Nicholls, 1992) to enhance the TEOSQ measurement of goal orientations in sport. Their 1992 study's updated TEOSQ resulted in greater internal reliability values—.89 for both orientation subscales—and continued to show these two goal orientation constructs to be orthogonal, and have opposite relationships with the included outcome variables. This later version of the TEOSQ has since been used with a variety of different populations, including being translated for use in Spain, Portugal, and Greece with sport participants and PE students (Castillo et al., 2010; Digelidis et al., 2003; Duda, 1989; Duda & Nicholls, 1992; Moore et al., 2009). Across this varied population the TEOSQ's two subscales have continued to have strong factor structures, been orthogonal, and had relationships with other constructs in theoretically expected directions and magnitudes (Castillo et al., 2010; Digelidis et al., 2003; Duda, J., 1989; Moore, J. B. et al., 2009).

Task- and Ego-Involving Climate Measure Development

In terms of measuring the motivational climate in sport, Seifriz, Duda, and Chi (1992) developed the Perceived Motivational Climate in Sport Questionnaire (PMCSQ) to quantitatively assess sport participants' perceived motivational climate—task- and ego-involving—on their team. This was the first motivational climate questionnaire grounded in Nicholls' AGPT for the sport domain. Seifriz, et al's (1992) exploratory factor analysis (EFA) examination of the PMCSQ's psychometric properties supported the two construct model—task-involving and ego-involving climates. Both constructs were found to have good internal consistency with Cronbach alpha coefficient values of .84 (task-involving climate) and .80 (ego-involving climate). The climate constructs' significant -.26 correlation was in the direction expected based upon AGPT. Additionally, criterion validity was supplied by the relationships between individuals' perceived motivational climate and reported

determinants of success, and intrinsic motivation (based upon the Intrinsic Motivation Inventory). Specifically, those perceiving a high task-involving climate also reported a significantly higher level of enjoyment and overall intrinsic motivation compared to those who reported a low task-involving climate. On the other hand, the ego-involving climate did not have significant bivariate correlations. The follow-up canonical correlation found 15% of enjoyment's variance to overlap with individuals' perceiving a high task-, low ego-involving climate (Seifriz et al., 1992). This study's findings provided initial support for the final version of the PMCSQ reported.

Walling, Duda, and Chi (1993) further examined the psychometric validity of the PMCSQ. Their confirmatory factor analysis (CFA) model with items loading on one of the two constructs (task- or ego-involving climate) had acceptable fit based upon the Chi-square to degrees of freedom ratio, 2.02 (Walling et al., 1993). Additionally, the climate constructs' significant correlations with performance/worry and team satisfaction followed AGPT's predicted directions. Specifically, performance/worry was significantly, positively correlated with perceptions of a high ego-involving climate and significantly, negatively correlated with perceptions of a high task-involving climate (Walling et al., 1993). Team satisfaction followed the opposite pattern: it was significantly, positively correlated with a high task-involving climate, and significantly, negatively correlated with a high ego-involving climate (Walling et al., 1993). Although this study provided additional criterion validity for the PMCSQ's climate constructs, the high number of correlated indicator residuals in the final CFA model left open the question of an underlying hierarchical structure.

To directly examine the appropriateness of modeling the task- and ego-involving climates as second-order constructs with first order subscales loading onto them, different models of the revised PMCSQ (e.g., the PMCSQ-2) were compared for model fit by Newton, Duda, and Yin (2000). They found the hierarchical nature of the subscales to be supported based upon the model fit and loadings

from the subscales onto the latent constructs of the task- and ego-involving climate scales in the CFA. However, the authors recommended using the most parsimonious approach for modeling the constructs by representing them as two, oblique, first-order latent constructs due to the lower internal reliability of one ego-involving climate subscale (i.e., mistakes are punished). Newton, et al's (2000) two-latent construct model supported the oblique nature of the task- and ego-involving scales with their $-.69$ significant correlation in this sample of high school athletes. This study also increased the concurrent and divergent validity evidence based upon the climate constructs' significant correlations with effort, enjoyment, team satisfaction, and pressure/tension (all measured by the IMI) in AGPT predicted directions. Specifically, perceiving a high task-involving climate was positively correlated with effort, enjoyment, and team satisfaction, while being negatively correlated with pressure/tension (Newton et al., 2000). Furthermore, perceiving a high ego-involving climate was positively correlated with experiencing pressure/tension, and negatively correlated with effort, enjoyment, and team satisfaction reports. These results continued to build the criterion validity for modeling task- and ego-involving climates as two, oblique constructs based on the model goodness of fit values and significant correlations with the IMI subscales.

Recently, the increased focus on how to get individuals interested in exercise and physical activity has fostered the adaptation of the PMCSQ to the exercise realm. This new measure – the Perceived Motivational Climate in Exercise Questionnaire (PMCEQ) – was developed initially for use in corporate wellness facilities (Huddleston et al., 2012), and has since been used in a variety of general population facilities as well (Brown & Fry, 2009; Kwon & Fry, 2011; Moore et al., 2011, September). Huddleston, Fry, and Brown (2011) found strong CFA model fit support for the two latent construct representation of the task-and ego-involving climate constructs. Perceiving a high task-involving climate was again significantly, positively correlated with reporting intrinsic motivation

(Huddleston et al., 2012). A new criterion validity variable added to the exercise literature was the significant, positive relationship between a corporation's employees perceiving a high task-involving exercise climate and feeling more valued by the corporation (i.e., their employer) (Huddleston et al., 2012). This and the earlier psychometric studies illustrate the consistency of Nicholls' AGPT's constructs across all the educational, sport, and exercise settings. The research literature in sport and exercise utilizing these measures has shown the AGPT expected overall climate relationship patterns. See the Appendices for a review of task- and ego-involving climate relationships.

