Students' Basic Psychological Needs in Learning Science: The Role of Teacher Autonomy Support and Classmate Support

Gülşen Koçak, Yasemin Tas, and Sundus Yerdelen

Abstract

This study examined the predictive effect of students' perceptions of science teacher's autonomy support and classmates' support on their basic psychological needs (i.e., relatedness, autonomy, and competence) in science. 1,018 middle school students from 9 public schools in Turkey completed self-report surveys. Hierarchical multiple regression analyses showed that while controlling for students' gender and previous achievement, both teachers' autonomy support and classmates' support positively predicted students' basic psychological needs and teacher autonomy support emerged as a better predictor than classmates' support. The amount of explained variance was .41, .38, and .33 in the relatedness, autonomy, and competence aspects, respectively. It can be concluded that students tend to feel more autonomous, related, and competent in science classes where science teachers consider their ideas, encourages them ask questions, and give opportunity to make choices about the lesson and where classmates pay attention to them, treat them nicely, and spend time with them.

***Keywords**:* science education, teacher autonomy support, classmate support

Dr. Gülşen Koçak is a research assistant doctor at Atatürk University, Kazım Karabekir Faculty of Education, Department of Mathematics and Science Education. She can be reached at gulsen.demir@atauni.edu.tr

Dr. Yasemin Tas is an Associate Professor at the Department of Mathematics and Science Education at Kazim Karabekir Faculty of Education in Ataturk University. She can be reached at tasyase@gmail.com

Dr. Sundus Yerdelen is an Associate Professor in the Department of Mathematics and Science Education at Kafkas University. She can be reached at suyerdelen@gmail.com

The word “motivation” originated from the Latin verb of “movere” (to move); which is defined as “the process whereby goal-directed activity is instigated and sustained” (Pintrich & Schunk, 2002, p. 5). There have been a lot of theories put forward to better understand the concept of motivation. Self-determination theory emerged in the 1970s, and early studies first conducted by Edward Deci and Richard Ryan are another representative of this theory. It is related to experiencing a sense of choice of the individuals in initializing and organizing their own behaviors (Deci et al., 1989). Self-determination theory (Deci & Ryan, 1985a; Ryan & Deci, 2000; Ryan & Deci, 2008) is a theory built on the basic psychological needs of people and also it is one of the detailed and well-studied theories (Evelein et al., 2008). It was found that basic psychological needs are closely related to many student outcomes such as motivation (e.g., Dincer, 2014; Lavigne et al., 2007; Zhou et al., 2019), subjective well-being (e.g., Balaguer et al., 2012; Su et al., 2021; Tian et al., 2016), student engagement (e.g., Authors, 2018; Zhou et al., 2019), and achievement (e.g., Wang et al., 2019).

There have been studies conducted with a view to dealing with the roles of different social factors such as the family (parents), teacher and friends, regarding the meeting of basic psychological needs of individuals (e.g., Amorose & Anderson-Butcher, 2007; Grolnick et al., 1991; Zhou et al., 2009; Zhou et al., 2019). In those studies, especially the importance of teacher’s autonomy support stands out (e.g., Kiefer & Pennington, 2017; Maulana et al., 2016; Wu et al., 2014). However, there are few studies dealing with the effects of friends on students’ motivation (Núñez & Jaime León, 2015). It was found that perceived peer support in middle school is positively associated with school satisfaction in high school (Muscarà et al., 2018). Considering the power of teacher and peer supports especially in middle school years, investigating the effects of those supports on student motivation is quite important (Wentzel et

al., 2010). In this study, the predictive effect of middle school students' perceptions of autonomy support of the teacher and support of classmates on their basic psychological needs in science class will be investigated.

Basic Psychological Needs

Basic psychological needs in the theory of self-determination consist of three components: competence, relatedness and autonomy. Competence is defined as the self-infusion of the fact that the person has the factors of skills, power and knowledge required to achieve a certain task (Deci & Ryan, 1985a). Individuals having a high level of competence can interact with the people around them and also have the tendency to influence those people and to display their own capacities (Kowal & Fortier, 1999; Ryan & La Guardia, 2000; Vlachopoulos & Michailidous, 2006). The second factor, relatedness, is defined to be the state of having a connection between oneself and his/her social circle and also having supportive relationships with them (Deci & Ryan, 2000). It also encompasses the meanings of sensitivity, warmness, sentimentality and acceptance (Andersen et al., 2000). Skinner and Edge (2002) stated that the removal of the need of relatedness would lead to some dangerous situations such as withdrawal and depression (as cited in., Evelein et al., 2008). The last sub-dimension of the basic psychological needs is autonomy. It is defined as the initialization of an individual's own actions, organization of his/her own behaviors and experiences, self-check of his/her own decisions and making choices (Deci & Ryan, 1987; Ibarra-Rovillard & Kuiper, 2010; La Guardia & Patrick, 2008). In other words, it is the self-feeling of the individual at the center of his/her actions (Kowal & Fortier, 1999). Since autonomy is the concrete state of the theory of self-determination, autonomy has special importance in terms of representation of the theory of self-determination (Deci & Ryan, 1985b).

Teacher Autonomy Support

The most important channels for the sense of autonomy are autonomy supportive attitudes of social environment such as the family, teacher and friends. Namely, if the environment in which the individual exists and perceives behaves in an autonomy supportive manner, then this situation leads to a satisfaction of basic psychological needs (Deci & Ryan, 1985b). Alongside with autonomy, social support is also important for the satisfaction of other two components of basic psychological needs (Calp & Bacanlı, 2016). Teachers and classmates are important sources of social support for the students. (Tian et al., 2016).

