BASIC PSYCHOLOGICAL NEEDS IN RELATIONSHIPS WITH
PARENTS AND TEACHERS: LINKS TO ACADEMIC MOTIVATION,
SELF-EFFICACY, AND PERFORMANCE IN MATHEMATICS

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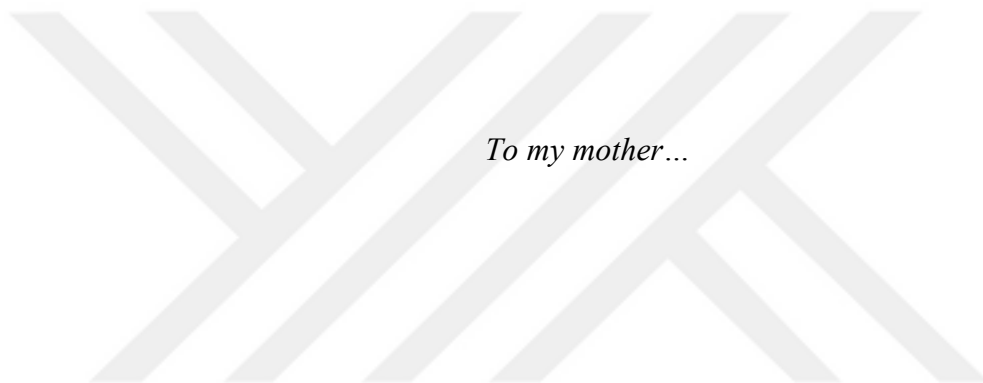
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To my mother…

ABSTRACT

The propose of the current study was to examine the relations between the perceived gratification of basic psychological needs (autonomy, relatedness, and competence) in relationships with parents and mathematics teacher, and academic outcomes in mathematics among Turkish early adolescents. A total of 551 secondary school students completed the questionnaire; the questions assessed the level of perceived gratification of basic psychological needs in relationships with mother, father, and mathematics teacher, as well as academic self-efficacy, self-determined motivation, approach and avoidance goals in mathematics, and implicit theories of intelligence of adolescents. Path analyses showed that after controlling for the demographic variables, mathematics teacher's gratification of psychological needs was positively linked with all the academic outcomes; higher levels of mothers' gratification of psychological needs predicted higher self-determined motivation; and higher levels of fathers' gratification of psychological needs predicted higher levels of approach goals. There was no significant difference between fixed and growth mindset groups in the mediation model. However, univariate analysis of variance revealed significant mindset differences: growth mindset group had higher scores on all of the variables than the fixed mindset group. The findings were discussed considering the previous studies.

Keywords: early adolescence, self-determination theory, basic psychological needs, motivation, mindset, academic self-efficacy, approach goals, avoidance goals

ÖZET

Erken ergenlik döneminde olan öğrencilerle yürütülen bu çalışma kendini belirleme kuramı perspektifinden, temel psikolojik ihtiyaçların (özerklik, yakınlık, yetkinlik) ebeveynler ve matematik öğretmeni tarafından karşılanması ve akademik sonuçlar arasındaki ilişkiyi araştırmayı amaçlamıştır. Toplam 551 orta okul öğrencisi, temel psikolojik ihtiyaçların anne, baba ve matematik öğretmeni tarafından karşılanması, matematik dersindeki akademik öz yeterlik, motivasyon, yaklaşma ve kaçınma hedefleri ve örtülü zeka inanışları hakkındaki soruları cevaplamıştır. Yol analizleri analizleri , temel psikolojik ihtiyaçların matematik öğretmeni tarafından karşılanması ile tüm akademik sonuçların olumlu yönde ilişkili olduğunu göstermiştir Demografik değişkenler kontrol edildikten sonra, temel psikolojik ihtiyaçların anne tarafından karşılanması sadece öz-belirlenmiş motivasyon ile ilişkili bulunurken, bu ihtiyaçların baba tarafından karşılanması ise yalnızca yaklaşma hedefleri ile ilişkili bulunmuştur. Bununla birlikte, öz-belirlenmiş motivasyonun aracı değişken olarak modellendiği analiz sonuçları, öz-belirlenmiş motivasyonun, temel psikolojik ihtiyaçların matematik öğretmeni tarafından karşılanması ve akademik benlik algısı, matematik notu ve yaklaşma hedefleri arasındaki ilişkide aracı değişken rolüne sahip olduğunu göstermiştir. Zekanın gelişebilir ve gelişemez olduğunu düşünen iki farklı grup arasında aracı değişken yol analizi modelinde bir fark bulunmazken, iki grup çalışmadaki tüm değişkenler açısından tek değişkenli varyans analizleri ile karşılaştırıldığında zekanın gelişebilir olduğunu düşünen grubun tüm değişkenlerde, zekanın gelişemez olduğunu düşünen gruba göre daha yüksek puanlar aldığı görülmüştür. Sonuçlar literatürdeki diğer sonuçlarla tartışılarak açıklanmıştır.

Anahtar Kelimeler: erken ergenlik dönemi, temel psikolojik ihtiyaçlar, kendini belirleme kuramı, özbelirlenmiş motivasyon, örtülü zeka teorisi, akademik öz-yeterlik, yaklaşma hedefi, kaçınma hedefi

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CHAPTER 1

INTRODUCTION

Education plays a significant role on children's lives in terms of providing them new tools and skills needed to prepare for the future. Academic outcomes are important in education life of the students. Even if there are limited studies in the literature, research shows that students in Turkey perform poorly especially in mathematics compared to students from other countries (Schleicher, 2014). Literature states that mathematics skills are accepted as one of the most essential indicator of overall academic performance (Garon-Carrier et al., 2016; Reyna & Brainerd, 2007) because mathematics is accepted as the integral element for success in today's world in terms of having creative thinking, and dynamic and productive thought (Grouws, 1992). Furthermore, mathematics is perceived as a difficult subject among students (Blackwell et al., 2007; Grant & Dweck, 2003). It is also a challenging subject as it requires different skills such as connected thinking, accuracy of statement and definite mental concepts and readiness to recognize the relations between forms (Merril, 1918). All these show that, mathematics play an essential role in students' academic lives. Programme for International Student Assessment (PISA) is one of the tests that investigates what 15-yer-olds know and what they can do what they know by focusing on reading, mathematics and science. It is conducted by the OECD in every three years. According to results from PISA 2012, Turkey was 44th country out of 65 countries for the mathematics success. This result shows that students have some difficulties about either learning mathematics or showing what they know in mathematics in Turkey. Studies investigated the determinants of Turkish students' achievement. According to Dincer and Uysal (2009) the program type the students enrolled, parental education and parental employment are major determinants of student achievement. Besides, Kılıç, Çene and Demir (2012) found that socio–economic status, elaboration, memorization, control strategy, home

educational resources and cultural possession have positive effect on students' mathematic achievement. Furthermore, Yenilmez and Özbey (2006) reveal that primary school students have higher anxiety about mathematics and students who have higher anxiety get lower success in mathematics than others. Studies in the literature stated some factors influencing students' achievement, the current study aims to investigate the effects of the perceived basic psychological needs (BPN) satisfaction from parents and teachers and academic outcomes in mathematics.

Based on the self-determination theory (SDT), the present study aims to investigate the relationship between the gratification of the BPN and academic outcomes among adolescents with growth and fixed mindsets. For both adolescent groups, the mediating role of self-determined motivation will be examined in the link between adolescents' basic need gratification in relationships with mother, father and mathematics teacher and four mathematics-related academic outcomes: goal setting (approach and avoidance), academic self-efficacy and math grade. Hence, the current study aims to examine a) the relationship between the satisfaction of BPN in the family and the school contexts and academic outcomes (goal setting, math grade, and academic self-efficacy), b) the mediating role of self-determined motivation between the independent and outcome variables (see, Figure 1), c) how these relationships work in students who have fixed or growth mindsets and d) whether there is any difference between fixed and growth mindset groups in any of the variables measured in the present study.

Self-determination theory (SDT) is a framework which suggests that people can develop and function optimally when their BPN (autonomy, competence, and relatedness) are supported in their social environments (Deci & Ryan, 2000). According to SDT, the need for autonomy refers to being self-regulated in one's own actions. The need for competence refers to having an understanding of how to achieve different external and internal outcomes as well

as being sufficient during a performance. Lastly, the need for relatedness refers to being able to develop satisfying and secure relations with others in one's social environment (Deci, Vallerand, Pelletier, & Ryan, 1991). Deci and Ryan (2000) have also claimed that gratification of each of these BPN is necessary for optimal development. In other words, these are separate concepts but satisfaction for just one or two of them is not enough for optimal development and psychological health. This implies the importance of feeling satisfaction for each of the basic needs across different social contexts.