Caring Climate Scale Development

In addition to developing the PMCEQ, Fry and colleagues have also introduced a third climate construct into the AGPT framework, caring climate. This new climate construct's quantitative measure is the Caring Climate Scale (CCS: Newton, Fry et al., 2007), which examines "the extent to which individuals perceive a particular setting to be interpersonally inviting, safe, supportive, and able to provide the experience of being valued and respected" (Newton, Fry et al., 2007, pg 70). The EFA performed in the psychometric article found all the CCS items to load onto a single construct with strong reliability, .92 (Newton et al., 2007a). The single caring climate construct was found to be significantly, positively correlated with perceiving a task-involving climate ($r=.56$) and significantly, negatively correlated with perceiving an ego-involving climate ($r=-.19$) (Newton et al., 2007a). These relationships were in the hypothesized direction and provided support for a caring climate being a significantly related, yet distinct construct from a task-involving climate. Thus, the CCS filled a gap that had previously existed in the literature by providing a quantitative measure of the level to which "our children believe they themselves are cared for...." (Noddings, 1995, p. 675).

Studies focusing solely on caring climate have shown it to be related to positive adaptive outcome measures. Throughout these studies, the strong internal reliability of the CCS has continued

to be illustrated with Cronbach alpha reliability coefficient values ranging from .90 to .98 (Brown & Fry, 2009; Magyar et al., 2007; Moore et al., 2011, September; Newton et al., 2007a; Newton et al., 2007b). In 2007, Magyar, et al found that when perceiving a high caring climate, leaders also report higher emotional intelligence, including the ability to recognize and regulate their positive and negative emotions. Gano-Overway, et al (2009) found that participants perceiving a high caring climate also reported having greater empathetic self-efficacy, and prosocial behavior expression. Perceiving a high caring climate was also negatively associated with lower antisocial behavior expression (Gano-Overway et al., 2009). These studies' findings with youth and adolescent populations suggest that experiencing a high caring climate may positively influence their psychosocial development, though longitudinal studies are needed to confirm this theorized connection.

The CCS has also been used in conjunction with the task- and ego-involving climate measures (e.g., PMCSQ or PMCEQ). Individuals' perception of the caring climate has consistently been positively correlated with their perception of the task-involving climate, and negatively correlated with their ego-involving climate perceptions (Brown & Fry, 2009; Newton et al., 2007a; Newton et al., 2007b). These studies have been conducted in sport, and exercise settings, but research is needed examining the influence on students of experiencing a caring climate in the PE setting.

Intrinsic Motivation Measurement

Competence & Effort in PE. To better understand the constellation of factors that contribute to individuals being intrinsically motivated towards physical activity, McAuley, Duncan, and Tammen (1989) developed the Intrinsic Motivation Inventory (IMI). The IMI's four subscales are interest-enjoyment, competence, effort-improvement, and tension-pressure, and the researchers' initial work reveal Cronbach alpha reliability coefficients of .78, .80, .84, and .68, respectively. Continued research

has shown similar Cronbach alpha values, including lower reliability values for the tension-pressure subscale (Duda et al., 1995; Ntoumanis & Biddle, 1999).

These subscales together and individually have been used as outcome or mediation variables in many AGPT-based studies (Duda et al., 1995; Ntoumanis & Biddle, 1999; Standage et al., 2003). Of particular interest for this study is the competence subscale, which is comprised of five items to measure individuals' perceived competence with respect to a target behavior or activity. One of these five items is a reverse-coded competence item (e.g., "I couldn't play this game very well.").

Intrinsic Motivation for Physical Activity. Individuals are intrinsically motivated to be physically active when they are active purely for the sake of being active and find it inherently enjoyable or satisfying (Ryan & Deci, 2000). Deci and Ryan stress that although at the end of the motivation regulation continuum, intrinsic motivation should not necessarily be the goal or expectation for every behavior of every individual (Deci, 1995; Ryan & Deci, 2000). However, their research has also emphasized that behaviors individuals report being internally regulated are the behaviors that they are the more likely to complete and continue regardless of whether there are external rewards or punishments (Deci, 1995). Rather external rewards can decrease the level of individuals' existing intrinsic motivation for the target activity (Deci, 1995; Deci & Ryan, 1995).

The Self-Regulation Questionnaire-Exercise (SRQ-E) was developed to represent the different reasons individuals exercise in general or for a specific activity to determine their current exercise regulation identification ("The Self-Regulation Questionnaires,"). The original Self-Regulation Questionnaires were developed for other context specific areas, such as academics and prosocial behavior, and evidenced good psychometric properties (Ryan & Connell, 1989). Since then, additional SRQ versions have been developed, including three versions for PA, including exercise, working out, and gymnastics. The gymnastics version was developed to be used with youth gymnasts. All three PA

versions measure individuals' levels of external, introjected, identified, and intrinsic motivation; however, only the gymnastics version also included three additional items to measure individuals' amotivation. The SRQ-E's have evidenced good psychometric properties, including Cronbach coefficient alpha reliability values, ranging from .68 up to .90 and represented the simplex structure expected of self-regulation constructs (Goudas et al., 1994). Research using this and similar self-regulation questionnaires has revealed that into the start of adolescence, individuals find it difficult to differentiate between all four regulation types. Often this results in at least one of the types being removed from the analysis model. Therefore, only the individuals' reported intrinsic motivation was used as an outcome variable due to the ages (e.g., 5th through 12th grades) represented in the proposed study.

Conclusion

Given only 33% of adults in America are completing the U.S. Surgeon General's daily physical activity recommendation to maintain a healthy lifestyle (US Department of Health and Human Services, 1996); leading a non-active adult lifestyle has been connected to negative exercise experiences (Thøgersen-Ntoumani et al., 2008); and that individuals report an increased likelihood to continue exercising when they have perceived an exercise setting with a highly caring and task-involving climate (Brown & Fry, 2009), it is currently important to examine the effects students' PE class' motivational climates have on their goal orientation adoption regarding PE and intrinsic motivation for PA in general. To experience an exercise climate as caring means that everyone participating feels welcome, valued, and respected. Additionally, perceiving a task-involving climate means participants' high effort, self-referenced improvement, and cooperation are emphasized. Published research has illustrated that when students perceive a climate to be task-involving they also report increased task orientation, competence, and effort (Newton et al., 2004; Newton et al., 2000;

Ntoumanis & Biddle, 1999; Standage et al., 2003). Furthermore, intervention studies in the PE setting have shown students' task orientation is significantly increased after just ten lessons in a task-involving climate (Todorovich & Curtner-Smith, 2002; Weigand & Burton, 2002). However, longitudinal (e.g., three or more time point) research has rarely been done to examine the relationship between individuals' goal orientations, competence, and the motivational climate they perceive in the PE class. This is an interesting, and important research question, as it will provide insight as to whether these variables relate in an additive, moderated, or perhaps cyclical manner.

