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Original article

Relationships Between Need-Supportive Teaching Style, Psychological Need Satisfaction, Motivation and Happiness Level in Secondary School Physical Education and Sports Course

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Abstract

From the perspective of Self-Determination Theory, this study aimed to investigate the relationships between middle school students' perceived need for support from their physical education (PE) teachers and their basic psychological need (BPN) satisfaction, motivation, and enjoyment through a structural equation modeling (SEM) approach. The study employed a cross-sectional design, with 1,266 public middle school students from various provinces in the Eastern Anatolia region of Türkiye participating in the research. Participants completed measurement instruments to assess the study variables. Preliminary analyses involved computing descriptive statistics for the study variables and conducting Pearson correlation analyses to evaluate their interrelations based on participants' self-reported data. SEM was employed to test the hypothesized mediation effects within the structural models. Our findings indicated that, within the context of PE classes, perceived need for support from teachers positively predicted middle school students' BPN satisfaction. In the model, perceived need support directly and positively predicted students' intrinsic and extrinsic motivation, while negatively predicting amotivation. Furthermore, BPN satisfaction partially mediated the relationships between perceived need for support and all three motivational regulations. Lastly, both BPN satisfaction and intrinsic motivation were found to mediate the effect of need support on enjoyment partially. The findings of the present study provide evidence for the assumption that, within the context of PE, teachers should adopt a need-supportive teaching style to create an environment where students initiate and engage in activities autonomously, experience enjoyment and satisfaction, and where amotivation is minimized or eliminated.

Keywords: basic psychological needs, enjoyment, motivation, physical education, self-determination theory, structural equation modeling

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Introduction

Movement is integral to childhood development, facilitating the advancement of physical, cognitive, and social skills (Cools et al., 2009; Lubans et al., 2010). The periods of childhood and adolescence are critical for establishing a foundation for sports and physical activity (Green, 2002). Within this developmental phase, the physical education (PE) classroom serves as a primary social context where children initially engage in physical activity and exercise. Schools, as fundamental social institutions, are tasked with promoting physical activity among youth through PE classes, thereby providing opportunities for physical engagement (Burgeson et al., 2001; Sallis et al., 1997). Although PE class schedules can enhance daily physical activity, there is a pressing need to develop specific curricula that support sustainability and generalization, alongside rigorous evaluation of these programs (Sallis et al., 1997). Consequently, it is crucial to comprehend the motivational, emotional, and cognitive processes that shape students' perceptions of PE classes (Ntoumanis, 2001; Okely et al., 2001). One factor contributing to this understanding is perceived teacher behavior, as teacher-student interactions are linked to children's school attachment and student motivation. Describing this bidirectional interaction is particularly important during middle school, a period characterized by a gradual decline in student motivation (Stroet et al., 2013).

One of the most suitable frameworks for describing the elements of a motivating teaching style is Self-Determination Theory (SDT) (Deci & Ryan, 1985, 2000). SDT addresses individuals' inherent developmental tendencies and psychological needs, serving as a macro theory that elucidates the intrinsic motivations driving behavior, independent of external influences. It emphasizes the nature of self-motivation and the degree of autonomy in human behavior. SDT delineates various types of motivation to explain the origins of behavioral drivers and their identifiable consequences in learning, performance, personal experience, and well-being. The theory establishes foundational principles regarding the development, maintenance, or diminishment of each type of motivation. Specifically, research based on SDT has explored factors that either enhance or diminish intrinsic motivation, self-regulation, and well-being (R. M. Ryan & Deci, 2000).

PE teachers can exert a profound and enduring influence on students' motivation and enjoyment (Bolter et al., 2018). The instructional styles employed by teachers are linked to student motivation and participation in PE classes (De Meyer et al., 2016). It has been suggested that PE teachers' instructional styles can significantly cultivate a supportive motivational climate, which predicts students' basic psychological needs (BPN) satisfaction, motivation quality, physical activity intentions, and engagement (Leo et al., 2022). It has been reported that students who perceive need-supportive behaviours from their teachers report more positive motivational experiences (Burgueño et al., 2024). In PE classes, need-supportive teaching behaviors have been positively associated with high-quality (autonomous) motivation and numerous positive outcomes, including enjoyment of PE classes, motor skill development, behavioral persistence, well-being, and increased levels of physical activity during leisure time (Ntoumanis, 2005; Standage et al., 2003, 2006). Conversely, need-thwarting teacher behaviors have been linked to negative affect, inadequate coping, low performance, controlled motivation, amotivation, and maladaptive student outcomes (R. M. Ryan & Deci, 2000; Van Den Berghe et al., 2013).

One of SDT's mini-theories, BPN Theory, states that teachers can either support or hinder students' BPN, such as autonomy, competence, and relatedness. According to SDT, it is extremely important for motivating teachers to succeed in supporting students' BPN such as autonomy, competence, and relatedness, which are seen as fundamental requirements for student development (Deci & Ryan, 2000). It is believed that PE teachers' teaching styles can greatly shape a supportive motivational climate that predicts students' BPN satisfaction, motivation quality, physical activity intentions, and engagement (Leo et al., 2022). The need-supportive teaching style is a concept that emphasizes the importance of meeting students' needs for autonomy, competence, and relatedness in the classroom. It is believed that positive learning outcomes will emerge in classrooms where these needs are supported (Stroet et al., 2015). In PE classes, BPN satisfaction