In the existing literature, studies about BPN satisfaction and academic self-regulation (i.e., the extent of self-determined motivation) put emphasis on both parents and teachers as socializing agents in the lives of children (Deci, Ryan, & Williams, 1996; Deci et al.,1991; Tian, Chen, & Huebner, 2014). Adolescence is especially important for the gratification of BPN (La Guardia & Ryan, 2002) as adolescence is a challenging period for the growing young in terms of the developmental changes in the physical, social, cognitive, and behavioral domains (Glatz & Buchanan, 2015). Moreover, this period can also be challenging for parents. It is stated that during early adolescence communication problems between parents and children are very likely to occur and problems in communication can affect the adolescent's need satisfaction (Keijsers & Poulin, 2013). Thus, especially early adolescence is a crucial period to investigate the role of need satisfaction on academic outcomes as transition from primary to secondary school system poses additional challenges for adolescents (Eccles, Midgley, Wigfield, Buchanan, Reuman, Flanagan, & Mac Iver, 1993; Gutmann & Eccles, 2007).

The role of the implicit theories of intelligence also will be examined in the link between BPN satisfaction and academic outcomes in the current study. Implicit theories of intelligence are about individual's implicit assumptions about whether the intelligence is a malleable or a fixed trait. People with fixed mindset (entity theorists of intelligence) believe that intelligence is an inborn constant characteristic and it is not possible to chance it. In contrast, people with a

growth mindset (incremental theorists of intelligence) believe that it is possible to enhance intelligence with effort (Dweck, 2000; Dweck & Leggett, 1988).

The current study will approach autonomy, relatedness, and competence not separately but conjunctively as BPN. The present study hypothesized that gratification of these BPN will increase the self-determined motivation of students and it is expected that this, in turn, will be linked to positive academic outcomes. Secondly, the current study will examine whether this model has a similar pattern for students who have different mindsets about intelligence. Below, a review of the literature on the relationships between BPN, motivation and academic outcomes will be presented, and then the role of the implicit theories of intelligence in this link will be discussed.
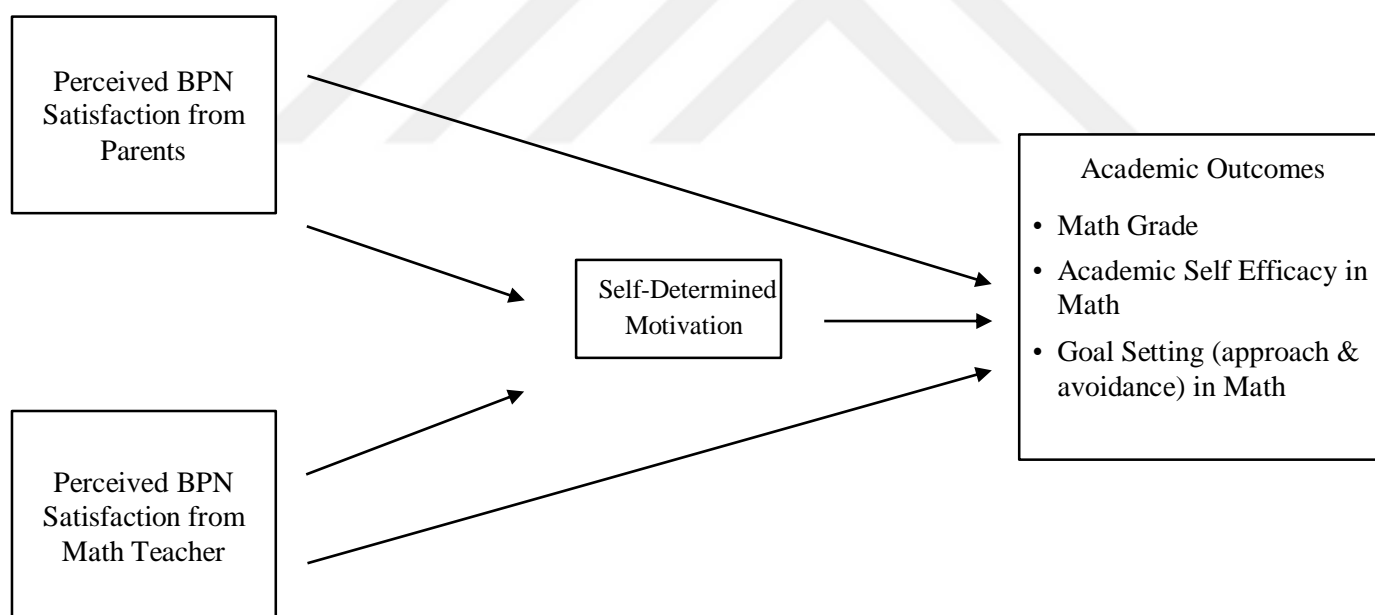
Figure 1. Conceptual model with the mediation of motivation between the perceived basic psychological needs satisfaction and academic outcomes.

1.1 Basic Psychological Needs

BPN theory is based on the self-determination framework (Deci et. al., 2000) which suggests that there are three BPN for optimal psychological well-being and growth: These are needs for autonomy, competence, and relatedness (Deci et al., 2000). The need for autonomy is related to making decisions and behaving in accordance with individual's own free will. If people have the chance to control their own actions, this satisfies their need for autonomy. Another one is the need for competence which means that people want to feel self-efficacy by actualizing their capacity. Gratification of this need is related to achieving goals or performing well on difficult tasks as well as being appreciated by others. Lastly, the need for relatedness refers to feeling attached significant others and being in supportive relationships with them (i.e., parents, teachers, close friends etc.) in one's social environment. Based on this need people also satisfy their need to love and being loved. Moreover, it is also related to need for belonging to someone or to a group (Deci & Ryan, 1985). These needs are important for addressing motivational universals of human beings and more importantly, the satisfaction of these needs facilitates development, performance, and motivation (Deci et al., 1991). Thus, BPN of human beings identify the fundamental conditions for psychological health and well-being as well as most effective functioning (Deci et. al., 2000). In other words, if social contexts provide satisfaction for these three BPN, it can enhance one's development, functioning, performance, and motivation. Therefore, according to SDT, BPN determine innate psychological needs that are fundamental for continuing psychological development, well-being and entirety (Deci et. al., 2000).

Literature shows that the effect of gratification of BPN was studied in Turkey. Previous studies conducted in Turkey suggest that gratification of BPN is positively related to subjective well-being among university students (Çankaya, 2009; Kermen & Sarı, 2013; Özer, 2009; Toprak, 2014; Türkdoğan & Duru, 2012). Furthermore, Sayıl (2009) investigated the role of

autonomy support in family context in the development of healthy adolescent functioning. The study shows that perceived satisfaction of autonomy need in the family context is related to higher levels of self-determination in adolescents; and, increased self-determination and autonomy gratification are positively related to academic outcomes (school success, academic self-efficacy and academic competence), positive peer relations and prosocial behaviors in adolescents. Instead of just focusing on gratification of autonomy need in the family context, the current study will focus on gratification of BPN in three important relationships (mother, father and teacher) while examining their links with academic outcomes in math class. Additionally, the difference between fixed and growth mindset groups in this relation will be investigated.

BPN play an important role in the academic life of adolescents. Tian and Huebner (2013) state that satisfaction of perceived psychological needs are essential contributors to school success of adolescents. Similarly, Jang, Kim, and Reeve (2012) report that 8th-grade students' autonomy need satisfaction in the classroom context is associated with perceived autonomy support and higher levels of classroom engagement. Kındap (2011) conducts a longitudinal study in Turkey to investigate the relation between BPN and social development as well as academic outcomes (academic competence in math and academic success in math course) among adolescents. Among the three BPN, Kındap's study (2011) focuses on the need for autonomy, and awareness of self and supportive parenting. Firstly, it is indicated that autonomy support in the family can protect adolescents from adjustment problems. Secondly, results reveal that autonomy support in the family is related to being autonomous in school-related subjects which also increases autonomous academic motivation and mathematics achievement as well as self-efficacy of adolescents in mathematics.

Studies in the literature also highlight the importance of children's perception of the classroom climate. Ryan and Grolnick (1986) examine the extent students feel controlled or

autonomy-supported in the classroom by conducting two studies. Results suggest that children's perception of the classroom environment tend to influence their self-perception, self-esteem, cognitive competence and learning motivation. It is stated that when children perceive classroom climate as the origin (agency) promoting, they report more internal control over outcomes and less control by the teacher. Furthermore, Church and colleagues (2001) suggest that perception of classroom climate is related with achievement goals, GPA and intrinsic motivation. Results of the study reveal that perceived classroom environment indirectly affect achievement goal adoption and achievement goal adoption directly influence intrinsic motivation and higher GPA.

The current study aims to investigate the relation between adolescents' perceived satisfaction of BPN in relationship with parents and math teacher, and academic outcomes.

1.2 Self-Determined Motivation

Motivation is one of the most important predictors of performance. SDT has specific predictions with regard to motivation (Kowal & Fortier, 1999). It is stated that the concept of needs are necessary to have psychologically meaningful explication and implementation in the areas of intrinsic motivation and internalization (Deci & Ryan, 1980). According to SDT, there are two types of motivation: intrinsic and extrinsic motivation (Deci et al., 1991). Intrinsic motivation is about engaging in the activity for its own sake, pleasure and satisfaction whereas extrinsic motivation refers to engaging in an activity for its instrumental outcomes (Deci et. al., 2000). Deci and Ryan also suggest that intrinsically motivated behaviors are related to feeling competent and self-determined which requires the satisfaction of BPN of competence and autonomy. In other words, while intrinsically motivated individuals engage in an activity because they enjoy and interested in an activity itself, extrinsically motivated individuals

engage in activity just because of instrumental reasons such as getting rewards (Eccles & Wigfield, 2002).

