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Abstract

This study examines the complexities of the social learning environment in middle school physical education. Specifically, we investigate the independent and interactive predictive effects of situational interest and needs supportive teaching on students' personal interest and class engagement. Middle school students (N = 388) in compulsory physical education courses completed questionnaires on situational interest, needs supportive teaching, personal interest, and behavioral and emotional engagement. Results from structural equation modeling tests revealed independent predictive effects of situational interest and needs supportive teaching on personal interest, and behavioral and emotional engagement. There was also an interactive effect between situational interest and needs supportive teaching on personal interest. This association was conditional on a minimum level of needs support in the social learning environment. To date, the conceptualization of situational interest has focused on student – activity interactions; however, our findings highlight the importance of social learning environment on student – activity interactions.

Keywords: interest, engagement, need support.

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Interés y Compromiso del Alumnado en Educación Física en el Instituto: Examinando el Papel de la Enseñanza de Apoyo a las Necesidades

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Resumen

Este estudio examina las complejidades del entorno social de aprendizaje en la educación física en la escuela media. Específicamente, investigamos los efectos predictivos independientes e interactivos del interés situacional y de la enseñanza de apoyo a las necesidades sobre los intereses personales del alumnado y el compromiso en la clase. Estudiantes de escuela media (N = 388) en cursos de educación física obligatoria completaron cuestionarios sobre intereses situacionales, enseñanza de apoyo a las necesidades, interés personal y compromiso conductual y emocional. Resultados de tests de modelos de ecuaciones estructurales revelaron efectos predictivos independientes del interés situacional y la enseñanza de apoyo a necesidades sobre el interés personal, y el compromiso conductual y emocional. También hubo un efecto interactivo entre el interés situacional y la enseñanza de apoyo a las necesidades sobre el interés personal. Esta asociación fue condicional en un nivel mínimo de apoyo a las necesidades en el entorno social de aprendizaje. Hasta el momento, la conceptualización del interés situacional se ha focalizado en las interacciones estudiante-actividad; sin embargo, nuestros resultados subrayan la importancia del entorno social de aprendizaje sobre las interacciones estudiante-actividad.

Palabras clave: interés, compromiso, apoyo a las necesidades

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Middle school is a critical juncture in understanding early adolescents' motivation toward establishing health lifestyle habits. Physical education (PE) provides early adolescents the opportunity to learning about healthy lifestyles in a structured, school-based learning environment. Unfortunately, early adolescence represents a time-period when students' attitudes toward PE start to decline (Mercier, Donovan, Gibbone, & Rozga, 2017). Students that lack motivation are unlikely to mobilize their personal resources toward the learning process, which undermines academic success (Skinner, Marchand, Furrer, & Kindermann, 2008) and impedes engagement in health behavior (Ntoumanis & Standage, 2009; Olson, Gaffney, Lee, & Starr, 2008). On the other hand, students who are interested and engaged in PE are more likely to achieve important outcomes such as knowledge development, motor skill proficiency, and physical activity participation (Chen & Ennis, 2009; Ennis, 2015).

In this study, we examine the complexities of middle school students' interest and engagement in PE. Recently, Chen and Wang (2017) challenged investigators to address the dearth of research on students' personal interest in PE. We attempt to answer this call by examining middle school PE students' beliefs about their social learning environment. Specifically, we explore students' personal interest and engagement regarding the interaction between situational interest toward routine activities in PE and perceptions of their teachers' motivational style. Situational interest is a powerful motivational factor in PE learning contexts (Chen & Darst, 2001). Despite strong theoretical links between interest development and social aspects of classrooms (Deci, 1992), research on situational interest in PE has focused on specific activities without addressing teachers' motivational style for delivering those activities. In the following paragraphs, we argue that situational interest and teacher motivational style need to be further investigated to enhance understanding about middle school students' personal interest and engagement in PE.

