Investigating Middle School Students' Physical Education Emotions, Emotional Antecedents, Self-Esteem, and Intentions for Physical Activity

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Purpose: Grounded in Control-Value Theory, this study aimed to investigate the relationships between emotional antecedents (control-value beliefs) and emotions with students' perceived self-esteem and physical activity intention. In addition, the potential differences in antecedents, emotions, and outcomes by gender were explored. ***Method:*** Multivariate analysis of variance and multiple hierarchical regressions were used to explore self-reported responses from middle school students ($N = 247$; 51% male, 49% female). ***Results:*** Preliminary analysis showed males reporting higher levels of intrinsic value, enjoyment, and self-esteem, while females reported more boredom and shame in PE. Control beliefs and intrinsic value were maintained as positive significant predictors ($p < .05$) of self-esteem and physical activity intention. Emotions of boredom and shame were significant predictors above any positive reported emotions for negatively impacting self-esteem and physical activity intention. ***Discussion/Conclusion:*** Emotions and their antecedents need consideration for understanding student motivation, particularly for female students who are more vulnerable to negative PE experiences.

Keywords: control beliefs, intrinsic value, shame, boredom

Historically, investigating student motivation in physical education (PE) has been an essential paradigm for understanding the student experience, particularly because motivation helps explain student engagement (Garn et al., 2017), learning (Chen et al., 2013), and intention for physical activity (PA) in and out of PE class (Standage et al., 2003). The concept of motivation is multifaceted. As defined by Linnenbrink and Pintrich (2002), motivation is made up of the energy one puts forth and the direction in which one pursues their goal-related activities. Motivation also helps explain how one may initiate and sustain actions toward those goals. Primary characteristics that explain motivation include cognition, agency, efficacy, environmental perspectives (i.e., appraisals of context), and emotion (Baumeister, 2016). It is clear that motivation is complex and while the debate about which characteristics may influence motivation to a greater degree, it appears each of these components work together in reciprocal ways (Reeve, 2016). One relationship in particular that has garnered a lot of attention in recent years within general education settings (Linnenbrink-Garcia et al., 2016; Pekrun, 2006; Shuman & Scherer, 2015) and specifically within PE (Fierro-Suero et al., 2023; Ladwig et al., 2018; Mouratidis et al., 2009; Simonton & Garn, 2019) is that of emotions role in student motivation.

Student emotions are defined as multifaceted personal constructs that result from control-value beliefs and influence ones' cognitive, psychological, physiological, motivational, and expressive actions for the task/activity (Pekrun, 2006; Shuman & Scherer, 2015). Understanding student emotions can be advantageous for several reasons including they help students interpret and explain how they are feeling in achievement situations, they are comprehensive in nature (i.e., involve cognitive, physical, psychological processes), and they are task/domain specific (Pekrun, 2006). In

addition, there is reason to believe that emotions may dictate one's motivated behavior (Shuman & Scherer, 2015). For example, even if a student has the necessary skills to perform a task and the knowledge of why being active is helpful to their health, they may still resist being active as they find it boring (Simonton & Garn, 2019). In PE, teachers target and incentivize achievement in learning physical skills and knowledge of games, activities, and fitness, but there is also great emphasis placed on development of positive attitudes, beliefs, and motivations for lifetime activity (Society of Health and Physical Educators [SHAPE] America, 2014). In summary, the motivational concepts that impact and explain achievement in these areas is highly related to the emotional connection students have, or develop, regarding the tasks and learning environment. Simonton and Garn (2019) presented the relationship between motivation and emotion by presenting key questions that represent the core of motivation by asking, "can I do it?" and "why do I want to do it?" and emotion with "how will I feel about it?" (p. 435). These examples provide details into the cognitive, psychological, and physiological processes (i.e., arousal and activation) that coordinate one's actions. Thus, it is crucial to understand the emotional experience of students to understand their motivation.

Emotions are also particularly helpful for measuring and assisting our understanding of motivation as they are inextricably experienced in all learning endeavors (Linnenbrink-Garcia et al., 2016). They represent a tangible and explainable marker to each individual connecting how they feel to what they experienced. This is advantageous in educational settings like PE because emotions are class, task/activity, and achievement specific. In other words, understanding emotions provides a window of information on motivation directed toward, specific tasks and experiences. For PE achievement, for the emphasis placed on volitional PA in and out of PE, this construct is likely to provide more nuanced and detailed motivational feedback to teachers and students

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themselves. However, limited research on these relationships in explaining the connection between emotion and behavior in PE exists. Using the control-value theory of achievement emotions (CVTAEs; Pekrun, 2006), this study aimed to investigate the relationships between emotional antecedents (control-value beliefs) and emotions on two integral PE outcomes suggested as pillars of a quality PE experience, including students perceived self-esteem and intention for PA (Society of Health and Physical Educators [SHAPE] America, 2014). In addition, potential differences in emotional antecedents, emotions, and outcomes were explored to aid in understanding motivation differences between male and female students in PE.