In the past, intrinsic and extrinsic motivation were conceptualized as antagonistic concepts and only intrinsically motivated behaviors were assumed to be self-determined (e.g., Deci, 1971). However, according to the recent formulation, different levels of extrinsic motivation can be defined depending on the level of internalization of initially extrinsic motives (Deci et. al., 2000; Deci & Connell, 1989;). In this conceptualization, internalization is defined as a proactive process that transforms external regulatory processes into internal regulatory processes (Deci et al., 1991). Internalization is also considered as a fundamental aspect of social cohesion and psychological integrity (Deci et. al., 2000). Based on the level of internalization Deci and Ryan (1985) define four different types of extrinsic motivation: these are external regulation, introjected regulation, identified regulation, and integrated motivation.

External Regulation. Externally regulated behaviors derive from external contingencies that are considered as the loci of initiation and regulation of that behavior. External regulation is accepted as the least self-determined form of extrinsic motivation (Deci et. al., 1985). For instance, a child's studying math just because he is forced by his parents, to avoid punishment and gain approval by parents would be an example of extrinsic motivation.

 Introjected Regulation refers to engaging in behaviors out of internal compulsions. Sanctions and rewards play roles in introjected regulations, although internally regulated behavioral choices are not true choices but they are motivated by internal coercions (Deci et. al., 1985). Because it is not part of integrated self, it is not accepted as self-determined regulation (Deci & Ryan, 1991). That child's studying math apart from being forced by parents, because of his thought that it is necessary to study, and that he *should* study is an example of introjected regulation.

Identified Regulation. In this type of regulation, people start to value the behavior by accepting it as a personally important. Identification plays an essential role in internalizing regulatory processes as part of the self. Because identification allows more autonomous and self-determined behavior, people can act more willingly. However, the motivation is still extrinsic because the action stems from usefulness and instrumentality of the circumstances instead of just being interesting. Yet, the behavior is kind of a self-determined one because there is no external and internal pressure and it is based upon personal reasons (Deci et. al., 1985). The child's studying math because he thinks that getting high grades in math is important for his success and for his future would be an example of identified regulation.

Integrated Regulation. refers to the developmentally most advanced form of extrinsic motivation (Deci et al., 1991). People are able to totally integrate their regulatory processes with the compatible sense of self in this circumstance. Depending on what is important for an individual and what is valued more, different identifications can become harmoniously integrated with each other and the sense of self would be a coherent one (Deci et al.,1991). Moreover, there are essential similarities between integrated regulation and intrinsic motivation such as having a total involvement of the self and true self-regulation. On the other hand, these two types of motivations are not the same because activities that are derived from intrinsic motivation are desirable in itself whereas integrated regulation helps to behave freely for getting the instrumental outcome which is meaningful and important for that person (Deci et. al., 1996). In an example where the child is totally aware that math course is essential to be successful and that he studies math with his free will to achieve his goal and being a successful student at school, the motivational process is integrated regulation. However, the child still does not have intrinsic motivation for studying math because he is not interested in math itself, and studying math is not fun and enjoyable in itself but math has an instrumental value for the child and he has a goal and he believes that studying math is a fundamental way to achieve his goal.

In addition to extrinsic and intrinsic motivation Deci and Ryan (1985) state a third type of motivational state that is also essential to consider to understand human behaviors ideally: this is defined as *amotivation*. People tend to have amotivation when there is no contiguity between their own actions and outcomes. They are not motivated in any way; neither intrinsically nor extrinsically. Amotivated people tend to experience incompetence. They feel that their actions are out of their own control and they are forced to do these actions. For instance, amotivated students may query why they need to go to school so finally they may stop participating in academic activities (Vallerand, Pelletier, Blais, Briere, Senecal, & Vallieres, 1992).

All these show that, rather than supporting dichotomized types of motivation as either intrinsic or extrinsic motivation, we need to be aware of that external regulation can become internalized and integrated which means that the behavior can become fully self-regulated. Moreover, it is also important to know that amotivation also affects individual's behaviors.

Yerlikaya (2014) recently conducted a study to investigate the motivation of primary and secondary school students in their academic life in terms of several variables in Turkey. Results reveal that the motivation of students differs depending on the gender of the student, education levels of parents, the number of siblings, having a study room and having a chance to go to preschool. In the study, while boys have higher scores than girls in introjected motivation and amotivation, girls have higher scores in intrinsic motivation. Therefore, the level of motivation is found to be higher in girls than boys. The study also reveals that both mothers' and fathers' education levels are negatively correlated with the extrinsic motivation of students. It means that education level of parents positively affects motivation of students. The number of siblings is negatively linked whereas having study room at home is positively related with motivation of students. Lastly, students who have preschool experience have higher level of motivation than others.

According to the literature, it is clearly seen that motivational concepts that are conceptualized by SDT explain variations in students' academic life. Thus, the link between motivation of students and academic outcomes will be discussed below.

1.3 Motivation and Academic Outcomes

Motivation is accepted as an important determinant of students' behavior (Pintrich & Schunk, 1996 as cited in Elliot & Covington, 2001). The question; whether intrinsic motivation has an effect on academic achievement has become an attractive topic among researchers. Studies show that intrinsic motivation plays fundamental role for both learning and achievement according to SDT (Ryan & Deci, 2009). Because intrinsic motivation is based on the main constructs of self-determined activity (Ryan & Deci, 2000) and it is expected being mutually related with achievement; they are perceived as developmentally interlocked (Garon-Carrier, Boivin, M., Guay, F., Kovas, Y., Dionne, G., Lemelin, J. P., & Tremblay, 2016). Accordingly, studies show that self-determined regulation is positively related with academic outcomes (Grolnick, Ryan, & Deci, 1991) as well as with higher grades (Miserandino, 1996) among elementary school children. Moreover, Burton, Lydon, D'Alessandro and Koestner (2006) indicate that identified self-regulation predict university students' academic performance.

SDT suggests that motivation depends on two cognitive processes; a) the degree that individuals feel that their acts satisfy their need for autonomy and b) the degree that they perceive themselves as efficient in an act (Garon-Carrier et al., 2016). Garon-Carrier and colleagues (2016) also underlie that, if the psychological needs of autonomy and competence are fulfilled, intrinsic motivation and achievement can be reciprocally encouraged (reinforced). In other words, intrinsic motivation helps individuals to endure in a task which helps the achievement. Thus, it can be said that higher achievement in a given task such as good grades

in a school subject encourages perceived competence and then this induces to more intrinsic motivation in this task.

The present study will investigate the link between BPN, self-determined motivation, and academic outcomes in mathematics class. Academic outcomes will include variables such as self-efficacy in math, approach and avoidance goal setting in math and math grade. Studies suggest that there is a positive relation between motivation and academic outcomes (Gottfried, 1990; Pintrich & De Groot, 1990; Zimmerman & Martinez-Pans, 1990). A study by Gottfried (1990) shows that there is a positive correlation between intrinsic motivation and academic achievement in mathematics and reading lectures in an adolescent sample. Moreover, Vallerand, Fortier, and Guay (1997) report that autonomy-supportive behaviors of teachers and parents positively affect adolescents' perceptions of competence and autonomy. They also indicate that the type of academic motivation is linked with school dropout. In the study, results show that low levels of self-determined motivation are linked with developing intentions to drop out school in high school students.

Deci and his colleagues (1996) also make analyses about self-regulation of learning. In these analyses intrinsic motivation and the internalization of extrinsic motivation is the focus so it is stated that these two types of motivation are positively related to high-quality learning. Moreover, both intrinsic and internalized extrinsic motivations are facilitated by social contexts and that also enable gratification of BPN, autonomy, competence, and relatedness.

More recently, Garon-Carrier and the colleagues (2016) investigated the developmental relation between intrinsic motivation and achievement in mathematics among elementary school students (ages 7-10). Intrinsic motivation toward mathematics was self-reported by children and achievement was measured by direct assessment of their mathematics abilities. Results showed that, while achievement in mathematics predicted later intrinsic motivation in mathematics over time (from Grades 1 to 2 and from Grades 2 to 4), intrinsic motivation did

not predict achievement at any time. The results are similar for both sexes but there is small sex difference. Boys' performance was better in early grades and they were more motivated than girls. On the other hand, girls' intrinsic motivation significantly decreased over time. Hence, the results of the study challenged the view that intrinsic motivation encourages higher achievement in mathematics which is contradictory to SDT tenets. However, this study did not investigate the satisfaction of BPN which is fundamental for the link between intrinsic motivation and higher achievement depends on SDT. Moreover, the study of Leondari and Gialmas (2002) has revealed that students' academic motivation and academic performance decreases during the early adolescence.

