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Exploring perceived autonomy support and emotions in university tennis courses

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Using the control-value theory of achievement emotions (CVTAE) as a framework, this study investigated relationships among students’ perceived autonomy support, appraisals of control and value, and achievement emotions. Participants were students (N = 268) enrolled in a university physical education (UPE) class. They completed validated questionnaires measuring the major constructs within CVTAE including perceptions of the learning environment (autonomy support), control–value beliefs, and achievement emotions (enjoyment and boredom). Hypothesised relationships among the constructs were investigated using structural equation modelling. Autonomy support shared significant relationships with control and value beliefs. Also, control and value beliefs shared direct positive relationships with enjoyment and negatively with boredom. Indirect positive relationships were found from autonomy support to enjoyment and negatively to boredom through value and control as proposed by CVTAE. Overall, 47% of the variance was explained for enjoyment and 41% of boredom. CVTAE is an effective framework to investigate the emotional experiences of participants in UPE settings. Student emotions are important motivation outcomes and represent mechanisms that can potentially help explain outcomes such as volitional physical activity. Findings support the conclusion that perceptions of autonomy support relate to student appraisals of value and control, which in turn relate to higher positive and lower negative achievement emotions. Autonomy-supportive learning environments that provide students with choices, self-pacing, and individualised success can increase attributions of student control. The findings also contribute to a growing body of evidence that demonstrates the importance of students’ value toward PE.

Keywords: emotion; value; control; autonomy support

Perceived autonomy support and achievement emotions in university tennis courses

Quality physical education (PE) classes help students develop skills, knowledge, confidence, and dispositions necessary for participation in enjoyable physical activity (PA). University physical education (UPE) courses represent a final opportunity for students to engage in structured, school-based PA. UPE courses commonly consist of a structured PE environment that focuses on a single activity with learning goals focused on promoting PA participation (Garn, Simonton, Dasingert, & Simonton, 2017). Recent research suggests UPE courses can play a major role in shaping students’ future PA choices (Esslinger, Grimes, & Pyle, 2016).

However, motivation research consistently demonstrates a decline in students’ PA motivation as they progress through school (Barkoukis, Ntoumanis, & Thorgersen-Ntoumani, 2010). Almost half of the university students do not meet recommended PA guidelines (Keating, Guan, Pinero, &
Quality UPE courses can play an important role in helping students build positive feelings toward PA before entering the workforce. Within UPE- and PA-related courses, motivation is critical in regard to promoting student engagement (Garn et al., 2017), learning (Chen, Chen, Sun, & Zhu, 2013), and intention to participate in PA (Garn, McCaughtry, Shen, Martin, & Fahlman, 2013). Student emotions have been identified as motivational indicators for a variety of cognitive, behavioural, and physiological responses in academic settings (Fredrickson, 2001; Pekrun, 2006). Emotions, such as enjoyment, have been explored in PE/PA settings and share relationships with intrinsic forms of motivation and PA behaviours (Cox, Smith, & Williams, 2008). However, less is known about the antecedents and development of emotions in these settings. Providing a sound theoretical framework that highlights emotions adds to the ability to interpret motivation and one’s subjective experiences within and across life domains.

Discrete emotions produce a set of predictable action tendencies (i.e. behaviours, decisions, pursuits; Fredrickson, 2001) in schools and form the foundation of students’ subjective appraisals toward specific classes, subject-area domains, and broader aspects of the learning context (Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011).

The conceptualisation of achievement in PE lacks consensus. Unlike other classes in the school curriculum, grades in PE often reflect trivial outcomes such as dressing out rather than learning or PA participation (Michael, Webster, Patterson, Laguna, & Sherman, 2016; Young, 2011). Therefore, the alignment between grades and student achievement is questionable. Emotions such as enjoyment may provide a great deal of information on students’ progress toward the learning goals of PE such as students’ intentions to engage in PA. Previous research shows that emotional experiences are predictors of student enrolment and future intentions to engage in class content (Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000). Enjoyment also acts as a mediating construct between PE interventions and PA choices outside of PE (Cox, Duncheon, & McDavid, 2008; Yli-Piipari, Barkoukis, Jaakkola, & Liukkonen, 2013).

Emotions, independent of PA or other classifications of achievement, are viewed as important outcomes because they relate closely to psychological well-being and interest toward a learning task or domain (Frenzel, Pekrun, & Goetz, 2007; Mouratidis, Vansteenkiste, Lens, & Vanden Auweele, 2009; Simonton, Garn, & Solmon, 2017). Furthermore, enjoyment is recognised as an important standard-based outcome of quality PE (Society of Health and Physical Educators, 2014). Understanding emotions as a critical student outcomes using sound theoretical approach aids in our understanding of motivation and related behaviours (Linnenbrink-Garcia, Patall, & Pekrun, 2016; Pekrun, 2006).