Interest Theory and Engagement

Interest is a critical element of motivation in the classroom because it predisposes students to engage and reengage in the learning process (Hidi & Renninger, 2006; Mitchell, 1993; Renninger & Hidi, 2016). Educational

researchers typically focus on two main types of interest, situational and personal (Hidi & Renninger, 2006). It is important to note, however, that cognitive activation, positive emotion, and personal meaning/value are core elements in both types of interest. Situational interest is a short-term type of interest focusing on the interaction between a student and her/his learning context. Specifically, situational interest is associated with personal attachment to the appealing contextual aspects of a learning task or content (Chen & Wang, 2017). Hidi and Renninger (2006) suggest that triggering situational interest occurs from external sources within the learning environment such as the instructional conditions, topic-focus, and social interactions with teachers and/or peers. On the other hand, personal interest is a person-centered psychological disposition toward a learning tasks or content, grounded in personal meaning, preference, and value (Hidi & Renninger, 2006). Personal interest develops over longer periods through repeated experiences with learning tasks and/or content.

Research on student interest in PE has concentrated on situational interest (Chen, Darst, & Pangrazi, 1999). Chen and his colleagues developed the situational interest framework in PE, which focuses on students' connection to activity characteristics that stimulate short-term interest. This is a highly productive research agenda because it provides vital information on how to structure PE tasks that activate student attention and positive emotional states. According to Chen and Wang (2017), situational interest may receive greater attention because external characteristics of the learning context are easier to manipulate than person-centered personal interest. However, the study of both situational interest and personal interest are necessary to obtain a comprehensive understanding of student interest (Chen & Wang, 2017; Garn, Cothran, & Jenkins, 2011; Hidi & Renninger, 2006; Renninger & Hidi, 2016). Situational interest has been linked to a variety of student outcomes in PE such as steps (Shen, Chen, Tolley, & Scrabis, 2003), engagement (Ding, Sun, & Chen, 2013), and physical activity (Huang & Gao, 2013). There is less evidence that links situational interest to knowledge gains in PE (Chen & Ennis, 2009; Shen, Chen, & Guan, 2007; Zhu et al., 2009). This may suggest the relationship between situational interest and knowledge gain is more complex and underscore the need to investigate intervening constructs including personal interest (Shen et al., 2007).

Garn et al. (2011) investigated middle school students' development of personal interest in a PE class over an 18-week period. In this qualitative

study, students reported the interconnection between interest development and learning in PE but noted a disconnect between the two. Specifically, students believed that interest was a key component of learning, but that learning rarely took place in their PE class. Thus, personal interest development was relegated to students who already had previous knowledge and high skill for a specific PE topic (e.g., basketball; soccer). This supports previous research that highlights intrinsic links between student interest and providing PE students with meaningful learning opportunities (Zhu et al., 2009).

Interest is a motivational resource that increases students' learning engagement (Hidi & Renninger, 2006; Renninger & Hidi, 2016). We conceptualize engagement as students' active participation in classroom activities, which reflects behavioral components such as attention and effort regulation and emotional components such as vitality and satisfaction (Skinner et al., 2008). Engagement provides the underpinnings of goal-directed behavior, cognition, and affect in academic settings and is an important catalyst for student learning, school adjustment, and psychological well-being (Skinner, Kindermann, & Furrer, 2009).

Situational Interest and Teacher Motivational Style in PE

Deci's (1992) theorizing on interest has provided a substantive foundation for the situational interest framework in PE (Chen et al., 1999). Deci (1992) persuasively discusses interest by addressing the interrelatedness of students, activities, and learning contexts. Situational interest research in PE partially captures Deci's conceptualization by emphasizing the interrelatedness between students and activities. Specifically, Chen et al. (1999) developed the Situational Interest Scale in PE (SIS-PE) consisting of person – activity dimensions such as attention demand, challenge, exploration intention, enjoyment, and novelty. Students report these cognitive and affective states toward a specific activity. There is also a total interest component on the SIS-PE that represents students' overall situational interest toward the activity.