Children's achievement goals and their relation to achievement behavior have been studied by researchers who focus on motivation (Ames, 1992; Arias, 2004; Dweck, 1986; Elliot, 1999). This research concerns how children have different goals and how these different goals develop different behavior patterns (Dweck, 1986). Achievement goal theorists (e.g., Dweck, 1986; Nicholls, 1984) have supported that there are two distinct types of goals which vary according to competence definition; learning (mastery) goals versus performance goals. These two types of goals differentiate concept of success, reasons for engaging in achievement activity and task outcomes (Ames, 1992). Individuals who have learning oriented goals tend to increase their competence in order to understand and master something new (Nicholls, 1984). It means that, effort and outcome covary in the learning oriented goals which sustain achievement administered behavior in progress of time (Ames, 1992). Besides, Butler (1987) stated that, intrinsic interest of learning activities plays an essential role on learning goals. On the other hand, people who owe performance based goals are more prone to focus on ability and sense of self-worth, gaining rewards for their competence or avoiding negative judgments of their competence (Nicholls, 1984). Because learning itself is just a way of achieving normatively defined success, instead of being engaged in the process of learning, doing better than others

and achieving success with little effort are underlying motives of performance goals (Ames, 1992).

Dweck (1986) also stated that, adaptive (mastery-oriented) motivational pattern is characterized by developing and maintaining challenging and valued achievement. Children display mastery-oriented patterns if they take pleasure of making effort after getting task mastery. In contrast, maladaptive (helpless) patterns are related with not being able to establish reasonable and valuable goals as well as failure to maintain sufficient effort to reach these goals.

Optimal challenging tasks are accepted as the best for developing one's abilities but studies show that children who have performance oriented goals choose to have challenging tasks only when they have high self-efficacy on that type of ability (Bandura & Dweck, 1985; Elliott 2005). It means that children who have low self-efficacy on an ability are more likely to choose a personally easy task to easily achieve or an extremely difficult one on which failure does not express low ability because of the importance to look smart. On the other hand, children who have learning goals want to choose challenging tasks to foster learning although their self-efficacy is low in that ability (Bandura et. al., 1985; Elliott 2005; Nicholls, 1984). Moreover, the Bandura and Dweck's (1985) study shows that only children with learning goals choose challenging seeking tasks regardless of their self-efficacy level of the certain ability.

In order to understand the educational experience, one particular aspect of motivation is investigated in the literature: distinction between approach and avoidance motivation (Elliot et. al., 2001). Eliot (1999) states that approach and avoidance motivation have different valence: in the approach aspect, behavior is driven by as driven by an undesirable possibility.

As to the relation between students' grade levels and their goal orientations, studies have shown that both approach and avoidance goals moderately stay stable from elementary to middle school (Middleton, Kaplan & Midgley, 2004; Skaalvik, 1997). On the other hand, Keklik and Keklik (2014) investigate the relationship between goal orientation and grade level

with the 266 high school students in Turkey. Results show that grade level has an effect on both learning-avoidance and performance-avoidance goal orientation. Mean scores of both types of avoidance goals decreased from 9th-grade students to 11th-grade students. Results also indicated that girls had higher scores on performance-avoidance goal orientation.

Bandura (1997) developed a social cognitive model about the role of self-perception of efficacy. In this theory, Bandura described the term self-efficacy as individuals' own confidence and trust in their ability to achieve necessary actions to overcome a problem or succeed in a task. Therefore, there are two groups: people who have high sense of self-efficacy and others who do not have. Hence, the ones who have strong self-efficacy are more likely to select challenging tasks than others. Bandura also stated that individuals' self-efficacy expectations are the fundamental components of goal setting. Thus, self-efficacy influences achievement both directly and indirectly by its effects on goals (Zimmerman & Bandura, 1994). Furthermore, the study of Komarraju and Nadler (2013) indicated that self-efficacious students with higher self-efficacy were more likely to prefer challenging tasks to show their intelligence in schoolwork and were more likely to reports higher academic achievement whereas students with lower self-efficacy were not motivated by either performance and mastery goals, and they were more likely to support that intelligence is fixed and cannot be improved by effort.

1.4 Implicit Theories of Intelligence

Attributions play fundamental role on motivation (Hong, Chiu, Dweck, & Wendy, 1999) and adolescents may have different theories about the nature of intelligence. The model called implicit theories of intelligence states that there are two main implicit frameworks: entity (fixed) theory and incremental (growth) theory. Entity theorists support that intelligence is a

fixed and it cannot be changed by effort whereas incremental theorists support that intelligence has a malleable trait which can be improved by working (Dweck, 2000; Dweck et. al., 1988). In other words, implicit theories of intelligence indicate two fundamentally different mindsets that take place on a continuum.

Individuals believe in entity theory define intelligence as a constant and finite phenomenon. Thus, people who have entity theory believe that intelligent is a 'given' trait and it cannot be growed. On the other hand, people with incremental theory think that intelligence is flexible and everyone has a potential to enhance their intelligence, therefore, substantially, individuals have equal chance to enhance their intelligence (Dweck, 2000). Furthermore, it is possible that they have different definitions and attributions about ability. While entity theorists describe ability as a constant intellectual quality, incremental theorists perceive ability as an indicator of their current level of specialty on a task and that level can be improved by effort (Hong et. al., 1999).

Studies investigated the role of implicit theories of intelligence in academic functioning of students. Romero and Master (2014) conducted a research with middle school students and the study suggests that students who believe that intelligence has malleable trait get higher grades than students who view intelligence as fixed in math course. In other words, it is stated that implicit theories of intelligence predict students' grades in math. Moreover, results also have revealed that students who believe that intelligence is a malleable trait are more likely to challenge themselves by taking more advanced (hence more difficult) math courses. On the other hand, Leondari and Gialamas (2002) reported that implicit theories of intelligence were not associated with academic success and goal orientation (neither approach nor avoidance goals) in elementary school aged students; but the study also indicated that goal orientation had an indirect effect on achievement when it was mediated by perceived competence.

Implicit theories of intelligence are first studied as a model by Dweck (1986) in order to understand motivational processes affecting learning. It is stated that entity and incremental theories have their own goal orientation and behavior patterns so children's theories of intelligence give direction to their orientation toward different goals. Dweck (1986) suggests that children who have entity theory have performance goals which refer to gaining positive judgments and abstaining negative judgments of others about their competence. If their confidence in their ability is high, then they are more likely to be learning oriented as a behavior pattern which includes seeking challenge and having high persistence, but if they have low confidence, then they are more likely to become helpless as a behavior pattern by avoiding challenge and having low persistence. In contrast, children who support that intelligence can grow are more likely to have learning goals and they aim to improve their competence. According to this goal orientation, depending on whether their confidence in the present ability is high or low, children have learning oriented behavior pattern which refers to seeking challenge and having high persistence. In other words, children, who have performance goals, believe that intelligence is a fixed quality and they tend to orient their performance toward gaining appropriate judgments. On the other hand, children, who have learning goals, think that intelligence is changeable and they more likely to regulate their behavior to develop their intelligence. Consequently, different behavior patterns emerge depending on these goals.

People who have performance oriented goals tend to focus on ability whereas people who have learning-oriented goals tend to focus on effort (Dweck, 1986). In terms of the ability focus, in the performance goal, people have helpless-oriented pattern. The term 'helpless' was first identified by Seligman and Maier (1967) based on helpless responses of animals in painful situations because they believed that the current situation is beyond their control (Dweck, 2000). In the case of students, once failure occurs, students perceive that the situation is out of their control and nothing can be done to change it. Helpless-oriented children tend to show

negative emotions, lower persistence and deteriorating performance, whereas, mastery-orientation refers to remaining focused on the task and achieving learning in the face of difficulties rather than giving up (Dweck, 2000). Dweck (2000) states that, in the helpless pattern, because failures are so meaningful for children, they either tend to call attention to their success in another area or they tend to blame their intelligence and they may say things like 'I am not good at things like this' and 'I am not very smart'. All these show that helpless-oriented pattern involves not only an inaccurate evaluation of the situation but it also involves a reaction to failure which has negative attributions to the self which in turn damages students' ability to use their mental resources effectively. On the other hand, learning-oriented group does not blame their abilities when they face with failure because they are more concerned with searching how they could improve their performance. Because of that, they do not perceive failure as a risk. They like to be challenged and they see mistakes as friends in the way of learning.

Dweck and Leggett (1988) also state that, because the fundamental point of incremental theory is working hard and being appropriately challenged to improve their abilities, students from incremental view of intelligence aim to improve their performance and effort as task difficulty increases, whereas students from an entity view tend to be more concerned with the success by avoiding challenging tasks and by choosing less challenging tasks.