Students being intrinsically motivated to live an active lifestyle is the ultimate goal of physical education classes (NBPTS, October 2011). Research has shown strong cross-sectional relationships for students' perceptions of a task-involving and/or caring climate with their interest to continue being physically active and intrinsic motivation (Brown & Fry, 2009; Nicholls, 1989; Seifriz et al., 1992; Standage et al., 2003). Additionally, intervention research has started to reveal the positive impact that interventions focused on increasing task-involving climate characteristics in PE can have on students' activity levels and positive view of exercise (Christodoulidis et al., 2001; Digelidis et al., 2003). The climate developed by the teachers' prior to the intervention training does not seem to have been taken into account, resulting in being unable to account for the teachers' prior motivational climate levels. Additionally, the impact of the caring climate in the PE domain has not yet been published. Therefore, the effectiveness of an intervention to adjust PE teachers' motivational climate emphasis on their students' intrinsic motivation for PA will be an important addition to the exercise and education psychology literature.

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Study 1 Tables and Figures

E. Whitney G. Moore

University of Kansas

Dissertation Defense, Spring 2013

Table 1

Summary Nested Model Comparison Results for the Invariance Tests

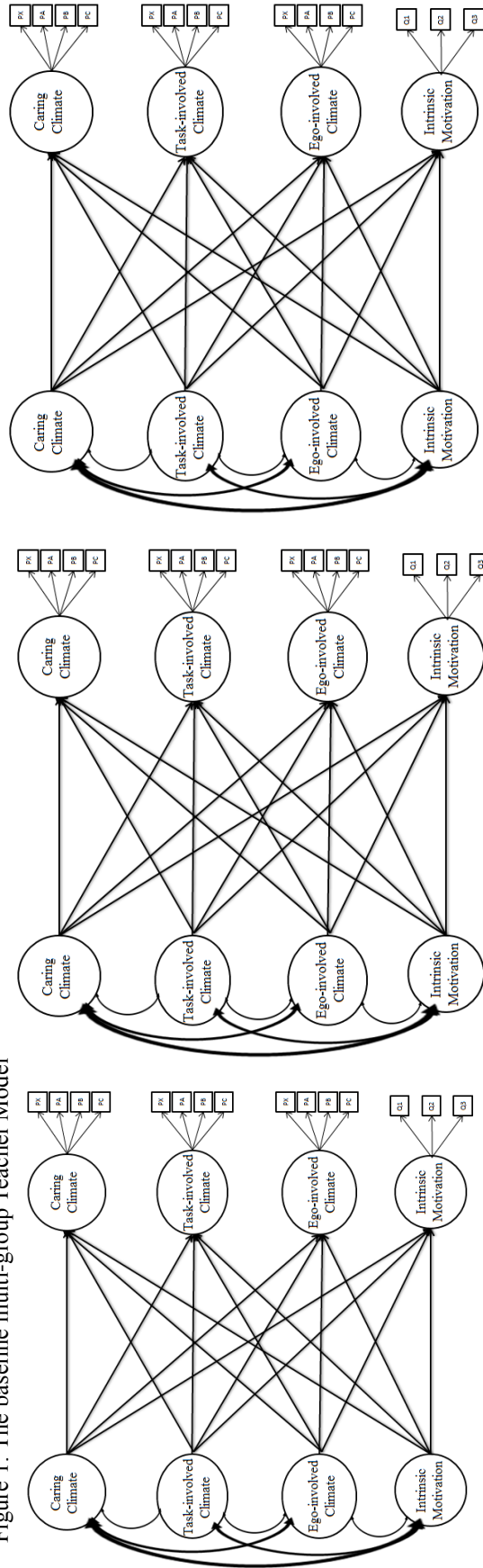
	Weak Invariance			Strong Invariance			Homogeneity of Variances			Homogeneity of Covariances			Homogeneity of Means		
	$\Delta\chi^2_1$	Δdf	<i>p-value</i>	$\Delta\chi^2_1$	Δdf	<i>p-value</i>	$\Delta\chi^2_1$	Δdf	<i>p-value</i>	$\Delta\chi^2_1$	Δdf	<i>p-value</i>	$\Delta\chi^2_1$	Δdf	<i>p-value</i>
Teacher 1	127.825	194	1.000	107.223	195	1.000	18.99	20	0.520	36.13	62	1.000	38.77	20	0.007
Teacher 2	79.97	194	1.000	98.655	195	1.000	24.31	20	0.230	30.22	62	1.000	35.13	20	0.020
Teacher 3	23.058	194	1.000	32.617	195	1.000	11.01	20	0.950	20.34	62	1.000	15.87	20	0.730
Teacher 4	109.802	194	1.000	119.434	195	1.000	41.28	20	0.003	34.78	62	1.000	60.07	20	< .0001
Teacher 5	155.19	194	0.981	99.076	195	1.000	32.72	20	0.040	45.45	62	1.000	28.32	20	0.100
Teacher 6	79.446	194	1.000	86.159	195	1.000	26.01	20	0.170	25.99	62	1.000	17.18	20	0.640
Teacher 7	**configural did not converge			104.122	195	1.000	52.18	20	0.000	22.49	62	1.000	28.06	20	0.110
Teacher 8	**configural did not converge			93.467	195	1.000	37.36	20	0.010	22.69	62	1.000	23.47	20	0.270