**The control-value theory of achievement emotions**

The control-value theory of achievement emotions (CVTAE) framework conceptualises antecedents and outcomes of domain-specific emotions in school settings (Pekrun, 2006). Characteristics of the learning environment are indirect predictors of student emotions, via the direct predictors of control and value beliefs (Pekrun, 2006). Emotions are defined as multicomponent psychological processes that organise affect, cognition, motivation, expression, and physiological response (Pekrun, 2006; Pekrun, Goetz, Titz, & Perry, 2002, 2011). Achievement emotions are emotions situated in achievement settings directly linked to learning domains, activities, and outcomes (Pekrun, 2017). Students experience a diverse set of emotions during school such as enjoyment, boredom, anxiety, shame, or pride to name a few. In CVTAE, Pekrun (2006) argues that each emotion has a distinct set of characteristics that produce a unique set of outcomes. Although some emotions have overlapping characteristics and outcomes, emotions are considered discrete in nature. Pekrun and colleagues often use the term “discrete emotions” to highlight the CVTAE assumption that emotions are unique and should not be aggregated into global indices of affect.
In CVTAE, emotions are classified by valance and activation and have a subject-related object focus. Pekrun (2006) posits that emotions are categorised as either outcome-related or activity-related. Activity-related emotions are representative of feelings experienced during the activity process versus after a lesson or following results of an activity. According to Pekrun (2006), activity emotions place attentional focus on the action itself (i.e. learning, practice, and effort) and not on outcomes. Thus, these emotions imply that outcomes do not play a role in the interpretation of the experience. This is particularly important in learning-related environments as it is related to developing intrinsic motivation (Pekrun & Perry, 2014). Researchers have generally chosen to focus on in-activity emotions when focusing on perceptions of the in-activity environment. Both enjoyment and boredom have an in-activity object focus, meaning they are linked to students’ ongoing achievement activities. Enjoyment is a positive and activating emotion that facilitates problem-solving, approach-oriented behaviours, and high arousal while boredom is a negative and deactivating emotion that produces low attention/distraction, avoidance-oriented behaviours, and low arousal (Fredrickson, 2001; Pekrun, 2006).

The selection of enjoyment and boredom for this investigation were three-fold. First, enjoyment and boredom are commonly experienced in academic settings (Pekrun & Perry, 2014; Putwain et al., 2018) including PA settings (Barkoukis et al., 2010; Garn et al., 2017). In fact, these emotions are arguably the most prevalent emotions students report in academic settings (Pekrun et al., 2002). Secondly, the polarity produced by enjoyment and boredom align closely to common distinctions made between highly motivated and unmotivated students (Deci & Ryan, 2000). Thirdly, few studies to date have used the CVTAE framework in PE settings. Enjoyment is often examined in PE settings independent of theoretical assumptions about how it develops (Michael et al., 2016; Yli-Piipari et al., 2013). CVTAE provides a clear framework for testing indirect and direct predictors of emotions such as enjoyment and boredom. Findings from this study could present a foundation for understanding enjoyment, boredom, and other emotions in the future.

Control and value beliefs are two major determinants of emotions within CVTAE (Pekrun, 2006). Control-related beliefs encompass students’ perceived control over actions and outcomes (Pekrun, 2006; Pekrun & Perry, 2014) and are associated with personal evaluations of competence, expectancy outcomes, and success/failure attributions (Pekrun & Perry, 2014). Having high control beliefs increases students’ ability to initiate action and expectations for success (Pekrun, 2006; Pekrun et al., 2002). High control beliefs are also associated with university students’ achievement, effort, intrinsic motivation, and self-monitoring behaviours (Perry, Hladkyj, Pekrun, & Pelletier, 2001). Low control beliefs attribute success or failure to outside sources or imply the lack of ability to produce the required action (Pekrun, 2006; Perry et al., 2001). Different aspects of student control beliefs relate to adaptive outcomes in PA settings (Bryan & Solmon, 2007) including engagement in university PA courses (Garn et al., 2017). Although stronger feelings of control often result in adaptive outcomes, the combinations of control and value beliefs determine emotions. For example, high control and high value can result in enjoyment or pride. However, low perceptions of control combined with high value can result in frustration or shame.