According to the theory of self-determination, for a healthy development of individuals, it is important to meet the psychological needs. Learning environments in which the students are supported by their teachers and peers contribute to satisfaction of those needs (Deci & Ryan, 2000). If a teacher provides autonomy support to his/her students, then he/she gives importance to the interests, desires, choices and preferences of the students, tries to understand their feelings towards learning activities, and motivates them continually so that the intrinsic motivation of the students is supported (Cai et al., 2002; Reeve et al., 1999). When the teacher behaves in an autonomy supportive manner, he/she considers students' opinions and provides them choices (Patall et al., 2013). Thus, a teacher providing autonomy, can help meet the basic psychological needs of the students (Liu et al., 2020). Instead of supporting autonomy, contrarily, if a teacher begins controlling the students' behaviors, then the students might feel pressured to change their behaviors and start questioning their abilities. They might feel refused or disliked by the teacher and thus they might experience disappointment in terms of autonomy, competence and relatedness (Deci & Ryan, 1985a; Haerens et al., 2015).

Classmates' Support

Another social agent in science learning environment discussed in this study is classmate (or peer) support based on the perceptions of the students. Contemporary adolescent teens spend more time in peer groups, compared to teens in the past. Any peer group plays a very important role in the psychological development of adolescent teens, independent of its structure and norms (Küdür-Çırpan & Çınar, 2013). Social support provided by classmates contributes to formation of close peer relationships (Tian et al., 2016). Classmates provide a sense of confidence in students (e.g. Hamm & Faircloth, 2005), a sense of belonging to school (Kiefer et al., 2015) and a higher school satisfaction (Epstein, 1981). Earlier studies have demonstrated that the support of teachers and classmates is related with many variables such as academic achievement (Chambers et al., 2006; Ghaith, 2002), student engagement (Jang et al., 2010), self- esteem and depression (Ibarra-Rovillard & Kuiper, 2011; Siyez, 2008).

Relationships between Social Agents and Basic Psychological Needs

In the literature, there are some studies that investigate the effect of different social supports such as family, teacher and friends on student motivation from the perspective of self-determination theory (e.g., Amorose & Anderson-Butcher, 2007; Chirkov & Ryan, 2001; Grolnick et al., 1991; Zhou et al., 2009; Zhou et al., 2019). In these studies, basic psychological needs of students were generally examined in relation to the family support (e.g., Kurt, 2016; Marbell & Grolnick, 2013; Ratelle et al., 2005; Soenens & Vansteenkiste, 2005) and teacher autonomy support (e.g., Cox & Williams, 2008; Soenens & Vansteenkiste, 2005). For instance, Authors (2018) found that parents' educational aspiration, parental communication, parents' participation, and parental autonomy support positively predicted middle school students' basic

psychological needs in science. However, there is need to investigate the effects of other social supports just like the peer support in the studies.

Another study (Zhou et al., 2009), which was conducted with children in 4th, 5th and 6th grades in rural China showed that autonomy support of parents, friends and teachers positively predicted the students' basic psychological needs. As for the students with a higher level of basic psychological needs, it showed that their level of motivation and engagements were higher. The findings of the study supported that autonomy was very important in collectivist societies in the east such as China and also in individualistic cultures in the west. In their study with high school students (n= 1476), Tian et al. (2016) examined the relationships among school related support as measured by teacher support and classmate support, basic psychological needs (i.e., autonomy, relatedness and competence), and school-related subjective well-being. They found that basic psychological needs mediate the relationship between school related support and school-related subjective well-being. In the literature, there are some studies investigating the social support factors such as the family, teachers and friends altogether (Zhou et al., 2019; Ricard & Pelletier, 2016), while some studies address them one by one; such as teacher or coach autonomy support (Adie et al., 2008) and family support (Grolnick, 2009). For instance, Lavigne et al. (2007) focused on teacher autonomy support and they investigated the relationships among teacher autonomy support, perceptions of competence, perceptions of autonomy, science motivation and intentions to pursue science education in a group of high school students (n= 728). Structural equation modeling analysis showed that teacher autonomy support is positively linked to perceptions of competence and autonomy, which in turn positively predicts science motivation. Additionally, perceptions of competence and autonomy and science motivation all positively predict students' intentions to pursue science education. However, research has

focused truly little on the effect of peers on student motivation (Núñez & Jaime León, 2015). In a transition study, it was found that the relationship between affective involvement in middle school and school satisfaction in high school was mediated by the perceived peer support in middle school (Muscarà et al., 2018). Considering the power of different effects of teacher and peer support especially in middle school years, it is important to examine the interactive effects of teacher and peer support together on student motivation (Wentzel et al., 2010). Moreover, there have been very few studies investigating the common effects of autonomy support from teachers, parents and peers on the student motivation and learning activities, within the framework of theory of self-determination (Zhou et al., 2019).

Purpose of the Study

This study aimed to investigate the predictive effect of middle school students' perceptions of science teacher autonomy support and classmates' support on their basic psychological needs in learning of science. Because the earlier studies revealed that gender and prior achievement factors are connected with students' basic psychological needs (e.g., Amorose & Anderson-Butcher, 2007; Brown et al., 1995; Harvey & Retter, 2002; Navarro-Patón, 2018; Tian et al., 2016; Wang et al., 2019), the effect of these variables will be controlled in statistical analyses. Therefore, the research question of the study is:

Do middle school students' perceptions of teacher's autonomy support and peers' support predict their needs for autonomy, competence, and relatedness, after controlling for the effect of gender and prior achievement?