and their possible outcomes have been examined in numerous previous studies involving students at different grade levels (Aibar et al., 2021; Burgueño et al., 2024; Cox & Williams, 2008; De Meyer et al., 2014; Franco & Coterón, 2017; Leo et al., 2022; Ntoumanis, 2005; Rutten et al., 2012; Sanchez-Oliva et al., 2014; Standage et al., 2005; Zhang et al., 2011). Research has consistently demonstrated that satisfaction of BPN is correlated with increased self-determined motivation (Cox & Williams, 2008; Ntoumanis, 2005; Rutten et al., 2012; Sanchez-Oliva et al., 2014; Zhang et al., 2011) and serves as a positive predictor of future intentions to engage in physical activity (Leo et al., 2022; Ntoumanis, 2005). Conversely, BPN satisfaction has been shown to have a negative association with amotivation (De Meyer et al., 2014; Leo et al., 2022; Shen et al., 2010; Vasconcellos et al., 2020). Evidence has been obtained that students with high BPN satisfaction enjoy PE classes more and feel more energetic (Franco & Coterón, 2017; Mouratidis et al., 2011; Standage et al., 2005).

In light of this information, it is imperative to comprehend the positive emotional characteristics of students in PE classes to achieve the desired educational outcomes. Cultivating positive attitudes towards PE and physical activity at an early age can contribute to individuals leading physically active lives and mitigating the adverse health consequences of inactivity. In alignment with this social benefit, the present study aims to elucidate the importance of a need-supportive teaching style and the satisfaction of needs in influencing students' motivation and happiness levels towards PE during the early stages, specifically the middle school period. Based on this information, the study aimed to examine the structural relationships between a supportive teaching style perceived by middle school students in PE classes, BPN satisfaction, motivation, and enjoyment.

Methods

Design and Participants

This research was conducted as a cross-sectional study utilizing the correlational survey model, a quantitative research methodology. The study involved 1,433 students from public secondary schools (grades 5 to 8) in the provinces of Malatya, Elazığ, Bingöl, and Tunceli, located in the Eastern Anatolia Region of Turkey, during the 2023–2024 academic year. Of these students, 533 (42.1%) were male and 733 (57.9%) were female. Regarding grade level, 273 (21.6%) were in fifth grade, 386 (30.5%) in sixth grade, 302 (23.9%) in seventh grade, and 305 (24.1%) in eighth grade. Ethical approval for the study was obtained from the Social and Human Sciences Research Ethics Committee at Inonu University.

Measurements and Procedures

Prior to the commencement of the research, parents were informed and provided written consent for their children's participation. After obtaining parental consent, students completed paper-and-pencil questionnaires in their classrooms under the supervision of the research team. Data were collected by the research team prior to regular PE classes in accordance with the principles of voluntariness and confidentiality. After invalid data were excluded, the final sample consisted of 1,266 public secondary school students. The sample group was selected using convenience sampling, a non-random sampling method.

Perceived Need-Supportive Behaviours

The Need-Supportive Teaching Style Scale in Physical Education-NSTSSPE Turkish version was used to measure the perceived need support that middle school students participating in this study received from their teachers. The original form of this scale was developed by Liu and Chung (2017). The adaptation of the scale to the Turkish form for the middle school sample was carried out by Sakallı and Kerkez (2021). The scale is evaluated using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) based on participants' self-reports. Following the adaptation of the scale for the middle school sample, it was ascertained that the three sub-dimensions and the total of 15 items from the original form were retained. These sub-dimensions include autonomy support (e.g., ‘My teacher offers me many options’), competence

support (e.g., 'My teacher shows me how to solve problems on my own'), and involvement support (e.g., 'My teacher spends time with me').

Basic Psychological Need Satisfaction in PE

The Basic Psychological Needs in Physical Education Scale developed by Vlachopoulos, Katartzi, and Kontou (2011) and adapted to the Turkish middle school and high school population by Turkay et al. (2019) was used to measure students' BPN satisfaction. The scale is evaluated using a 7-point Likert scale ranging from 1 (not at all appropriate) to 7 (completely appropriate) based on participants' self-reports. After the adaptation study, the 12-item structure of the scale with 3 sub-dimensions named autonomy (e.g., "I feel like I choose the activities we do"), competence (e.g., "I feel very good at tasks that most children find difficult"), and relatedness (e.g., "I feel like a valued member of a group of close friends") was preserved.

Motivation in PE

The Physical Education Motivation Scale (PEMS) developed by Sulz, Temple, and Gibbons (2016) and adapted for Turkish middle school and high school students by Akbulut and Öncü (2023) was used to determine the motivation levels of students participating in the current study in PE classes. PEMS is evaluated using a 5-point Likert scale ranging from 1 (I do not agree at all) to 5 (I agree completely) based on participants' self-reports. The scale consists of a 3-factor structure with a total of 9 items. The sub-dimensions of the scale consist of intrinsic motivation (e.g., 'I participate in PE classes because they are fun'), extrinsic motivation (e.g., 'I try very hard in PE classes because I want to get good grades'), and amotivation (e.g., 'I waste my time in PE classes').

Enjoyment in PE

In this study, the Happiness Level Scale for Physical Education Course (HSFPEC) developed by Uğraş and Serbes (2019) was used to determine participants' enjoyment of PE classes. The HSFPEC is a single-factor 5-point Likert scale measurement tool consisting of 9 items (e.g., 'I enjoy PE and sports classes'). The scale is calculated based on participants' self-reports, with scores ranging from 1 (strongly disagree) to 5 (strongly agree). The scale items do not contain any negative statements.