Control-Value Theory of Student Emotions

The CVTAE provides an emotion centric framework that highlights the importance of student emotions in relation to achievement motivation. Specifically, student emotions are placed as the central tenant mediating the relationship between learning experiences/environments with outcomes/beliefs/actions (Pekrun, 2006). The major pillars of the theory include environmental/instructional perceptions which proximally influence emotional antecedents, which lead to discrete emotional experiences. Based on the theory, emotions then become proximal predictors of student outcomes ranging from educational achievement to behaviors and actions related to the learning experience. This causal relationship is important to consider as traditional motivational thought in education settings often considers the environment or the cognitive processes alone as direct predictors of outcomes, whereas CVTAE positions the internal emotional side of student learning as the mediator of those relationships (Pekrun, 2017). Although environmental and instructional discrepancies are important to consider and have been evaluated in previous PE literature (Fierro-Suero et al., 2023; Simonton, Garn, & Washburn, 2022), the focus of this study was to investigate emotional antecedents and emotions' influence on outcomes (self-esteem; PA intention), which has received limited research. This is essential for understanding student motivation in PE as the emotional antecedents not only shape motivational tendencies via emotion, but also are likely mechanisms for intervention that can be targeted during the teaching and learning processes.

Emotional Antecedents

As alluded to in the name of the framework, student control and value beliefs represent the key emotional antecedent markers that help explain the diversity in emotional experience and the varying degree one can learn and find meaning in their learning experiences. Control beliefs, which are closely related to perceived competence and self-efficacy, are explained as the personal or external agency one has over their capabilities (Pekrun, 2006). Specifically, control beliefs represent students' belief in having control over their ability to succeed and their ability to overcome failure. Low control beliefs can represent a student who feels less competent and their ability to succeed is out of their control due to external circumstances (Parker et al., 2016). Control beliefs have been identified consistently as predictors of student emotion (Pekrun, 2017) and have shown positive relationships with health and PA-related behaviors (Chipperfield et al., 2017). In general education settings, control belief improvements and/or interventions show that appraisals of control can be successfully improved through specific instructional strategies (i.e., appraisal retraining

techniques) and is most effective for students at high risk with low perceived control, motivation, and avoidance orientations (Parker et al., 2016). In PA settings, previous research has shown that control beliefs can change over a short instructional session for improvement, and these changes were strongly linked to improved student motivation in college female students (Simonton et al., 2021).

Within CVTAE, value beliefs are considered the student appraisals of the subjective importance and interest one has, which is parceled into intrinsic and extrinsic value (Pekrun, 2006). Intrinsic value is defined as one's interest in the activity/topic regardless of reward, outcome, or external recognition. On the other hand, extrinsic value is defined as importance placed on activities/tasks that have instrumental use, reward, or external recognition from others (Frenzel et al., 2007). Value is seen as the moderating appraisal meaning, in conjunction with control, it can determine the valence and magnitude of the resulting emotion. For example, high control and low value beliefs can often lead to anger whereas high value will lead to perceived enjoyment. Pekrun (2006) suggests that when exploring student emotions, it is essential to explore these antecedents as it provides key information on student ability and perceived relevance for learning. However, in settings like PE, this has not readily been explored especially in relation to the student emotions themselves (Simonton & Garn, 2019).

Student Emotions

Within CVTAE, there is a taxonomy of discrete emotions explained by their valance (positive and negative), physiological arousal (activating and deactivating), and object foci (inactivity or outcome related). The spectrum of emotions that are explained by the varying degrees of these characteristics are linked to specific behaviors and outcomes called action tendencies (Fredrickson, 2001). Emotions are more nuanced and task specific than similar constructs, such as affect or mood (Pekrun, 2006). Thus, they are advantageous when exploring motivation of students as they are helpful in understanding learning and achievement in PE. In addition, although a spectrum exists, this study focused on two positive and two negative emotions that vary in their physiological arousal and object foci.

For positive emotions, student PE enjoyment and relief were targeted. Enjoyment is considered a positive, in-activity, and high arousal emotion linked to intrinsic motivation (Deci & Ryan, 2002). Enjoyment has received the most attention in the PE student literature and has been linked to increased motivation, skillfulness, and higher PA-related behaviors (Yli-Piipari et al., 2013). Student relief has received considerably less attention in the literature. Relief is also considered positive but is a deactivating emotion that is outcome related. Students typically feel relief when they feel a low sense of control and anticipate failure but often experience unintended achievement or baseline achievement as determined by the instructor (Pekrun, 2006). When students focus on this reprieve, they often experience maladaptive and avoidance levels of motivation. Thus, although considered a positive emotion, relief may actually impact long term behaviors in a negative way, including things like lifetime PA (Simonton et al., 2021).

Boredom and shame were the targeted negative emotions in this study. Boredom is considered low activation and in-activity focused with strong connections to amotivation (Deci & Ryan, 2002). Students who experience boredom are typically over/under-challenged, do not find meaning in the content, and/or become tired

of monotonous teaching strategies (Daschmann et al., 2014). Shame is considered an outcome-related emotion that results from feeling less control, and fear of failure, followed by lack of achievement (Pekrun, 2006). Shame in PE has become more concerning given data that shows students are fearful of being put on display in front of others (Phillips et al., 2021) and that while students appear engaged in PE, they develop deep rooted negative feelings and attitudes toward PE/PA (Simonton, Garn, & Washburn, 2022). The intensity of these emotions and the vulnerability of the population being studied warrant consideration to curb the potential maladaptive outcomes as it relates to students in PE.

PE Outcomes: Self-Esteem and PA Intention

As previously mentioned, agreed upon PE outcomes of great importance include student learning and achievement in skills, knowledge, motivation, and affect for lifetime activities. However, the affective outcomes of PE are often overlooked or are considered superfluous compared with physical and cognitive goals (Mercier et al., 2017; Mouratidis et al., 2009). In addition, explaining the translation of PE experiences to lifetime activities is still an area of limited understanding but significant importance. Therefore, investigators focused on investigating two outcomes that are viewed as subcomponents of these bigger picture outcomes including student self-esteem and intention for PA outside of PE.