Method

Design

This is a cross-sectional quantitative study which aims to investigate the relationship between students' perceptions of teachers' autonomy support and classmates' support in science learning environment and their basic psychological needs in science learning. In this study, correlational research method was utilized and data were collected through self-report questionnaires. Before launching the questionnaire, information about the study was given to the participants and it was declared that data would be anonymized and not shared at the individual level. Also, due measures were taken to make sure that the classmates would not see each other's codifications. Students took part in this research on a basis of volunteering and it took about 20 minutes to fill in the scales.

Sample

In the study, convenience sampling was used and the sample included 1,018 students in nine middle schools located in one of the biggest cities in eastern Turkey. In terms of the age of participants, 33.8% were 6th graders, 36.4% were 7th graders and 29.8% were 8th graders and 51.1% were boys and 47.6% were girls. Fifteen students did not answer for their genders. Science lesson average mark of the participants for the previous year was 4.37 out of 5 (*SD* = .78) and average age is 12.75 (*SD* = .99).

Instruments

Basic Psychological Needs

"Basic psychological needs scale" developed by Gagné (2003) was used to measure the basic psychological needs of the students. The scale was adapted to Turkish aiming at mathematics by Durmaz (2012) and there has been some findings indicating that the Turkish

version of the scale is a valid and reliable tool to measure the basic psychological needs of Turkish high school students. Durmaz (2012) reduced it to 5-point Likert scale (1= strongly disagree, 5= strongly agree) from a 7-point Likert, considering the age range of the participants in the research. In this version of the scale, there are six items for relatedness, eight items for competence and seven items for autonomy. In the study carried out by Durmaz (2012), Cronbach alpha's internal consistency reliability coefficients were found to be .72 for autonomy, .72 for relatedness, and .65 for competence. Later on, Authors (2018) also used the Turkish version of the scale for measuring the basic psychological need of middle school students in science lessons. The following are the sample items for the sub-dimensions of the basic psychological needs: Sample item for relatedness: "I really like the people I interact with in science class", for competence: "I have been able to learn interesting new skills recently in science class", and for autonomy: "I generally feel free to express my ideas and opinions in science class" (Authors, 2018, p. 186). In the present study, Cronbach alpha coefficients were calculated .66 for autonomy, .70 for competence and .72 for relatedness.

Teacher Autonomy Support

In order to measure the teachers' autonomy support, Learning Climate Questionnaire developed by Williams and Deci (1996) was used. In this unidimensional scale, there are 15 items regarding the relationships of students with their teachers. A sample item is as follows: "I feel that my teacher provides me choices and options." The scale has a 5-point response ranging between "strongly disagree" and "strongly agree". The scale's adaptation to Turkish and its reliability and validity studies were carried out by Dincer (2014) who decided to remove one item from the scale as a result of factor analysis. Cronbach alpha coefficient for the remaining 14

items was calculated as .95. In the present study, Cronbach alpha was calculated as .94, indicating high internal consistency of the scores obtained from the instrument.

Classmates' Support

Classmates subscale of Child and Adolescent Social Support Scale (Malecki & Demaray, 2002) was used. This subscale consists of 12 items and one sample item is as follows: "My classmates treat me nicely." Frequency gradation of the scale is arranged in 6-point Likert form as follows: never (1), almost never (2), sometimes (3), most of the times (4), almost always (5) always (6). Cirik (2010) made the adaptation of the scale into Turkish. In the Turkish adaptation study, 5^{th}, 6^{th}, 7^{th}, and 8^{th} graders were participants and Cronbach alpha reliability coefficient for the sub-dimension of classmates was calculated as .96 (Cirik, 2010). In the present study, Cronbach alpha coefficient for classmates' support was calculated as .94.

Results

Descriptive statistics were conducted to examine the level of students' perception of their science teacher's autonomy support, and classmates' support, as well as their basic psychological needs (see Table 1). Results showed that mean values for students' perceptions of autonomy support from science teacher (M= 3.89, SD= .89), classmates' support (M= 4.23, SD= 1.27), and basic psychological needs components of relatedness (M= 3.77, SD= .74), competence (M= 3.66, SD= .81), and autonomy (M= 3.70, SD= .72) were above mid points of the scales. Furthermore, students' perceptions of both teacher autonomy support and classmates' support were positively and significantly related to all aspects of basic psychological needs.

Table 1

Descriptive Statistics and Bivariate Correlations

Variables	*M*	*SD*	Possible range	Classmates' support	Relatedness	Competence	Autonomy
Teacher's autonomy support	3.89	.89	1-5	.42**	.59**	.50**	.56**
Classmates' support	4.23	1.27	1-6		.41**	.28**	.30**
Relatedness	3.77	.74	1-5			.65**	.71**
Competence	3.66	.81	1-5				.68**
Autonomy	3.70	.72	1-5				

Note: ** $p < .01$

In order to examine whether students' perceptions of teacher autonomy support and classmate support predict their basic psychological needs, three hierarchical multiple regression analyses were conducted by using each component of basic psychological needs as criterion variables. Assumptions of no multicollinearity and outliers, and normality, linearity, homoscedasticity, and independence of residuals were met. As the first step of the hierarchical multiple regression analysis, gender and prior science achievement were included in the model in order to control for their effects. Afterwards, as the second step, teacher's autonomy support and classmates' support were included (see Table 2).

