The relationship between physical education teachers' relatedness support and students' psychological needs and study motivation

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Abstract: The role of teachers in developing autonomy, competence, and relatedness in students is well established. This study investigated the correlations between students' perception of relatedness support and their levels of psychological needs satisfaction and study motivation in physical education classes. Questionnaire data were gathered from 149 students (aged 14 to 16, 137 boys, 151 girls). Using 5-point rating scales, the questionnaires measured 1) teachers' relatedness support behaviors, 2) students' levels of satisfaction autonomy, competence, and relatedness satisfaction, and 3) students' motivation to learn in physical education classes. A descriptive statistical analysis, reliability analysis, and correlation analysis were performed on the measured variables, and a path analysis was performed to verify the relationship between each variable. The bootstrap method determined the impact of teachers' relatedness on psychological needs and internal motivation. Teacher's relatedness support and students' basic psychological needs and learning motivation showed a significant positive correlation ($p < 0.01$). Relatedness support had a significant effect on autonomy ($\beta = 1.21$, $p < 0.001$), relatedness ($\beta = 0.77$, $p < 0.001$), and competence ($\beta = 1.02$, $p < .001$). The three psychological needs had a significant effect on learning motivation (autonomy: $\beta = 0.37$, $p < 0.001$; relatedness: $\beta = 0.41$, $p < 0.001$; competence: $\beta = 0.46$, $p < 0.001$). Relatedness support did not have a significant effect on learning motivation ($\beta = -0.33$, $p > 0.05$). These findings demonstrate the importance of relatedness support teaching behaviors in physical education classes. Future research must aim to enhance these behaviors.

Keywords: Motivation, Perceived relatedness support, Physical education, Psychological needs, Self-determination theory

1. Introduction

Physical education is a school subject that utilizes physical activities as the essence and tool of education. Improving students' physical activities is one of the main goals of physical education classes. Through physical activities, students experience various emotions, and these should improve their physical and mental health.

Students' positive emotional experiences in physical education classes are influenced by effective communication and positive exchanges between the teacher and students [1]. In addition, students' emotional experiences are determined by the teacher's interaction with the students and the quality of the relationship. In particular, the relatedness between teacher and students serves as an important driving force in enhancing students' study motivation, and academic achievement is a medium for achieving class goals and promotes learning outcomes efficiently [2].

According to self-determination theory, which has been widely used in recent research on physical education [3], the social environment formed by important others (such as teachers) affects three basic psychological needs of individual students: autonomy, competence, and relatedness. The satisfaction levels of these needs directly or indirectly affect behavior, cognition, emotion, and motivation [4]. Major factors in the social environment that determine a student's level of psychological satisfaction include autonomy support, competence support, and relatedness support.

In the social environment, self-determination theory considers relatedness support to be as important as competence support and autonomy support [3]. In physical education classes, it is important for students to do the activities they want to do and use their skills efficiently. It is very important that teachers and students communicate, interact, and bond smoothly to improve students' skills and ability to do sports. If the relationship between teachers and students is not amicable in the classroom situation, they will feel distant toward each other [5].

To summarize, while studies based on self-determination theory have been conducted regularly to investigate teachers' autonomy support and competence support in physical education classes [6], only a small number of studies have been conducted sporadically on physical education learning environments supporting teachers' relatedness [7]. Studies on relatedness and relatedness support in physical education classes have been conducted in terms of emotional support [4], environments that provide cooperative learning[8], and understanding others (students) from a mutually understanding perspective [9]. A stable relationship between teachers and students in physical education classes is of paramount importance for the operation of classes and the achievement of students' learning goals. The relationship between teachers and students boosts students' motivation to learn and encourages students to increase their confidence in teachers and physical education classes, thereby improving their academic ability. The role of teachers is important as a social factor that promotes students' motivation for learning, and teachers' encouragement, understanding, and consideration have a positive influence on students' desire for relatedness, cognition, emotion, and behavior [10]. The way teachers understand and respect students in physical education classes is an important factor in predicting learning behaviors related to students' learning motivation

and task performance. Thus, exploring students' internalization processes of participation motivation based on physical education teachers' relatedness support will provide important insights for improving students' performance in and the quality of physical education classes [11].