According to Deci (1992), teachers' motivational style plays a vital role in developing and sustaining student interest. We operationalize teacher motivational style as student perceptions of needs supportive teaching (Reeve, 2006; Standage, Duda, & Ntoumanis 2005). Teachers are most effective at cultivating interest when they support students' feelings of autonomy, competence, and relatedness (Deci, 1992). Autonomy support focuses on how well teachers are able to produce a social learning environment that allows

students to experience agency in self-endorsed behaviors. Competence support focuses on how well teachers can produce a social learning environment that promotes achievement, meaningful learning, and skill development. Relatedness support focuses on how well can produce a social learning environment that facilitates positive interpersonal relationships. Deci and Ryan (2000) suggest that feelings of autonomy, competence, and relatedness are basic psychological needs that must be fulfilled for students to develop motivational resources. Thus, needs supportive teaching represents an optimal motivational style (Standage et al., 2005; Ryan & Deci, 2007). Student reports of their teachers' needs supportive teaching in PE facilitates a host of positive motivational constructs (Ntoumanis, 2001; Taylor & Ntoumanis, 2007).

To our knowledge, the potential interaction between situational interest and teacher motivational style in PE contexts is missing. Hidi and Renninger (2006) argue that situational interest may or may not lead to personal interest. They suggest that personal involvement and support from teachers are social aspects of a learning context that can strengthen the connection between situational interest and personal interest. Similarly, Schraw, Flowerday, and Lehman (2001) report that situational interest may be closely linked to teaching strategies such as providing students with choices or creating well-structured learning tasks, which align closely to autonomy support and competence support, respectively. Rotgans and Schmidt (2011) revealed an association between student perceptions of their teachers' social congruence, like relatedness support, and situational interest in university classrooms. Two studies in classroom contexts other than PE revealed that autonomy support predicted personal interest (Ciani, Ferguson, Bergin, & Hilpert, 2010; Tsai, Kunter, Ludtke, Truatwein, & Ryan, 2008).

This study addresses numerous gaps in the current student interest literature. First, situational interest researchers in PE have neglected to investigate the role of the social learning context that activities are situated in, specifically, students' perceptions of the motivational style of their teacher (Ciani et al., 2010; Deci, 1992; Tsai et al., 2008). We hypothesize that the level of needs supportive teaching that students perceive in their PE context strengthens the relationship between situational interest and personal interest (Hidi & Renninger, 2006). Studies on interest development outside of PE have focused solely on autonomy support as a motivational style of teaching, yet all three types of support (i.e., autonomy; competence; relatedness) are

necessary for optimal interest development (Deci, 1992). Similarly, studies outside of PE have not examined the multiplicative effects of situational interest and needs supportive teaching on personal interest or engagement (Ciani et al., 2010; Deci, 1992; Tsai et al., 2008). Hidi and Renninger (2006) theorize that the link between situational interest and personal interest may be conditional (i.e., moderated) by constructs related to personal involvement/support of teachers. Testing the independent effects of situational interest and teacher motivational style on personal interest does not reflect the complexities originally theorized by Hidi and Renninger (2006). Finally, personal interest in PE is an area of research that needs greater exploration because like situational interest, it is a powerful motivator that can facilitate important learning outcomes in PE (Chen & Ennis, 2009; Chen & Wang, 2017).

The Present Study

The purpose of this study is to investigate relationships between middle school students' reports of situational interest, teacher motivational style, personal interest, and multidimensional engagement in PE. The following hypotheses guided this study:

Hypothesis 1 (H1): Situational interest and needs supportive teaching will independently predict student reports of personal interest and multidimensional engagement.

Hypothesis 2 (H2): Needs supportive teaching will moderate the relationship between situational interest and personal interest.

Hypothesis 3 (H3): Needs supportive teaching will moderate the relationship between situational interest and multidimensional engagement.

Method

Participants and Context

Participants for this study were middle school students (N = 388) enrolled in PE classes from five schools in Southeastern region of United States. The participants mean age was 12.40 (SD = 1.04) and were predominantly female (64%). Most students reported their ethnicity as African American (46%) and Caucasian (33%). The grade-level distribution of the students was 40% sixth grade, 33% seventh grade, and 27% eighth grade. All five schools used a traditional, sports-based multi-activity curricular model where short units of

instruction focused on team sports dominated by large-sided games rather than skill development.