The first model was set by defining the relatedness as outcome variable. Results of the first step of this analysis showed that both gender (β= .08) and previous year science grade (β= .28) emerged as significant predictors of relatedness. Girls and students with higher previous science grade reported higher levels of relatedness than boys and lower achievers. In the second step of the hierarchical multiple regression analysis, students' perceptions of the science learning

environment as measured by teacher's autonomy support and classmates' support were entered into the model. Both teacher's autonomy support (β= .46) and classmates' support (β= .20) positively predicted the outcome variable. The explained variance in the relatedness was found to be 40.8%.

In the second model, autonomy was the dependent variable. Both, gender (β= .13) and prior achievement (β= .35) were found to be significant and positive predictors of autonomy. Girls and students with high prior achievement reported feeling more autonomous than boys and students with low prior achievement, respectively. In the second step, both teacher's autonomy support (β= .46) and classmates' support (β= .08) emerged as significant and positive predictors of autonomy. The predictor variables together explained 38.3% of the variance in the autonomy.

The third model was built by using competence as the outcome variable. In the first step, only previous year science grade (β= .38) was found to be a significant predictor of competence while gender (β= .02) was a non-significant predictor. Students with higher previous science grade reported higher levels of competence than lower achievers. In the second step of the hierarchical multiple regression analysis, both teacher's autonomy support (β= .41) and classmates' support (β= .07) positively predicted the outcome variable. These predictors explained 33.4% of the total variance in the competence variable.

Results showed that the R^2 change from step 1 to step 2 was statistically significant for each model, indicating that the models were improved at the second stages of the analyses. Accordingly, teacher's autonomy support and classmates' support are important predictors of students' basic psychological needs. Based on the standardized coefficients (β), it can be said that teachers' autonomy support is a better predictor of basic psychological needs than classmates' support.

Table 2

Hierarchical Multiple Regression Analysis Predicting Basic Psychological Needs

	Relatedness			Autonomy			Competence		
	B	*SE* B	*B*	B	*SE* B	*β*	B	*SE* B	*β*
Step 1									
Constant	2.54	.13		2.20	.13		1.94	.14	
Gender	.12	.05	.08**	.19	.04	.13***	.03	.05	.02
Prior achievement	.27	.03	.28***	.32	.03	.35***	.39	.03	.38***
R^2			.09			.14			.14
Step 2									
Constant	1.05	.13		.99	.13		.71	.15	
Gender	.05	.04	.03	.12	.04	.09***	-.03	.04	-.02
Prior achievement	.16	.02	.17***	.23	.02	.25***	.30	.03	.29***
Teacher's autonomy support	.38	.02	.46***	.38	.02	.46***	.38	.03	.41***
Classmates' support	.12	.02	.20***	.04	.02	.08**	.05	.02	.07*
R^2			.41			.38			.33
ΔR^2			.32***			.24***			.19***

Note: *p< .05, **p< .01, ***p< .001. Gender coded 0= Boy, 1= Girl.

Discussion

In this study, after controlling for prior achievements and genders of the students, predictive effect of teacher's autonomy support and classmates' support on the basic psychological needs of the students were tested. According to hierarchical multiple regression analysis, results conducted for each basic psychological need, teacher autonomy support in science lesson positively predicts all of the basic psychological need components (i.e. relatedness, competence and autonomy). These results indicate that the students who receive an autonomy support from the teacher of the science lesson, tend to experience a feeling of self-sufficiency and successfulness during the class. They also get on well with the people in their interaction circle and enjoy a feeling of affinity towards them and feel a freedom in expressing their opinions and views and in deciding how to study. Consequently, teacher's regardfulness of students' points of view and offering them options, are apparently important for satisfying their basic psychological needs.

Results of similar studies are in compliance with the result that there is a positive relationship between the teacher autonomy support and basic psychological needs (e.g., Adie et al., 2008; Amorose & Anderson-Butcher, 2007; Lavigne et al., 2007; Reeve et al., 2008; Wu et al., 2014). For instance, Lavigne et al. (2007) found that teachers' autonomy support positively predicts high school students' perceptions of autonomy and competence which in turn positively predict students' motivation in science and intentions to pursue science education. When students receive a sufficient autonomy support from their teachers, they are more interested in the course (Tsai et al., 2008) and they conduct their studies in their own ways (Jang et al., 2016). On the other hand, when the students are pressured by the teacher in a way to make them think, feel or behave in the direction determined by the teacher, they might tend to be less autonomous,

less competent and less related (Reeve, 2009). Reeve (2006) summarized the features of a teacher who provides autonomy support during class, in nine items as follows: (1) attentive listening; (2) creating opportunities for the students to study; (3) providing speaking opportunities to students; (4) arranging learning materials and creating learning mediums for the students enabling them to manipulate the objects and speeches, rather than rendering them passive listeners and onlookers; (5) encouraging effort and sustainability; (6) extolling their improvements and proficiency; (7) providing them clues when they are in dire need; (8) responding to their questions and comments; (9) providing a clear feedback to their points of view. In this way, the teacher may support the inner motivational resources of the students (Reeve, 2006).

Another result obtained in this study is that, classmates' support positively predicts the basic psychological needs. Thereby, the students who are cared about, who are supported by better relationships and whose feelings and views are liked by their friends tend to have a higher level of autonomy, relatedness and competence. It has been considered that the students who think that they are being cared about by their classmates and being liked by them (Goodenow, 1993), and also who have close and nurturing relationships with their classmates, have a sense of school belonging (De Wit et al., 2010). Moreover, peer influence gains more importance beginning from late childhood (Ntoumanis et al., 2012). The finding of positive association between support of classmates and the basic psychological needs of the students seems to be consistent with the results of similar studies (e.g., Ricard & Pelletier, 2016; Tian et al., 2016; Zhou et al., 2019). For example, Zhou et al. (2019) conducted a study regarding the support offered by classmates to the students, and showed that this support positively predicted the psychological needs of 3^{th}, 4^{th}, 5^{th} and 6^{th} graders.