The purpose of this study is to verify the structural relationship between students' perception of physical education teachers' relatedness support and their psychological needs and learning motivation. The research hypotheses for achieving this objective are as follows. First, the students' perception of relatedness support provided by physical education teachers will affect students' psychological needs. Second, the psychological needs that students experience will affect their motivation for learning. Third, each psychological need will mediate between relatedness support and learning motivation.

2. Background

2.1. Self-Determination Theory (SDT) and Relatedness Support

Education is an activity that pursues educational values through the interaction between teachers and students. Education focuses teaching and learning on a person's qualities and traits by building interpersonal relationships. Subsequently, what is crucial in the educational situation is the relationship between teachers and students.

Most of the educational experience provided to students is implemented through classes, and the diverse range of interactions between a teacher and their students can play a major role in determining the overall process of the class, its atmosphere, and student participation.

According to the relationship motivation theory (RMT) [3], one of the SDT theories, the satisfaction of needs for autonomy, competence, and relatedness is an essential psychological factor for humans to communicate and interact socially in a healthy way. RMT attaches great importance to providing a social environment that supports the needs for autonomy, competence, and relatedness, which are the fundamental factors for improving students' physical skill acquisition and motivation for learning. The social environment consists of autonomy support, competence support, and relatedness support, and it is a significant factor in determining the degree of satisfaction of students' psychological needs.

Autonomy support refers to the teacher's motivational method of bringing out and developing students' inner resources such as interest, fascination, and curiosity, to support these resources and help develop the students [12]. Autonomy support improves students' individual self-determination motivation, strengthens patience and perseverance, induces pleasure and fun, and improves learning participation. Competence support is a motivational method for teachers to provide classroom objectives, standards, guidelines, guidance, and feedback so that students can exercise their abilities and feel a sense of accomplishment in all classes, including physical education classes [13]. The teacher's competence support induces students' continued effort and interest [14, 15] and leads to improvements in the quality of their participation in sports and the promotion of their performance [4]. Relatedness support is a motivational method in which teachers show interest in students and support fundamental human needs, such as mutual respect, consideration, attention, and encouragement, based on understanding and empathy [6]. Students feel a desire to be trusted, cared for, and supported by others (such as teachers) within the social environment. In the process of satisfying these needs, students develop in social learning and gain a sense of psychological stability [3]. A teacher who forms an amicable and trusting relationship with students will positively influence them and shape their self-awareness, self-respect, emotional stability, and pleasure in studying.

Relatedness, which is the need to form mutual bonds and have a sense of belonging, is a core psychological element in making people a healthy part of society, and it serves as the source of value sharing, motivation, and behavior through internalization.

2.2. Correlation between Relatedness Support and Result Parameter

When teachers understand, sympathize with, and form amicable relationships with students in physical education classes, they can predict and encourage students' learning motivation and learning behaviors related to task performance. This is the basis for improving students' skills and promoting their task performance. Teachers' relatedness support, as perceived by students in physical education classes or sports environments, is an important factor in the formation of learning motivation and affects exercise performance [16]. The enjoyment of, interest in, and curiosity about learning activities and tasks increases students' immersion and concentration in assignments and ensures that they continue to participate in learning activities [17–18]. Continued and enthusiastic learning participation by students is the basis for self-determination motivation, a conceptual understanding based on learning, and deep thinking. Ultimately, improving students' participation in learning begins with the interaction and relatedness between teachers and students. Teaching behaviors that support students' psychological needs (autonomy, competence, and relatedness) positively affect students' attitudes, learning intentions, and psychological adaptation [3]. Globally, studies on sports and physical education confirm that teachers' relatedness support, which is their social support behavior, satisfies students' psychological needs, resulting in positive changes in emotional aspects such as concentration, competitiveness and forming a positive attitude toward classroom activities [4,8,19]. It has been demonstrated that when the relatedness needs in the teacher-student relationship are satisfied, students persevere, they are less bored with learning, participate more in learning, and experience less anxiety [20].