Statistical analyses

In the SEM analyses, two structural models were tested. Model 1 examined the relationships from perceived need support to basic psychological needs satisfaction, and subsequently to intrinsic motivation, extrinsic motivation, and amotivation (Figure 1). Model 2 tested the pathways from perceived need support to basic psychological needs satisfaction, then to intrinsic motivation, and finally to enjoyment in PE classes (Figure 2). In the current study, SPSS v25 statistical software was used for preliminary analyses and descriptive statistics, while AMOS v22 statistical software was used to test structural models. Before proceeding to the main analyses, confirmatory factor analyses (CFA) were conducted for all variables included in the study to validate the factor structures of the scales. In the next step, descriptive statistics (means, standard deviations) were calculated. The normality of the data was assessed using Skewness and Kurtosis values. The skewness (-1.169 to 1.145) and kurtosis (-0.943 to 0.579) values indicate that the data are normally distributed (George & Mallery, 2016). Cronbach's alpha coefficients were considered to evaluate the reliability of the measurement tools. Total indirect effects were evaluated using SEM for the two hypothesized models (Figure 1 and 2), with 95% bias-corrected bootstrap confidence intervals (95%CIBC), maximum likelihood estimation, and 5000 bootstrap samples. Model goodness was assessed using the chi-square statistic (x^2/sd) value, comparative fit index (CFI), goodness-of-fit index (GFI), incremental fit index (IFI), root mean squared error of approximation (RMSEA), and standardized root mean squared residuals (SRMR) indices. Fit indices of CFI, IFI, and GFI values close to or greater than 0.90, RMSEA values less than 0.06, and SRMR values less than 0.08 indicate an acceptable fit (Hu & Bentler, 1999). In the structural equation modeling (SEM) analyses, the structural models tested the relationships between perceived need support and students' basic

psychological needs satisfaction, motivational regulations, and enjoyment. The level of relationship between variables was determined using Pearson's Correlation Test.

Results

Descriptive statistics, including means, standard deviations, skewness, kurtosis, and internal consistency values (Cronbach's alpha), were calculated for all study variables and are presented in Table 1. The perceived need-supportive teaching style, which includes the sub-dimensions of competence support, autonomy support, and involvement, was measured using a 7-point Likert-type scale. The internal consistency coefficients for the total scale and its sub-dimensions were high (α = 0.85 to 0.94), indicating good reliability. The mean scores for total support and its components ranged from 4.55 to 4.62, suggesting a moderately high perception of need-supportive teaching among students. Skewness values ranged from -0.60 to -0.47 and kurtosis values from -0.94 to -0.75, falling within the acceptable range for normal distribution (±2), as recommended by George and Mallery (2016). The BPN-PE, which includes competence, relatedness, and autonomy satisfaction, also utilized a 7-point response format. The internal consistency coefficients for the total score and sub-dimensions ranged from 0.74 to 0.85. The mean scores for these variables ranged between 4.43 and 5.02, indicating a moderate to high level of psychological need satisfaction. Skewness values (-0.63 to -0.26) and kurtosis values (-0.75 to -0.44) were within acceptable ranges, supporting the assumption of normality.

Motivation toward PE was assessed via PEMS, which includes intrinsic motivation, extrinsic motivation, and amotivation subscales, each measured on a 5-point Likert scale. Cronbach's alpha values ranged from 0.77 to 0.83, confirming adequate reliability. The mean scores across motivation types ranged from 2.01 (for amotivation) to 3.96 (for intrinsic motivation). Skewness and kurtosis values for motivation sub-dimensions were also within acceptable ranges (-1.17 to +1.14 for skewness and -0.57 to 0.29 for kurtosis), indicating that the distributions of the responses were not significantly deviated from normality.

The enjoyment level in PE was assessed via the HSFPEC scale on a 5-point Likert scale. The scale demonstrated excellent internal consistency (α = 0.93). The mean score was 3.81 (SD = 0.79), suggesting a relatively high level of enjoyment. The skewness (-1.08) and kurtosis (0.11) values were within the acceptable range, indicating a normal distribution.

Table 1. Mean scores, standard deviations, reliability coefficients, Skewness and Kurtosis values for all study variables.

Scale	Chronbach (α)	Scale range	Min.	Max.	$\bar{X}$	SD	Skew.	Kurt.
NSTSSPE	0.94	1-7	1.20	6.93	4.62	1.54	-0.558	-0.814
Competence support	0.85	1-7	1.00	7.00	4.69	1.62	-0.600	-0.753
Involvement support	0.88	1-7	1.00	7.00	4.63	1.68	-0.530	-0.854
Autonomy support	0.87	1-7	1.00	7.00	4.55	1.70	-0.471	-0.943
BPN-PE	0.85	1-7	1.25	6.92	4.66	1.25	-0.401	-0.441
Competence satisfaction	0.76	1-7	1.00	7.00	4.55	1.50	-0.261	-0.710
Autonomy satisfaction	0.74	1-7	1.00	7.00	4.43	1.58	-0.389	-0.759
Relatedness satisfaction	0.79	1-7	1.00	7.00	5.02	1.57	-0.637	-0.531
Intrinsic motivation	0.83	1-5	1.00	5.00	3.96	1.13	-1.169	0.422
Extrinsic motivation	0.77	1-5	1.00	5.00	3.71	1.13	-0.780	-0.290
Amotivation	0.81	1-5	1.00	5.00	2.01	1.05	1.145	0.579
HSFPEC	0.93	1-5	1.11	5.00	3.81	1.04	-1.084	0.115

Table 2 displays the mutual correlations of all variables. The correlation coefficients indicate that total need support and its three subdimensions (competence, involvement, autonomy support) are all positively correlated with total need satisfaction (r values range = 0.46–0.51, all p values < 0.01). Total need support showed positive correlations with intrinsic (r = 0.46, p < 0.01) and extrinsic motivation (r = 0.44, p < 0.01), and negative correlations with amotivation (r = -0.45, p < 0.01). Similarly, total need satisfaction showed positive correlations with intrinsic (r = 0.55, p < 0.01) and extrinsic motivation (r = 0.48, p < 0.01) and negative correlations with amotivation (r = -0.44, p < 0.01). Finally, the table shows that the relationship between total need support and enjoyment (r = 0.53) and the relationship between total need satisfaction and enjoyment (r = 0.58) are positive and significant at the p < 0.01 level. The mutual correlation coefficients between all variables shown in the table indicate that advanced mediation analyses can be performed.