The findings obtained in this study support the fact that both teacher autonomy support and classmates' support undertake important roles in predicting the basic psychological needs of the students. However, according to the results obtained in this study, teacher's autonomy support is a stronger predictor on the basic psychological needs, compared to classmates' support. Likewise, Ricard and Pelletier (2016) showed that, for the basic psychological needs, teacher support is more predictive than classmate support. Besides, they also stated that class friendships play an important role in predicting the academic motivation, but teacher support has more important effects in terms of meeting the students' basic psychological needs. This might be explained by the fact that in school students primarily place the figure of a teacher as the first important other person and also the teacher may even have an influence on the class environment, daily student affairs and peer relations. (Tian et al., 2016) Moreover, when a student receives consent from his/her teacher due to his/her ideas, feelings and behavior (Reeve, 2009), and also feels that he/she is loved by their teachers (Wentzel & Asher, 1995), this could be effective in explaining why these factors are important predictors in students' intrinsic motivations. However, besides the fact that teacher support is very necessary, it does not suffice on its own for the school development of the student. It is recommended that it must be considered together with other types of social supports such as classmate support and parent support (Rosenfeld et al., 2000).

Despite the fact that the variance values explained by teacher autonomy support and classmate support in the components of basic psychological needs (varying between .33 and .41) are close to each other, the considered learning environment variables explain the variance mostly in the variable of relatedness among the components of basic psychological needs. This finding complies with most of the studies in the literature, (Adie et al., 2008; Standage et al.,

2006; Wu et al., 2014; Zhou et al., 2019), however, in some other studies teacher autonomy support predicts autonomy the strongest (Amorose & Anderson-Butcher, 2007; Tian et al., 2016). For example, Tian et al. (2016) found in their study that while the best predictor of autonomy was teacher autonomy support, the best predictor of relatedness variable was classmate support.

Limitations of this Study and Suggestions for Future Studies

There are some limitations in this study that must be mentioned. First of all, this study is based on cross-sectional data and is a correlational study which restrains the causality claims. In future studies, it might be possible to establish cause and effect relations between the learning environment and basic psychological needs by using longitudinal and experimental designs. Next, in the present study, the perceived science learning environment is limited by the teacher's autonomy support and classmates' support. In future studies, it could be possible to investigate the effect of features of different science learning environments on basic psychological needs of students. Moreover, in order to put forward more details, together with self-report questionnaires, classroom observations focusing on the interactions between students-teacher and students-students, and interviews with students and teacher can be included in data collection methods. Another limitation is about the certain age range of the sample. The obtained results can be generalized to groups having similar features. Because of the fact that students from different age ranges might have different developmental features, for example they might have different levels of being influenced by their teachers and friends, in future studies, students from different age ranges can be selected as sampling and relationships among the variables can be compared.

References

Adie, J. W., Duda, J. L., & Ntoumanis, N. (2008). Autonomy support, basic need satisfaction and the optimal functioning of adult male and female sport participants: A test of basic needs theory. *Motivation and Emotion*, *32*(3), 189-199. https://doi.org/10.1007/s11031-008-9095-z

Amorose, A. J., & Anderson-Butcher, D. (2007). Autonomy-supportive coaching and self-determined motivation in high school and college athletes: A test of self-determination theory. *Psychology of Sport and Exercise*, *8*(5), 654-670. https://doi.org/10.1016/j.psychsport.2006.11.003

Andersen, S. M., Chen, S., & Carter, C. (2000). Fundamental human needs: Making social cognition relevant. *Psychological Inquiry*, *11*(4), 269-275.

Authors (2018).

Balaguer, I., González, L., Fabra, P., Castillo, I., Mercé, J., & Duda, J. L. (2012). Coaches' interpersonal style, basic psychological needs and the well-and ill-being of young soccer players: A longitudinal analysis. *Journal of Sports Sciences*, *30*(15), 1619-1629. https://doi.org/10.1080/02640414.2012.731517

Brown, W. E., Chance, L., & Payne, T. (1995). Male and female teacher education students' profiles on the Edward's personal preference schedule. *Education*, *115*(3), 475-481.

Cai, Y., Reeve, J., & Robinson, D. T. (2002). Home schooling and teaching style: Comparing the motivating styles of home school and public school teachers. *Journal of Educational Psychology, 94*(2), 372–380. https://doi.org/10.1037/0022-0663.94.2.372

Calp, Ş., & Bacanlı, H. (2016). Algılanan akademik yeterlik ve özerklik desteğinin özerk akademik motivasyon ve akademik başarıyla ilişkisi [The relationship between perceived autonomy support and academic competence with autonomous academic motivation and academic success]. *Mehmet Akif Ersoy University Journal of Education*, *1*(40), 300-317. DOI: 10.21764/efd.47706

Chambers, E. A., Hylen, M., & Schreiber, J. B. (2006). Achievement and at-risk middle school students' perspectives of academic support. *Journal of Research in Character Education*, *4*(1-2), 33-46.