Positive relatedness with the teacher, as perceived by students, also increases student interest in schoolwork, motivates them to participate enthusiastically, and positively affects academic achievement [19]. Middle school students, in particular, who experience rapid changes in the school environment and many physical and mental changes related to puberty compared with their elementary school years, can enjoy a stable school life [21] and class participation by building positive relationships with their teachers. In addition, the development of relationships with the teacher and their support, as well as behavioral and emotional engagement, induces students' help-seeking behaviors and can promote class participation and academic achievement.

Teachers and students grow and develop as they internalize positions, values, attitudes, ideas, and thoughts of others into their own identity by forming meaningful relationships with significant others. A social (learning) environment that supports relatedness along with autonomy and competence is essential in supporting students' psychological needs. Relatedness support should be treated as important in schools and sports fields [7] as teaching behaviors [22] that support autonomy [23] and competence.

3. Methods

3.1. Participants

In this study, data were collected using a random sampling method. The subjects were 14- to 16-years-old students from five selected middle schools in North Jeolla Province in South Korea. The survey was conducted from September 2019 to November 2019, and consent was obtained from the students and their parents, who were informed of the study's purpose, intent, and ethics. Among the collected questionnaires, valid samples from 278 participants (137 males and 151 females) were used in this study, excluding 12 with either unsatisfactory responses or unanswered questions. Students and parents were informed that the collected personal data would not be used for any purpose other than the survey statistics.

3.2. Measures

The research tool used was the questionnaire. The validity and reliability of questionnaires as research tools have been proven in prior global research and are deemed suitable for the purpose of studies such as this. Two questionnaires were used, and each question consists of a 5-point rating ranging from 1 (strongly disagree) to 5 (strongly agree).

First, the scales developed by [4] and [10] were used to measure teachers' relatedness support teaching behaviors in physical education classes. These measures are widely used in studies in physical education fields [8, 24] and have been verified for reliability and validity. The following is an example of a question on relatedness support (there are four questions) with possible responses: "The teacher in physical education class ... 'Tries to respect and understand me,' 'Respects my thoughts and opinions and listens to me well.'"

Second, to measure students' psychological needs in physical education classes, a measure of autonomy, competence, and relatedness was used, each consisting of four questions. The degree of students' autonomy was measured with the measure of autonomy used by [25] and [15]. Examples of questions and possible responses on autonomy include: "In physical education classes ... 'I am given the choice and opportunity to engage in the activities I prefer,' 'I take part in class because I like it and want to.'" The measures used in studies by [25] and [26] were used to measure competence. Examples of questions on competence include: "In physical education classes ... 'I'm pretty good at sports,' 'I think I'm pretty good at physical education.'" The measure of relatedness used by [27] was used to measure the desire for relatedness. This measure is widely used internationally [25, 28] and is suitable for measuring the desire for relatedness based on self-determination theory [15]. Examples of responses to questions on relatedness include: "I feel comfortable" and "I feel I am receiving attention."

Third, to measure students' learning motivation in physical education classes, this study used questions on the factor of effort developed by [29], which are sub-factors of motivation measure within learning, and the factors of pleasure and fun used in [30]. The learning motivation factor section consists of four questions, and examples of responses include "I do my best in physical education" and "Physical education is fun, and I enjoy activities."

3.3. Reliability and Validity of the Scale

To test the reliability of the research tools, the study used IBM SPSS 23.0 to estimate internal consistency with Cronbach's α. To test validity, the study used IBM AMOS 23.0 to perform a confirmatory factor analysis (CFA).

The reliability of relatedness support as a social factor based on self-determination theory was .797. Moreover, the CFA, which measured the validity of the scale ($Q=2.808$, $p<.001$, CFI=.989, NFI=.984, TLI=.968, RMSEA=.080, and SRMR=.0231), proved that it was fairly appropriate.