Table 2

Within Time Correlation Significance Test Results

	Caring with Task-Involving			Caring with Ego-Involving			Caring with Intrinsic Motivation			Task-involving with Ego-involving			Task-involving with Intrinsic Motivation			Ego-involving with Intrinsic Motivation		
	r*	$\Delta\chi_1^2$	p-value	r*	$\Delta\chi_1^2$	p-value	r*	$\Delta\chi_1^2$	p-value	r*	$\Delta\chi_1^2$	p-value	r*	$\Delta\chi_1^2$	p-value	r*	$\Delta\chi_1^2$	p-value
Teacher 1	0.98	290.007	<.001	-0.26	26.362	<.001	0.61	83.79	<.001	-0.14	13.329	0.0003	0.72	105.848	<.001	-0.13	9.734	0.002
Teacher 2	0.98	263.595	<.001	-0.49	47.708	<.001	0.72	78.428	<.001	-0.41	33.499	<.001	0.75	91.002	<.001	-0.34	14.545	0.0001
Teacher 3	0.98	116.499	<.001	-0.38	16.708	<.001	0.62	33.192	<.001	-0.25	11.231	0.0008	0.68	37.446	<.001	-0.09	4.705	0.03
Teacher 4	0.98	315.066	<.001	-0.37	40.281	<.001	0.72	84.978	<.001	-0.29	25.609	<.001	0.72	109.001	<.001	-0.22	10.666	0.001
Teacher 5	0.96	337.9	<.001	-0.30	30.64	<.001	0.52	65.141	<.001	-0.19	14.676	0.0001	0.65	100.282	<.001	0.04	2.239	0.13
Teacher 6	0.93	276.149	<.001	-0.16	3.438	0.06	0.65	84.324	<.001	-0.02	0.144	0.70	0.72	102.716	<.001	0.1	0.134	0.71
Teacher 7	0.94	425.259	<.001	-0.15	4.724	0.03	0.62	101.155	<.001	0.06	2.259	0.13	0.74	102.419	<.001	0.05	2.119	0.15
Teacher 8	0.96	267.843	<.001	-0.05	0.656	0.42	0.58	64.04	<.001	0.05	0.548	0.46	0.68	87.072	<.001	0.06	0.594	0.441

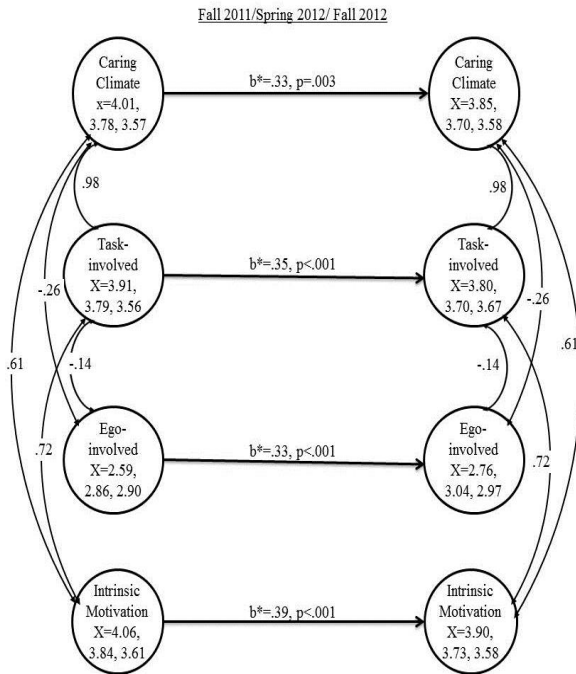
Figure 1: The baseline multi-group Teacher Model



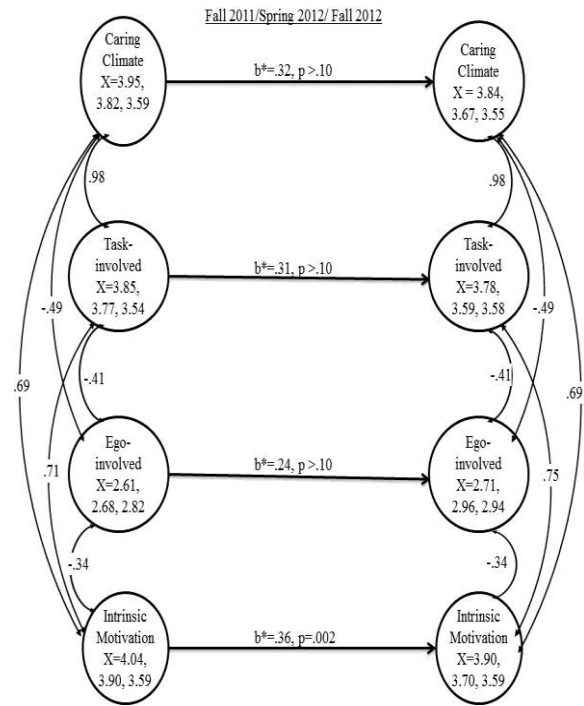
Note: The within time correlations were also estimated at T2, but not shown to decrease figure clutter.