Chirkov, V. I., & Ryan, R. M. (2001). Parent and teacher autonomy-support in Russian and US adolescents: Common effects on well-being and academic motivation. *Journal of Cross-Cultural Psychology*, *32*(5), 618-635. https://doi.org/10.1177%2F0022022101032005006

Cirik, İ. (2010). *İlköğretim 5., 6., 7. ve 8. sınıf öğrencilerinin algıladıkları sosyal destek düzeylerinin incelenmesi* [Research conducted on 5th, 6th, 7th and 8th grade primary school students' perception of social support levels]. Unpublished Doctoral dissertation, Marmara University, Turkey.

Cox, A., & Williams, L. (2008). The roles of perceived teacher support, motivational climate, and psychological need satisfaction in students' physical education motivation. *Journal of Sport and Exercise Psychology*, *30*(2), 222-239. https://doi.org/10.1123/jsep.30.2.222

De Wit, D. J., Karioja, K., & Rye, B. J. (2010). Student perceptions of diminished teacher and classmate support following the transition to high school: Are they related to declining attendance? *School Effectiveness and School Improvement*, *21*(4), 451-472. https://doi.org/10.1080/09243453.2010.532010

Deci, E. L., Connell, J. P., & Ryan, R. M. (1989). Self-determination in a work organization. *Journal of Applied Psychology*, *74*(4), 580-590. https://doi.org/10.1037/0021-9010.74.4.580

Deci, E. L., & Ryan, R. M. (1985a). Cognitive evaluation theory. In *Intrinsic motivation and self-determination in human behavior* (pp. 43-85). Springer.

Deci, E. L., & Ryan, R. M. (1985b). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality*, *19*(2), 109-134. https://doi.org/10.1016/0092-6566(85)90023-6

Deci, E. L., & Ryan, R. M. (1987). The support of autonomy and the control of behavior. *Journal of Personality and Social Psychology*, *53*(6), 1024-1037.

Deci, E. L., & Ryan, R. M. (2000). The what and why of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Dincer, A. (2014*). Antecedents and outcomes of self-determined engagement in Turkish efl classrooms: A mixed-method approach.* Unpublished Doctoral dissertation, Atatürk University, Turkey.

Durmaz, M. (2012). *Ortaöğretim öğrencilerinin (10. sınıf) temel psikolojik ihtiyaçlarının karşılanmışlık düzeyleri, motivasyon ve matematik kaygısı arasındaki ilişkilerin belirlenmesi* [Identifying the relationships among the degrees of basic pyschological needs satisfaction, motivation and mathematics anxiety of high school students (10th grade)]. Unpublished Master Thesis, Abant Izzet Baysal University, Turkey.

Evelein, F., Korthagen, F., & Brekelmans, M. (2008). Fulfilment of the basic psychological needs of student teachers during their first teaching experiences. *Teaching and Teacher Education*, *24*(5), 1137-1148. https://doi.org/10.1016/j.tate.2007.09.001

Epstein, J. L. (1981). *The quality of school life*. D.C. Heath and Company.

Gagné, M. (2003). The role of autonomy support and autonomy orientation in prosocial behavior engagement. *Motivation and Emotion*, *27*(3), 199-223.

Ghaith, G. M. (2002). The relationship between cooperative learning, perception of social support, and academic achievement. *System*, *30*(3), 263-273. https://doi.org/10.1016/S0346-251X(02)00014-3

Goodenow, C. (1993). Classroom belonging among early adolescent students: Relationships to motivation and achievement. *Journal of Early Adolescence, 13*(1), 21–43. https://doi.org/10.1177%2F0272431693013001002

Grolnick, W. S. (2009). The role of parents in facilitating autonomous self-regulation for education. *Theory and Research in Education*, *7*(2), 164-173. https://doi.org/10.1177/1477878509104321

Grolnick, W. S., Ryan, R. M., & Deci, E. L. (1991). Inner resources for school achievement: Motivational mediators of children's perceptions of their parents. *Journal of Educational Psychology*, *83*(4), 508-517. https://psycnet.apa.org/doi/10.1037/0022-0663.83.4.508

Haerens, L., Aelterman, N., Vansteenkiste, M., Soenens, B., & Van Petegem, S. (2015). Do perceived autonomy-supportive and controlling teaching relate to physical education students' motivational experiences through unique pathways? Distinguishing between the bright and dark side of motivation. *Psychology of Sport and Exercise*, *16*(3), 26-36. https://doi.org/10.1016/j.psychsport.2014.08.013

Hamm, J. V., & Faircloth, B. S. (2005). The role of friendship in adolescents' sense of school belonging. *New Directions for Child and Adolescent Development, 107*, 61–78. https://doi.org/10.1002/cd.121

Harvey, V. S., & Retter, K. (2002). Variations by gender between children and adolescents on the four basic psychological needs. *International Journal of Reality Therapy, 21*(2), 33–36.

Ibarra-Rovillard, M. S., & Kuiper, N. A. (2011). Social support and social negativity findings in depression: Perceived responsiveness to basic psychological needs. *Clinical Psychology Review*, *31*(3), 342-352. https://doi.org/10.1016/j.cpr.2011.01.005

Jang, H., Reeve, J., & Deci, E. L. (2010). Engaging students in learning activities: It is not autonomy support or structure but autonomy support and structure. *Journal of Educational Psychology*, *102*(3), 588-600. https://psycnet.apa.org/doi/10.1037/a0019682

Jang, H., Reeve, J., & Halusic, M. (2016). A new autonomy-supportive way of teaching that increases conceptual learning: Teaching in students' preferred ways. *The Journal of Experimental Education*, *84*(4), 686-701. https://doi.org/10.1080/00220973.2015.1083522

Kiefer, S. M., Alley, K. M., & Ellerbrock, C. R. (2015). Teacher and peer support for young adolescents' motivation, engagement, and school belonging. *Rmle Online*, *38*(8), 1-18. https://doi.org/10.1080/19404476.2015.11641184

Kiefer, S. M., & Pennington, S. (2017). Associtions of teacher autonomy support and structure with young adolescents' motivation, engagement, belonging, and achievement. *Middle Grades Research Journal*, *11*(1), 29-46.