In the motivation variable of psychological desire, autonomy (.836), competence (.844), and relatedness (.855) showed fair reliability. The CFA, which measured the validity of the scale ($Q=1.284$, $p<.001$, CFI=.993, NFI=.971, TLI=.991, RMSEA=.032, SRMR=.0348), proved that it was fairly appropriate.

Learning motivation (.834) according to the locus of causality registered a fair level of reliability, and the CFA, which measured the validity of the scale ($Q=2.1314$, $p<.001$, CFI=.991, NFI=.983, TLl=.972, RMSEA=.063, SRMR=.0234), proved that it was fairly appropriate.

3.4. Data analyses

This study used the questionnaire survey method to collect data. The respondents filled out a self-administered questionnaire. Data that were free from missing values were analyzed using IBM SPSS 23.0 and IBM SPSS AMOS 23.0.

A descriptive statistical analysis, reliability analysis, and correlation analysis were performed on the measured variables, and a path analysis was performed according to the structural model to verify the relationship between each variable. The bootstrap method was used to determine the impact of teachers' relatedness on psychological needs and internal motivation. Lastly, 5,000 bootstrapping data samples generated from the original data were used for parameter estimation to verify the significance of the parameters. The bootstrap was used at a 95. confidence interval.

4. Results

4.1. Descriptive statistics, reliability, and correlation analysis

Table 1 presents the results for the descriptive statistics' reliability and correlation. To verify that the questions for each variable of the measurement tool meet the normal distribution curve, we looked for skewness and kurtosis. Given the normal distribution conditions (skewness and kurtosis: ± 2.0 or less), the questions for each variable were found to meet the normal distribution conditions.

Regarding the results of the correlation analysis, teachers' relatedness support, basic psychological needs, and all the sub-factors of learning motivation showed a significant positive correlation ($p < 0.01$). Additionally, correlation values (*.r*) of .90 or lower verified the low likelihood of multicollinearity among the measured variables.

To identify the psychological needs of students who experience various physical and psychological changes, this study analyzed each of the factors of autonomy, competence, and relatedness by setting them as parameters, instead of setting psychological needs satisfaction, which is the sum of the values of autonomy, competence, and relatedness, as parameters.

Table 1. Mean, standardized deviation, reliability, and correlation analysis

Variables	1	2	3	4	5
Relatedness support	1				
Autonomy	0.479**	1			
Competence	0.598**	0.587**	1		
Relatedness	0.403**	0.482**	0.515**	1	
Class motivation	0.342**	0.505**	0.469**	0.473**	1
Mean(SD)	3.71(.58)	3.57(.83)	3.53(.71)	3.30(.68)	3.20(.80)
Skewness	0.18	0.02	0.07	0.33	0.16
Kurtosis	-0.07	-0.42	0.13	-0.30	-0.10

**$p < 0.01$, SD=Standard Deviation

4.2 Cause-and-effect analysis and mediated effect analysis

To determine the suitability of the research model, Q, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) were used as criteria for judgment [31]. The goodness fit index (GFI) of the research model was $Q=1.815(x^2=295.852$, $df=163$, $p < 0.001$), TLI = 0.950, CFI = .957, RMSEA = 0.053, and SRMR = 0.0633, demonstrating that all the indexes met the standard value.

As the hypothesis test results illustrate (Table 2), teachers' relatedness support in physical education class is an important predisposing factor for predicting students' psychological needs. The relatedness support of physical education teachers had a significant effect on the three psychological needs: autonomy ($\beta = 1.21$, $p < 0.001$), relatedness ($\beta = 0.77$, $p < 0.001$), and competence ($\beta = 1.02$, $p < 0.001$). In addition, the three psychological needs had a significant effect on learning motivation (autonomy: $\beta = 0.37$, $p < 0.001$; relatedness: $\beta = 0.41$, $p < 0.001$; competence: $\beta = 0.46$, $p < 0.001$). However, the relatedness support of physical education teachers did not have a significant effect on learning motivation ($\beta = -0.33$, $p > 0.05$).