Table 2. Pearson correlation matrix between NSTSSPE, BPN-PE, PEMS and HSFPEC subscales.

Scale	1	2	3	4	5	6	7	8	9	10	11
1. NSTSSPE	-										
2. Competence support	0.90**	-									
3. Involvement support	0.92**	0.73**	-								
4. Autonomy support	0.93**	0.77**	0.81**	-							
5. BPN-PE	0.51**	0.46**	0.46**	0.49**	-						
6. Competence satis.	0.40**	0.36**	0.36**	0.38**	0.81**	-					
7. Relatedness satis.	0.30**	0.26**	0.28**	0.28**	0.78**	0.42**	-				
8. Autonomy satis.	0.55**	0.50**	0.49**	0.53**	0.83**	0.56**	0.46**	-			
9. Intrinsic motivation	0.46**	0.41**	0.43**	0.44**	0.55**	0.43**	0.34**	0.55**	-		
10. Extrinsic motivation	0.44**	0.41**	0.38**	0.42**	0.48**	0.41**	0.27**	0.49**	0.54**	-	
11. Amotivation	-.45**	-.40**	-.42**	-.43**	-.44**	-.38**	-.25**	-.45**	-.75**	-.46**	-
12. HSFPEC	0.53**	0.47**	0.49**	0.50**	0.58**	0.47**	0.36**	0.57**	0.78**	0.52**	-,68**

Note: **significant at p<.01

Preliminary Analyses

Before evaluating the proposed structural model, confirmatory factor analyses (CFA) were performed to assess the factorial validity of the scales utilized in the research. These analyses were executed using AMOS v22 with maximum likelihood estimation. The NSTSSPE, which comprises three latent dimensions—competence support, autonomy support, and involvement support—showed a satisfactory model fit: χ^2/df = 331.78/84 = 3.95, GFI = 0.96, CFI = 0.97, IFI = 0.97, RMSEA = 0.052, SRMR = 0.02. The factor loadings for the observed items varied from 0.68 to 0.77 for competence support, from 0.73 to 0.80 for autonomy support, and from 0.73 to 0.85 for involvement support. The BPN-PE was also structured with three latent factors—competence satisfaction, autonomy satisfaction, and relatedness (involvement) satisfaction. The CFA results indicated an acceptable fit: χ^2/df = 192.08/50 = 3.84, GFI = 0.97, CFI = 0.96, IFI = 0.97, RMSEA = 0.05, SRMR = 0.03. Factor loadings for the BPN-PE items ranged from 0.48 to 0.82 across the three subscales. The PEMS was evaluated as a three-factor model representing intrinsic motivation, extrinsic motivation, and amotivation. The CFA findings showed a good model fit: χ^2/df = 64.11/24 = 2.67, GFI = 0.98, CFI = 0.99, IFI = 0.99, RMSEA = 0.03, SRMR = 0.02. The factor loadings ranged from 0.63 to 0.90 for intrinsic motivation, 0.63 to 0.80 for extrinsic motivation, and 0.68 to 0.85 for amotivation. Finally, the unidimensional structure of the HSFPEC was confirmed with acceptable fit indices: χ^2/df = 61.61/24 = 2.56, GFI = 0.95, CFI = 0.98, IFI = 0.98, RMSEA = 0.07, SRMR = 0.02. All item factor loadings for the HSFPEC ranged from 0.66 to 0.90. In conclusion, all measurement models exhibited satisfactory levels of model fit and standardized factor loadings, supporting the construct validity of the scales before their inclusion in the full structural model. .

Structural Equation Modeling (SEM)

Firstly, the aim was to determine the predictive effect of the perceived need support that students receive from their PE teachers on BPN satisfaction and their motivation regulations in class. In the structural model (Figure 1), perceived need support is an exogenous variable, whereas BPN satisfaction, intrinsic motivation, extrinsic motivation, and amotivation are endogenous variables. In this context, the goodness-of-fit values for the tested model were found to be χ^2/df (167.10/80) = 2.089; GFI = 0.98; CFI = 0.99; SRMR = 0.02; RMSEA = 0.029. All fit indices obtained from the analysis were within the good fit reference range. The tested structural model showed a good fit with the data.

The structural model tested and the standardized path coefficients obtained from the analysis are shown in Figure 1. According to the analysis results shown in the figure, the direct path coefficient from need-supportive teaching style to BPN satisfaction (β=0.66; C.R=18.440; p<.001), intrinsic motivation (β=0.13; C.R =3.336; p<.001), extrinsic motivation (β=0.16; C.R=3.739; p<.001) was found to be positive, while the direct path coefficient to amotivation (β=-0.23; C.R= -5.541; p<.001) was found to be negative and statistically significant. In addition, the direct path coefficient from BPN satisfaction to intrinsic motivation (β=0.61; C.R=13.365; p<.001) and extrinsic motivation (β=0.54; C.R=11.067; p<.001) was found to be positive, while the direct path coefficient from amotivation (β=-0.44; C.R=-9.642; p<.001) was negative and statistically significant. Furthermore, when examining the r^2 values explaining the percentage of variance explained by independent variables, 43% of BPN satisfaction is explained by perceived need support (r^2= 0.429). Furthermore, 49% of intrinsic motivation (r^2 = 0.492), 43% of extrinsic motivation (r^2 = 0.430), and 38% of amotivation (r^2 = 0.382) were explained by BPN satisfaction and need support.