CVTAE aligns with and is grounded in several achievement motivation theories, including Expectancy-Value Theory (EVT; Eccles, 2005). Similarities are identified in the conceptualisation of value, and while CVTAE and EVT share complementary views on terms of value, clear distinctions are available as well (see Guo, Marsh, Parker, Morin, & Yeung, 2015 for discussion on similarities and differences). Pekrun (2006) delineates value beliefs as both intrinsic and extrinsic in nature; however, measuring both types of value in CVTAE research rarely occurs. The most common approach to evaluating value within CVTAE has been including a single extrinsic value factor (Buff, 2014; Luo, Ng, Lee, & Aye, 2016; Garn et al., 2017; Pekrun et al., 2011). Extrinsic value refers to student beliefs about the usefulness of class-related
actions and outcomes. For example, students may view UPE courses as a way to improve health, meet new friends, or increase grade point average. Several studies have shown positive relationships between utility value and enjoyment (Ainley & Ainley, 2011) because gaining mastery and achieving success can be viewed as a personal value. Students can experience enjoyment during class and still be driven by the utility of the goals mentioned previously (Frenzel et al., 2007). Although this form of value is extrinsic, the personal value attached to content usefulness may cause enjoyment. Overall, higher value is closely linked to positive emotions such as enjoyment or pride and negatively linked to emotions such as boredom or shame (Frenzel et al., 2007; Pekrun, 2006). Although there are theoretical and empirical reasons that value can be separately evaluated (Frenzel et al., 2007), more research is needed, and appropriate measurement tools need to be developed. Empirical evidence of the conceptual differences in value and its’ relation to emotions may improve instructors abilities to plan and design courses to maximise student experience. Given the relationship between CVTAE and EVT, assumptions can be made that previously validated value measures developed within EVT and used within PE/PA research are representative of value in CVTAE (Chen et al., 2013; Garn et al., 2017). This investigation chose to align with previous CVTAE work and measure extrinsic value through perceived usefulness of the course content.

Theoretically, control and value interactions determine and predict achievement emotions, and this has been established in several academic studies (Frenzel et al., 2007; Goetz, Ludtke, Nett, Keller, & Lipnevich, 2013; Pekrun et al., 2002, 2011) and PE contexts (Garn et al., 2017; Simonton et al., 2017) within CVTAE. Nevertheless, future research is needed to explore and establish the theoretical relationships and potential causal relationships as well as potential overlap between and within antecedents and emotions.

In this study, we examine links between student perceptions of the learning environment focusing on autonomy support, appraisals of control and value beliefs, and emotions including enjoyment and boredom in UPE courses. According to the CVTAE, students develop discrete emotions toward classes based on environmental and subjective determinants (Daschmann, Goetz, & Stupnisky, 2014; Pekrun et al., 2002; Pekrun, 2006). Environmental determinants include characteristics of the learning environment such as course content, instruction, climate, and teacher support. Subjective determinants include appraisals of control ability and value within the specific experiences (Fredrickson, 2001; Pekrun, 2006; Pekrun et al., 2011). Overall, the manner in which teachers structure the learning environment affects students’ beliefs about experiences in the class (Goetz et al., 2013). Student control and value beliefs are the prominent subjective determinants of emotion within CVTAE. Specifically, the level of control and value students ascribed to the learning environment predicts varying discrete emotions.

**Antecedents of emotions in the learning environment**

There is currently a dearth of research exploring the proposed antecedents of discrete emotions in PE/PA courses (Mouratidis et al., 2009; Simonton et al., 2017). Thus, there is limited understanding about what characteristics of the learning environment promote or inhibit student control and value beliefs, and subsequent emotions within PE. Student control and value beliefs are theorised as the primary mechanisms that explain relations between characteristics of the learning environment and emotions in CVTAE (Daschmann et al., 2014; Frenzel et al., 2007; Goetz et al., 2013). We examine student perceptions of teacher autonomy support because previous research outside of CVTAE suggests these are aspects of PA learning environments critical to facilitating student motivation (Aelterman, Vansteenkiste, Van den Berghe, De Meyer, & Haerens, 2014; Deci & Ryan, 2000).
Grounded in self-determination theory (SDT; Deci & Ryan, 2000), autonomy support represents a set of teaching practices that cultivates student motivation by promoting feelings of self-endorsed learning. Autonomy-supportive practices include giving students meaningful choices, matching course content to student interests and ability levels, providing students with learning explanations and rationales, and using non-controlling instructional language (Deci & Ryan, 2000; Jang, Reeve, & Halusic, 2016). In basic terms, a learning context that is autonomy supportive is student-centred and makes students feel like they are in control of their learning and can pursue useful goals that matter. Based on these characteristics, autonomy support closely aligns with promoting student control and value beliefs. For example, when students believe they have meaningful choices about what they are learning and the content matches their ability, it is likely that control beliefs will increase. Furthermore, when teachers tailor content to student interests and explain why content/learning activities are useful in attaining physical health goals; it is likely that value beliefs will increase. Specifically, autonomy support may enhance usefulness value as students are allowed to explore the application of the content and make educational and personal choices (Pekrun, 2006). In addition, autonomy-supportive environments support self-regulation which allows students to decide what is of value to them. Students may have personal values and extrinsic pursuits (i.e. grades, success, PA) and autonomy-supportive teaching can promote relevance towards students’ life goals (Ainley & Ainley, 2011). There are clear conceptual connections between autonomy support and subjective determinants of emotion as postulated in CVTAE (Linnenbrink-Garcia et al., 2016), however, to date, there is no empirical evidence linking autonomy-supportive learning environments to student control and value beliefs in a PE setting.