Table 2. Hypothesis test results

Path			Est.	SE	CR(t)
Autonomy	←	Relatedness support	1.206	0.147	8.231***

Relatedness	←	Relatedness support	0.766	0.114	6.701***
Competence	←	Relatedness support	1.017	0.124	8.174***
Class motivation	←	Autonomy	0.374	0.090	4.156***
Class motivation	←	Relatedness	0.415	0.117	3.539***
Class motivation	←	Competence	0.457	0.211	2.167*
Class motivation	←	Relatedness support	-0.325	0.339	-0.959

***$p < 0.001$, *$p < 0.05$, Est.=estimate, SE=standard error.

4.3 Mediated effect analysis

Next, the bootstrapping (5,000 times) method proposed by [32] was used to verify the mediating effects of psychological needs in the relationship between physical education teachers' relatedness support and learning motivation. A significance test of the indirect effect demonstrated that psychological needs' indirect effect was significant (1.233, $p < 0.001$) in the relationship between teachers' relatedness support and learning motivation. This can be seen in Figure 1, which illustrates the structural relationship between variables based on theory. This demonstrates that in physical education classes, the higher the teacher's relatedness support, the higher the satisfaction of students' psychological needs, which positively impacts their motivation.

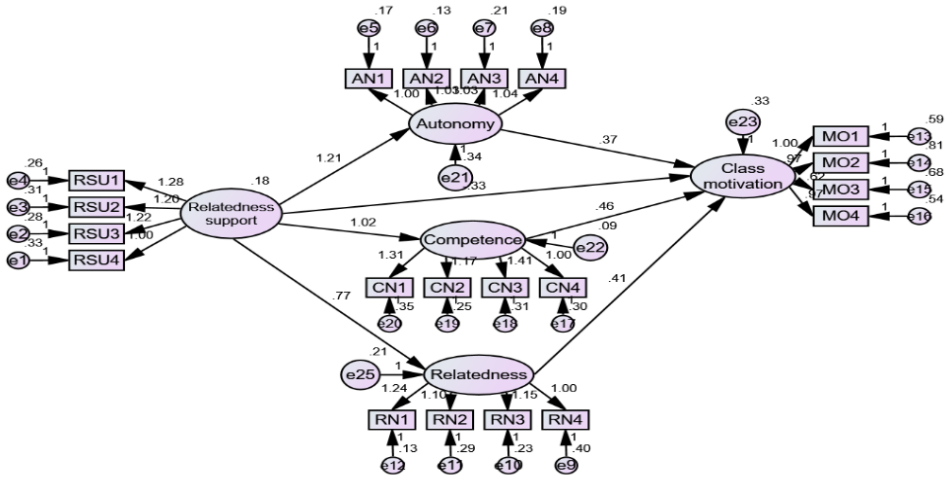

Figure 1. Results of the structural equation model analysis

Physical education teachers' relatedness support presented in this study had a positive effect on the three psychological needs of autonomy, competence, and relatedness; autonomy, competence, and relatedness positively affected learning motivation. In addition, autonomy, competence, and relatedness played a mediating role in the relationship between teachers' relatedness support and learning motivation. However, teachers' relatedness support did not affect learning motivation directly.

5. Discussion

This study aimed to determine the influence of physical education teachers' relatedness support on three basic psychological needs (autonomy, relatedness, and competence) among their students and the influence of each of these psychological needs on students' motivation for learning. It also examined the mediating roles played by autonomy, competence, and relatedness in learning motivations.

First, teachers' relatedness support in physical education class positively affected students' basic psychological needs of autonomy, relatedness, and competence. Depending on the quality and degree of relatedness support by teachers or leaders in physical education classes and sports environments, the learner's psychological needs satisfaction and attitude revealed considerable differences. Relatedness support from teachers improves relatedness and autonomy. As it increases the desire for competence, it also improves intrinsic motivation. Friendly communication, understanding and empathy, and passion, which are provided by a teacher while physical education is in progress, fulfill the psychological needs of students and stimulate high levels of class participation [33].