Self-esteem is conceptualized as the overall positive feelings one has about themselves and is considered a top component of one's perceived physical self-concept (Marsh et al., 2010). In addition, self-esteem is considered an essential element of one's psychological well-being (Garn et al., 2012). The importance of self-esteem in settings like PE is quite clear as students' esteem is linked to the physical and affective sides of their PE experiences. Of note, students middle school years represent a particularly vulnerable time in one's personal and social development (Jackson & Cunningham, 2015). This is important because one's self-esteem is linked to multiple aspects of one's identity (Marsh et al., 2010) and the different types of motivation one may have toward many things (Deci & Ryan, 2002), including PE. Garn et al. (2012) found that high school students' self-esteem was highly related to their PE experience including the quality of the instruction and the degree to which their basic needs were met. However, it stands to reason that self-esteem is highly related to one's emotional state, yet this important relationship has not been explored in the PE literature to date.

The intention for PA outside of school was included as it is considered one of the most important outcomes of a quality PE experience (Society of Health and Physical Educators [SHAPE] America, 2014), yet is still not completely understood and has not reached the levels PE specialists intended given national trends. One's intention for PA is considered to be a strong indicator for one's actions (Hagger et al., 2003) and for autonomous motivation for activity (Deci & Ryan, 2002). Recent evidence suggests that student emotions may be a predictor of intention for PA and self-reported PA (Fierro-Suero et al., 2023; Simonton & Garn, 2020; Simonton, Garn, & Washburn, 2022). In recent work by Fierro-Suero et al. (2023), specific emotions like pride, enjoyment, and hopelessness were major predictors of PA intention, with different emotions impacting academic achievement. Thus, while achievement and activity are related in PE, there are clear perceived emotional differences reported by students. Emotions may help explain what activities/behaviors transfer from PE to volitional PA.

Another important note to this previous study was the significant differences found in male versus female students regarding their reported emotions and its influence on their PA intention (Fierro-Suero et al., 2023; Simonton, Garn, & Washburn, 2022). Results showed increased discrete negative emotions and less value reported by female students. This is an important finding and aligns with previous research that shows gender-related beliefs can decrease female students' sense of competence (Belcher et al., 2003), their motivation (Bryan & Solmon, 2012), and their attitudes toward PA behaviors (Mercier et al., 2023). Recent research found gender differences in emotions and resulting outcomes between male and female students in high school and college-aged individuals (Simonton & Garn, 2020, 2022). However, emotional differences by gender at the middle school level have received little attention but are potentially a very formidable and vulnerable time in one's development. Potential emotional differences between genders may not be surprising given the historical evidence of gender bias, hegemonic masculinity, and gender-specific curriculum seen in K–12 PE (Chen & Curtner-Smith, 2013). Therefore, collecting information on potential underlying differences that males and females may feel emotionally and in their appraisal of the PE environment is vital to understand their motivation and likely impacts their self-perceptions like esteem and PA behaviors (short and long term). Thus, in addition to exploring emotions relation with this important PE-related outcome, it seems short sided to not test or account for the reported differences in gender as well.

Purpose

Overall, emotions have been identified as essential in explaining student motivation, but overall, have received limited attention in PE. In addition, the importance of emotional antecedents and the impact they have on emotions and self-esteem, and PA intention has received little attention. However, emotional antecedents are central to understanding students' learning experience and provide an essential psychological construct for learning interventions. Therefore, grounded in CVTAE, the purpose of this study was to investigate the relationships between emotional antecedents (control-value beliefs) and emotions on students, perceived self-esteem, and intention for PA. In addition, based on previous literature, the potential differences in antecedents, emotions, and self-esteem and PA intention by gender were explored to account for any differences in final analysis. The following research questions (RQs) guided this study:

RQ1: To what extent do student emotions, emotional antecedents, self-esteem, and PA intention differ by gender and grade.

RQ2: To what extent are student emotional antecedents related to their self-esteem and PA intention.

RQ3: To what extent do student emotional antecedents and emotions relate to their self-esteem and PA intention

Methods

Participants and Setting

Participants for this study were sixth to eighth middle school students ($N = 247$; 51% male, 49% female; $M_{age} = 12.31$, $SD = 0.94$) taking compulsory PE courses from three schools in a large suburban community in the Southeast United States (sixth =

34%; seventh = 38%; eighth = 28%). Students self-reported as 34% Black/African American, 34% White, 16% Hispanic/Latinx, 7% American Indian/Native Pacific Islander, 7% multiracial, and 2% as other. All students were taught by certified PE teachers who had access to large gyms and outdoor spaces. Classes met on alternating days for 40–50 min, and all students are required a minimum of one semester of PE for each grade level.

Procedure

Following permission to conduct the study from the institutional review board from each researcher's university, the researchers recruited prospective school districts and PE teachers to assist with the study via email. Following their approval, researchers visited each school in person to recruit students and explain the purpose of the study during PE class time. Students were given 1 week to return their parental consent form at which time the researchers came back to the school to administer the survey to those who had received consent. For those participating, they were reminded of the purpose of the study, that all participants would remain anonymous, there were no incorrect answers, and that they could stop without penalty at any time. PE teachers were asked to leave the space during this time as to not potentially bias or influence student responses. The survey took approximately 10 min to complete.

