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The influence of state motivation, content relevance and affective learning on high school students' intentions to use class content following completion of compulsory physical education

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The Influence of State Motivation, Content Relevance and Affective Learning on High School Students' Intentions to Use Class Content Following Completion of Compulsory Physical Education

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Little research has examined mechanisms leading to the utilization of compulsory physical education content in future contexts. This study tested a model in which motivation to be in physical education class functions as a predisposition influencing perceptions of teacher communication of content relevance, perceptions of course relevance to one's personal life, affect for physical education and intentions to apply class content in the future. High school students (*N* = 636) enrolled in compulsory physical education classes completed questionnaires assessing each of these variables. Exploratory and confirmatory factor analyses indicated the questionnaire items were adequate indicators of the five constructs. Structural equation modeling with diagonally weighted least squares estimation supported the hypothesized model. The results suggest that continued use of knowledge and skills learned in physical education might hinge on teachers making physical education appealing to students and communicating how class content connects with students' personal interests.

Keywords: instructional communication, student perceptions, secondary teaching, structural equation modeling

A major purpose of physical education programs is to guide children and adolescents in the process of becoming physically active for life (National Association for Physical Education and Sport [NASPE], 2004). According to NASPE (2004), an important avenue to achieving this purpose is designing learning experiences which foster value, or affect for personal engagement in physical activity. Physical education research has used a number of theoretical perspectives to conceptualize student affect as well as identify the factors that influence it and the outcomes it espouses. For example, theories of motivation have been widely disseminated in the literature

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(see Chen, 2001, Standage, Gillison, & Treasure, 2007, and Subramanium, 2009 for reviews of this literature). In particular, research within the self-determination theory, achievement goal theory and interest-based motivation theory has helped to map several dimensions of affective learning in physical education and elucidate relationships between classroom context variables (e.g., the teacher's instruction, task design), student motivation (e.g., intrinsic motivation, situational interest) and future physical activity participation (e.g., behavioral intentions).

While theories of motivation provide informative perspectives of affective learning, it is important to consider other perspectives that might lend additional insight into the nature, determinants and function of affective learning. One such perspective is the work of Krathwhol, Bloom and Masia (1964), which organizes affective learning into higher and lower order affective responses. Within this framework, the higher order response of extending or applying knowledge and skills learned in class to future contexts seems particularly relevant to the current interest in understanding affective links between physical education and future physical activity. Moreover, given that the hierarchical structure of Krathwohl et al.'s (1964) conceptualization subsumes a developmental perspective of learning, it seems most appropriate to investigate this level of response with students who are ready to evaluate the utility and value of physical education in their lives.

Based on this reasoning, the current study was designed to better understand the underlying mechanisms leading to high school students' application of physical education content after completing compulsory physical education. Although the work of Krathwohl et al. (1964) has not previously been employed in physical education research, their conceptualization has found footing in instructional communication research (Mottet & Beebe, 2006). Most recently, Mottet, Garza, Beebe, Houser and Jurrells, et al. (2008) found that the communication of content relevance by high school teachers in math and science courses predicted ninth graders' interests in pursuing additional study and even careers in these fields. We therefore chose to adopt and expand this research to build a theoretical frame for the current study as a way to explore possible influences on high school students' affective learning in physical education.

Affective Learning Theory: An Instructional Communication Perspective

According to Mottet and Beebe (2006), "Addressing, changing, or reinforcing students' attitudes, beliefs, values, and underlying emotions or feelings as they relate to the knowledge and skills they are acquiring is the domain of affective learning" (p. 8). Hatfield, Cacioppo and Rapson (1993) suggest students may use their emotions to guide approach/withdrawal behaviors related to class content. Therefore, an important function of teaching is helping students develop positive feelings about what they are learning so they will approach, rather than avoid engagement and interaction with this content. As conceptualized by Krathwohl et al. (1964), approach tendencies manifest along a wide spectrum of affective behaviors, which can be hierarchically organized.

Krathwohl et al.'s (1964) taxonomy of affective learning includes five levels of response: receiving, responding, valuing, organizing and value complex. Lower levels include being willing to minimally receive and respond to class content. In physical education, students might demonstrate lower levels of affect by dressing out, listening, responding to the teacher's questions and staying on task. Higher levels in the taxonomy are relatively abstract and include modifying attitudes, beliefs and values to accept and take ownership of knowledge and skills learned in class. For example, a student might apply what they learned in physical education class to design a fitness program for him/herself over the summer or elect to take an optional physical education course the following semester. Krathwohl et al. (1964) describe the ascent from lower to higher levels in the taxonomy as a process of internalization where "the phenomenon or value successively and pervasively becomes part of the individual" (p. 28).