To summarise, students experience an array of emotions in academic settings including UPE courses. Emotions are interwoven with personal well-being and promote specific affective, cognitive, and behavioural response tendencies that are closely associated with motivation. However, CVTAE is one of the few motivational theories that not only accounts for student emotions, but also places them at the centre of the framework. Student motivation in PE courses and of PA declines with age (Dumith, Gigante, Domingues, & Kohl, 2011; Yli-Piipari et al., 2013). Thus, UPE courses often represent a final structured learning environment to develop motivation toward an active lifestyle. CVTAE is a comprehensive motivational framework to investigate student subjective experiences, yet to date, it has been underutilised in UPE courses. Understanding antecedents of student emotions can provide meaningful information on how to maximise student motivation in these courses. Emotions should be viewed as a critical outcome of students’ learning experiences given their alignment with approach and avoidance behaviours (Deci & Ryan, 2000; Linnenbrink-Garcia et al., 2016). Considering the comprehensive nature of antecedents (i.e. perceptions of learning environment, personal attributions of control and value) and the volitional nature of PA-related choices, understanding emotions could aide a great deal in understanding one’s motivation. In other words, students’ emotions toward UPE courses may help explain and predict their PE-related behaviour as well as PA choices in the future. The conceptualisation of emotions in a theoretically sound way has the potential to advance our understanding of motivation in UPE settings.

The present study

The purpose of this study is to use the CVTAE framework to investigate the proposed sequence of environmental and subjective antecedents of student emotion in UPE courses (see Figure 1). Specifically, we examine the proposed CVTAE relationships of student perceptions of the autonomy-supportive environment sharing a distal relationship with enjoyment and boredom, via control and value appraisals. We hypothesise that students who perceive an autonomy-supportive
learning environment will report higher perceptions of control and value (hypothesis 1). Control will share a positive relationship enjoyment and negative with boredom. Value will share a positive relationship with enjoyment and a negative relationship with boredom (hypothesis 2). Finally, we hypothesise that student perceptions of autonomy support will have positive indirect relationships with enjoyment and negative indirect relationships with boredom by way of their control–value appraisals (hypothesis 3).

Methods

Participants

Students (N = 268) from a large Southeastern university in the United States participated in the study. All undergraduate students completed a semester-long UPE beginning tennis course focused on tennis. Of these students, 73% were female and 27% male. The average age was 21.04 (SD = 1.73), and the majority of the students were juniors and seniors. Most of the students were White (79%); other reported ethnicities included Black/African-American (10.1%), and Asian/Asian-American (5.6%). A small percentage of students (<2%) reported Hispanic/Latino, American Indian/Pacific Islander, and Multiracial ethnicities.

Learning context

Three instructors were recruited to participate in this cross-sectional study over three consecutive semesters at a large Southeastern university. All instructors were graduate teaching assistants within the School of Kinesiology and each taught four sections of the course. Tennis was chosen for the content as it represents a lifetime activity that involves basic manipulative skills and a variety of health-related fitness abilities. These courses are assessed using a pass/fail grading system based on participation, attendance, passing two psychomotor domain skills tests, and two written examinations. Course goals and expectations are consistent across semesters and are congruent year to year and section to section. Instructors shared similar educational backgrounds and demonstrated comparable instructional techniques. In summary, students gain introductory level skill development and tactical play progressing into competitive singles play and eventually introduction into doubles strategies and game-play. All courses met three times a week for 50 minutes per session.

Procedures

Permission to complete the study was granted by the Institutional Review Board at the researchers’ university. The study summary and procedures were discussed with three tennis instructors.
Data were collected at one time-point toward the end of the semester. Students were informed about the study, signed consent, were given time to ask questions, and took the survey using paper and pencil. They were also awarded extra credit points for the completion of the survey. Students were told there were no incorrect answers and results would be anonymous. Researchers monitored and reviewed all surveys as instructors were asked to not be present during data collection. Students completed the surveys in approximately 10–15 minutes.

**Measures**

*Perceived autonomy support*

Autonomy support was measured with the Teachers as a Social Context Questionnaire (TASCQ) short version (Haerens, Aelterman, Vansteenkiste, Soenens, & Van Petegem, 2015). The three positively worded items from the TASCQ were used to measure autonomy support. Example items included, “My teacher gives me a lot of choices about how I practice during tennis.” Items were measured on a five-point Likert scale ranging from “totally disagree” (1) to “totally agree” (5).