Measures

Demographics

Students were asked and given the option to share their age, gender, grade level, and ethnic background.

Control Beliefs

In alignment with CVTAE, the academic control scale (Perry et al., 2001) was adapted to explore students' control beliefs for PE specifically (which has been found to be valid and reliable in previous studies (Simonton et al., 2021). Eight items are used to measure perceived control using a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Example items included, "I have a great deal of control over my performance in PE class," "When I do poorly in PE, it's because I haven't given my best effort" (Cronbach's α = .714).

Value Beliefs

Two forms of value were measured, including intrinsic and extrinsic value, using the CVTAE scale for value beliefs (Frenzel et al., 2007). The scale includes five items for intrinsic value and five items for extrinsic value. The scale was adapted specifically to address perceptions to PE value, which has been previously validated (Simonton, Washburn, et al., 2022). Examples for intrinsic value included, "Physical Education is important to me, irrespective of the grade I get" and "Physical Education is my favorite subject." Extrinsic value examples included, "It is very important to me to get good grades in Physical Education courses" and "I am only satisfied if I do well in Physical Education class." Each item was measured on a 5-poing Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) (intrinsic value Cronbach's α = .826; extrinsic value Cronbach's α = .856).

Student PE Emotions

To measure student emotion, four discrete emotion subcomponents from the Discrete Emotions in Physical Education Scale (Simonton et al., 2021) were used including enjoyment, boredom, relief, and shame. Each of the four emotions measured consisted of four items. An example item for enjoyment was, "I enjoy being in PE," for boredom, "I get bored in PE," for relief "After PE class I feel relieved" and for shame, "I am ashamed of my skills in PE." All items were measured on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) (Cronbach's α enjoyment = .875; boredom = .883; shame = .908; relief = .770).

Self-Esteem

The global self-esteem subcomponent from the short version of the Physical Self-Description Questionnaire (Marsh et al., 2010) was used to measure student self-esteem. The scale consists of five declarative statements measured on a 6-point Likert scale, including "Most things I do, I do well." This measure has been previously validated with adolescent PE students (Garn et al., 2012; Cronbach's α = .752).

PA Intention

The items targeting intentions for engaging in leisure PA were adapted from Hagger et al. (2003). Each question began with prompts including I intend, plan, and am determined to, and ended with "to be physically active/play games sports at least three times during the next two weeks." Each item was measured on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) (Cronbach's α = .871).

Data Analysis

All data were initially screened for potential outliers and missing data. Only surveys with a 90% completion rate or better were kept for final analysis. Descriptive statistics, internal consistency estimates, mean scores, and bivariate correlations were analyzed using SPSS (version 27). Following acceptable reliability estimates, all multiitem variables were combined to create composite mean scores. The initial preliminary analysis included a series of multivariate analysis of variance tests to explore potential differences by gender and grade level for their reported control-value beliefs, four emotions, and outcomes (self-esteem and PA intention). A Bonferroni adjustment was conducted in all analysis to account for Type I error and potentially inflated reliability results given the conceptually similar constructs and sample size (Mertler & Reinhart, 2017). Any significant interactions prompted post hoc analysis of variance to identify where differences were occurring (Tabachnick & Fidell, 2014). Last, grade and gender were included as potential covariates in the final regression analyses for those found to be significant.

In the primary analysis, hierarchical regression was utilized to test theorized relationships with emotional antecedents and emotions on student self-esteem and PA intentions. Two multiple regression models were tested, one for each outcome, which is recommended given the complexity of the model relationships and sample size (Raudenbush & Bryk, 2002). Following theoretical recommendations within CVTAE, control-value beliefs (emotional antecedents) were entered into each model first followed by the four emotion variables. The hierarchical regression model provides a holistic model testing the potential influence of both emotional antecedents and emotions on each outcome. The predictive relationships and contributing variance in Step 1 can be analyzed and then compared alongside the relationships and variance in Step 2 to help explain the factors impacting the outcome most. These models

generate two results including the (a) statistical results for the multilevel model and (b) the significant pathway relationships (Tabachnick & Fidell, 2014). Each model was analyzed by their results f-test statistics, unstandardized and standardized coefficients (β) based on p values ($<.05$) and effect size by explained variance (R^2) and change in explained variance (ΔR^2) from Steps 1 to 2.

Results

Preliminary Results

Demographic and descriptive analysis was first calculated with success as no major outliers or missing data was identified. All variables met acceptable reliability scores ($\alpha > .70$) and all mean scores were in the expected ranges (Table 1). Students reported moderately high control, value, enjoyment, self-esteem, and PA intention scores relative to their respective scales. They also reported nearly moderate boredom, shame, and above the halfway scale point for relief.