Within instructional communication research, affective learning has primarily been defined as students' attitudes toward a class they are taking and/or the probability of taking other classes with similar content (McCroskey, 1994). These conceptualizations encompass lower and higher levels of Krathwohl et al.'s (1964) taxonomy (Mottet & Richmond, 1998) and have been applied in studies attempting to identify the causes and consequences of affective learning. Researchers have proposed various theoretical models (e.g., Allen, Witt, & Wheeless, 2006; Christophel, 1990; Frymier, 1994; Richmond, 1990; Rodriguez, Plax, & Kearney, 1996), focused primarily on the relationships between teacher immediacy (i.e., instructional behaviors that communicate approachability to students), students' state motivation (i.e., drive or effort related to a particular class), affective learning and cognitive learning. To date, the research suggests teacher immediacy directly influences affective learning, which in turn influences cognitive learning outcomes (Allen, et al., 2006).

The role of state motivation in affective learning is less clear. Frymier (1994) found support for a model in which state motivation mediated the relationship between teacher immediacy and students' affective and cognitive learning. Yet Rodriguez et al. (1996) argue that state motivation and affective learning overlap conceptually and suggest this confounds the results of Frymier's (1994) study. Drawing on Krathwohl et al.'s (1964) work, Rodriguez et al. (1996) propose motivation "is captured by the more pervasive affective learning construct" (p. 297). Therefore, variance in state motivation as a consequence of teacher communication may simply reflect a more global change in affective learning. It is possible, however, that state motivation may also play an antecedent role in the teaching-learning process. Previous research has made the distinction between state motivation and trait motivation, with trait motivation defined as a predisposition toward learning in general and therefore more constant and enduring than state motivation (Rodriguez, et al., 1996). However, state motivation may function to specifically predispose students' orientations toward content in a particular class. Viewed this way, students enter class with higher or lower levels of state motivation, which influences their perceptions of the teacher's communication and subsequent affective learning.

Support for this line of thinking can be found in attention-arousal theory, which indicates that arousing stimuli in an instructional context serve to enhance students' attention (Kelly & Gorham, 1988). Students' motivation toward a particular class may function as a stimulus which influences their level of attention directed to class events, including the teacher's communication behaviors. Therefore, higher levels of state motivation would lead to greater awareness of class instruction and, subsequently, increased processing of instructional messages. Although this postulation has not previously been tested, we reason that examining state motivation as an antecedent variable might lend additional insight into a developing theory of affective learning.

Content Relevance and Affective Learning

The majority of studies assessing relationships between teacher communication, student motivation and affective learning have been conducted in college classrooms and have focused on teacher immediacy as the communication variable of interest. However, Mottet et al. (2008) recently conducted one of the few instructional communication studies in a high school setting and examined the predictive value of several teacher communication variables in relation to students' affective learning. Two communication variables, teacher clarity and content relevance, were found to be significant predictors of ninth graders' desires to take additional courses in these subject areas and interest in pursuing careers in math- and science-related fields. The largest proportion of variance in affective learning was explained by content relevance. Surprisingly, teacher immediacy did not explain a significant proportion of the variance in the affective outcomes measured. According to the authors, one possible explanation for the lack of immediacy's influence is that cognitive learning is a sort of prerequisite for affective learning for early high school students. Whereas affective learning is usually viewed as a precursor to cognitive learning, ninth graders may first need to understand math and science before learning to appreciate it.

Frymier and Shulman (1995) define content relevance as a student perception that course content satisfies his/her interests, personal and/or career goals. As a construct, relevance can be traced to Keller's (1983; 1987) ARCS (Attention, Relevance, Confidence, and Satisfaction) Theory of Motivation. From this perspective, students will be internally motivated to learn if their attention is captured in class, they view the class content as personally relevant, they are confident in their ability to learn and use the course material and they feel satisfied as learners in the class. Mottet et al. (2008) observe that motivation in Keller's work closely aligns with Krathwohl et al.'s (1964) taxonomy of affective learning, specifically with the idea that students must first be willing to receive and respond to new information, experience satisfaction from engagement with this information and recognize its value before achieving the highest levels of affective response. These similarities help to explain the significant contribution of content relevance to students' affective learning in Mottet et al.'s (2008) study. Reinforcing this idea are previous studies in which content relevance also predicted students' state motivation (Frymier & Houser, 2000; Frymier and Shulman, 1995).