When physical education teachers who teach classes provide students with a learning environment that looks at student activities from the perspective of students, communicate with friendly conversations, and present tasks

suitable for students' levels, students can enhance the psychological need of relatedness through positive experiences [1]. Students internalize values, attitudes, thoughts, and ideas by forming meaningful relationships with teachers, which plays an important role in promoting students' motivation and developing positive emotions [3]. The relatedness support that students perceive from the teacher positively influences their school and emotional adjustment. It has been reported that adaptive emotional adjustment is enhanced as the relationship with the teacher becomes more positive [34]. This study partially supports research results that reported that students who needed help sought advice from teachers when they perceived sufficient emotional support and that those students who felt more comfortable building an emotional rapport with the teacher were more likely to display greater learning participation and class immersion [35].

Under the current COVID-19 pandemic situation, individual-centered learning activities have limited feasibility in promoting students' learning motivation and inducing positive emotional development. A learning environment to support relatedness that promotes teamwork and cooperation is vital in enabling students to feel psychologically stable and focus more on class activities [33]. There is a dearth of research on the satisfaction of psychological needs depending on teachers' (or leaders') relatedness support in physical education classes and sports education, but teachers' relatedness support (mutual respect, consideration, encouragement, understanding, and empathy) was a factor that could satisfy the basic psychological need of each student for respect and being recognized by the teacher [36]. Students will be able to focus on class activities with a sense of psychological stability when a classroom environment is provided in which students who are not psychologically, socially, or physically mature, or are still developing, can satisfy their psychological needs through the teacher's relatedness support. Teachers should strive to maintain emotional ties in the process of providing communication and feedback, as their relatedness support enables close relationships with students and has an important effect on satisfying students' psychological needs.

Second, students' basic psychological needs of relatedness, autonomy, and competence significantly impacted learning motivation. It was confirmed that the satisfaction of these psychological needs in physical education classes is related to internal learning motivations that bring out high levels of class participation and academic achievement. The higher the degree of satisfaction of psychological needs (relatedness, autonomy, and competence) in sports and classroom environments, the greater the likelihood of internalizing internal motivation [34]. Studies on the intention of high school students to participate in physical education classes have demonstrated that students who perceived that their teachers met their psychological needs had high internal motivation and willingness to participate in physical education classes [15]. The basic psychological needs of students satisfied in class situations are directly or indirectly related to subjective happiness, positive emotional experience [15], and self-determination motivation [25]. Students work harder on learning activities when their relatedness needs are met. They participate more in class and feel less bored and anxious about learning [20]. With regard to autonomy, the teacher's supportive relationship influences the student's help-seeking behavior, with the result that in the classroom environment, students ask the teacher more questions and for appropriate help [37]. Particularly, previous studies have demonstrated that the degree of relatedness support could change depending on the phase of learning (before, during, and after class) and that its flexibility allows for the motivational methods and teaching behaviors in support of relatedness. In this regard, this study can be considered in line with previous studies.

Basic psychological needs, in particular, serve as crucial leads that decide how students will perform the behaviors that are requested based on the circumstances inside and outside the physical education class. Therefore, a teacher should have students voluntarily participate in learning activities and induce positive behaviors by understanding the changes in their behaviors and providing appropriate feedback. Students participate in learning activities actively when a class environment or atmosphere with teacher support, and reciprocity is guaranteed in the physical education class [38]. Instead of controlling student behavior through intervention and control in a strict classroom atmosphere, a teacher should try to motivate students to learn by creating a permissive class atmosphere that promotes autonomy and competence and by providing a class program and environment that enables students to participate freely in class, enjoy it, and experience positive emotions.

Third, teachers' relatedness support behavior in physical education classes was demonstrated to contribute to the formation of students' learning motivation mediated by the satisfaction of their psychological needs. When teachers provide personalized guidance and feedback to meet the psychological needs of individual students in the classroom, students will be emotionally stimulated and will experience more positive emotions, such as pleasure, interest, satisfaction, and competitiveness. This subjective sense of happiness and positive emotional experience can lead to students' participation and immersion in classes. The quality of students' participation in class and learning varies depending on the level of satisfaction they experience regarding relatedness [39].