The three multivariate analysis of variance analysis evaluating potential differences in gender and grade level for the variables identified several statistical relationship differences (see Table 2 for means by gender and grade). Before exploring the differences, each model met the assumptions of analysis showing nonsignificant Box's M test of equality of covariance ($p > .05$) and no multicollinearity with intercorrelations less than .80 (Stevens, 2002). Results for the emotional antecedent model revealed significant differences by gender, Wilk's $\Lambda = .871$, $F(3, 220) = 6.524$, $p < .001$, $\eta_p^2 = .13$. Post hoc analysis showed that males reported statistically higher intrinsic value, $F(1, 220) = 19.760$, $p < .001$, $\eta_p^2 = .08$, than female students. Similarly, gender differences were identified in the emotion model, Wilk's $\Lambda = .842$, $F(4, 228) = 10.689$, $p < .001$, $\eta_p^2 = .16$, and outcome variable model, Wilk's $\Lambda = .940$, $F(2, 231) = 7.323$, $p < .001$, $\eta_p^2 = .06$. Specifically, males reported higher mean scores for PE enjoyment, $F(1, 228) = 37.136$, $p < .001$, $\eta_p^2 = .14$, and self-esteem, $F(1, 231) = 14.710$, $p < .001$, $\eta_p^2 = .06$, whereas female students reported higher perceived PE boredom, $F(1, 228) = 19.591$, $p < .001$, $\eta_p^2 = .08$, and shame, $F(1, 228) = 21.950$, $p < .001$,

$\eta_p^2 = .09$. Only one statistical difference was identified by grade, which was found in the outcome multivariate analysis of variance model, Wilk's $\Lambda = .914$, $F(6, 440) = 2.030$, $p = .029$, $\eta_p^2 = .04$. Interestingly, intention for PA was statistically higher for seventh and eighth students, $F(2, 224) = 2.709$, $p = .05$, $\eta_p^2 = .03$, as compared with sixth-grade students. No significant grade by gender interactions were found.

Primary Results

Two hierarchical regression analyses were tested for each outcome of interest including students' perceived self-esteem and intention for PA outside of school. For each regression model, the control-value beliefs (emotional antecedents) were included as predictors in Step 1, and all four emotions were included in Step 2. See Table 3, for findings.

The first model predicting self-esteem showed several significant predictors including control ($\beta = 0.252$) and intrinsic value ($\beta = 0.283$) in Step 1 as positively associated with self-esteem. Next in Step 2, intrinsic value was no longer a significant predictor, but control beliefs ($\beta = 0.179$) remained a significant positive predictor. In addition to the emotional antecedents, two emotions also met acceptable level including boredom ($\beta = -0.146$) and shame ($\beta = -0.407$) as negative predictors of self-esteem. In comparing Steps 1 and 2, the change in the amount of variance statistically improved when adding emotions from approximately 25% to 45%.

In the second regression model, predicting PA intention all three emotional antecedents were significantly related to the outcome, including control ($\beta = 0.210$), intrinsic value ($\beta = 0.304$), and extrinsic value ($\beta = 0.179$). In addition, all three emotional antecedents maintained a significant relationship in Step 2 of the model. Of note, only one emotion, shame, was found to be significantly related to PA intention ($\beta = -0.154$), suggesting that the more shame experienced in PE, the less intentions there were for students to engage in PE outside of school. Overall, the amount of variance accounted for Step 1 (31%) to Step 2 (34%) did not significantly change but were statistically significant for the model overall.

Table 1 Descriptive Statistics, Correlations Estimates, and Cronbach Alpha Coefficients

	Variable	1	2	3	4	5	6	7	8	9
1	CON	1								
2	IVAL	.481**	1							
3	EVAL	.438**	.496**	1						
4	ENJ	.441**	.737**	.418**	1					
5	BOR	.348**	−.556**	−.319**	−.674**	1				
6	SHA	−.246**	.460**	.157*	−.472**	.598**	1			
7	REL	.084	−.052	.107	−.154*	.264**	.237**	1		
8	SES	.422**	.445**	.333**	.452**	−.497**	−.575**	−.111	1	
9	INT	.429**	.478**	.421**	.420**	−.329**	.340**	−.052	−.470**	1
	M	3.75	3.53	3.61	3.72	2.43	2.29	3.05	4.53	4.68
	SD	0.78	0.89	0.93	0.96	1.03	1.10	0.89	1.07	1.84
	Scale	1–5	1–5	1–5	1–5	1–5	1–5	1–5	1–6	1–7
	α	.714	.826	.856	.875	.883	.908	.770	.752	.871

Note. CON = control beliefs; IVAL = intrinsic value; EVAL = extrinsic value; ENJ = enjoyment; BOR = boredom; SHA = shame; REL = relief; SES = global self-esteem; INT = physical activity intention; α = Cronbach alpha estimates of internal consistency.
*$p < .01$. **$p < .001$.

Table 2 Overall Grade-Level Means for Male and Females on PA Attitudes, PE, Attitudes, and PA Intentions and Behaviors