*Control beliefs*

The Academic Control Scale developed by Perry et al. (2001) measured student control beliefs. The eight items were modified to focus specifically on the tennis course. Example items include, “I have a great deal of control over my performance in my tennis class,” and “No matter what I do, I can’t seem to do well in this tennis class.” Four of the eight items were negatively worded and, therefore, reverse coded. All items were measured on a 5-point Likert scale from “strongly disagree” (1) to “strongly agree” (5). These items have been used with the CVTAE framework and have produced valid and reliable scores with university students (Garn et al., 2017; Perry et al., 2001).

*Value beliefs*

Student value beliefs were measured using utility (usefulness) subcomponent of the Expectancy-Value Questionnaire (Xiang, McBride, & Guan, 2003). This scale has been adapted to a variety of PE/PA courses (e.g. Chen et al., 2013) including UPE (Garn et al., 2017). There were two items used to measure utility value, for example, “Compared to other school subjects, how useful is what you learn in Tennis?” Scale answers ranged from “not useful at all” (1) to “very useful” (5).

*Achievement emotions*

Enjoyment and boredom were measured using the subcomponent scales from the Discrete Emotions in Physical Education Scale (DEPES; Simonton, Mercier, & Garn, 2018). There were four items assessing enjoyment and boredom, respectively. Example items include “I enjoy being in tennis class” and “I get bored in tennis class.” All items were measured on a five-point Likert scale from “disagree a lot” (1) to “agree a lot” (5). These two scales have demonstrated strong psychometric properties in UPE courses (Garn et al., 2017).

**Data analysis**

Descriptive statistics and bivariate correlations were calculated using R software. Results can be found in Table 1. Cronbach’s alpha (α) was calculated for internal consistency estimates of all
latent factors. Researchers used the full information maximum likelihood (FIML) method to handle small amounts (<3%) of missing data (Enders, 2010). The robust maximum likelihood estimation (MLR) procedure was used in order to account for departures from normal distributions in study variables (Sartorra & Bentler, 2001).

Structural equation modelling (SEM) was used to test the hypotheses of this study, allowing researchers to investigate a measurement model and structural model. Model analysis was conducted using Mplus 7.4 and all latent variables were scaled using the fixed-factor method (Little, 2013). We used the CLUSTER function in Mplus to account for the natural nesting of students within classes. The measurement model uses CFA procedures, testing the alignment between the proposed model and observed data. All exogenous latent variables and residual variance estimates were allowed to covary (Kline, 2016). The structural model uses path analysis procedures to test direct and indirect relationships among latent factors (Kline, 2016). For example, direct relationships between autonomy support and control and value as well as between control and value and our emotions were evaluated in the SEM. Also, the indirect relationships mimicked the proposed relationships of CVTAE (Figure 1) and evaluated relationships from autonomy support to enjoyment and boredom via control and value.

Joint criteria including absolute and relative fit indices were used to evaluate CFA/SEM model fit (Hu & Bentler, 1999). Robust chi-square ($\chi^2$) values based on degrees of freedom (df) and $p$-values were the absolute fit index reported in this study. However, $\chi^2$ is highly sensitive to sample size (Hu & Bentler, 1999; Kline, 2016); therefore, relative fit indices were also used to judge model fit. The comparative fit index (CFI), Tucker–Lewis Index (TLI), and the root mean square error of approximation (RMSEA; Hu & Bentler, 1999) have all demonstrated to be effective measures for determining model fit. The CFI and TLI are robust to sample size and compare observed data to poor fitting models. Scores of .90 are considered adequate and .95 or higher are considered a good fit (Hu & Bentler, 1999). TLI is often included because it penalises model fit based on parsimony (Kline, 2016). RMSEA measures the degree of misfit as per the amount of degrees of freedom in comparison to the perfect model fit; adequate scores are .08 or lower and .06 and lower for a good fit (Hu & Bentler, 1999). Each indirect path was evaluated using a 95% bootstrapping confidence interval (1000 resamples), which is a non-parametric test of indirect effects in which resampling and replacement of the possible variable relationships are tested (Kline, 2016). This resampling technique allows significant indirect relationships to be identified. Specifically, 95% confidence intervals that do not straddle zero are considered statistically significant at an alpha level of .05.
Results

Preliminary analyses

Descriptive statistics and internal consistency estimates are presented in Table 1 for all latent variables. Autonomy support, control beliefs, and value beliefs all had mean scores above the scale midpoint, while boredom scores were below the midpoint. Cronbach’s alpha coefficients were acceptable, ranging from .727 (autonomy support) to .855 (enjoyment). All latent factors showed significant relationships following bivariate correlation analyses (see Table 1). Enjoyment shared positive relationships with all predictor variables while boredom had negative associations. Following these results, researchers moved forward with analysis of hypothesised relationships.