The extant research base on content relevance draws on the work of Frymier and Shulman (1995) to conceptualize this construct as a teacher communication variable (e.g., Finney & Pike, 2008; Mottet, et al., 2008; Muddiman & Frymier, 2009; Webster, Gozález, & Harvey, in press). Specifically, Frymier and Shulman (1995) designed a scale to measure college students' perceptions of their teachers' use of various communication behaviors, such as the use of examples and explanations that link class content to students' interests and goals. However, a corresponding scale measuring the extent to which students perceive class content to be personally relevant does not appear to exist, even though Frymier and Shulman (1995) suggest that establishing a connection between students' perceptions of relevance and teachers' communication is an important direction for continued research in this area. More broadly, investigating this relationship is a necessary step in continuing to explore the theoretical implications of content relevance in student learning.

Purpose of the Study

The theoretical perspective outlined above provides a useful framework for beginning to understand some of the factors that might influence the extent to which early adolescents' value and internalize what they learn in physical education class. Based on Krathwohl et al.'s (1964) conceptualization, a logical consequence of developing higher order affective responses to physical education content would ultimately be the application of that content in future contexts after the course is finished. Therefore, the aim of the current study was to test the hypothesis that state motivation, content relevance, affective learning and behavioral intentions are connected through a chain of causal links, in which motivation has an indirect effect on intentionality to use class content in the future. Specifically, we tested a model suggesting that high school students with more state motivation toward their compulsory physical education class perceive more teacher communication of content relevance. In turn, it was proposed that students more receptive of teacher communication should have stronger perceptions of class relevance to their personal lives, subsequently leading to enhanced affective learning. Finally, we expected stronger affective responses to increase students' intentionality to use the knowledge and skills learned in class once the course was finished.

To our knowledge, the variables investigated in this study are new to classroom-based physical education research and existing measures have not been adapted to the physical education learning context. Given this, a secondary aim of this study was to yield valid and reliable inventories that could be employed in continuing physical education research on high school students' state motivation, perceptions related to content relevance, affective learning and future intentions to use class content.

Method

Participants and Setting

Participants ($N = 636$) were students (mean age = $14.93 \pm .89$) enrolled in semester-long compulsory physical education classes at five South Carolina high schools from three school districts. Students self-identified their sex as male (44%) or female (56%), their race/ethnicity as African American (27%), Caucasian (52%), Asian (4%), Hispanic (6%) or Other (11%), and their year in school as Freshman (84%), Sophomore (8%), Junior (3%), Senior (2%) or Not Sure (3%).

Total student enrollment at the schools ranged from approximately 1200–2000 students. The percentage of low-income students eligible for free or reduced lunch ranged from 7% to 36%. Physical education classes met daily or every other day for approximately 90 min and were a mix of both single gender and coeducational. At all schools, students received one credit toward their high school diploma for successful completion of the required physical education course, although the course curriculum varied from school to school. Based on casual observation, a wide range of content and varied instructional approaches were being applied in the different classes and schools participating in the study. In accordance with South Carolina educational guidelines, satisfactory completion of the course was sufficient for graduation requirements, such that future enrollment in physical education at these high schools would be on an elective basis.

Measures

State Motivation. Richmond's (1990) State Motivation Scale (SMS) was used to measure students' motivation to be in their physical education class. Students responded to five items each using a seven-point semantic differential scale anchored by bipolar adjectives. Scale items are preceded by the question, "How do you feel in regard to this physical education class?" and include the scales of Motivated/Unmotivated, Excited/Board, Uninterested/Interested, Uninvolved/Involved and Dread it/Look forward to it.

Teacher Communication of Content Relevance. A modified version of Frymier and Shulman's (1995) Communication of Content Relevance Scale (CCRS) was used to measure students' perceptions of their physical education teacher's communication. Using the original five-point Likert scale (0 = Never; 4 = Very Often) and the stem, "My PE teacher…" students responded to six items (e.g., "Explains why PE is important to me", "Gives examples that show how PE connects to my personal life").