	CON	IVAL	EVAL	ENJ	BOR	SHA	REL	SES	INT
All	3.75 (0.78)	3.53 (0.89)	3.61 (0.93)	3.72 (0.96)	2.43 (1.03)	2.29 (1.10)	3.05 (0.89)	4.53 (1.07)	4.68 (1.84)
Sixth	3.80 (0.75)	3.64 (0.81)	3.67 (0.90)	3.82 (0.89)	2.37 (1.07)	2.30 (1.10)	3.15 (0.86)	4.53 (0.99)	4.32 (1.88)[a]
Seventh	3.72 (0.83)	3.57 (0.98)	3.57 (1.01)	3.73 (0.99)	2.49 (1.04)	2.20 (1.03)	2.99 (0.92)	4.48 (1.05)	4.96 (1.71)
Eighth	3.74 (0.75)	3.36 (0.83)	3.57 (0.88)	3.60 (0.96)	2.43 (0.97)	2.38 (1.15)	3.01 (0.90)	4.58 (1.18)	4.73 (1.91)
Males	3.83 (0.79)	3.79 (0.78)[b]	3.63 (0.92)	4.07 (0.83)[b]	2.13 (0.93)	1.94 (0.94)	2.94 (0.95)	4.78 (0.94)[b]	4.91 (1.90)
Sixth	3.86 (0.75)	3.77 (0.76)	3.48 (0.95)	4.14 (0.79)	2.09 (0.92)	2.07 (1.06)	3.07 (0.89)	4.80 (0.77)	4.46 (1.90)
Seventh	3.82 (0.88)	3.90 (0.83)	3.74 (0.93)	4.11 (0.81)	2.17 (0.99)	1.81 (0.79)	2.85 (0.99)	4.81 (0.83)	5.31 (1.69)
Eighth	3.84 (0.62)	3.61 (0.75)	3.67 (0.78)	3.94 (0.84)	2.16 (0.87)	2.04 (1.04)	2.90 (0.92)	4.82 (1.21)	5.05 (1.99)
Females	3.68 (0.75)	3.26 (0.91)	3.57 (0.95)	3.37 (0.95)	2.72 (1.03)[b]	2.64 (1.13)[b]	3.14 (0.83)	4.26 (1.13)	4.43 (1.75)
Sixth	3.68 (0.77)	3.51 (0.86)	3.82 (0.83)	3.51 (0.84)	2.67 (1.12)	2.57 (1.14)	3.14 (0.83)	4.26 (1.17)	4.14 (1.92)
Seventh	3.62 (0.79)	3.12 (1.01)	3.34 (1.10)	3.28 (0.98)	2.82 (0.96)	2.63 (1.10)	3.13 (0.79)	4.03 (1.14)	4.54 (1.62)
Eighth	3.70 (0.75)	3.15 (0.86)	3.55 (0.88)	3.30 (1.01)	2.63 (0.99)	2.65 (1.15)	3.12 (0.89)	4.40 (1.12)	4.62 (1.74)

Note. CON = control beliefs; IVAL = intrinsic value; EVAL = extrinsic value; ENJ = enjoyment; BOR = boredom; SHA = shame; REL = relief; SES = global self-esteem; INT = physical activity intention; PA = physical activity; PE = physical education.
[a]Significant differences by grade. [b]Significant differences by gender.

Table 3 Summary of Hierarchical Regression Models to Each of the Three Outcome Variables

Predictor	b (SE)	β	t	p	R^2	ΔR^2	F
SES							
Step 1					.253	n/a	24.788**
CON	0.360 (0.097)	0.252	3.707	<.001			
IVAL	0.346 (0.087)	0.283	3.962	<.011			
EVAL	0.088 (0.081)	0.076	1.084	.275			
Step 2					.452	.199**	25.355**
CON	0.262 (0.085)	0.184	3.079	.002			
IVAL	0.003 (0.099)	0.002	.029	.997			
EVAL	0.123 (0.071)	0.106	1.727	.086			
ENJ	0.060 (0.101)	0.051	.588	.557			
BOR	−0.160 (0.083)	−0.146	−1.933	.050			
SHA	−0.406 (0.065)	−0.407	−6.299	<.001			
REL	−0.013 (0.067)	−0.011	−.196	.845			
PA.INT							
Step 1					.313	n/a	33.092**
CON	0.507 (0.158)	0.210	3.209	<.001			
IVAL	0.630 (0.142)	0.304	4.430	.008			
EVAL	0.353 (0.132)	0.179	2.683	.002			
Step 2					.335	.022	15.395**
CON	0.477 (0.159)	0.197	2.995	.003			
IVAL	0.453 (0.186)	0.218	2.435	.016			
EVAL	0.400 (0.134)	0.202	2.990	.003			
ENJ	0.115 (0.191)	0.057	.602	.548			
BOR	−0.119 (0.155)	0.064	−.764	.446			
SHA	−0.262 (0.121)	−0.154	−2.165	.031			
REL	−0.106 (0.125)	0.050	−.850	.396			

Note. CON = control beliefs; IVAL = intrinsic value; EVAL = extrinsic value; ENJ = enjoyment; BOR = boredom; SHA = shame; REL = relief; SES = global self-esteem; PA.INT = self-reported physical activity intentions; b (SE) = unstandardized regression coefficient and standard error; β = Standardized regression coefficient; t = t score; R^2 = variance accounted for; ΔR^2 = change in variance accounted for.
**$p < .001$.

Discussion

The purpose of this study was guided by the CVTAE to investigate the relationships between emotional antecedents (control-value beliefs) and emotions on two integral PE outcomes, including student's perceived self-esteem and intention for PA. In addition, preliminary analysis tested the potential differences in emotional antecedents, emotions, and outcomes by gender and grade. In the primary analysis, researchers investigated the hierarchical relationships between control-value beliefs (emotional antecedents) and four discrete student PE emotions (enjoyment, boredom, shame, and relief) on perceived self-esteem and PA intention. Overall, findings identified several gender differences in emotional antecedents, emotions, and in PA intention (none for self-esteem). These findings highlight that many male and female middle school students are likely experiencing PE differently from a learning and motivational lens. In addition, other key findings showed that both emotional antecedents and specific negative emotions may be impacting middle school students' self-esteem and PA intention.