Structural equation model

Evaluating the data of our hypothesised model showed a good fit, $\chi^2(181) = 290.244$, $p < .001$; CFI = .983; TLI = .981; RMSEA = .047. Factor loadings for each latent variable also showed acceptable relationships (Autonomy support range = .644 to .746; Control range = .413 to .766; Value range = .740 to .798; Enjoyment range = .675 to .825; Boredom range = .705 to .844). Direct and indirect relationships are reported in Table 2. Hypothesis 1 was supported as perceptions of autonomy support were positively related to higher control beliefs and value. Perceptions of autonomy support explained variance in control ($R^2 = .189$) and value appraisals (intrinsic, $R^2 = .413$). Hypothesis 2 was also supported as control and value shared positive relationships with enjoyment and negative with boredom. Taken together, perceptions of control and value within this UPE course accounted for a significant portion of the variance for enjoyment (47%) and boredom (41%).

Table 2. Direct and indirect effects of environment and control value predicting enjoyment and boredom.

<table>
<thead>
<tr>
<th>Direct effect</th>
<th>$B$</th>
<th>$SE$</th>
<th>Boot CI 95% L</th>
<th>Boot CI 95% H</th>
<th>$\beta$</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>CON CONTROL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUTO</td>
<td>0.214</td>
<td>0.026</td>
<td>0.240</td>
<td>0.590</td>
<td>0.434</td>
<td>.189</td>
</tr>
<tr>
<td>VAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUTO</td>
<td>0.669</td>
<td>0.073</td>
<td>0.485</td>
<td>0.796</td>
<td>0.643</td>
<td>.413</td>
</tr>
<tr>
<td>Enjoyment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CON CONTROL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUTO</td>
<td>0.612</td>
<td>0.075</td>
<td>0.185</td>
<td>0.536</td>
<td>0.376</td>
<td>.471</td>
</tr>
<tr>
<td>VAL</td>
<td>0.391</td>
<td>0.065</td>
<td>0.378</td>
<td>0.644</td>
<td>0.507</td>
<td></td>
</tr>
<tr>
<td>Boredom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CON CONTROL</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>AUTO</td>
<td>−0.629</td>
<td>0.096</td>
<td>−0.512</td>
<td>−0.151</td>
<td>−0.342</td>
<td>.412</td>
</tr>
<tr>
<td>VAL</td>
<td>−0.420</td>
<td>0.052</td>
<td>−0.638</td>
<td>−0.334</td>
<td>−0.483</td>
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<table>
<thead>
<tr>
<th>Indirect effect</th>
<th>$B$</th>
<th>$SE$</th>
<th>Boot CI 95% L</th>
<th>Boot CI 95% H</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enjoyment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUTO × CON</td>
<td>0.131</td>
<td>0.050</td>
<td>0.053</td>
<td>0.284</td>
<td>0.163</td>
</tr>
<tr>
<td>AUTO × VAL</td>
<td>0.262</td>
<td>0.070</td>
<td>0.208</td>
<td>0.477</td>
<td>0.326</td>
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<tr>
<td>Boredom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUTO × CON</td>
<td>−0.135</td>
<td>0.053</td>
<td>−0.272</td>
<td>−0.044</td>
<td>−0.149</td>
</tr>
<tr>
<td>AUTO × VAL</td>
<td>−0.281</td>
<td>0.081</td>
<td>−0.484</td>
<td>−0.185</td>
<td>−0.310</td>
</tr>
</tbody>
</table>

Note: AUTO: autonomy support; CON: control beliefs; VAL: value beliefs; $B$: unstandardised beta; $SE$: standard error of the unstandardised beta; Boot CI L 95% CI: low end of 95% bootstrap confidence interval; Boot CI H 95% CI: high end of 95% bootstrap confidence interval (1000 bootstrap resamples); $\beta$: standardised beta.

*p < .05, **p < .01.
In congruence, hypothesis 3 was also supported regarding autonomy supports indirect association with perceptions of enjoyment and boredom in class. Indirect relationships were identified between autonomy support and both enjoyment and boredom via control and value. Positive indirect relations were identified indirectly from autonomy support to enjoyment and negatively toward boredom as predicted.

**Discussion**

Grounded in CVTAE, this study investigated relationships among autonomy support, student appraisals of control and value, and enjoyment and boredom. Findings supported all three hypotheses. Therefore, CVTAE appears to provide a systematic framework to guide research efforts regarding our understanding of the learning environment and achievement emotions. Taken together, the results support the notion that designing an autonomy-supportive environment can foster control and value beliefs and ultimately increase positive emotional experiences and decrease negative ones. According to CVTAE, positive emotions should lead to motivation, learning, and engagement during an activity.