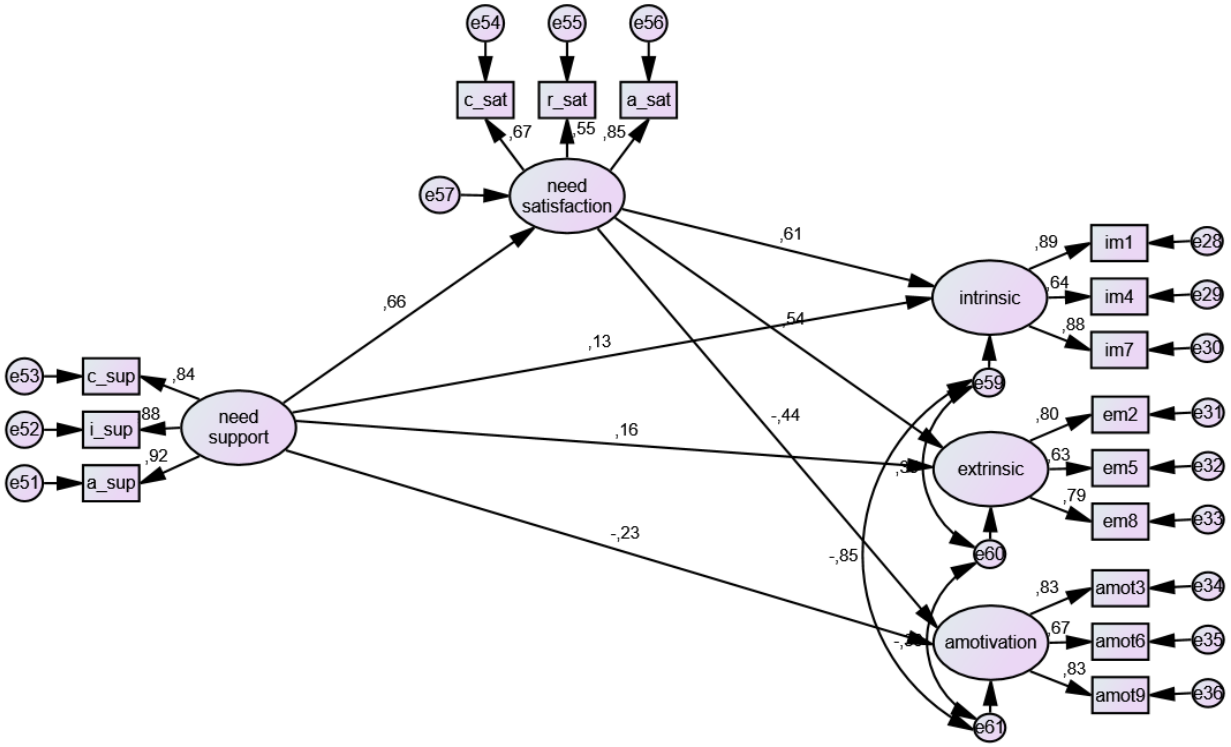

Figure 1. Standardized path coefficients related to the structural model

Note: c_sup - competence support, i_sup - involvement support, a_sup - autonomy support, c_sat - competence satisfaction, r_sat - relatedness satisfaction, a_sat - autonomy satisfaction, im - intrinsic motivation, em - extrinsic motivation, amot – amotivation.

In the current study, the mediating role of BPN satisfaction in the effect of perceived need support from PE teachers on motivational regulation and enjoyment was tested. Bootstrap 5000 resampling was preferred for the mediating effect analysis. It is known that the Bootstrap method provides highly reliable results in mediator variable analyses. Additionally, to conclude that a variable has a mediating effect, the values obtained from the analysis must not include zero (0) within the 95% confidence interval (Gürbüz, 2021). According to the Bootstrap results shown in Table 3, it was determined that the perceived need support has a significant indirect effect on intrinsic motivation through need satisfaction (β= 0.399; 95% Cl [0.335-0.473]). It can be seen that the lower and upper limits of the confidence interval do not include the value zero. These results indicate that perceived need-supportive teaching style partially mediates the effect of need satisfaction on intrinsic motivation.

Table 3. The mediating role of need satisfaction in the effect of perceived need support on intrinsic motivation.

Path	Effect Type	Standardized Coefficient (β)	SE	95% CI (Lower–Upper)	p-value	Significant
NsT → BPNs	Direct	0.65	0.027	[0.60, 0.70]	< .001	Yes
BPNs → IM	Direct	0.61	0.043	[0.52, 0.69]	< .001	Yes
NsT → IM	Direct	0.13	0.043	[0.04, 0.21]	.004	Yes
NsT → BPNs → IM	Indirect	0.40	0.035	[0.33, 0.47]	< .001	Yes
NsT → IM	Total	0.53	0.026	[0.47, 0.58]	< .001	Yes

According to the Bootstrap results presented in Table 4, it was determined that the perceived need support had a significant indirect effect on extrinsic motivation through need satisfaction (β= 0.354; 95% Cl [0.290-0.424]). It can be seen that the lower and upper limits of the confidence interval do not include the value zero. These results indicate that perceived need-supportive teaching style has a partial mediating effect on external motivation through need satisfaction.