First, in exploring differences in emotional antecedents and emotions it was clear that female students reported lower perceived value for PE, and they often struggled with more severe negative emotions in PE compared with male students. These findings align with previous work showing that female students continue to report lower levels of PE motivation, increased levels of amotivation, and reduced attitudes toward PE and PA from middle school into high school (Bryan & Solmon, 2012; Mercier et al., 2017). In this study, female students reported higher levels of boredom, which is often associated with amotivation, or a decrease of motivation (Deci & Ryan, 2002). This typically results from students finding little interest in tasks, tasks that are too easy/difficult, and/or participating in content that is not perceived as relevant (Daschmann et al., 2014). Also, this aligns closely with findings on perceived intrinsic value differences between males versus females which shows females are not identifying their PE experience as particularly valuable (Bryan & Solmon, 2012; Simonton & Garn, 2020). Reasons reported for reduced PE value for females includes irrelevant or male-specific content offered in PE, homogenic masculinity in how PE is taught and delivered, and less opportunity for female success/leadership within PE environments (Chen & Curtner-Smith, 2013).

Females also reported more shame than their male counterparts. Shame is often the result of wanting to achieve success but experiencing repeated bouts of failure and being put on display in front of others (Pekrun, 2006; Phillips et al., 2021). Overall, shame has received less attention in the student PE literature (Hogue et al., 2019; Simonton & Garn, 2020); however, its ramifications on student experiences can be quite severe. For example, while shame has been identified in predicting student engagement (i.e., I want/am willing to do what is asked of me; Simonton, Washburn, et al., 2022), shame also has been found to significantly increase sedentary time and reduce moderate to vigorous PA outside of school (Simonton & Garn, 2020). Interestingly, students experiencing shame are more difficult to spot in class as they go through the motions requested by the teachers, but the internal battle felt by these students during PE time has consequences on the translation of PE to lifetime activity.

In opposition, it is clear to see strong relationships between intrinsic value of PE, enjoyment, and positive self-esteem as reported by male middle school students. Enjoyment in isolation has repeatedly been shown to be related to intrinsic motivation, mastery goals/learning, and engagement (Deci & Ryan, 2002; Simonton, Washburn, et al., 2022; Yli-Piipari et al., 2013). In alignment with CVTAE, students who find value in PE experiences for the experience itself (regardless of reward or grade) enjoy their experience. It appears boys likely feel more optimal levels of challenge which prompt enjoyment and feel high bouts of self-esteem likely resulting from internal success and achievement. Mastery climate (Yli-Piipari et al., 2013) and caring climate (Gano-Overway, 2013) literature can be drawn up to identify techniques that prompt enjoyment in all students. This includes self-paced and initiated challenges, goals, learning progressions, and teachers engaging in one-on-one relationship building in which they display concern and appreciation for student needs. While enjoyment in PE is critical, it appears that other negative emotions and antecedents need strong considerations as well. As recommended by Fierro-Suero et al. (2020) and Simonton et al. (2017), it is imperative that researchers and teachers explore a wider range of emotions, beyond just enjoyment, to capture the spectrum of student experiences and to understand the nuance of motivational tendencies felt by male versus female students. This includes both in research and in practical investigation.

Emotional antecedents played an equal or more significant role in predicting both self-esteem and intention for PA in these students. This is novel to the current line of research which often does not consider emotional antecedents. However, Pekrun (2006, 2017) have alluded to the importance of not simply understanding students' emotions but to also recognize the simultaneous importance of their antecedents. The two major reasons for this are, (a) emotional antecedents are the interception point in which intervention and teaching strategies can be targeted to shape subsequent emotions and (b) emotional antecedents are embedded within emotions and can work reciprocally with emotions. For example, increasing the value of content can increase the enjoyment or pride in learning it and in opposition, having fun or feeling prideful when learning content can increase one's sense of value of it. In a recent study on emotions and emotional antecedents, college students were asked to retrospectively report these perceptions from their high school PE experience (Simonton, Washburn, et al., 2022). Results showed that control and intrinsic value beliefs were strong indirect predictors of lifetime PA attitudes, self-concept, and current MVPA. Thus, it appears these emotional antecedents are likely impactful from middle school all the way through college age students. This is important as this timeline of development has shown the sharpest declines in positive views of PE/PA and increases in sedentary time and negative attitudes toward PE/PA (Mercier et al., 2017). Targeting strategies in PE that focus on emotional antecedents (control-value beliefs) may help reverse or buffer these negative trends, beginning at the middle school level.

In terms of PA intention, the emotional antecedents involving control and value were the most significant contributors. The strong relationship maintained in each regression between control beliefs and PA intention aligns with previous literature on the importance of competence and self-efficacy for engaging in tasks (Baumeister, 2016). Students need to develop competence and internal perceptions that they can control their success and reverse perceived failures as opposed to crediting outside factors for resulting outcomes. It is not surprising that having strong control beliefs for engaging in activities is a necessary foundation for intentions to be active, however, it is important to note this prerequisite may be moderated by the level of value one holds for the activity (Pekrun, 2006). In other words, one must perceive some meaningfulness in order to engage, and the magnitude of value in combination with control will likely determine the level of motivation and the emotional connection one has. As seen by the data, both intrinsic

value (i.e., the activity is interesting) and extrinsic value (i.e., participating makes me physically look better) were maintained as strong predictors as well. In PE, value may be not only associated with interest and improvement, but also to earn specific grades, standardized measurement, and/or to appear skillful in front of others. Our data suggests both intrinsic and extrinsic factors impact PA intention. This is not particularly surprising given the PE system currently in place in the United States. For example, students are pushed to master skills to score well on assessments, meet state-level benchmarks, and reach certain standardized fitness levels. However, the juxtaposition between the external goals and the push for PE/PA enjoyment may be problematic. For example, in most achievement settings, there are both internal and external motivation beliefs operating as a result of how the learning environment is set up. Even though internal goals emphasized by the teacher, there are always external motivating factors operating as well.