Measures

Situational interest. The Chen et al. (1999) Situational Interest Scale was used to measure students' situational interest. Specifically, we used the total situational interest subscale, which consists of four items such as "This activity is interesting." The stem of the scale asks students to write down the reference activity and answer each item in relation to his/her experience with the reference activity. In this study, students' warm-up was used as the reference activity. Although there was variation across classes, warm-up activities focused on a combination of walking/running/agility and traditional calisthenics (e.g., push-ups, jumping jacks, etc.) and were routine in nature (i.e., low interest). We assumed that the interaction between situational interest and teacher motivational style may be more prevalent in low interest activities compared to high interest activities. We also used the warm-up as a reference activity to keep the content focus similar across schools. Each item was answered on a 5-point scale ranging from (1) very untrue to (5) very true. The Situational Interest Scale has consistently demonstrated sound psychometric properties in secondary PE (Chen et al., 1999).

Needs supportive teaching. Student perceptions of needs supportive teaching in PE were measured using scales developed by Standage et al., (2005). Autonomy support was measured using 6-items. A sample item was, "During PE, the teacher provides me with choices and options". Competence support was measured by means of a 4-items. A sample item was, "During PE, my teacher helps me to improve." Relatedness support was measured with 5-items. A sample item was: "During PE, the teacher encourages me to work with others." Each item was answered on a 5-point scale ranging from (1) very untrue to (5) very true.

Personal interest. A personal interest scale developed by Trautwein, Ludtke, Marsh, Koller, and Baumert (2006) measured students' personal interest in PE. The scale consisted of 3-items; the first two items measured affective quality, while the third item taped personal importance. The questionnaire was modified by replacing "mathematics" with "PE". The items were: "When I do PE, I sometimes get totally absorbed."; "Because PE is fun, I wouldn't want to give it up."; and "PE is important to me personally." Each

item was answered on a 5-point scale ranging from (1) strongly disagree to (5) strongly agree.

Engagement. Participants' behavioral and emotional engagement in PE was measured with an instrument developed by Skinner et al. (2008). Behavioral engagement was assessed using 5-items that captured students' attention, effort, and persistence in PE (e.g., "I pay attention in PE class."). Emotional engagement also included 5-items that assessed indicators of students' emotional participation during PE (e.g., "When I'm in PE class, I feel good."). Each item was measured on a 5-point scale ranging from (1) strongly disagree to (5) strongly agree. The instrument has been used in PE settings (Shen, McCaughtry, Martin, Fahlman, & Garn, 2012).

Procedure

Approval from the Institutional Review Board was acquired from the researchers' University before this study commenced. Parental consent and child assent forms were obtained from all the participants. The primary researcher thoroughly explained the nature of the study to the participants before administering the questionnaires. The primary researcher also clarified and responded to questions from the participants. On average, the students took ten minutes to respond to the questionnaires.

Data Analysis

Data were screened, and descriptive statistics were calculated for each construct. Internal consistency of each construct was tested with coefficient alpha estimates. Mplus 7.4 (Muthén & Muthén, 2015) with robust maximum likelihood (MLR) estimator was used for all structural equation modeling (SEM) analyses. The fixed-factor scaling approach was also used during all SEM analyses (Little, 2013). Small amounts of missing data were handled with full information maximum likelihood (Enders, 2010). We initially ran a fully exogenous model to evaluate latent correlations. This approach is superior to a bivariate correlation matrix because it parcels measurement error from the analysis, thus, estimates are generated from reliable variance only (Kline, 2015). SEM was used to test the main hypotheses of the study. First, we examined a model that situated situational interest and need support as exogenous or predicting constructs and personal interest, engagement, and disaffection as endogenous or outcomes. This baseline model provided information on overall fit (i.e., measurement model), structural relations (i.e.,

standardized betas), and effect size (i.e., R^2) without the interaction between situational interest and need support.

Next, we added the latent interaction between situational interest and need support to the baseline model using the latent moderated structural equations (LMS) approach (Klein & Moosbrugger, 2000). Modeling latent interactions with the LMS approach is a well-supported method of SEM moderation analysis (Little, Bovaird, & Widaman, 2009). One limitation of the LMS approach is that model fit statistics are not produced in Mplus (Muthén & Muthén, 2015). However, an adequate baseline measurement model fit provides justification to add the latent interaction. Furthermore, *p*-values for unstandardized beta coefficients and change (Δ) in R^2 values confirm or disconfirm the value of adding the interaction term. The Johnson-Neyman technique (Johnson & Neyman, 1936) with 95% confidence intervals (95% CIs) was used to probe statistical significance of latent interactions (Bauer & Curran, 2005). This plot represents the conditional relationship (i.e., unstandardized beta) between situational interest and outcomes for students who report diverse levels of need support. The Johnson-Neyman technique provides comprehensive information across all levels of the moderator unlike other techniques that only spotlight values one standard deviation above and below the mean (Spiller, Fitzsimons, Lynch, & McClelland, 2013). Regions of statistical significance for interactions were based on 95% CIs that did not straddle zero.