Kowal, J., & Fortier, M. S. (1999). Motivational determinants of flow: Contributions from self-determination theory. *The Journal of Social Psychology*, *139*(3), 355-368. https://doi.org/10.1080/00224549909598391

Küdür-Çırpan, F., & Çınar, S. (2013). Sağlık hizmetleri meslek yüksekokulu öğrencilerinde akran desteği ile akademik başarı arasındaki ilişkinin değerlendirilmesi [Assessment of the relationship between peer support and academic success among students of vocational school of healthcare services]. *Journal of Marmara University Institute of Health Sciences*, *3*(4), 191-199. DOI: 10.5455/musbed.20131206082103

Kurt, U. (2016). Ortaokul öğrencilerinin fen bilimleri dersindeki temel psikolojik ihtiyaçları: Öğrenci katılımı ve öğrenci algılarına göre ailenin rolü [*Middle school students' basic psychological needs in science: Student engagement and the role of family according to students' perceptions*]. Unpublished Master Thesis, Atatürk University, Turkey.

La Guardia, J. G., & Patrick, H. (2008). Self-determination theory as a fundamental theory of close relationships. *Canadian Psychology/Psychologie Canadienne*, *49*(3), 201-209. https://psycnet.apa.org/doi/10.1037/a0012760

Lavigne, G. L., Vallerand, R. J., & Miquelon, P. (2007). A motivational model of persistence in science education: A self-determination theory approach. *European Journal of Psychology of Education*, *22*(3), 351-369.

Liu, H., Yao, M., Li, J., & Li, R. (2020). Multiple mediators in the relationship between perceived teacher autonomy support and student engagement in math and literacy learning. *Educational Psychology*, 1-21. https://doi.org/10.1080/01443410.2020.1837346

Malecki, C. K., & Demaray, M. K. (2002). Measuring perceived social support: Development of the child and adolescent social support scale (cass). *Psychology in the Schools, 39*(1), 1-18. https://doi.org/10.1002/pits.10004

Marbell, K. N., & Grolnick, W. S. (2013). Correlates of parental control and autonomy support in an interdependent culture: A look at Ghana. *Motivation and Emotion, 37*(1), 79-92. https://doi.org/10.1007/s11031-012-9289-2

Maulana, R., Helms-Lorenz, M., Irnidayanti, Y., & van de Grift, W. (2016). Autonomous motivation in the Indonesian classroom: Relationship with teacher support through the lens of self-determination theory. *The Asia-Pacific Education Researcher*, *25*(3), 441-451. https://doi.org/10.1007/s40299-016-0282-5

Muscarà, M., Pace, U., Passanisi, A., D'Urso, G., & Zappulla, C. (2018). The transition from middle school to high school: The mediating role of perceived peer support in the relationship between family functioning and school satisfaction. *Journal of Child and Family Studies, 27*(8), 2690-2698. https://doi.org/10.1007/s10826-018-1098-0

Navarro-Patón, R., Lago-Ballesteros, J., Giráldez, V. A., & Basanta-Camiño, S. (2018). Assessment of the basic psychological needs in physical education according to age, gender and educational stage. *Journal of Human Sport and Exercise*, *13*(3), 710-719. https://doi.org/10.14198/jhse.2018.133.20

Ntoumanis, N., Taylor, I. M., & Thøgersen-Ntoumani, C. (2012). A longitudinal examination of coach and peer motivational climates in youth sport: Implications for moral attitudes, well-being, and behavioral investment. *Developmental Psychology*, *48*(1), 213-223. https://psycnet.apa.org/doi/10.1037/a0024934

Núñez, J. L., & León, J. (2015). Autonomy support in the classroom: A review from self-determination theory. *European Psychologist*, *20*(4), 275-283. https://doi.org/10.1027/1016-9040/a000399

Patall, E. A., Dent, A. L., Oyer, M., & Wynn, S. R. (2013). Student autonomy and course value: The unique and cumulative roles of various teacher practices. *Motivation and Emotion*, *37*(1), 14-32. https://doi.org/10.1007/s11031-012-9305-6

Pintrich, P. R., & Schunk, D. H. (2002). *Motivation in education: Theory, research, and applications* (2nd Ed.). Prentice Hall.

Ratelle, C. F., Larose, S., Guay, F., & Senecal, C. (2005). Perceptions of parental involvement and support as predictors of college students' persistence in a science curriculum. *Journal of Family Psychology, 19*(2), 286-293. https://psycnet.apa.org/doi/10.1037/0893-3200.19.2.286

Reeve, J. (2006). Teachers as facilitators: What autonomy-supportive teachers do and why their students benefit. *The Elementary School Journal*, *106*(3), 225-236. https://doi.org/10.1086/501484

Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy supportive. *Educational psychologist*, *44*(3), 159-175. https://doi.org/10.1080/00461520903028990

Reeve, J., Bolt, E., & Cai, Y. (1999). Autonomy-supportive teachers: How they teach and motivate students. *Journal of Educational Psychology*, *91*(3), 537-548. https://psycnet.apa.org/doi/10.1037/0022-0663.91.3.537

Reeve, J., Ryan, R. M., Deci, E. L., & Jang, H. (2008). Understanding and promoting autonomous self-regulation: A self-determination theory perspective. In *Motivation and self-regulated learning: Theory, research, and applications*, Editors: D. H. Schunk and B. J. Zimmerman. (p. 223-244).