There are two important considerations for exploration into PE emotions and emotional antecedents given these results. First, evaluating student emotions, as a way to further explain motivation, is not devoid of learning processes. In other words, to enjoy PE or have fun does not mean the foundations of teaching and learning are removed from the environment (i.e., teachers letting kids play because it's fun). In fact, the tenants of CVTAE and our results suggest the exact opposite. Emotions are intertwined and inextricably linked to learning processes. The use of effective instructional practices, developmentally appropriate learning progressions, and mastery-level tasks are all likely to enhance one's control beliefs in PE. Second, the content teachers select, and the opportunities teachers provide, will shape students value for those activities. However, those cognitive appraisals shape how one experiences the environment and will potentially shape their enjoyment, boredom, and so forth, associated with those activities/environments. Fredrickson (2001) suggested the broaden and build theory which highlights the relationship with emotion and learning. In summary, if one feels enjoyment, they will be psychologically and cognitively open to new ideas, new tasks, understanding at a deeper level, and willing to fail and try again. Boredom and anger, in opposition, can cloud one's judgment, ability to think beyond surface level, and can detract learning. Our results presented another example in shame detracting significantly from intentions. Shame presents new hurdles as it can severely detract from student learning, success, and activity longer term (Simonton & Garn, 2020).

Limitations and Future Research

This study is cross-sectional in nature and only captures a snapshot student perception; thus, temporal relationships cannot be drawn. Also, the current emotional state of the student may dictate their self-reported data, which may be susceptible to bias and social desirability. Last, this study was conducted in one region of the United States making generalizability limited and more research is needed to explore these relationships in other regions. Overall, follow-up research should consider longitudinal approaches to data collection to track student emotions and antecedents over time to test for fluctuation across grades and/or content. Additionally, information relating to the core PE curriculum, instructional strategies, and class climate were not collected here so impact their own emotions cannot be draw. Thus, efforts in understanding the true influence of content and instructional strategies on emotional antecedents, emotions, and important PE outcomes, is necessary. Researchers should consider measuring the taxonomy of emotions over affect and mood when

considering the nuance of student motivation. Also, it seems that emotional antecedent should be considered during emotional research too as they impact outcomes in conjunction with emotions. Researchers endorse a fully inclusive and mixed gendered PE experience; however, considerations for emotional differences in single-gendered PE courses may be warranted.

Practical Implications

These results suggest that relationships exist between student emotions, cognition, and behavior. Additionally, negative experiences or limited control and value development in PE seem to influence important emotion-related outcomes. Thus, teachers need to be educated on these important cognitive, psychological, and emotional mechanisms that impact students in order to address them in PE. For example, appraisal training intervention research targeting student control beliefs in many school subjects has shown to improve perception of high control beliefs to overcome failures, improve effort, and sustain more engagement during learning tasks (Parker et al., 2018). Simonton & Garn (2022) found that in a 30-min session, female students can significantly improve their enjoyment and reduce boredom in a novel physical task using attribution messaging, consolidation (i.e., connecting to other parts of their belief system), and feedback targeting reappraisal of outcomes. According to the caring climate literature (Gano-Overway, 2013), intentional strategies that promote caring instruction, influence positive control beliefs, and content that prompts intrinsic and extrinsic value in students is crucial. Teachers should consider techniques that promote growth mindsets in their students while also offering content that all male and female students find interesting and meaningful.

Both instructional and curricular decisions can impact antecedents and emotional outcomes of students (Pekrun, 2006; Simonton & Garn, 2020). Models-based practices such as the Sport Education Model, the Tactical Games approach, and the Teaching Personal and Social Responsibility model are focused on student-centered approaches (Metzler & Colquitt, 2021) that improve student motivation. It appears that a student-centered approach to instruction will both focus on developing students internal control beliefs and promote both internal and external value for content and learning. In addition, within Moston and Ashworth's (2008) Spectrum of Teaching Styles, the "productive" styles should be considered as they empower students and engage them in higher levels of decision making in the learning environment. Last, teachers can be trained to provide emotional "check ins" with their students. Things like exit tickets and journals that ask students questions about the emotions they are having in PE content areas, their perceived competence/control with the tasks learned that day, and the degree to which they are finding the content interesting and useful may help teachers head off negative emotions.

Conclusion

In alignment with current trends in understanding student motivation at a deeper level, more consideration for the measurement and understanding of student emotion is warranted. Specifically, the wider array of emotional experiences and their diverse motivational tendencies is needed, especially for the complexities found with negative emotions. Similarly, it appears important to further understand emotional antecedents (control-value beliefs) as these constructs not only shape student emotions but are strongly linked to

the teaching and learning processes in PE environments. Middle school is a particularly vulnerable time for students in which identities, relationships, and physical development are being shaped. Spikes in negative emotions and disinterest in PE/PA may be reduced when targeting and understanding the tenants of their emotional experience. Teachers must identify strategies that enhance emotional antecedents and positive emotional connections to PE via instructional and curricular decisions. This is particularly important for female students who are most vulnerable for developing negative relationships with PE due to bias in instruction and content offered in PE.

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