This is a continuum and it makes a difference when students from equal intellectual ability either have relatively more fixed or growth mindset in terms of shaping their responses to academic challenge (Blackwell, Trzesniewski, & Dweck, 2007). Henderson and Dweck (1990) found that junior high school students who supported more of incremental theory had an important advantage than those who supported entity theory for getting higher grades. Furthermore, Blackwell and colleagues (2007) conducted a longitudinal study and intervention about the effects of implicit theories of intelligence on mathematics achievement in an

adolescent sample. Results show that while students who believe intelligence is constant have no improvement, students who believe that intelligence can be improved increase their math grades over the two years of junior high school. It is stated that students with incremental theory of intelligence are more prone to believe that more effort is essential in achievement than students who have fixed mindset. In the intervention part, the study shows that teaching incremental theory of intelligence to the 7th-grade students supports positive change in students' classroom motivation and their grades are also affected positively by this change. Moreover, Komarraju and Nadler (2013) investigated the role of implicit theories of intelligence in the relation between academic self-efficacy and academic achievement among university students. Results showed that students who supported that intelligence can be improved by effort also had high self-efficacy in their academic performance.

The current study examined how the relationship between gratification of BPN and academic outcomes which are mediated by self-determined motivation work in adolescents with different implicit theories of intelligence.

1.5 Current Study

The present study aimed to examine the relationship between basic need gratification both in the family and school contexts, and academic outcomes. Moreover, as it is shown in the literature review above, motivation is related with both BPN satisfaction and academic outcomes. Therefore, mediating role of self-determined motivation in the relation between BPN satisfaction and academic outcomes is aimed to investigate in the current study. All academic outcomes, motivation and need satisfaction from school context focus specifically on the mathematics course. The second aim of the study is to explore the extent the relationship between these variables show the same pattern among fixed and growth mindset

students. To our knowledge the role of the implicit theories of intelligence in the relation between BPN and academic outcomes as well as in theoretical models formulated in the present study has not been examined yet. Research questions and hypotheses are given below:

Research question 1) How does the gratification of BPN in relationships with the mother, father and math teacher influence math-related academic outcomes; self-determined motivation, academic self-efficacy, approach and avoidance goals in early adolescence?

Hypothesis1a: It is expected that that higher levels of satisfaction of BPN from mother will predict more positive academic outcomes in math (higher grade, higher levels of self-efficacy, higher self-determined motivation and approach goals, and lower avoidance goals).

Hypothesis1b: It is expected that that higher levels of satisfaction of BPN from father will predict more positive academic outcomes in math (higher grade, higher levels of self-efficacy, higher self-determined motivation and approach goals, and lower avoidance goals).

Hypothesis1c: It is expected that that higher levels of satisfaction of BPN from mathematics teacher will predict more positive academic outcomes in math (higher grade, higher levels of self-efficacy, higher self-determined motivation and approach goals, and lower avoidance goals).

Research question 2) Does self-determined motivation mediate the relation between BPN satisfaction and academic outcomes?

Hypothesis2: Self-determined motivation will act as a mediator between BPN and academic outcomes such that the relationship between BPN gratification and academic outcomes will be accounted for by self-determined motivation.

Research question 3) How do these relationships work in students who have fixed or growth mindset?

Hypothesis3: The present study will be explanatory regarding the question of how this model will work for adolescents with different implicit theories of intelligence. Therefore, there is no any specific hypothesis about this research question.

Research question 4) How do variables measured in the present study vary between students with fixed and growth mindsets?

Hypotheses4: Adolescence with growth mindset would be expected to have higher self-determined motivation and higher grade in math than the fixed mindset group based on the literature. In terms of other academic outcomes, it is expected that adolescents with growth mindset have higher levels of self-efficacy than adolescence with fixed mindset as well as having approach goals rather than avoidance goals.

CHAPTER 2

METHODS

2.1 Participants

A total of 551 students (%47.0 girls, %52.6 boys) completed the questionnaires administered by school staff in the second semester in 2015-2016. A hundred fifty-seven of them (%45.5 girls, %54.5 boys) were in the fixed mindset group and 288 of them (%48.3 girls, %51.7 boys) were in the growth mindset group. Two schools were reached with convenience method. The target population was 6th, 7th and 8th grade students. Table 1 shows statistics of the participants' demographic variables. Comparisons of demographics between the two groups showed that while mothers' education of growth mindset group significantly higher than fixed mindset group $F(1,534) = 5.27$, $p = .02$, $\eta^2 = .010$, there was no significant difference for the grade, fathers' education level and number of siblings between the two groups.

Table1. Demographic Statistics

Variables	Fixed Mindset		Growth Mindset		Total		Minimum-Maximum
	Mean	SD	Mean	SD	Mean	SD	
Grade	7.11	0.81	7.12	0.80	7.12	0.80	6-8
Mother's Education Level	2.73	2.89	2.89	0.84	2.81	0.82	1-5
Father's Education Level	2.90	0.79	3.00	0.82	2.95	0.81	1-5
Number of Siblings	1.34	1.28	1.25	0.50	1.31	1.15	0-11

2.2 Procedure

Before collecting data from the participants, approval from the Ministry of Education and Ethics Committee of Ozyegin University was obtained. Participants were recruited from two different middle schools in İzmir. Informed consent forms were obtained from both parents and students. At the beginning of questionnaire administration, all participants were informed about the aim of the study students were reminded that participation in the study is voluntary, their responses will be kept confidential and that they are free to withdraw from participating to the study in anytime. Lastly, debriefing form was distributed to the participants at the end of the data collection. Scales were completed in approximately 20-30 minutes by the participants.

2.3 Measures

Need Satisfaction Scale (La Guardia, Couchman, & Deci, 2000) was used for measuring perceived need satisfaction in relationships with parents and teachers. The scale was adapted to Turkish by Dost-Gözkân in 2016. The scale includes nine items in total; the scale consists of three items for competence, for autonomy and for relatedness. Total score is calculated as the average of the all nine items to assess the perceived need satisfaction. Participants are asked to answer how free, competent, and loved they feel when they are with their mothers, fathers and mathematics teacher as target figure on a five point Likert Scale. Sample items include "When I am with X, I feel free to be who I am" (autonomy), "When I am with X, I feel like a competent person" (competence), "When I am with X, I feel loved and cared

about" (relatedness). Internal reliability coefficients of the original scale were .91 for mothers and .94 for the fathers. For the present sample, Cronbach's alphas are .74 for mothers, .79 for fathers and .85 for math teacher.

Academic Motivation Scale (AMS) (Vallerand, Blais, Brière, & Pelletier, 1989) which was adapted to Turkish by Kara (2008) was used to assess motivation types (introjected regulation, identified regulation as types of external motivation, intrinsic motivation and amotivation) of participants in their academic life. Originally AMS was developed by Vallerand and colleagues in 1989 and the original name of the scale is 'Echelle de Motivation en Education'. This adapted version of AMS was developed specially for students who are in early adolescence. AMS includes 12 statements about the reasons why students are attending to school. There are three possible choices to answer these questions; "Yes", "I have no idea", "No". Sample items include 'I do my schoolwork because my parents and teachers want me to do' (introjected regulation), 'I do my schoolwork because of my own favor' (identified regulation) and 'Doing schoolwork makes me happy' (intrinsic motivation). AMS does not include any item for integrated regulation because the target population of the questionnaire is early adolescents and integrated motivation requires advanced form of self-regulation which mostly adults can have. For the Turkish version, the Cronbach's Alpha was .84 for the whole scale. For the four subscales Cronbach's Alpha values were .79 for identified regulation, .78 for amotivation, .80 for introjected regulation, and .78 for intrinsic motivation. In the present sample questions were asked specifically for math course; Cronbach's alphas are .77 for identified motivation, .87 for amotivation, .87 for introjected motivation and .88 for intrinsic motivation.

Academic Self-Efficacy Questionnaire (Özdemir, 2002) was used to measure the perceived success of the early adolescents in Math and English courses. There are 12 items in total and

questionnaire is rated in a 4 point Likert Scale (1- totally wrong to 4- totally true). The present study used the scale for Mathematics class. Sample items include 'When I compare myself with my peers, I am good at Math' and 'Studying English is easy for me'. The Cronbach alpha for Mathematics course was 88. In the present sample, questions were asked specifically for math course, Cronbach's alpha is .72.

Implicit Theory of Intelligence Scale (Levy & Dweck, 1997) was adapted into Turkish by Özkan, Altınsoy, and Beyazıt (2004) and this adapted version was used to determine the implicit theories of the participants. Participants are asked to answer questions about the statements pertaining to intelligence by using a 6 point Likert scale (1-strongly agree to 6-strongly disagree). A sample growth mindset item is 'No matter who you are, you can significantly change your intelligence level' and sample fixed mindset item is 'Your intelligence is something about you that you cannot change very much'. For the Turkish version, the Cronbach's alpha is .90 for the whole scale. In the present sample, Cronbach's alpha is .80.

Achievement Goal Orientation Scale (Elliot, 1999) was adapted into Turkish by Arslan and Akın (2015). The adapted version of the scale was used to assess the achievement goal orientation (learning approach, learning avoidance, performance approach, performance avoidance) of the participants. There are 12 items in total which were rated by 5 point Likert scale (1-strongly agree to 5- strongly disagree). Sample items include 'I aim to understand all topics that are covered during the lecture' (learning approach), 'I avoid to learn things less than I am able to' (learning avoidance), 'I aim to perform better than rest of the class' (performance approach), I try to avoid to look less successful than rest of the class' (performance avoidance). For the Turkish version, Chronbach's alpha levels are .74 for learning-approach, .68 for learning-avoidance, .62 for performance-approach and .69 for

performance avoidance. In the present sample, questions were asked for specifically about math course, Cronbach's alphas are .92 for approach goals and .71 for the avoidance goals.