Figure 2: Final, Pruned SEM Teacher Models

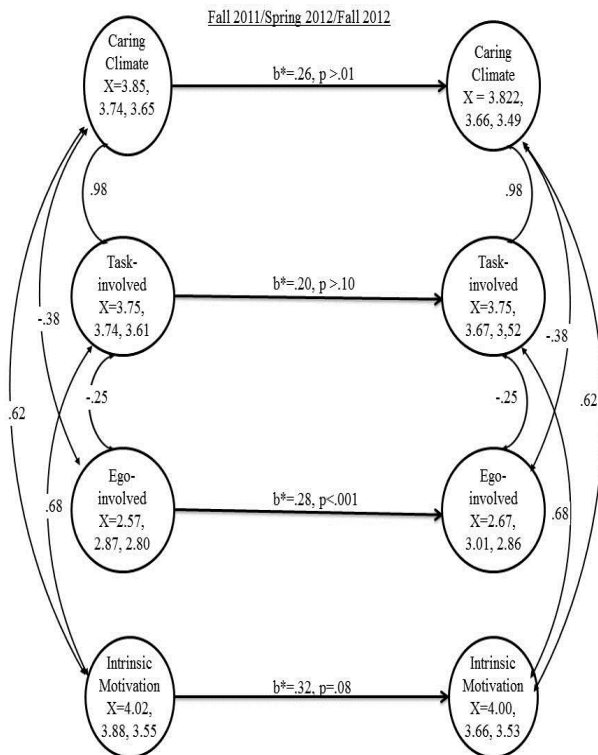
Teacher 1



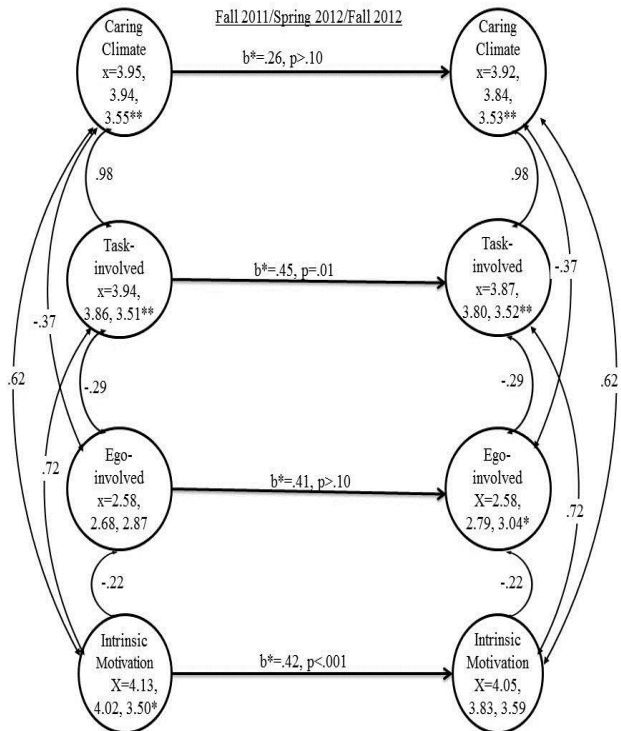
Teacher 2



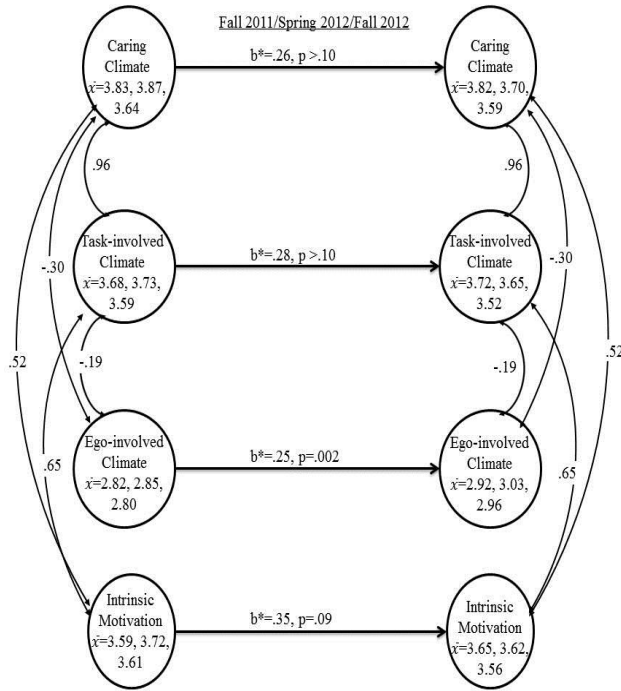
Teacher 3



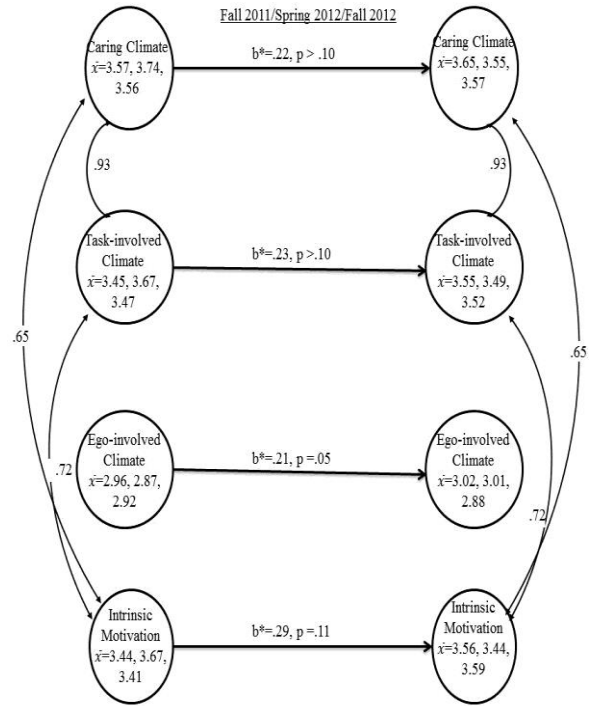
Teacher 4



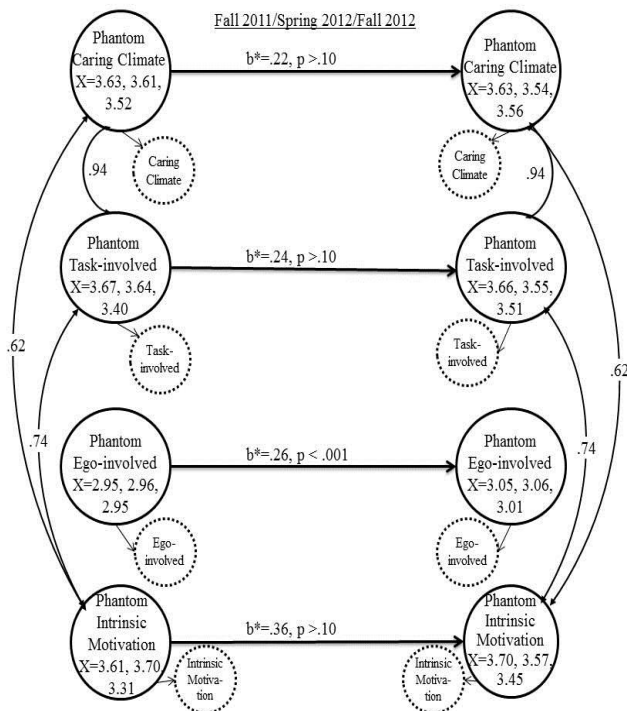
Teacher 5