The first hypothesis was grounded in theoretical relationships between the learning environment and control and value beliefs. As expected, autonomy-supportive environments were associated with higher perceptions of control and ability to perform the necessary physical and cognitive skills required for the course. Providing choice and teacher support that is less controlling can support feelings of control over activities and ownership of the learning material (Bryan & Solmon, 2007; Deci & Ryan, 2000). Autonomy-supportive practices also allow students to choose an appropriate difficulty level and progress at their own pace (Aelterman et al., 2014), which may facilitate the development of proficiency versus working at an externally regulated pace. According to Pekrun (2006) and Perry et al. (2001), high control beliefs are enhanced by attributing success and causality internally and fostered by the belief that ability is malleable. For example, students make decisions during learning tasks concerning whether to engage and exert effort or to avoid participation. Autonomy-supportive environments provide choice and also provide cues relevant to achieving success and overcoming failure. Developing control may be tied to the self-evaluative nature that autonomy support provides. Students can focus on aspects of the task they believe are useful, reference important cues, and make judgements about causes of success. Teachers who encourage a self-referenced criterion for success related to personal improvement and mastering a task create an environment that encourages learners to believe they can succeed if they exert effort and fosters control beliefs.

Autonomy-supportive environments were associated with perceptions of value as well. Conceptualising value as an antecedent, as proposed within CVTAE, could potentially advance our understanding of the intricacies of the subjective emotional experience (Pekrun & Perry, 2014); however, more research is needed. Likewise, consideration of conceptual differences between value and emotions like enjoyment is important, although those terms have been used interchangeably in previous definitions. Within this study, the usefulness of the UPE course and content provided positive relationships with autonomy support and enjoyment of the course. Value is driven by the usefulness of the activity and how it can help an individual reach an intended goal (Pekrun & Perry, 2014). This may be particularly important in UPE courses given the importance of one developing the disposition to live an active lifestyle as they enter adulthood. Our results suggest that autonomy support may promote components of value, such as appreciating the usefulness of skills and individual pursuit for success. Both autonomy support and value may contribute to long-term outcomes such as future PA behaviours.

Hypothesis 2 reflects the central tenet of CVTAE that control and value beliefs share a potential direct relationship with achievement emotions. The hypothesis was supported, in that control
and value were positively associated with enjoyment and negatively with boredom. Control beliefs can be influenced by task design, feedback, achievable goals presented by the teacher. It is important that the teacher trains students to attribute their control to internal sources of effort and comparison as well as promote the importance of practice (Perry et al., 2001; Putwain et al., 2018). These findings also align with research in secondary PE settings where value was a powerful predictor of enjoyment and boredom (Simonton et al., 2017). Similarly, related constructs such as relevance have also predicted positive affective experiences in PE (Webster, Mindrila, & Weaver, 2011). This highlights the growing body of evidence that learning environments focused on reinforcing students’ perceived value of class content increase enjoyment and decrease boredom (Garn et al., 2017; Pekrun & Perry, 2014; Sanchez-Rosas & Esquivel, 2016; Simonton et al., 2017). Strategies that practitioners can use to accomplish this include a deliberate focus on improving clarity of instruction, use of personally relevant tasks, emphasising learning and improvement, and underscoring the usefulness of the activity (Simonton et al., 2017; Linnenbrink-Garcia et al., 2016; Webster et al., 2011).

Interestingly, in two previous studies using CVTAE as a framework, perceptions of control were not related to enjoyment and boredom (Garn et al., 2017; Simonton et al., 2017). Specifically, control was not a significant predictor of enjoyment or boredom and also did not facilitate the indirect relationships between the environment and the emotions as they did in this study. Garn et al. (2017) suggest that if control is not facilitated then students in UPE courses are likely to experience outcome-related emotions such as anger. Control may have a greater influence in predicting emotional experience if attributions to perform and succeed at tasks are specifically addressed in the learning environment (Pekrun & Perry, 2014; Perry et al., 2001). Appropriate progressions that lead to expectations of success, competence, and increased self-efficacy, play an important role in the subjective experience and have been found to predict positive experiences (Bryan & Solmon, 2007; Pekrun et al., 2002). These results suggest that developing content in ways that increase success and confidence is a key element in promoting an enjoyable UPE course and reducing negative experiences. These recommendations of fostering control beliefs and emphasising value are preferable to a standardised curriculum that may introduce forced game-play when students are not ready and compromise value through teacher demeanour. For example, suggesting students need to “just get through practice and we can play a game” or “if you have not figured it out yet, you never will.” These sentiments and other related messages can undermine the positive control–value perceptions.

Lastly, hypothesis 3 addressed the theorised indirect relationships from the environment to emotions, via the control–value beliefs. Relationships between autonomy support and enjoyment were found by way of positive perceptions of control and value. Although mediation cannot be evaluated in a cross-sectional design, the indirect effect supports the inference that when an autonomy-supportive environment fosters control beliefs and supports value (e.g. usefulness) toward course content that positive achievement emotions such as enjoyment will be promoted. Understanding the suggested links from the environment and the person that prompt positive experiences is vital to understanding subjective experiences. UPE course instructors who utilise autonomy-supportive environments may enhance student well-being and relevance in activities that may lead to active lifestyles after college. This exploratory study was a preliminary look into relationships as theorised through CVTAE.