2.4 Analyses Plan

Path analyses with observed variables were conducted to investigate the relation between need satisfaction and academic outcomes (Research question 1); the extent students' self-determined motivations mediate the relation between BPN and academic outcomes (Research question 2); and to test whether this meditational model differs between growth and fixed mindset groups. Multivariate analysis of covariance (MANCOVA) and follow-up Univariate analyses of covariance (ANCOVAs) were conducted to examine the fixed and growth mindset group differences in all the variables (Research question 4).

CHAPTER 3

RESULTS

3.1 Confirmatory Factor Analyses

To test if the scales used in the present study had a factor structure that they should have a series of confirmatory factor analysis (CFA) was conducted using M*plus* version 7.4 (Muthén & Asparouhov, 2015). To evaluate the model fit the Comparative Fit Index (CFI), the Trucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and chi-square test statistics were used. CFI and TLI vary along a 0-to-1 continuum and values greater than .90 typically represents an acceptable fit, RMSEA < .08 and non-significant result of chi-square value (Little, 2013). Browne and Cudeck (1993) state that if RMSEA values are lower than .05 it shows a close fit and that values up to .08 indicate reasonable errors of approximation. On the other hand, Hu and Bentler (1999) suggest stricter cutoff points for the goodness of fit indices such as .95 for the CFI and TLI and .06 for the RMSEA. All of the fit indices for the confirmatory factor analyses used in the present study show good fit indices.

For the perceived BPN gratification from mother scale, the three-factor model, with autonomy, competence and relatedness subscales, showed an acceptable fit to the data, $\chi^2(16) = 8.36$, $p = .93$, CFI = 1.00, TLI = 1.01, RMSEA = .000. Similarly, for the perceived BPN gratification from father scale, the three-factor model showed an acceptable fit to the data, $\chi^2(19) = 15.86$, $p = .66$, CFI = 1.00, TLI = 1.01, RMSEA = .000. For the perceived BPN gratification from mathematics teacher scale, three-factor model again showed an acceptable fit to the data, $\chi^2(17) = 12.73$, $p = .75$, CFI = 1.00, TLI = 1.00, RMSEA = .000. For the

academic self-efficacy scale, one-factor model was examined and results indicated an acceptable fit to the data, $\chi^2(5) = 2.28$, $p = .81$, CFI = 1.00, TLI = 1.00, RMSEA = .000. For the implicit theories of intelligence scale, four items loading on each of the subscales of entity and incremental theories of intelligence. Two-factor model indicated an acceptable fit to the data, $\chi^2(11) = 9.20$, $p = .60$, CFI = 1.00, TLI = 1.00, RMSEA = .000. For the self-determined motivation scale, three items loading on subscales of identified motivation, amotivation, introjected motivation and intrinsic motivation. Four-factor model showed an acceptable fit to the data, $\chi^2(38) = 44.59$, $p = .21$, CFI = 1.00, TLI = 1.00, RMSEA = .018. Lastly, for the goal setting scale, six items loading on subscale of approach and five items loading on subscale of avoidance. Two-factor model indicated an acceptable fit on the data, $\chi^2(26) = 12.55$, $p = .99$, CFI = 1.00, TLI = 1.00, RMSEA = .000.

3.2 Descriptive Analyses

Descriptive statistics among variables including BPN gratification in relationship with the mother, father and math teacher, math grade, approach and avoidance goal setting strategies, academic self-efficacy in math, self-determined motivation, and entity and incremental scores with the means and standard deviations in the Table 2.

As presented in Table 3, correlational analyses showed that gender was positively correlated with math grade and self-determined motivation, indicating that female students have higher grades mathematics and higher self-determined motivation than male students. Grade level was positively correlated with BPN gratification in relationships with mother, father and mathematics teacher, math grade, approach and avoidance goals, academic self-efficacy and self-determined motivation. Moreover, education level of parents was positively related with BPN gratification in relationship with the mathematic teacher, math grade,

avoidance goals, academic-self-efficacy and negatively correlated with fixed mindset score. BPN gratification from mother was positively related with BPN gratification from father and mathematics teacher, math grade, approach and avoidance goals, academic self-efficacy, self-determined motivation and growth mindset scores, and negatively correlated with fixed mindset score. BPN gratification from father was positively related with BPN gratification from mathematics teacher, math grade, approach and avoidance goals, academic self-efficacy, self-determined motivation and growth mindset score, and negatively correlated with fixed mindset score. BPN gratification mathematics teacher was positively correlated with math grade, approach and avoidance goals, academic self-efficacy, self-determined motivation and growth mindset score and negatively related with fixed mindset score. Furthermore, math grade was positively correlated with approach and avoidance goals, academic self-efficacy, self-determined motivation and growth mindset score, and negatively correlated with fixed mindset score. Approach goals were positively correlated with avoidance goals, academic self-efficacy, self-determined motivation, and growth mindset score, and negatively correlated with fixed mindset score. Avoidance goals are positively related with growth mindset score, academic self-efficacy and self-determined motivation, and negatively correlated with fixed mindset score. Academic self-efficacy was positively related to self-determined motivation, and growth mindset score, and negatively correlated with fixed mindset score. Self-determined motivation was positively related with growth mindset score, and negatively correlated with fixed mindset score. Lastly, fixed mindset score was negatively correlated with growth mindset score.

Table 2
Descriptive Statistics for all of the Study Variables

Variables	Fixed Mindset		Growth Mindset		Minimum-Maximum
	Mean	SD	Mean	SD	
BPN from Mother	4.17	0.64	4.40	0.55	1 - 5
BPN from Father	4.14	0.66	4.29	0.56	1 - 5
BPN from Math Teacher	3.47	0.92	3.92	0.86	1 - 5
Math Grade	3.43	1.25	3.95	1.11	1 - 5
Approach Goals	4.06	0.88	4.40	0.72	1 - 5
Avoidance Goals	3.40	0.91	3.63	0.88	1 - 5
Academic Self-Efficacy in Math	2.40	0.68	2.60	0.65	1 - 5
Self-Determined Motivation	2.43	0.50	2.65	0.42	1 - 5
Fixed Mindset	2.73	0.97	4.68	0.91	1 - 5
Growth Mindset	3.45	1.04	4.87	0.84	1 - 5

Table 3. *Correlations among Variables*

	1	2	3	4	5	6	7	8	9	10	11
1-Sex											
2-Grade	.06										
3-Education Level of Parents	.01	-.03									
4-BPN Gratification from Mother	.00	.15**	.06								
5-BPN Gratification from Father	-.10*	.21**	.04	.65**							
6- BPN Gratification from Mathematic Teacher	.04	.22**	.09*	.34**	.33**						
7-Grades in Mathematics	.10*	.18**	.31**	.23**	.23**	.49**					
8-Approach Goals in Mathematics	-.00	.31**	.09	.31**	.35**	.60**	.51**				
9-Avoidance Goals in Mathematics	-.01	.13**	.13**	.14**	.14**	.34**	.39**	.49**			
10-Academic Self-Efficacy in Mathematics	-.04	.30**	.22**	.23**	.27**	.64**	.69**	.55**	.33**		
11-Self-Determined Motivation in Mathematics	.12**	.25**	.04	.30**	.29**	.58**	.38**	.60**	.30**	.47**	

*$p < .05$, **$p < .01$

3.2 Hypothesis Testing

The propose of the current study was to explore the relationships between the

gratification BPN in relationship with mother and father as well as with mathematics teacher

and academic outcomes in mathematics. To test these relationships, path analyses were

conducted by using M*plus* version 7.4 (Muthén et. al., 2015).

Before conducting the multivariate analyses, one-way ANOVA tests were performed

in order to see whether there are any differences on demographics variables and outcome

variables between the entity (fixed) and incremental (growth) mindset groups. Regarding

demographic variables, only the education level of mothers was significantly higher in growth

mindset group, $F(1,534) = 5.27$, $p = .02$, $\eta^2 = .010$. Therefore, this variable was controlled for

in the analyses reported below to prevent bias.

Hypothesis 1 assumed that higher levels of satisfaction of BPN in the family (in

relationships with father and mother) and school contexts (with math teacher) would predict

positive academic outcomes. To examine this hypothesis, basic need gratification in

relationship with the mother, father and math teacher were regressed on the dependent

variables (academic self-efficacy, approach goal setting, avoidance goal setting, math grade

and self-determined motivation) by using M*plus* 7.4. To control for the effects of

demographic variables on the variables examined, the education levels of parents, sex and age

of students were included in the model (for the final model see Figure 2). Table 4. shows the

fit statistics of the final model for the whole sample; $\chi^2 = 19.09$, $df = 15$, $p = 0.21$, CFI = 1.00,

TLI = 0.99, RMSEA = 0.02, CI RMSEA = [0.00 – 0.049]. The final model was achieved after

nonsignificant paths were removed respectively in the previous model. The final model

provided very good fit indices. This model showed that, after controlling for the effects of

demographic variables, only the perceived BPN satisfaction in relationship with math teacher

had a significant effect on all of the outcome variables. More specifically, perceived gratification of BPN from the math teacher predicted better academic self-efficacy, higher grade in math and higher levels of avoidance goals, approach goal setting, and self-determined motivation. Perceived BPN gratification from father predicted higher approach goal setting, and higher levels of BPN gratification from mother predicted higher self-determined motivation.