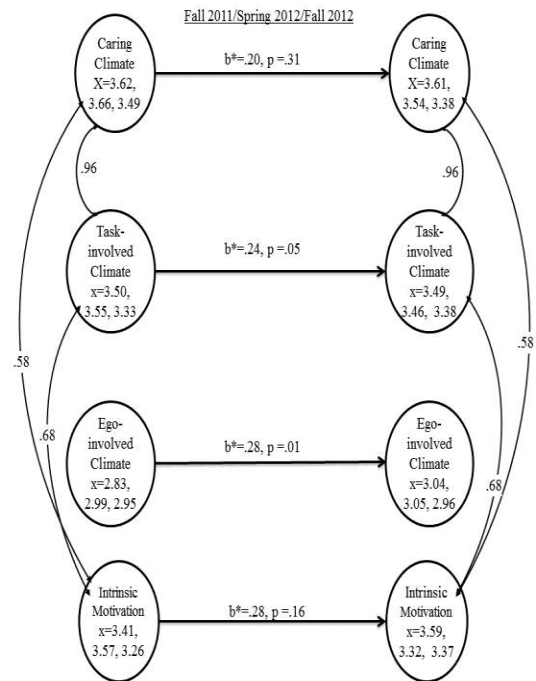
Teacher 6



Teacher 7



Teacher 8



Study 2 Tables and Figures

E. Whitney G. Moore

University of Kansas

Dissertation Defense, Spring 2013

Table 1: Model Fit Statistics

Table 1

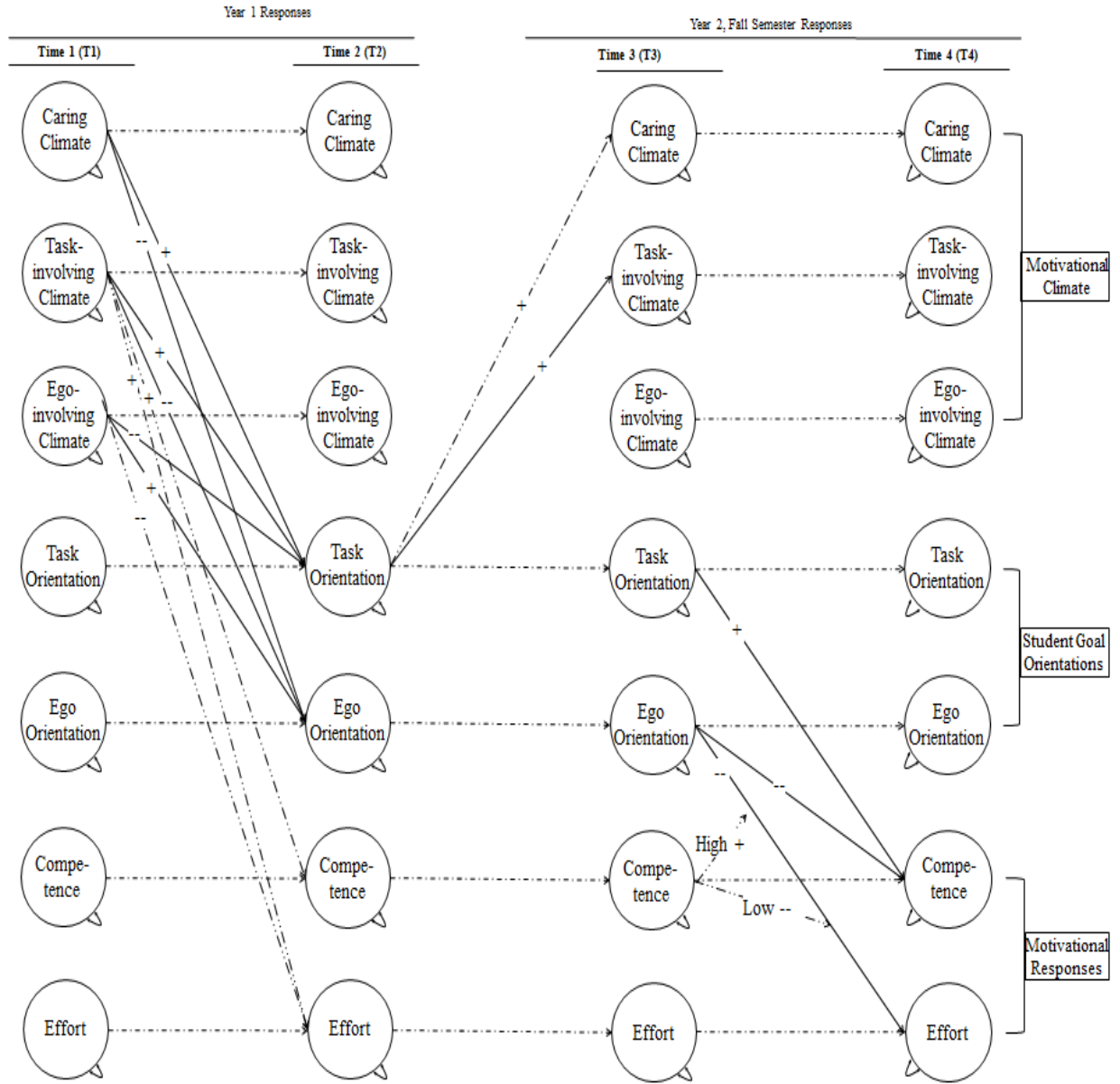
Summary Nested Model Comparison Results for the Invariance Tests