Ricard, N. C., & Pelletier, L. G. (2016). Dropping out of high school: The role of parent and teacher self-determination support, reciprocal friendships and academic motivation. *Contemporary Educational Psychology*, *44*, 32-40. https://doi.org/10.1016/j.cedpsych.2015.12.003

Rosenfeld, L. B., Richman, J. M., & Bowen, G. L. (2000). Social support networks and school outcomes: The centrality of the teacher. *Child and Adolescent Social Work Journal*, *17*(3), 205-226.

Ryan, R. M., & Deci, E. L. (2000). The darker and brighter sides of human existence: Basic psychological needs as a unifying concept. *Psychological inquiry*, *11*(4), 319-338. https://doi.org/10.1207/S15327965PLI1104_03

Ryan, R. M., & Deci, E. L. (2008). A self-determination theory approach to psychotherapy: The motivational basis for effective change. *Canadian Psychology/Psychologie Canadienne*, *49*(3), 186-193. https://psycnet.apa.org/doi/10.1037/a0012753

Ryan, R. M., & La Guardia, J. G. (2000). *What is being optimized? Self-determination theory and basic psychological needs. I*n S. H. Qualls & N. Abeles (Eds.), Psychology and the aging revolution: How we adapt to longer life (pp. 145–172). American Psychological Association.

Siyez, D. M. (2008). Adolescent self-esteem, problem behaviors, and perceived social support in Turkey. *Social Behavior and Personality: An International Journal*, *36*(7), 973-984. https://doi.org/10.2224/sbp.2008.36.7.973

Soenens, B., & Vansteenkiste, M. (2005). Antecedents and outcomes of self-determination in 3 life domains: The role of parents' and teachers' autonomy support. *Journal of Youth and Adolescence*, *34*(6), 589-604. https://doi.org/10.1007/s10964-005-8948-y

Standage, M., Duda, J. L., & Ntoumanis, N. (2006). Students' motivational processes and their relationship to teacher ratings in school physical education: A self-determination approach. *Research Quarterly for Exercise and Sport, 77*(1), 100–110. https://doi.org/10.1080/02701367.2006.10599336

Su, T., Tian, L., & Huebner, E. S. (2021). The reciprocal relations among prosocial behavior, satisfaction of relatedness needs at school, and subjective well-being in school: A three-wave cross-lagged study among Chinese elementary school students. *Current Psychology, 40*, 3734–3746. https://doi.org/10.1007/s12144-019-00323-9

Tian, L., Tian, Q., & Huebner, E. S. (2016). School-related social support and adolescents' school-related subjective well-being: The mediating role of basic psychological needs satisfaction at school. *Social Indicators Research*, *128*(1), 105-129. https://doi.org/10.1007/s11205-015-1021-7

Tsai, Y. M., Kunter, M., Lüdtke, O., Trautwein, U., & Ryan, R. M. (2008). What makes lessons interesting? The role of situational and individual factors in three school subjects. *Journal of Educational Psychology, 100*(2), 460-472. https://psycnet.apa.org/doi/10.1037/0022-0663.100.2.460

Vlachopoulos, S. P., & Michailidou, S. (2006). Development and initial validation of a measure of autonomy, competence, and relatedness in exercise: The Basic Psychological Needs in Exercise Scale. *Measurement in Physical Education and Exercise Science*, *10*(3), 179-201. https://doi.org/10.1207/s15327841mpee1003_4

Wang, Y., Tian, L., & Huebner, E. S. (2019). Basic psychological needs satisfaction at school, behavioral school engagement, and academic achievement: Longitudinal reciprocal relations among elementary school students. *Contemporary Educational Psychology, 56*, 130-139.

Wentzel, K. R., & Asher, S. R. (1995). The academic lives of neglected, rejected, popular and controversial children. *Child Development, 66*(3), 754–763. https://doi.org/10.1111/j.1467-8624.1995.tb00903.x

Wentzel, K. R., Battle, A., Russell, S. L., & Looney, L. B. (2010). Social supports from teachers and peers as predictors of academic and social motivation. *Contemporary Educational Psychology*, *35*(3), 193-202. https://doi.org/10.1016/j.cedpsych.2010.03.002

Williams, G. C., & Deci, E. L. (1996). Internalization of biopsychosocial values by medical students: a test of self-determination theory. *Journal of Personality and Social Psychology*, *70*(4), 767-779. https://psycnet.apa.org/doi/10.1037/0022-3514.70.4.767

Wu, A. M., Lai, M. H., & Chan, I. T. (2014). Coaching behaviors, satisfaction of needs, and intrinsic motivation among Chinese university athletes. *Journal of Applied Sport Psychology*, *26*(3), 334-348. https://doi.org/10.1080/10413200.2014.888107

Zhou, M., Ma, W. J., & Deci, E. L. (2009). The importance of autonomy for rural Chinese children's motivation for learning. *Learning and Individual Differences*, *19*(4), 492-498. https://doi.org/10.1016/j.lindif.2009.05.003

Zhou, L. H., Ntoumanis, N., & Thøgersen-Ntoumani, C. (2019). Effects of perceived autonomy support from social agents on motivation and engagement of Chinese primary school students: Psychological need satisfaction as mediator. *Contemporary Educational Psychology*, *58*, 323-330. https://doi.org/10.1016/j.cedpsych.2019.05.001