Table 4. The mediating role of need satisfaction in the effect of perceived need support on extrinsic motivation.

Path	Effect Type	Standardized Coefficient (β)	SE	95% CI (Lower–Upper)	p-value	Significant
NsT → BPNs	Direct	0.65	0.027	[0.60, 0.70]	< .001	Yes
BPNs → EM	Direct	0.54	0.045	[0.45, 0.63]	< .001	Yes
NsT → EM	Direct	0.16	0.046	[0.06, 0.24]	.001	Yes
NsT → BPNs → EM	Indirect	0.35	0.034	[0.29, 0.42]	< .001	Yes
NsT → EM	Total	0.51	0.026	[0.45, 0.56]	< .001	Yes

NsT: Need-supportive Teaching BPNs: Basic Psychological Need Satisfaction EM: Extrinsic Motivation SE: Standard Error CI: Confidence Interval.

According to the Bootstrap results shown in Table 5, it was determined that the indirect effect of perceived need support on amotivation through need satisfaction was significant (β= -0.291; 95% Cl [-0.365, 0.224]). It can be seen that the lower and upper limits of the confidence interval do not include the zero value. These results indicate that perceived need-supportive teaching style partial mediates the effect of need satisfaction on amotivation.

Table 5. The mediating role of need satisfaction in the effect of perceived need support on amotivation

Path	Effect Type	Standardized Coefficient (β)	SE	95% CI (Lower–Upper)	p-value	Significant
NsT → BPNs	Direct	0.65	0.027	[0.60, 0.70]	< .001	Yes
BPNs → AM	Direct	-0.44	0.048	[-0.53, -0.35]	< .001	Yes
NsT → AM	Direct	-0.23	0.047	[-0.32, -0.13]	< .001	Yes
NsT → BPNs → AM	Indirect	-0.29	0.036	[-0.36, -0.22]	< .001	Yes
NsT → AM	Total	-0.52	0.027	[-0.57, -0.46]	< .001	Yes

NsT: Need-supportive Teaching BPNs: Basic Psychological Need Satisfaction AM: Amotivation SE: Standard Error CI: Confidence Interval.

Secondly, the structural model was created to determine the predictive effect of the perceived need support from PE teachers on students' enjoyment through BPN satisfaction and intrinsic motivation. In this context, the goodness-of-fit values for the tested model were found to be χ2/df (78.929/32) = 2.467; GFI = 0.98; CFI = 0.99; SRMR = 0.02; RMSEA = 0.034. The goodness-of-fit values obtained were between good fit and acceptable fit values.

The standardized path coefficients obtained from the tested structural model are shown in Figure 2. According to the analysis results presented in the figure, there is a significant relationship from need support to enjoyment (β=0.15; C.R.=7.608; p<.001), and BPN satisfaction (β=0.67; C.R.=19.168; p<.001), from BPN satisfaction to intrinsic motivation (β=0.72; CR:=19.981; p<.001) and from intrinsic motivation to enjoyment (β=0.79; C.R.=34.685; p<.001) were found to be positive and statistically significant. Additionally, when examining the r^2 values, which indicate the percentage of variance explained by the independent variables, 45% of BPN satisfaction is explained by the need-supportive teaching style (r^2=0.455). Furthermore, 75% of enjoyment in PE class (r^2=0.757) was explained by need support, need satisfaction, and intrinsic motivation.

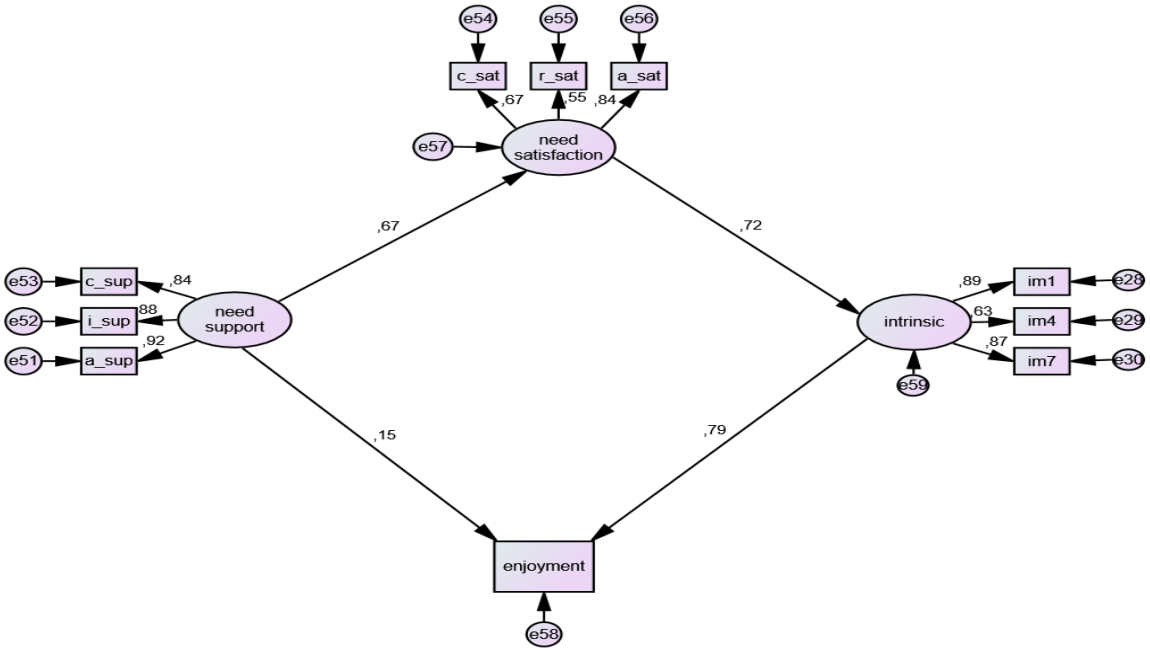

Figure 2. Standardized path coefficients related to the structural model

c_sup: competence support ***i_sup:*** involvement support ***a_sup:*** autonomy support ***c_sat:*** competence satisfaction ***r_sat:*** relatedness satisfaction ***a_sat:*** autonomy satisfaction ***im:*** intrinsic motivation