Measurement Model Tests	χ^2	<i>df</i>	<i>CFI</i>	<i>NNFI</i>	<i>SRMR</i>	<i>RMSEA</i>	ΔCFI	$\Delta\chi^2$	Δdf	<i>p-value</i>	Tenable?
Null Model	25336.28	8320	0.000	-0.94	0.13	0.070	--	--	--	--	--
Configural Model	9938.10	7432	0.853	0.835	0.048	0.027	--	--	--	--	YES
Configural Model*	8234.05	6299	0.886	0.850	0.047	0.026	-0.034	--	--	--	YES
Weak Invariance	8235.01	6364	0.89	0.856	0.049	0.026	-0.004	--	--	--	YES
Strong Invariance	9018.06	6340	0.848	0.803	0.055	0.030	0.042	--	--	--	NO
Latent Space Tests											
Homogeneity of Variances**	8448.65	6385	0.879	0.842	0.056	0.027	--	153.408	21.000	0.000	NO
Homogeneity of Covariances**	8707.085	6544	0.873	0.838	0.054	0.027	--	353.432	180	0.000	NO

*Configural Model items removed were T1: Competence item 2; T2: Competence items 2 and 3, Effort items 1 and 2, and Task Orientation item 2; T3: Competence items 2 and 6; and T3: Competence items 6

**Homogeneity of Variances, Covariances, and Regression Models were based off of the Weak Invariance Model

Figure 1: Hypothesized Longitudinal Structural Equation Model



Note: The figure depicts the hypothesized, pruned mediation model. The solid lines represent relationships that have been previously reported in two or more time point research, while the dotted lines represent relationships that have not been reported with longitudinal data as of yet. The direction of the predictive relationship has been represented as positive (+) or negative (--). To present an uncluttered model, the climate predictive pathways between T1 and T2 are not shown between T3 and T4, but are expected. The goal orientation predictive pathways have to been shown from T3 and T4, though they are also expected from T1 to T2.

Figure 2. Pruned Longitudinal Structural Model



Figure depicts the final, pruned model with only significant pathways. To present an uncluttered model, only within time correlations that were heterogeneous with T1 coefficients and significantly different from zero were included at T2, T3, or T4. T2, T3, and T4 correlations that could be constrained with a time point other than T1 have their value followed by the time period it was constrained to (ex. T3 means the correlation was homogeneous with the correlation value at T3). Any T2, T3, or T4 correlation coefficient not followed by a time period was heterogeneous with all other time periods' coefficients. All values reported are standardized.

<p align="center">Task and Ego in Sport Questionnaire (Duda, 1989)</p> <p>Directions: Please read the phrase in the box that beings "<u>I feel most successful in PE class when ...</u>" Then reach each of the following statements and indicate how much you personally agree with each statement by circling the response (i.e., from strongly disagree to strongly agree) that best expresses your feelings. There is no right or wrong answer. Please answer how you really feel.</p>	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
<i>I feel most successful in PE class when . . .</i>					
1) . . . I'm the only one who can do a skill.					
2) . . . I learn a new skill and it makes me want to practice more.					
3) . . . I can do better than other people.					
4) . . . Others can't do as well as me.					
5) . . . I learn something that is fun to do.					
6) . . . Others mess up and I don't.					
7) . . . I learn a new skill by trying hard.					
8) . . . I work really hard.					
9) . . . I score the most points, goals, etc.					
10) . . . Something I learn makes me want to practice more.					
11) . . . I'm the best.					
12) . . . A skill I learn really feels right.					
13) . . . I do my very best.					

<p style="text-align: center;"><i>Caring Climate Scale</i> <i>(Newton, Fry, et al, 2007)</i></p> <p>Directions: Read each statement and think about how much you believe the statement describes the environment in your Physical Education class. Then choose the answer that shows how much you agree or disagree with each statement.</p>	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
1) In, PE class, students are treated with respect.					
2) In PE class, the teacher respects the students.					
3) In PE class, the teacher is kind to the students.					
4) In PE class, the teacher cares about the students.					
5) In PE class, students feel that they are treated fairly.					
6) In PE class, the teacher tries to help students.					
7) In PE class, the teacher wants to get to know all the students.					
8) In PE class, the teacher listens to students.					
9) In PE class, students like one another for who they are.					
10) In PE class, the teacher accepts students for who they are.					
11) In PE class, students feel comfortable.					
12) In PE class, students feel safe.					
13) In PE class, students feel welcome every day.					

Perceived Motivational Climate in Exercise Questionnaire (Huddleston, Fry, and Brown, 2010)		Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
Directions: Reach each statement and think about how much you believe the statement describes the environment in your Physical Education class. Then choose the answer that shows how much you disagree or agree with each statement.						
1)	In PE, the teacher encourages us to try new exercises/skills.					
2)	In PE, students are hesitant/embarrassed to ask the teacher or other students for help.					
3)	In PE, the teacher gives most of his/her attention to only a few students (most fit, most popular, etc).					
4)	In PE, students of all fitness levels are made to feel valued.					
5)	In PE, the teacher praises students only when they do better than other students.					
6)	In PE, students feel embarrassed if they do not know how to use the equipment or perform the exercise/skill/drill/activity.					
7)	In PE, students feel good when they try their best.					
8)	In PE, all students feel welcome.					
9)	In PE, students help each other learn.					
10)	In PE, students are encouraged to do better than other students.					
11)	In PE, the teacher has his/her favorite students.					
12)	In PE, the teacher encourages students to improve on skills they are good at.					
13)	In PE, students feel successful when they improve.					
14)	In PE, only a few students (popular, most fit, etc) get praised.					
15)	In PE, trying hard is rewarded.					
16)	In PE, the teacher encourages students to help each other.					
17)	In PE, the teacher makes it clear who he/she thinks are the most fit and/or most skilled students.					