We used joint criteria to evaluate all SEM tests (Hu & Bentler, 1999). Specifically, the robust chi-square (χ^2) with degrees of freedom (*df*) and *p*-value, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and the root-mean-square error of approximation (RMSEA) with 90% CI were used to evaluate model fit (Marsh, Hau, & Grayson, 2005). Marsh et al. (2005) suggests this combination absolute and relative fit index provides suitable information to judge quality of model fit. Values greater than .90 and .95 for the CFI and TLI indicate adequate and excellent fit to the data, whereas RMSEA values smaller than .08 or .06 support acceptable and excellent model fit (Hu & Bentler, 1999; Marsh et al., 2005). We also made SEM judgements based on parameter estimates such as standardized factor loadings and latent correlation estimates (Kline, 2015).

Results

Preliminary Analyses

Descriptive statistics, coefficient alpha estimates, and latent correlations are presented in Table 1. Each factor had a mean score above the mid-point of its respective scale. Standard deviations ranged from low of .791 for behavioral engagement, to a high of 1.016 for situational interest. Coefficient alpha estimates ranged from a low of .766 for personal interest to a high of .927 for need support. Latent correlation estimates were positive with moderate-to-strong magnitudes ($p < .001$ for all pairs). The strongest latent correlations occurred between behavioral engagement and emotional engagement ($r = .794$) and between personal interest and emotional engagement ($r = .773$). The weakest latent correlations occurred between need support and behavioral engagement ($r = .490$).

Table 1

Descriptive Statistics, Coefficient Alpha Estimates, and Latent Correlations of Study Factors

Factor	SI	NS	PI	BE	EE
SI	1.000				
NS	.596	1.000			
PI	.537	.600	1.000		
BE	.506	.490	.576	1.000	
EE	.619	.562	.773	.794	1.000
M	3.584	3.597	3.387	3.943	3.738
SD	1.016	0.890	0.996	0.791	0.908
α	0.872	0.927	0.766	0.880	0.879

Note. SI = situational interest; NS = needs support; PI = personal Interest; BE = behavioral engagement; EE = emotional engagement; All latent correlations = p < .001; M = mean; SD = standard deviation; α = coefficient alpha.

Main Analyses

The baseline SEM produced a good fit of the data, robust $\chi^2 = 296.646$ based on 160 *df*, $p < .001$, CFI = .962, TLI = .955, RMSEA = .047 (90% CI = .039 – .055). It is important to note that this model was identified in a fully *a priori* manner in accordance with interest theory. All indicator uniqueness

was treated as orthogonal and we did not use statistical information such as modification indices to re-identify our model. SEM has come under scrutiny for dubious practices such as adding *posthoc* parameter estimates for the simple reason of improving model fit (Marsh, Morin, Parker, & Kaur, 2014). Standardized factor loadings from the measurement model are presented in Table 2. Indictors for all five latent constructs yielded strong factor loadings, which provided evidence that each latent factor accounted for substantial amounts of explained variance in its indicators (Kline, 2015). Taken together, robust support was evident for the baseline measurement model (Hu & Bentler, 1999; Marsh et al., 2005).

Table 2
Standardized Factor Loadings from Baseline SEM Measurement Model

SFL	SI	NS	PI	BE	EE
SI1	.673				
SI2	.774				
SI3	.860				
SI4	.871				
AS		.899			
CS		.895			
RS		.906			
PI1			.633		
PI2			.798		
PI3			.748		
BE1				.754	
BE2				.815	
BE3				.668	
BE4				.811	
BE5				.830	
EE1					.821
EE2					.823
EE3					.830
EE4					.781
EE5					.599

Note. SFL = standardized factor loading; SI = situational interest; AS = autonomy needs support; CS = competence need support; RS = relatedness need support; PI = personal interest; BE = behavioral engagement; EE = emotional engagement.