According to the Bootstrap results in Table 6, it was determined that the perceived need support had a significant indirect effect on enjoyment through need satisfaction and intrinsic motivation (β= 0.38; 95% CI [0.33-0.43]). It can be seen that the lower and upper limits of the confidence interval do not include the value zero. These results indicate that perceived need-supportive teaching style has a serial partial mediating effect on enjoyment through need satisfaction and intrinsic motivation.

Table 6. The mediating role of need satisfaction and intrinsic motivation in the effect of perceived need support on enjoyment.

Path	Effect Type	Standardized Coefficient (β)	SE	95% CI (Lower–Upper)	p-value	Significant
NsT → BPNs	Direct	0.67	0.025	0.62 – 0.72	< .001	Yes
BPNs → IM	Direct	0.72	0.022	0.68 – 0.76	< .001	Yes
IM → ENJ	Direct	0.78	0.026	0.73 – 0.83	< .001	Yes
NsT → ENJ	Direct	0.15	0.026	0.10 – 0.20	< .001	Yes
NsT → BPNs → IM → ENJ	Indirect	0.38	0.025	0.33 – 0.43	< .001	Yes
NsT → ENJ	Total	0.53	0.023	0.49 – 0.58	< .001	Yes

NsT: Need-supportive Teaching BPNs: Basic Psychological Need Satisfaction IM: Intrinsic Motivation ENJ: Enjoyment SE: Standard Error CI: Confidence Interval

Discussion

The present study aimed to investigate the structural relationships between teacher-provided need support and student need satisfaction, motivational regulations, and enjoyment. It was hypothesized that students who perceive their needs as supported would exhibit higher intrinsic motivation and greater enjoyment in PE classes while experiencing reduced amotivation. Two distinct structural models were developed within the scope of the research. The first structural model (Figure 1) confirmed the hypothesis that a supportive teaching style in PE lessons influences students' BPN satisfaction and motivational regulations, with the tested model demonstrating a good fit. The research found that middle school students' views on the autonomy, competence, and relatedness support they receive from teachers in PE classes positively influenced their overall satisfaction of psychological needs. Students' perception of need support had a direct and positive impact on both their intrinsic and extrinsic motivation, while it negatively impacted their amotivation. In the structural model, the satisfaction of basic psychological needs was shown to partially mediate the relationship between need-supportive teaching and all three types of motivation. As BPN satisfaction increased, so did students' intrinsic and extrinsic motivation, while their amotivation decreased. Overall, these results highlight the theoretical relevance of need-supportive teaching practices in promoting adaptive motivational outcomes among students in PE contexts.

Taken together, these findings align with the fundamental propositions of SDT (Deci & Ryan, 2000), suggesting that when individuals' BPN are met, they are more likely to develop autonomous forms of motivation, particularly intrinsic motivation. Conversely, when students experience low need satisfaction, they are more prone to amotivation or adopting less self-determined (i.e., lower-quality) motivational orientations. According to SDT, BPN satisfaction are crucial for developing and maintaining intrinsic motivation (Deci & Ryan, 1985; R. M. Ryan & Deci, 2000). In line with previous research, the current findings further illustrate the motivational and behavioral implications of need satisfaction in educational settings. Based on these findings, it can be assumed that prolonged amotivation may eventually lead to students' lack of participation in physical activity outside of PE classes. Indeed, students who experience a sustained lack of motivation toward physical activity are at a higher risk of developing a sedentary lifestyle (Ntoumanis et al., 2009).