Regarding the demographic variables; sex had an influence on math grade and self-determined motivation, and grade had an effect on math grade, approach goals, self-determined motivation and academic self-efficacy. The significant effect of sex indicated that girls had higher math grades, higher approach goals, self-determined motivation, and self-efficacy in math than boys. Lastly, higher levels of parental education predicted higher academic self-efficacy in math and higher math grade.

Secondly, to test whether results are different between growth and fixed mindset groups, multigroup analysis was conducted in M Plus 7.4. Fit indices were good and indicated that the model did not significantly differ between the two groups; $\chi^2 = 29.71$, $df = 30$, $p = 0.48$, CFI = 1.00, TLI = 1.00, RMSEA = 0.00, CI RMSEA = [0.00 – 0.046]. Examinations of path coefficients indicated minor differences. For both growth and fixed mindset groups, perceived gratification of BPN from the math teacher predicted better academic self-efficacy (growth; $\beta = .590$, $p < .001$, fixed: $\beta = .605$, $p < .001$), higher grade in math (growth; $\beta = .419$, $p < .001$, fixed; $\beta = .455$, $p < .001$) and higher levels of avoidance (growth; $\beta = .337$, $p < .001$, fixed; $\beta = .309$, $p < .001$) and approach goals (growth; $\beta = .543$, $p < .001$, fixed; $\beta = .496$, $p < .001$), and self-determined motivation (growth; $\beta = .583$, $p < .001$, fixed; $\beta = .425$, $p < .001$). Perceived BPN gratification from father predicted higher approach goals (growth; $\beta = .151$, $p = .002$, fixed; $\beta = .119$, $p = .015$). Regarding the demographic variables; sex had an effect on self-determined motivation (growth; $\beta = .110$, $p = .014$, fixed; $\beta = .149$, $p = .004$), grade had an

influence on self-determined motivation (growth; $\beta = -.166$, $p = .001$, fixed; $\beta = -.185$, $p = .027$), approach goals (growth; $\beta = -.107$, $p = .019$, fixed; $\beta = -.196$, $p < .001$), and academic self-efficacy (growth; $\beta = -.080$, $p = .038$, fixed; $\beta = -.185$, $p < .001$). The significant effect of sex showed that girls had higher self-determined motivation in math than boys in both groups. Lastly, higher levels of parental education predicted higher academic self-efficacy in math (growth; $\beta = .194$, $p < .001$, fixed; $\beta = .127$, $p = .005$), higher math grade (growth; $\beta = .287$, $p < .001$, fixed; $\beta = .239$, $p < .001$). In addition to that, there were minor differences between two groups. For the growth mindset group, sex had an influence on math grade ($\beta = .138$, $p = .004$). For the fixed mindset group, basic psychological satisfaction from father had an effect on self-determined motivation ($\beta = .180$, $p = .002$), and sex had an influence on academic self-efficacy ($\beta = -.112$, $p = .014$).

Figure 2. Path model for the relations between basic psychological needs satisfaction, demographics, and academic outcomes

Note: All paths presented in the model are significant. Values above .10 are significant at .000 and values below .10 are significant at .05 level.

Hypothesis 2 assumed that self-determined motivation mediates the relations between BPN satisfaction in relationships with father, mother, mathematics teacher and the academic outcomes. The effects of demographic variables were controlled on the dependent variables examined; therefore, the education levels of parents, sex and grade level of students were included in the model. There was an acceptable fit for the mediational model: $\chi^2 = 42.45$, df = 20, $p = 0.00$, CFI = 0.98, TLI = 0.97, RMSEA = 0.04, CI RMSEA = [0.026 – 0.064]. Examinations of path coefficients showed that after controlling for the effects of the demographics, self-determined motivation mediated only the relation between BPN from mathematics teacher and academic self-efficacy, approach goals, and math grade (See Figure 3 for the significant direct and indirect effects). Confidence intervals of the model results are shown in the Table 4.

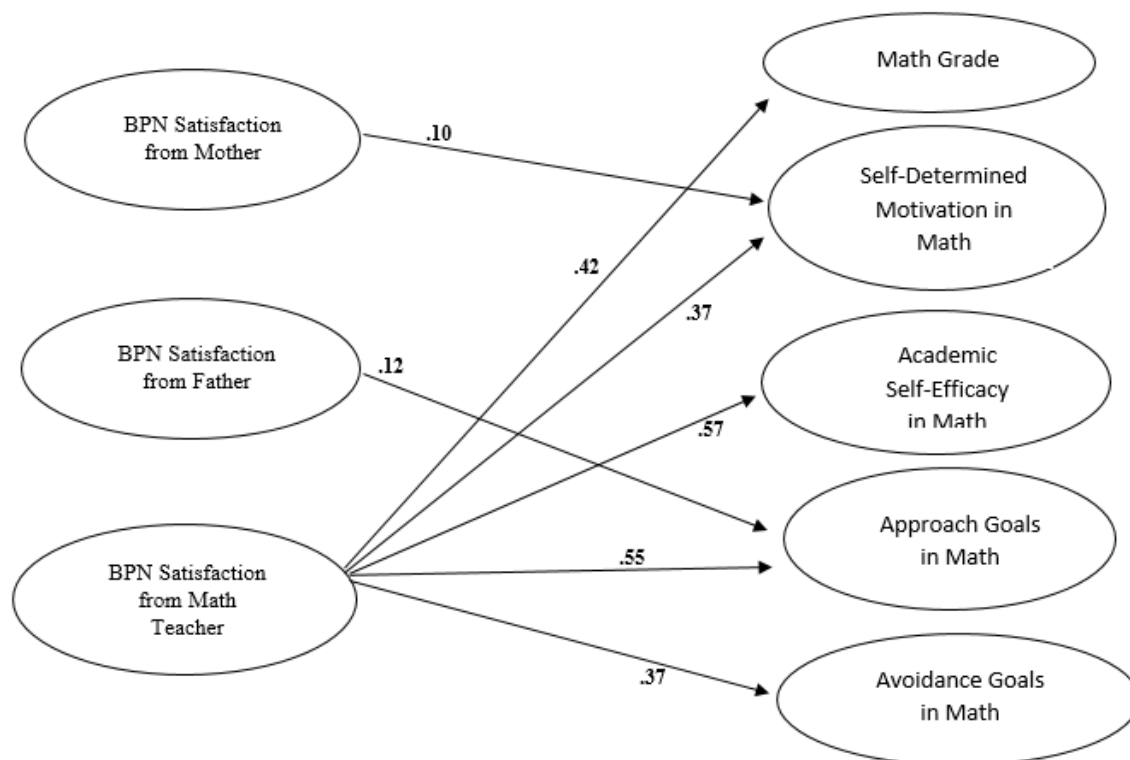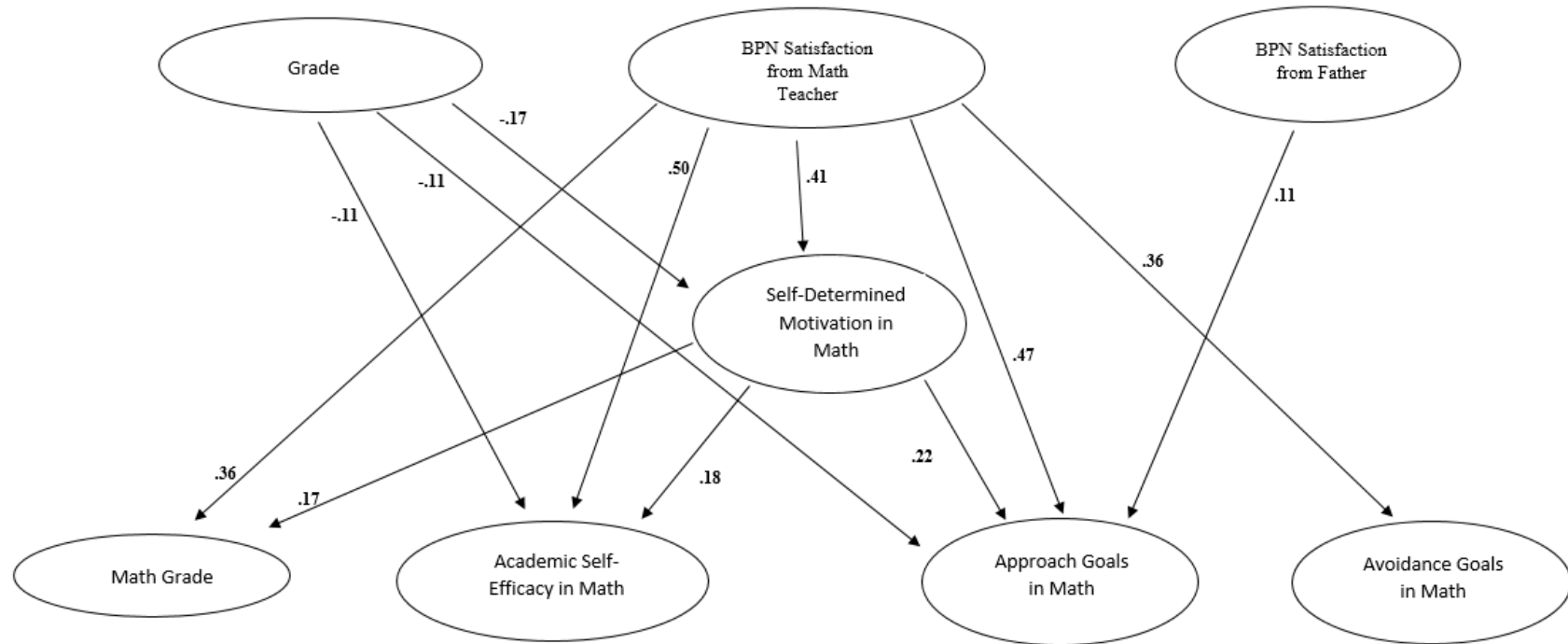Figure 3. Model showing the direct and indirect effects between basic psychological needs satisfaction, demographics, and academic outcomes.
Note: All paths presented in the model are significant. Values above .10 are significant at .000 and values below .10 are significant at .05 level.