Results from the baseline structural model revealed consistent predictive relations between exogenous and endogenous factors. Both situational interest and need support produced statistically significant standardized beta coefficients ($p < .001$) on all three outcomes. Specifically, situational interest predicted personal interest (β = .278), behavioral engagement (β = .332), and emotional engagement (β = .441). A similar pattern of standardized beta coefficients occurred between need support and personal interest (β = .434), behavioral engagement (β = .292), and emotional engagement (β = .299). Finally, a substantial amount of variance was explained in personal interest (R^2 = .410), behavioral engagement (R^2 = .311), and emotional engagement (R^2 = .441). Taken together, results from the baseline model provided clear justification to test the latent interaction between situational interest and needs support (Klein & Moosbrugger, 2000).

A visual representation of final SEM with the addition of the interaction term and standardized beta coefficients can be found in Figure 1. The interaction effect between situational interest and need support on personal interest was statistically significant. However, this was not the case for behavioral engagement or emotional engagement. The main effects remained stable from the baseline model. An additional 3% of explained variance was accounted for by the interaction term (R^2 = .443).

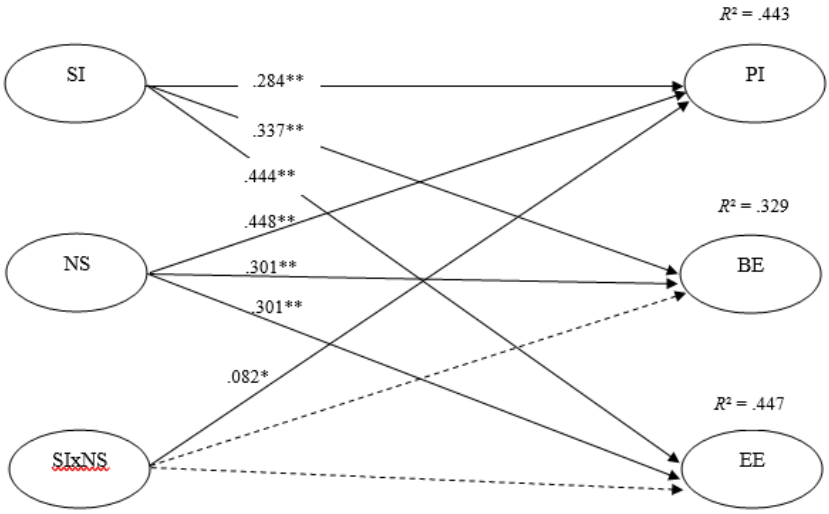

Figure1. Standardized results of structural model testing the independent and interactive effects of situational interest (SI) and need supportive teaching (NS) on personal interest (PI), behavioral engagement (BE), and emotional engagement (EE). Dashed lines = non-significant paths.
* = $p < .05$; ** = $p < .01$.

Figure 2 highlights findings from the Johnson-Neyman procedure, which provides clarity on the conditional relation between situational interest and personal interest. The relation between situational interest and personal interest was positive for students reporting need support, when SD scores were approximately -.05 or higher. In other words, there was not a statistically significant relationship between situational interest and personal interest for students who fell below the 30th percentile in their reports of needs support.