According to Standage et al. (2005), students who perceived their PE classes as need-supportive reported higher levels of BPN satisfaction. Their findings showed that need-supportive teaching positively predicted intrinsic motivation and introjected regulation (a form of extrinsic motivation) through need satisfaction, while negatively predicting amotivation. Similarly, Ntoumanis (2005) found that PE teachers' support for students' needs for competence, relatedness, and autonomy significantly predicted their overall need satisfaction. This, in turn, was associated with more self-determined forms of motivation, which were linked to positive emotional, behavioral, and cognitive outcomes, as well as a greater intention to enroll in elective PE classes the following academic year. Zhang et al. (2011) identified that the link between perceived need support and physical activity is mediated by BPN satisfaction and intrinsic motivation. Their research demonstrated strong positive correlations among teacher-provided need support, need satisfaction, and intrinsic motivation. Rutten et al. (2012) found that BPN satisfaction mediates the relationship between students' perceptions of need-supportive teaching in PE classes and their autonomous motivation. Similarly, Leo et al. (2022) reported that students who perceived their teachers as engaging in need-supportive behaviors demonstrated stronger intentions to be physically active in the future, and this relationship was positively mediated by BPN satisfaction and autonomous motivation. In contrast, students who perceived their teachers as need-thwarting were more likely to report amotivation, which, in turn, negatively predicted their intentions to be physically active. Cox and Williams (2008) showed that the effect of perceived teacher need support on autonomous motivation was partially mediated by autonomy, competence and relationship needs satisfaction. Shen et al. (2010) reported that decreased need support from the teacher is an important factor resulting in students' amotivation. On the other hand, Franco and Coterón (2017) reported that a need-supportive intervention curriculum slightly increased students' intrinsic motivation, although the results were not statistically significant. The results of the present study are consistent with a growing body of literature suggesting that perceived need-supportive behaviors from teachers significantly enhance students' BPN satisfaction (Aibar et al., 2021; Burgueño et al., 2024; Franco & Coterón, 2017; Leo et al., 2022; Sanchez-Oliva et al., 2014; Vasconcellos et al., 2020). Furthermore, need-supportive teaching has been found to positively predict intrinsic motivation (Burgueño et al., 2024; Leo et al., 2022; Mouratidis et al., 2011; Sanchez-Oliva et al., 2014) and certain types of extrinsic motivation (Leo et al., 2022; Sanchez-Oliva et al., 2014) while negatively predicting amotivation (Burgueño et al., 2024; De Meyer et al., 2014; Leo et al., 2022; Vasconcellos et al., 2020). Collectively, these findings reinforce the theoretical proposition of SDT that the social environment, particularly through need-supportive teaching, plays a crucial role in the quality and regulation of students' motivation.

Secondly, considering the model (Figure 2), the hypothesis that a need-supportive teaching style affects students' enjoyment in PE courses through BPN satisfaction and intrinsic motivation was confirmed. The present study concluded that students' perceived need support has a significant positive effect on enjoyment, both directly and through BPN satisfaction and intrinsic motivation. According to the results of the quasi-experimental study conducted by Mouratidis et al. (2011), students enjoyed the lessons more and felt more energized when their teachers employed a need-supportive teaching style compared to a typical teaching style. The experimental group exposed to need-supportive practices differed positively and significantly from the students exposed to direct instructional practices in terms of enjoyment, interest, and vitality. Similarly, Franco and Coterón (2017) reported that students who participated in a need-supportive intervention program experienced greater enjoyment during PE classes. In research conducted with a middle school group, Standage et al. (2005) supported our conclusions by showing that teaching methods that support students' needs can indirectly boost enjoyment in PE by fulfilling BPN. Similarly, Huhtiniemi et al. (2019) emphasized the importance of students' experiences of need satisfaction and self-directed motivation in enhancing enjoyment during PE classes.

The results of the current study are largely consistent with SDT, with a few exceptions. Specifically, the positive impact of need-supportive teaching and overall need satisfaction on extrinsic motivation seems to contradict

the theoretical assumptions of SDT. Nonetheless, these findings align with previous studies in the PE context (e.g., Behzadnia et al., 2018; Leo et al., 2022; Sanchez-Oliva et al., 2014; Standage et al., 2005). One possible explanation is the nature of introjected regulation, a type of extrinsic motivation that is only partially internalized and often involves internal conflict. As a result, it may show positive links with both beneficial and detrimental outcomes. In conclusion, more autonomous forms of extrinsic motivation are generally linked to positive outcomes, while less autonomous forms are associated with less favorable consequences (Vasconcellos et al., 2020). According to SDT, extrinsic motivation is not a unitary construct but consists of four qualitatively distinct, regulatory styles. Furthermore, the strong predictive role of relatedness satisfaction on external regulation, as reported by Vasconcellos et al. (2020), may offer a theoretical basis for our findings. Indeed, students' desire to maintain positive relationships with their teachers might enhance their levels of extrinsic motivation, particularly when driven by externally referenced goals. Ryan and Deci (2000) noted that externally motivated behavior is often performed to satisfy significant others in one's social environment, and that such motivation is not particularly conducive to sustained or persistent engagement. In line with this, the finding in our study that need support and need satisfaction positively influence external motivation reinforces our belief that students may be motivated to participate in PE classes in order to please their teachers.

Conclusion

The findings of the present study emphasize the importance of cultivating a supportive social environment in which educators deliberately foster the satisfaction of students' fundamental psychological needs, thereby enhancing their intrinsic motivation and enjoyment. Specifically, implementing a needs-based supportive teaching approach proves particularly effective in establishing an environment that enables students to engage autonomously and derive satisfaction from participating in PE classes. The validation of the structural models demonstrates that the motivational behaviors of PE teachers who employ a need-supportive instructional style—characterized by strategies that promote competence, autonomy, and relatedness—enhance students' BPN satisfaction, which subsequently encourages their voluntary participation in PE classes, driven by enjoyment and well-being. Moreover, this need-supportive style appears to inversely correlate with amotivation, indicating its potential as an effective tool for mitigating students' motivational deficits.

In light of these findings, the study largely corroborates the theoretical assumptions of SDT and affirms its applicability to Turkish middle school students. The results suggest that SDT provides a valuable theoretical framework for understanding teaching behaviors and motivational processes in PE and may serve as a foundation for designing effective intervention programmes aimed at enhancing learning outcomes in PE settings. Conversely, controlling teaching behaviors should be minimized or avoided, as even low levels of perceived teacher control can adversely affect students' motivation and affective outcomes (De Meyer et al., 2014). In summary, the current findings underscore that the teaching style adopted by educators plays a critical role in shaping positive outcomes among PE students and should therefore be a central consideration in teacher training and curriculum development efforts.

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***Data availability*:** All collected data are included in the manuscript. Raw data are available upon reasonable request to the corresponding author.

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