18)	In PE, students are excited when they do better than their classmates.					
19)	Only fit/skilled students participate in PE.					
20)	In PE, the teacher emphasizes always trying your best.					
21)	In PE, only a few students (popular, most fit, etc) get noticed by the teacher.					
22)	In PE, students are afraid to make mistakes.					
23)	In PE, students are encouraged to work on their weaknesses.					
24)	In PE, the teacher favors some students over others.					
25)	In PE, the focus is to keep improving on each exercise/skill/activity each class session.					
26)	In PE, students really "work together" as a team.					
27)	In PE, students help each other get better and excel.					

<i>Intrinsic Motivation Inventory</i> <i>(McAuley & Tammem, 1989)</i>		Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
Directions: Reach each statement and please indicate how true it is for you in this Physical Education class.						
<i>Perceived Competence Subscale</i>						
1)	I think I am pretty good at this activity.					
2)	I think I did pretty well at this activity, compared to other students.					
3)	After working at this activity for a while, I felt pretty competent.					
4)	I am satisfied with my performance at this task.					
5)	I was pretty skilled at this activity.					
6)	This was an activity that I couldn't do very well. (R)					
<i>Effort/Importance Subscale</i>						
1)	I put a lot of effort into this.					
2)	I didn't try very hard to do well at this activity. (R)					
3)	I tried very hard on this activity.					
4)	It was important to me to do well at this task.					
5)	I didn't put much energy into this. (R)					

<i>Sport Satisfaction Enjoyment Items (Duda & Nicholls, 1992)</i>	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
Directions: The statements below ask how you feel about your Physical Education class this semester. Please read each of the statements and circle the number on the 5-point scale listed below that shows how you feel.					
1) I usually find doing activities in my PE class interesting.					
2) I usually have fun doing activities in my PE class.					
3) I usually get involved when I am doing PE class activities.					
4) I usually enjoy playing my PE class activities.					
5) I usually find time flies when I am in PE class.					

<i>Ownership in Exercise (Moore & Fry, 2009)</i>	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
Directions: For each of the following, indicate the level at which you would disagree or agree with the statement as describing your experience in PE class.					
1) I feel my input, interests, or needs are considered by the teacher.					
2) I feel I have the freedom to adjust PE class activities to meet my personal goals and/or ability level.					
3) I feel my opinion matters to the teacher.					
4) The teacher gave me opportunities to modify movements/intensities.					
5) I experience a sense of ownership in this class.					

Empowerment in Exercise (Moore & Fry, 2009)		Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
Directions: For each of the following, please indicate the level to which you would disagree or agree with the statements relating to <u>how your experiences in PE CLASS HAVE AFFECTED YOUR VIEWPOINT TOWARDS EXERCISE/PHYSICAL ACTIVITY IN GENERAL.</u> Think of each statement as starting with:						
AS A RESULT OF PARTICIPATING IN PE CLASS ...						
1)	... my confidence to do physical activities/exercises on my own has increased.					
2)	... my knowledge of physical activity/exercise has increased.					
3)	... I now have a better understanding of the basic concepts (such as timing, movements, vocabulary) and principles for doing physical activity.					
4)	... my confidence in my ability to perform physical activity movements/skills has increased.					
5)	... my teacher's feedback helped to increase my confidence to perform physical activity movements/skills.					
6)	... I would now feel comfortable doing physical activity/exercise somewhere else if needed.					
7)	... I have a better understanding of how to exercise.					
8)	... I have a better understanding of how to be physically active.					
9)	... I believe I can have a positive effect on my general physical health (e.g., blood pressure, decreased aches and pains, improved weight).					
10)	... I believe I can have a positive effect on my physical appearance (such as increased definition, improved posture, muscle gain, weight loss).					
11)	... I believe I can have a positive effect on my physical capabilities (such as strength, endurance, agility, flexibility, balance).					
12)	... I believe I can have a positive effect on my mental health (such as attitude, mood, productivity, clear thinking, confidence).					
13)	... I am not afraid to walk into other fitness facilities/environments to exercise/complete physical activity.					

Exercise Self-Regulation Questionnaire (SRQ-E) Ryan & Connell, 1989		Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
There are a variety of reasons why people work out. Please indicate how much each of these reasons describes why you do physical activity outside of PE class.						
1	I do physical activity, because I simply enjoy physical activity.					
2	I do physical activity, because it is important and beneficial for my health and lifestyle.					
3	I do physical activity, because I would feel bad about myself if I didn't do it.					
4	I do physical activity, because it is fun and interesting.					
5	I do physical activity, because others like me better when I am in shape/fit.					
6	I do physical activity, because I'd be afraid of falling too far out of shape.					
7	I do physical activity, because it helps my image.					
8	I do physical activity, because it is personally important to be to be physically active.					
9	I do physical activity, because I feel pressured to do so.					
10	I do physical activity, because I have a strong value for being active and healthy.					
11	I do physical activity for the pleasure of discovering and mastering new training techniques/skills.					
12	I do physical activity, because I want others to see me as physically fit.					
13	I used to have good reasons for doing physical activity, but now I am asking myself if I should continue being physically active.					
14	It is not clear to me anymore why I do physical activity; I don't really think physical activity is my thing.					
15	I'm not sure what I still do physical activity, I don't seem to be going anywhere in it.					

Autonomy Supportive Climate Questionnaire (Short version) Adapted for PE Baard, P. P., Deci, E. L., & Ryan, R. M. (2000). Intrinsic need satisfaction as a motivational basis of performance and well-being at work. Unpublished manuscript, Fordham University.		Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
1	I feel like I can make a lot of suggestions on how my PE class activities are done.					
2	I feel pressured in this PE class.					
3	I am free to express my ideas and opinions in this PE class.					
4	When I am in PE class, I have to do what I am told. (Mary should it read, do only what I am told?)					
5	My feelings are taken into consideration in this PE class.					
6	I feel like I can pretty much be myself in this PE class.					