Perceived Relevance of Physical Education. The Perceived Class Relevance Scale (PCRS) was developed for this study to measure whether students perceived what they were learning in physical education class to be personally relevant. Item construction for the scale drew on Keller's (1983) definition of relevance and Frymier and Shulman's (1995) work, which identifies three main features of content relevance, including the ability of the content to satisfy personal values, goals and interests. Using a four-point Likert scale (1 = Strongly Disagree; 4 = Strongly Agree) and the stem, "The knowledge and skills I am learning in this PE class…" students responded to eight items (e.g., "Will help me reach my personal goals", "Are related to interests I have outside of class").

Affective Learning. A modified version of McCroskey's (1994) Affective Learning Scale (ALS) was used to measure students' higher order affective learning in physical education. Students responded to four items using a seven-point semantic differential scale anchored by bipolar adjectives. The items are intended to specifically measure students' feelings about classes that teach similar content as their current physical education class. These items are preceded by the stem, "My likelihood of taking future courses offering the same or similar content is…" and include the scales of Unlikely/Likely, Possible/Impossible, Improbable/Probable, and Would/Would Not.

Intentions to Use Class Content. A modified version of Hagger, Chatzisarantis and Biddle's (2001) scale of intentions to be physically active was used to measure students' intentions to use the content taught in their physical education class after the course ended. Intentionality in this study was viewed as a logical consequence of higher order affective learning measured by the ALS. Students responded to three items: "After taking this course, I plan to use some or all of the knowledge/skills taught", "After taking this course, I intend to use some or all of the knowledge/skills that were taught" and "After taking this course, I am determined to use some or all of the knowledge/skills that were taught". Each item uses a seven-point semantic differential scale anchored by the bipolar adjectives Likely/Unlikely.

Procedure

Since the PCRS was newly developed for this study and the other scales used were modified from their original versions, several steps were taken before data collection to assess each scale's content validity and appropriateness for use with high school students in physical education. First, two instructional communication professors specializing in research on content relevance and affective learning were consulted. They reviewed a description of the study as well as the scales for conceptual fidelity, clarity and appropriateness of the wording for use with high school students. Both professors suggested no revisions were needed.

Second, the scales were pilot tested for readability and feasibility of implementation with members of the target population. The survey was administered to 78 high school students enrolled in two compulsory physical education classes at a South Carolina high school that did not participate in the actual study. Based on the pilot, several scale items were rewritten for brevity, clarity and straightforwardness. Students completed their survey in approximately 15 min, which was deemed adequate in terms of its feasibility of use for the study.

The researchers' university review board for research with human subjects approved the study before data collection. In addition, each school district and the school principals granted permission to conduct the study, and parents and students gave informed consent/assent. The authors administered the surveys with intact physical education classes at the participating schools. Surveys included a cover page with directions emphasizing that participation was voluntary, students should respond to all questions, responses would be kept confidential and the survey would not affect the students' grades in class. These directions were also given orally. Students were also asked to write the name of their physical education teacher and their school on the cover sheet before beginning the survey. As with the pilot, most students took approximately 15 min to complete the survey.

Data Analysis

Data Screening. Before conducting statistical analyses, negatively worded items were recoded, and descriptive statistics along with univariate skewness and kurtosis coefficients were computed using the PRELIS component of the LISREL 8.80 statistical package. To determine the extent to which the assumption of multivariate normal distribution was met, the researchers also conducted Mardia's tests of multivariate normality (Mardia, 1970) using the R.10.1 statistical package.

Univariate skewness coefficients above 2, univariate kurtosis coefficients above 7, and multivariate kurtosis coefficients above 3 for were considered indicative of nonnormality (Finney & DiStefano, 2006). The low number of missing values and their random distribution allowed the researchers to use a mean imputation procedure to prevent losing information by deleting observations. With 24 observed variables and a sample size of 636 students, our hypothesized model meets the sample size requirement of at least 10 subjects per variable (Bentler and Chou, 1987).

Factor Analysis. Exploratory factor analysis (EFA) with Maximum Likelihood estimation (ML) and Promax rotation was employed to reveal the latent dimensions that underlie the data. EFA was conducted using the SPSS 17.0 statistical package, and results were used to create separate measurement scales for the constructs included in the hypothesized structural model. Subsequent confirmatory factor analysis (CFA) was conducted to determine how well the survey items measure the proposed constructs, and the factor structure derived from the exploratory procedure was used to specify the measurement model. CFA was conducted with the same data set using the LISREL 8.80 statistical software package with the Diagonally Weighted Least Squares (DWLS) estimation procedure.