Control and value facilitated an indirect relationship from autonomy support to boredom as well. This suggests that when students gain positive and internal control abilities and find value within the course material, they are less likely to experience boredom. This is an important finding as boredom has been found to reduce engagement (Garn et al., 2017), learning (Daschmann et al., 2014), and resulting health outcomes such as PA behaviours (Viira & Raudsepp, 2000). UPE classes are not only meant to provide learning experiences but to enhance regular
PA behaviours, therefore, students who are bored may not capitalise on the experience or achieve the intended outcomes. While an autonomy-supportive teacher utilising appropriate pedagogy may benefit the emotional experience of the learner, further research is needed to evaluate other environmental influences on emotions. Likewise, a greater array of positive/negative and intrinsically/extrinsically driven emotions may capture more student experiences.

Limitations and directions for future research

There are several limitations that need to be acknowledged as considerations for future research. All measures were collected during a single session so temporal relations cannot be established. The lack of multiple data collection points does not allow us to make strong conclusions about mediation or causation, therefore measurement across time would be a stronger design. Next, the sample recruited from the tennis classes was predominantly white and female. Although this is reflective of the class enrolment, this limits the ability to generalise the results. It should be noted that we did not control for social desirability in this study. Furthermore, we did not examine autonomy support at the class level. Therefore, future research would benefit from larger scale studies that include enough classes to test class-level relations of autonomy support on motivation factors and emotions using multi-level modelling. Lastly, we were not able to capture the full taxonomy of emotions as proposed by Pekrun et al. (2002). Exploring the relationships among control–value beliefs and a wider range of achievement emotions could enhance the understanding of students’ subjective emotional experiences in UPE courses. In the future, consideration for quality measurement tools incorporating intrinsic value and extrinsic value in PE using the CVTAE are of immediate importance if this theory will be used moving forward. The potential overlap of intrinsic value and emotions such as enjoyment and boredom needs clarification from a measurement standpoint.

The incorporation of outcomes related to UPE courses such as amount of PA, class engagement, and achievement as outcomes predicted by emotion is also an important consideration for future research. However, it may be important for research moving forward to recognise emotion as an important outcome in itself, especially given the importance of affective learning domains and the relationship between subjective experience and behaviour choice. Nevertheless, objective measures regarding the environment such as observations of supportive teaching should be considered. Although all pedagogical and environmental variables in an education setting cannot be captured in a single study, researchers acknowledge that other instructional and pedagogical variables may have an influence on control–value beliefs and emotions (i.e. task design, progression, teaching styles, etc.) and should be considered in future studies.

Conclusions

This study provides evidence that CVTAE can be used as a framework for investigating student emotions in UPE courses. Applying CVTAE to understand achievement emotions and how they influence student engagement in UPE classes has the potential to provide insight into ways to promote PA outside of class. Perceptions of autonomy support shared strong relationships with control, value, and demonstrated strong indirect relationships with enjoyment and boredom via control and value. Establishing perceptions of the environment in relation to control–value appraisals provides more insight into students’ emotional experiences. The results also show the benefits of evaluating discrete emotions versus affective states (Garn et al., 2017; Mouratidis et al., 2009). These initial findings show promise, but control and value appraisals need further investigation in UPE settings. It appears that value and control beliefs will remain critical components associated with positive emotions like enjoyment and boredom (Garn et al., 2017; Simonton et al., 2017).
Results from this study should inform best teaching practices in UPE courses with the understanding that special emphasis should be placed on promoting greater control and value through the environment, based on student needs.

Motivation is a clear antecedent to predicting student success and PA-related behavior (Barkoukis et al., 2010; Cox et al., 2008; Deci & Ryan, 2000). Internalised and autonomous forms of motivation necessary to engage are both physically demanding and emotionally taxing, yet much of the research investigating motivation disregards the emotional experience. Individuals are motivated when they find an activity both emotionally rewarding and attractive. CVTAE highlights the importance of emotions as an outcome of consequence associated with experiences in UPE settings as well as emotions as potential predictors of adaptive and maladaptive behaviors. In other words, competency, self-efficacy, control, value, and perceived importance are antecedents for achievement but they may not directly predict achievement outcomes. Instead, those constructs may predict positive and negative emotional experiences, which in turn, ultimately determine whether an individual pursues the behavior. Although the literature is replete with studies investigating motivation within UPE and PA-related settings, this study is one of the initial attempts to incorporate emotional experiences as an aspect of motivation. Findings demonstrate that an autonomy-supportive environment that emphasises the control and value of the activity can foster enjoyment and reduce boredom.

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