Of the three psychological needs, sports athletes reportedly perceive the need for relatedness most strongly and use it to improve their performance [40]. Sports athletes prize personal ties with their instructors, and they attempt ample interaction through respect and trust. In physical education classes, teachers also interact with students [41]. Teachers and students engage in verbal and non-verbal communication mediated by class content and personalized teaching and feedback that meet individual needs, satisfy psychological needs, and enhance intrinsic motivation [42]. After all, strengthening students' intrinsic motivation, which activates emotional stimulation, such as

enjoyment, satisfaction, fun, and challenge, can greatly contribute to improving students' learning performance, immersion, and class participation.

Various previous studies have highlighted the importance of creating a positive social (learning) environment. However, positive experiences do not necessarily lead to positive outcomes by offsetting negative experiences [36]. Relatedness support has no adverse effect on the frustration of psychological needs, and unfavorable circumstances can better explain and predict the frustration of needs or negative consequences of negative experiences. Students' positive and negative experiences in sports and physical education classes should be seen as independent concepts rather than complementary, and various teaching strategies should be developed and applied accordingly. Therefore, teachers should create and apply teaching methods and strategies to help reduce or minimize social factors (i.e., indifference, neglect, and coldness) that can impact a social (learning) environment.

In summary, teaching behavior that supports relatedness in physical education classes is an antecedent variable for learning motivation, and the satisfaction of psychological needs serves as a variable that mediates physical education teachers' relatedness support and learning motivation. The degree of relatedness support can vary with classroom situations and registers flexibility. Teachers need to provide a learning environment that supports relatedness to enhance students' learning motivation.

6. Conclusion

This study investigated the effects of a teacher's relatedness support on students' psychological needs such as autonomy, competence, and relatedness in physical education classes and examined its influence on learning motivation mediated by different needs. The study concluded that relatedness support from a teacher is as important as autonomy support. It demonstrated that a teacher's relatedness support positively affected students' psychological needs such as autonomy, competence, and relatedness and that these different psychological needs mediated relatedness support and learning motivation.

The relationship between teachers and students in class affects the process and results of learning as well as communication. The quality of the relationship and communication varies depending on how the relationship between the teacher and the student is formed. In a classroom where teacher-student relations are unilateral or subject to excessive norms, it is not easy to maximize students' potential skills, and students are not actively engaged in carrying out or solving tasks. Whether students meet their basic psychological needs directly or indirectly affects their motivation, attitude, and academic achievement. Students' willingness to participate in classes and make their own choices and the competency of "I can do it" is achieved through self-awareness. As the study demonstrates, students participate actively in classes only when their basic psychological needs are met. Through the teacher's relatedness support, students develop self-determination through self-control and the adjustment of their behavior. Teachers' relatedness support is an important factor that invigorates students' self-determination, such as class participation and attitude toward classes. Through interaction with students, teachers can improve students' psychological needs satisfaction, such as relatedness, autonomy, and competence, and can improve the quality of classes by promoting students' motivation to learn. To meet students' basic psychological needs, teachers should improve their teaching and learning strategies, class management, and methods to create a teaching environment that strengthens teachers' relatedness support to enhance students' self-determination. Thus, relatedness support from teachers is a major antecedent variable that predicts the quality of learning. Therefore, increasing students' learning motivation requires exploring a teaching strategy oriented toward relatedness.

Based on the results of this study, the following suggestions are made for follow-up research. Students who form positive relationships with teachers in physical education activities ask their teachers for help or communicate in a friendly way. However, students who often get scolded by teachers or engage in deviant behavior will experience negative emotions and form negative relationships with teachers. To enable teachers and students to communicate with each other and have positive experiences, it is necessary to develop and apply a relatedness improvement program to support teachers' relatedness and verify its effectiveness. Also, expanding studies that can prevent and reduce problem behaviors (such as antisocial behavior) that can occur between teachers and students in physical education classes and expanding studies that suggest useful ways to solve these problem behaviors desirably will improve the relatedness between teachers and students.

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