Due to the limitations imposed by the assumption of unidimensionality and uncorrelated errors of measurement (Bollen, 1989), the Cronbach coefficient alpha often underestimates the internal consistency of a scale (Raykov, 1997). To obtain a measure of internal consistency that is robust to the violation of these assumptions, the composite reliability (CR) of each construct was computed using the CFA standardized item factor loadings and errors of measurement. The same estimates were used to calculate the average variance extracted (AVE) by each factor, which indicates the amount of variance shared by the observed variables for each construct (Hair, Anderson, Tatham, & Black, 1998).

Structural Equation Modeling (SEM). Based on the evidence that the observed variables are accurate measures of the five constructs, the researchers estimated the proposed causal relationships among the latent constructs and tested the hypothesized model. After specifying the parameters to be estimated, the application of the T-rule (Byrne, 1998) showed that the model was overidentified, meaning that sufficient information and enough degrees of freedom (df = 225) were left to compute fit indices. The parameter estimates and the goodness of fit indices were computed using the LISREL 8.80 statistical package. Parameter estimates were considered significant when the corresponding t statistics took values above 1.96. To assess the goodness of fit of the model, the following fit indices were recorded: (1) Chi-square statistic/ degrees of freedom (Jöreskog & Sörbom, 1993); (2) goodness-of-fit index (GFI); (3) nonnormed fit index (NNFI); (4) root mean square error of approximation (RMSEA) and 90% confidence interval; (5) comparative fit index (CFI); and (6) the standardized root mean residual (SRMR). Modification indices (MI), the residual matrix, the parameter t statistics, and the errors of measurement of the observed variables were examined to determine if changes to the model were needed. Modification indices lager than 4, along with large values in the residual matrix, nonsignificant parameter estimates, or large measurement errors were taken to indicate that the fit of the model could be improved by adding or removing paths and/or variables (Schumacker & Lomax, 2004).

Results

Although the univariate skewness and kurtosis coefficients do not exceed the cutoff values indicative of nonnormality (Appendix A), Mardia's tests of multivariate skewness (Mardia's multivariate skewness = 4588.94, p-value< .001) and multivariate kurtosis (Mardia's multivariate kurtosis= 49.40, p-value< .001) yielded significant coefficients. While the multivariate skewness coefficient may occur because items from different scales have different numbers of response categories and may not have much impact on estimation accuracy (Finney and DiStefano, 2006), kurtotic data may lead to estimation bias, which can be attenuated by selecting an estimation method that is robust to multivariate nonnormality (Finney and DiStefano, 2006).

EFA procedures yielded a five-factor solution: State Motivation (SM), Teacher Communication of Content Relevance (CCR), Perceived Content Relevance (PCR), Affective Learning (AL), and Intentionality (INT). After deleting two cross-loading items from the PCRS, the final solution had a simple structure with factor loadings between .49 and .93. As expected, the five factors were moderately correlated, with correlation coefficients between .35–.60. As indicated in Table 1, all five factors have Cronbach coefficients alpha above .70, showing consistent responses for items of similar content.

Subsequent confirmatory factor analysis showed that the items included in each factor were adequate measures of the corresponding constructs. Observed variables had small errors of measurement and high factor loadings, and the measurement model had a very good fit to the data (χ^2/df = 2.75, GFI=.99, NNFI=.99, RMSEA=.05, SRMR=.04). Results also revealed moderate positive relationships among the five latent variables, with correlation coefficients ranging from .39 to .66 (Table 1).

Furthermore, the scale CR coefficients ranged between .85 and .93 (Table 1). These values are well above the recommended threshold of .70 (Hair et al., 1998), indicating high levels of internal consistency. Similarly, the AVE by each factor is above the threshold of .50 (Hair et al., 1998), showing that, on average, the observed variables for each construct share more than half of their total variance. Given the robust fit of the measurement model and the high internal consistency of the scales,

Table 1 Internal Consistency Coefficients and Factor Correlations (*n* = 636)

	Internal Consistency		CFA Factor Correlations				
	Cronbach's Coefficient Alpha	Composite Reliability	SM	CCR	PCR	AL	AVE
SM	.86	.89	*				.62
CCR	.88	.92	.48	*			.67
PCR	.85	.85	.63	.58	*		.53
AL	.91	.93	.61	.39	.61	*	.78
INT	.90	.92	.59	.46	.66	.51	.79