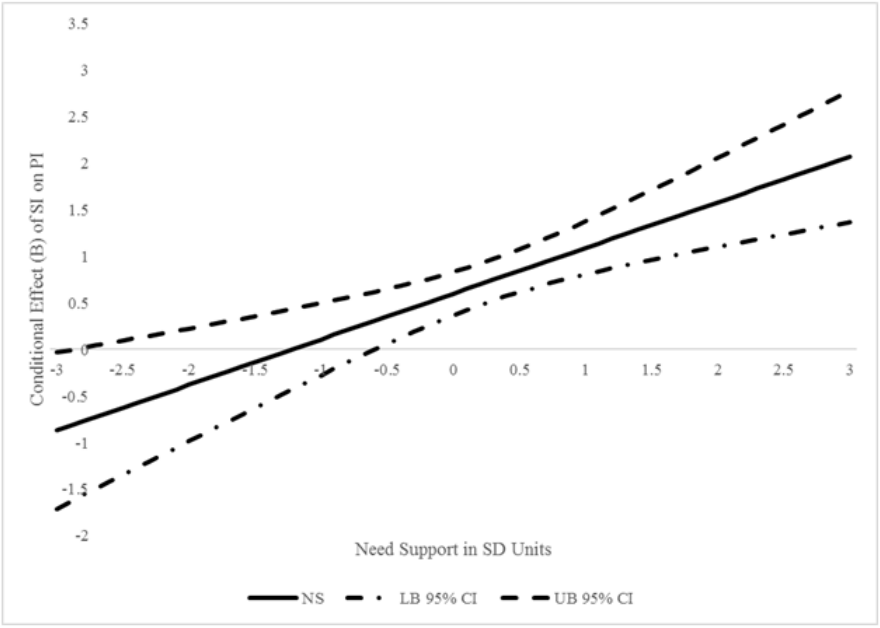

Figure 2. Unstandardized beta coefficients highlighting the conditional effects of situational interest (SI) on personal interest (PI) across variation of needs supportive teaching (NS). Confidence intervals (CI) that do not straddle zero = $p < .05$.

Discussion

Findings supported our first two hypotheses about relations between students' perceptions of situational interest, needs supportive teaching, personal interest, and class engagement. However, results did not support our third hypothesis; need supportive teaching did not moderate the relation between situational interest and engagement. Overall, these findings advance understanding about the complexities of student interest in PE, especially as it pertains to the social learning environment.

Results from the baseline measurement model testing H1 revealed a good fit of the data at both parameter and model levels, enhancing confidence in patterns established in the structural model (Hu & Bentler, 1999; Kline, 2015; Marsh et al., 2005). Situational interest and needs supportive teaching were

both associated with higher levels of students' personal interest, behavioral engagement, and emotional engagement in PE. While all associations were statistically significant, the links between situational interest and emotional engagement and between needs supportive teaching and personal interest produced the strongest magnitudes in the model. We hypothesize that the connection between situational interest and emotional engagement resulted from the affective component of situational interest (Chen et al., 1999; Hidi & Renninger, 2006). Specifically, positive feelings toward the warm-up activity likely energized students' participation and enhanced satisfaction (Skinner et al., 2008).

The shared variance between need supportive teaching and personal interest supports Deci's (1992) theorizing about the substantive relationship between student interest and the social learning environment. Previous studies outside of PE have underscored associations between teacher autonomy support and student interest (Ciani et al., 2010; Tsai et al., 2008). However, Deci (1992) stresses the importance of cultivating motivational resources including interest by supporting students' autonomy, competence, and relatedness simultaneously. The measurement of needs supportive teaching in this study met Deci's (1992) key assumption by including all three psychological needs, which may explain its strong connection with students' personal interest toward PE.

The small, positive relationship between situational and personal interest in the baseline model may have reflected the routine nature of the warm-up activity used as the situational interest reference activity. Chen and Darst (2001) provided clear evidence that cognitive demand represents an important element of task design when considering student interest. The warm-up activities of this study provided students with minimal cognitive demand. Thus, the relationship would likely be stronger if the situational interest reference activity called for greater levels of cognitive demand. However, the main contribution of this study was testing H2 and H3. We assumed that the strength between situational interest and personal interest (H2) and engagement (H3) would be more dependent on need supportive teaching during low-interest activities (Deci, 1992; Hidi & Renninger, 2006). Examination of effect sizes revealed the model explained substantial amounts of variance in emotional engagement (44%), personal interest (41%), and behavioral engagement (31%). Overall, support for H1 provided compelling

evidence to move forward with the moderation analysis (Klein & Moosbrugger, 2000; Little et al., 2009).

Findings revealed a significant situational interest by needs supportive teaching interaction on students' reports of personal interest, yielding support for H2 (see Figure 1). Readers should note, however, that the standardized beta coefficient and change in effect size were relatively small. Figure 2 casts light (Spiller et al., 2013) on the conditional relationship between situational interest and personal interest across all levels of student reports of needs supportive teaching (i.e., -3 *SD* to +3 *SD*). Based on 95% confidence intervals, results demonstrated that the relationship between situational interest and personal interest was dependent on a minimum amount of need supportive teaching reported by students. This threshold was approximately one-half a *SD* below the mean. Interest researchers note that situational interest does not always lead to the development of personal interest (Chen & Wang, 2017; Hidi & Renninger, 2006). Our findings provide further clarification on how conditions in the social learning environment strengthen or weaken the relationship between situational interest and personal interest.