Note: SM = State Motivation; CCR = Teacher Communication of Content Relevance; PCR = Perceived Content Relevance; AL = Affective Learning; INT = Intentionality; AVE = Average Variance Extracted the covariance matrix (available upon request) of the observed variables was then used as input for estimating the goodness of fit statistics and the parameters of the hypothesized structural model. The fit indices obtained were: $\chi^2 = 989.30$ (df = 226, p value < 0.001); χ^2/df =4.37; SRMR=.10; RMSEA=.07, RMSEA CI = 0.07–0.08; GFI=.96; NNFI=.97; CFI=.97. Although the χ^2/df is slightly higher than the general cut-off value of 3, this index is sensitive to both sample and model size. While the SRMR and RMSEA values show an acceptable to moderate model fit, the GFI, NNFI, and CFI values indicate a very good fit of the model to the data (Jöreskog & Sörbom, 1993; Rigdon, 1996; Schumacker and Lomax, 2004). Overall, estimated fit indices show a relatively good model fit. Along with the statistically significant path coefficients, and small measurement errors and error variances, these outcomes show a good fit of the data to the relationships specified in the hypothesized structural model.

Analysis of modification indices, parameter estimates and errors of measurement indicated that deleting one of the remaining six items in the PCR factor would optimize the model fit. A review of the content for this item revealed that the item information was redundant and including the item on the scale increased the chance of multicollinearity issues. Consequently, this item was removed (the final PCRS items are presented in Appendix B). This action improved the model fit and increased the amount of variance in the dependent variables explained by the model. The final model includes 23 observed variables, which have small measurement errors, and factor loadings ranging from .57 to .89. These coefficients indicate that more than half of the variance of each item is explained by the corresponding factor.

All path coefficients were statistically significant and took values between .75 and .81 (Figure 1). These estimates show the amount of increase in the dependent

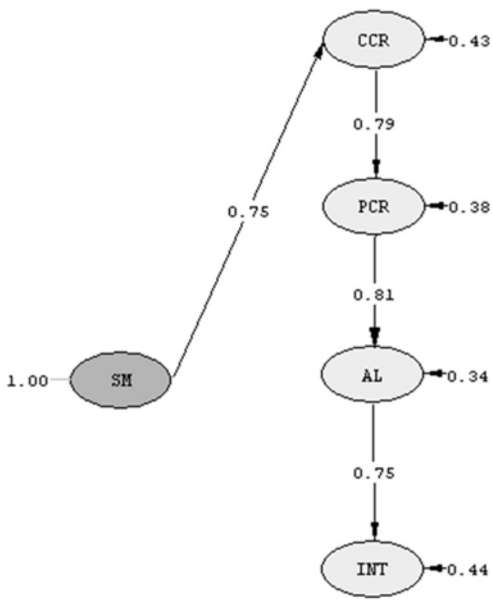

Figure 1 — Structural Model with Standardized Path Coefficients and Error Variances.

variable when the independent variable increases by one standard deviation. They also allow the researcher to estimate indirect effects between variables that are not directly linked, by computing the product of the intermediate path coefficients (Table 2). For instance, SM has an indirect effect of .36 on INT, which indicates that 36% of the variance in INT is accounted for by SM.

Table 2 Indirect Effects among Latent Constructs

	SM	PCR	CCR	AL
SM	*			
PCR	0.60	*		
CCR			*	
AL	0.48		0.64	*
INT	0.36	0.61	0.48	

Note: All parameter values are significant. SM = State Motivation; PCR = Perceived Content Relevance; CCR = Teacher Communication of Content Relevance; AL = Affective Learning; INT = Intentionality

As illustrated in Figure 1, the endogenous latent variables had relatively low residual error variances, while the model explained the rest of their variance. The squared multiple correlations for the structural equations show that the specified model explains 57% of the variance in CCR, 62% of the variance in PCR, 66% of the variance in AL, and 56% of the variance in INT.

Discussion

Given the need to better understand the mechanisms through which learning experiences in physical education class transfer to students' personal lives, the purpose of this study was to test a theoretical model predicting causal relationships between teacher communication and high school students' motivation, perceptions of class relevance and affective learning leading to the application of class content in the future. Below, the results are discussed in terms of their overall support for the measures used to collect data, their alignment with our proposed theoretical model and their implications for practice and future research in physical education.

Strength of the Measures

All measures employed in this study were novel to physical education research and were therefore validated before their use. Multiple indices provided support for the strength of each scale. EFA procedures revealed the five-factors (SM, CCR, PCR, AL, and INT) were moderately correlated indicating no problems with discrimination validity. In addition, Cronbach Alphas indicated good internal consistency for each construct. Subsequent CFA methods revealed small measurement errors and high factor loadings, and goodness of fit indices indicate a good to very good model fit. Finally, CR scores all indicate moderate to high reliabilities. Furthermore, AVE values indicate that the items included in each scale share more than half of the variance in student responses. These robust figures, coupled with the validation process before the study, suggest the instruments used in this study provide valuable measures for future use in physical education research examining high school students' state motivation, content relevance, affective learning and intentions to use class content in the future. Notably, the PCR measure was newly developed for this study and, based on the scale validation results, we feel confident recommending its application in studies investigating the extent to which students perceive class content as relevant to their personal interests and goals.

Alignment With the Proposed Theoretical Model

The proposed theoretical model suggested causal relationships between teacher and student variables identified in research and theory as potentially important to whether students develop intentionality to apply knowledge and skills learned in a course after the course ends. Based on previous research linking content relevance to high school students' interests in pursuing additional study in science and math (Mottet, et al., 2008), we expected content relevance to mediate similar affective responses (i.e., interest in taking other physical education classes and intentions to use class content following the completion of the course) in the current study. Furthermore, following attention-arousal theory (Kelly & Gorham, 1988), we expected state motivation to act as an antecedent variable in the teaching-learning process. We predicted that students with more positive predispositions toward their physical education class would experience greater arousal in class and that this would manifest itself in increased attention to and processing (i.e., perceptions) of the teachers' communication messages related to content relevance.

Results of the structural equation model showed statistically significant direct positive relationships between each of the constructs as predicted in the hypothesized model. State motivation influenced intentionality through a causal chain of links beginning with perceptions of the teacher's communication, which directly influenced perceptions of class relevance. Perceived relevance, in turn, had a direct bearing on students' affect for physical education and intentions to use the knowledge and skills learned in their physical education class. These results suggest the students in our sample who were more motivated to be in their physical education class were ultimately more likely to feel they would use at least some of the knowledge and skills they learned in class once the course was over. Although previous research has shown that motivation to be in class may be influenced by teacher communication (e.g., Frymier, 1994; Frymier & Shulman, 1995), the current study is the first to provide evidence of reverse causality. Our results suggest students' predispositions toward physical education may have powerful implications for how well class experiences ultimately transfer to future contexts.

Despite the antecedent effects of student motivation in this study, the subsequent links between teacher communication and students' intentions must also be emphasized. When the students perceived their teacher to communicate content relevance, they were more likely to feel that their physical education class was valuable and personally meaningful, have more interest in taking more physical education classes and report greater intentions to use the class content in the future. This finding is critical as it suggests a clear pedagogical pathway to facilitating continued engagement with motor-related learning experiences and utilization of knowledge and skills important to a physically active lifestyle. Moreover, teachers who couple relevance messages with communication behaviors that serve to gain students' attention may be able to increase the proportion of students in their classes who are able to identify with physical education on a personal level (Krathwohl, et al., 1964) and who ultimately choose to exercise what they learn in class later in their lives. The instructional communication literature provides some direction regarding attention-gaining strategies. For instance, research on teacher immediacy has shown that nonverbal behaviors such as making eye contact with students, moving around the classroom and smiling are related to student attentiveness (McDowell & McDowell, 1990). Theoretically, immediacy serves to increase perceptions of approachability and solidarity, which lead to approach tendencies such as attention to the teacher (Kelly & Gorham, 1988; Mehrabian, 1971).

Several constructs displayed moderate to high positive indirect relationships. Teacher communication and affective learning showed the strongest relationship, lending continued support to an evolving literature base which illustrates the importance of content relevance messages to affective learning outcomes in the college classroom (Frymier & Shulman, 1995), high school science and math classes (Mottet, et al., 2008) and now, high school physical education. Results also demonstrate a moderate relationship between teacher communication and intentionality, thus strengthening our assertion that content relevance messages can channel behavioral intentions oriented to physical activity. Furthermore, a strong indirect relationship was observed between perceived class relevance and affective learning, as well as for perceived relevance and intentionality. Establishing these connections is an important step theoretically, as previous research investigating content relevance has focused only on perceptions of the teacher's use of relevance messages and not on perceptions of class relevance. This study demonstrates the mediating role of perceived relevance in affective learning outcomes. Finally, state motivation displayed a strong positive relationship with perceived class relevance and moderate relationships with affective learning and intentionality. The relationship between motivation and perceived relevance is consistent with the ARCS theory of motivation (Keller, 1983; 1987), which in part posits that motivation to learn is related to how relevant the course material is to students' interests and goals. Moreover, the relationship between motivation and affective learning is not surprising, given the perspective of Rodriguez et al. (1996) that motivation is partly a conceptual artifact of affective learning. Thus, even though the results of this study indicate motivation and affective learning can be viewed as distinct concepts, one would naturally expect there to be a close association between motivation to be in class and feelings toward other similar classes. By extension, it is logical that motivation and intentions to use the class content would also be related.