To date, research on situational interest in PE has focused on person-activity interactions (Chen & Darst, 2002; Chen & Wang, 2017; Zhu et al., 2009). Importantly, this study is one of the first to consider the social learning environment that the person-activity is situated. Specifically, student beliefs about their teachers' needs supportive behaviors changed the relationship between situational interest and personal interest. Personal meaning is central to both situational and personal interest (Hidi & Renninger, 2006). Teachers who support students' psychological needs of autonomy, competence, and relatedness routinely explain why activities are important and how they connect to life outside of PE (Ntoumanis & Standage, 2009). Thus, middle school teachers who use this need supportive teaching strategy may be especially effective at facilitating early adolescents' interest in PE. Based on our findings and previous theorizing (Deci, 1992; Renninger & Hidi, 2016), accounting for teachers provides meaningful information about student interest development and warrants further investigation.

Evidence was not supportive of H3, suggesting that needs supportive teaching did not moderate the relationship between situational interest and multi-dimensional engagement. Stated differently, the strength of associations between situational interest and both types of engagement were consistent across all levels of need supportive teaching. This may reflect the inherent

activating nature of situational interest (Chen et al., 1999; Deci, 1992; Hidi & Renninger, 2006; Renninger & Hidi, 2016). Taken within the context of these findings, situational interest appears to be a stable predictor of middle school students' engagement in PE whereas its relationship with personal interest is more dynamic, relying on other factors within the social learning environment.

Practical Implications

Findings from this study can translate to effective practice in middle school PE classrooms serving early adolescents. Our results highlight the importance of student, teacher, and activity in relation to optimizing early adolescents' personal interest, behavioral engagement, and emotional engagement. Learning activities must include interesting characteristics such as attention demand, exploration, or optimal challenge (Chen et al., 1999) and be delivered in a social learning environment that supports student autonomy, competence, and relatedness (Reeve, 2006; Ntoumanis, 2001; Ntoumanis & Standage, 2009). Autonomy supportive strategies include explaining the importance and value of each activity, providing meaningful choices, reducing pressure within an activity, and connecting in-class activities to life outside of PE. Competence supportive strategies include individualizing activities when possible, giving skill and effort-related encouragement, providing positive specific feedback, and accounting for diverse skill levels. Finally, relatedness support strategies include showing empathy toward students, listening, emphasizing personalized social interactions, and avoiding criticism and blame. Creating a social learning environment that considers student, teacher, and activity characteristics are more likely to promote student interest and engagement.

Limitations, Future Research, and Conclusions

This study is not without limitations. Data were only collected at one time-point, so temporal dynamics in construct relationships cannot be established from our findings. The use of more stringent longitudinal designs would allow researchers to establish temporal patterns and examine changes (i.e.

development) between aspects of the social learning environment and interest and engagement. This seems especially important when considering relations between situational and personal interest. The reference activity for situational interest consisted of warm-ups, which we considered low-interest based on the limited amount of cognitive demand associated with the activities (Chen & Darst, 2001). Therefore, it is unclear if our findings translate to high interest activities. Future researchers should explore the moderating role of needs supportive teaching with a diverse set of activities. The need supportive teaching measure was based on student self-reports; future researchers would benefit from investigating needs supportive teaching practices based on systematic teaching observations.

In conclusion, interest and engagement are constructs that can help researchers and practitioners alike understand achievement in PE because it underscores students who are attentive, enthusiastic, and active in the learning process. A major contribution of this study was examining the role of the social learning environment, which had been missing in the PE situational interest literature. Our findings highlight the inner-dynamics between situational interest, which focuses on activity characteristics, and needs supportive teaching, which focused on the social learning context in which activities occur. Taking a more comprehensive approach to investigating student interest appears to be one strategy that can advance understanding about how to cultivate this powerful motivational resource in PE.

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