Limitations, Future Directions and Conclusions

The results of this study are primarily limited by the use of a cross-sectional design and perceptions-based data. The cross-sectional design limits our ability to make conclusive statements concerning causation in this study as data were not collected longitudinally and therefore there is no way to assess which variables in fact led to changes in others across time (Netemeyer, Bentler, Bagozzi, Cudeck, & Cote et al., 2001; Johnson, 2010). Nevertheless, researchers generally accept structural equation modeling as a statistically sound method to test hypothesized relationships between constructs (Schumacker & Lomax, 2004) so we offer that our results provide tentative evidence of such relationships. In addition, perceptions of teaching and learning are subjective and do not capture contextual factors, such as classroom events, interpersonal relationships and content coverage, that could influence the variables examined in this study. However, this limitation is slightly curbed by the large sample size and broad representation of school settings, which help to control for contextual differences.

Future studies should seek to confirm the results of the current study with other samples of high school students. While a longitudinal design is ideal to establish theoretical links, it is not always practical. However, several alternative approaches can help to shed further light on the propositions tested in this investigation. First, objective measures should be developed for teacher communication of content relevance and student application of physical education in outside-of-class contexts. Objective measures may include rating scales or observation instruments designed to systematically capture behavioral indices of teacher communication and student use of class-related knowledge and skills. Second, studies should correlate data collected by objective measures with perceptions data to determine the extent to which self-/other-reports depict an accurate representation of actual events. Third, measures of student arousal and/or attention should be included in future investigations to more precisely test the assertion that these qualities mediate the relationship between state motivation and perceptions of teacher communication. Finally, collecting qualitative data and conducting case studies will be helpful in terms of identifying contextual factors that influence state motivation, perceptions of relevance and affective learning in physical education.

Other directions for continued research include comparing the relative contributions of other teacher communication variables to affective learning in physical education and examining the influence of content relevance on both cognitive and psychomotor learning outcomes. For instance, Mottet et al. (2008) found both content relevance and teacher clarity (e.g., clearly explaining objectives, providing clear answers to students' questions, using clear examples to explain objectives and course material) to be significant predictors of high school students' affective learning in science and math. In addition, while no published studies have examined the influence of content relevance on cognitive or psychomotor learning, research in physical education and instructional communication highlights numerous teacher communication variables associated with cognitive outcomes Such outcomes include, for example, perceived and actual cognitive learning (Chesebro & McCroskey, 2000; 2001) and information recall (Kelly & Gorham, 1988; Webster, 2010), and psychomotor outcomes such as motor performance on volleyball (Gusthart, Kelly, & Rink, 1997) and lacrosse (Kwak, 1993) skills. Since communication is clearly a central aspect of effective teaching and student learning, we recommend that physical education research employ a greater range of communication variables.

In conclusion, this study extends the recent work of Mottet et al. (2008) in science and math to physical education, indicating content relevance operates consistently across these different subject areas in school. Specifically, perceptions of teacher communication behaviors that convey content relevance seem to have a significant positive effect on higher order affective responses (Krathwohl, et al., 1964). Further, the current study expanded the extant research on content relevance by also showing how students' state motivation and perceptions of class relevance may tie in to a broader theoretical framework explaining relationships between teacher communication and affective learning in the context of high school physical education. The most important contribution of this study is its identification of several factors, including those that are predisposing, pedagogical and attitudinal, which appear to be influential in students' choices about applying what they learn in physical education to their future lives. Considering the goal of physical education to promote active lifestyles through the development of knowledge and skills for physical activity participation (NASPE, 2004), continued research is needed to determine if these factors and others indeed lead to increased use of physical education content and whether the application of such content fosters increased levels of physical activity.

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