Research Question 3 examined whether this mediational model differs between fixed and growth mindset groups. Fit indexes of the model showed that model fit was acceptable, indicating that there was not a significant difference between the two groups in the mediational model tested: $\chi^2 = 48.45$, $df = 36$, $p = 0.07$, CFI = 0.99, TLI = 0.98, RMSEA = 0.04, CI RMSEA = [0.000 – 0.060]. Examination of path coefficients indicated few minor differences. For both growth and fixed mindset groups, perceived gratification of BPN from the math teacher predicted better academic self-efficacy ($\beta = .499$, $p < .001$, fixed; $\beta = .545$, $p < .001$), higher grade in math (growth; $\beta = .373$, $p < .001$, fixed; $\beta = .368$, $p < .001$) and higher levels of avoidance (growth; $\beta = .262$, $p = .002$, fixed; $\beta = .220$, $p = .002$) and approach goals (growth; $\beta = .347$, $p < .001$, fixed; $\beta = .356$, $p < .001$), and self-determined motivation (growth; $\beta = .573$, $p < .001$, fixed; $\beta = .416$, $p < .001$)in math. Perceived BPN gratification from father predicted higher self-determined motivation (growth; $\beta = -.072$, $p < .001$, fixed; $\beta = .188$, $p = .003$) in math. Self-determined motivation had an effect on academic self-efficacy (growth; $\beta = .150$, $p = .020$, fixed; $\beta = .128$, $p = .037$) and approach goal setting (growth; $\beta = .330$, $p < .001$, fixed; $\beta = .314$, $p < .001$) in math. Regarding the demographic variables; sex had an influence on self-determined motivation (growth; $\beta = .127$, $p = .010$, fixed; $S.E. = .056$, $p = .023$), grade had an influence on self-determined motivation (growth; $\beta = -.173$, $p = .001$, fixed; $\beta = -.121$, $p = .006$). The significant effect of sex showed that girls had higher self-determined motivation in math than boys in both groups. Lastly, higher levels of parental education predicted higher academic self-efficacy in math (growth; $\beta = .195$, $p < .001$, fixed; $\beta = .124$, $p = .003$) and higher math grade (growth; $\beta = .288$, $p < .001$, fixed; $\beta = .239$, $p < .001$). In addition to that, there are minor differences between both groups. For growth mindset group, BPN satisfaction from father had an effect on approach goals in math ($\beta = .173$, $p < .001$). Sex had an influence on math grade ($\beta = .138$, $p = .007$). On the other hand, for the fixed mindset group, self-determined motivation had an effect on grade in math ($\beta = .175$, $p =$

.019), and avoidance goals (β = .179, p = .032). Sex had an influence on self-efficacy (β = -.121, p = .011). Lastly, grade had an effect on approach goals (β = -.167, p < .001), and academic self-efficacy (β = -.167, p < .001). Examinations of path coefficients indicated that after controlling for the effects of the demographics, while self-determined motivation mediated the relation between BPN from mathematics teacher and academic self-efficacy and approach goals for the growth mindset group, self-determined motivation mediated the relation between BPN from mathematics teacher and academic self-efficacy, approach goals, avoidance goals and math grade for the fixed mindset group.

Table 4. Confidence Intervals for the Mediational Model

	Confidence Intervals of Model Results						
	Lower0.5%	Lower 2.5%	Lower5%	Estimate	Upper5%	Upper2.5%	Upper0.5%
Academic Self-Efficacy on							
Basic Need Gratification from Mathematic Teacher	0.286	0.306	0.315	0.358	0.403	0.414	0.432
Self-Determined Motivation	0.104	0.143	0.160	0.245	0.333	0.349	0.383
Sex	-0.202	-0.181	-0.168	-0.102	-0.031	-0.019	0.007
Grade Level	-0.151	-0.138	-0.132	-0.094	-0.057	-0.051	-0.036
Education Level of Parents	0.090	0.109	0.117	0.163	0.209	0.217	0.232
Mathematics Grade on							
Basic Need Gratification from Mathematic Teacher	0.325	0.352	0.368	0.460	0.552	0.573	0.606
Self-Determined Motivation	0.095	0.176	0.213	0.403	0.589	0.620	0.697
Sex	-0.019	0.025	0.046	0.175	0.309	0.333	0.376
Education Level of Parents	0.331	0.358	0.377	0.480	0.577	0.596	0.631
Approach Goals on							
Basic Need Gratification from Father	0.022	0.056	0.070	0.151	0.226	0.239	0.264
Basic Need Gratification from Mathematic Teacher	0.307	0.332	0.345	0.412	0.492	0.505	0.529
Self-Determined Motivation	0.105	0.161	0.197	0.368	0.504	0.527	0.574
Grade Level	-0.197	-0.172	-0.163	-0.113	-0.066	-0.059	-0.042
Avoidance Goals on							
Basic Need Gratification from Mathematic Teacher	0.256	0.283	0.294	0.355	0.417	0.428	0.448
Education Level of Parents	-0.003	0.032	0.046	0.133	0.216	0.231	0.262
Self-Determined Motivation on							
Basic Need Gratification from Mathematic Teacher	0.126	0.149	0.161	0.217	0.267	0.277	0.298
Grade Level	-0.171	-0.153	-0.145	-0.104	-0.065	-0.057	-0.047

Research question 4 asks whether the fixed and growth mindset groups differ in the variables examined in the present study. Multivariate analysis of covariance (MANCOVA) was conducted to answer this question. Because the maternal education is significantly different between fixed and growth mindset groups, $F(1,534) = 5.27$, $p = .02$, $\eta^2 = .010$, it was entered as a covariate. Firstly, The Box's Test of Covariance Matrices was checked for the assumption of homogeneity of covariance across the groups using $p < .001$ as a criterion. The result of the test needs to be non-significant. Because *Box's M* is a sensitive test, the value of .001 is accepted as the critical value. If the p value is greater than .001, then it is accepted as non-significant (Tabachnick & Fidell, 2001). Results showed that *Box's M* value was 61.63 and p was .007. Therefore, the assumption was not violated and Wilk's Lambda was the appropriate test to use. Results indicated that mindset had a significant main effect on all of the studied variables, *Wilk's Λ = .93*, $F(8,447) = 4.92$, $p < .001$, multivariate $\eta_p^2 = .074$. Univariate analyses of covariance (ANCOVAs) indicated that there were significant differences between the two groups on all of the variables examined: The growth mindset group had significantly higher scores on all of the variables after controlling for the effect of maternal education. The growth mindset group had higher BPN gratification from mother than the fixed mindset group. The growth mindset had higher BPN gratification from father than the fixed mindset group. The growth mindset group had higher BPN gratification from math teacher than the fixed mindset group. The growth mindset group had higher self-determined motivation in math than the fixed mindset group. The growth mindset group had higher academic self-efficacy in math than the fixed mindset group. The growth mindset had higher grade in math than the fixed mindset group. The growth mindset group had higher approach goals in math than the fixed mindset group. The growth mindset group had higher avoidance goals in math than the fixed mindset group. Results were shown in Table 5.

Table 5. *MANCOVA and ANCOVA results*

	Wilk's Λ	*F*	*df*	*p*	$\eta_p{}^2$	M_{fixed}	*SD*	M_{growth}	*SD*
The Main Effect of Mindset on the Study Variables	0.93	4.92	8	.000	.074				
Basic Psychological Needs Satisfaction from Mother		16.0	53	.000	.030	4.18	.64	4.40	.56
Basic Psychological Needs Satisfaction from Father		7.38	5	.007	.015	4.15	.66	4.30	.56
Basic Psychological Needs Satisfaction from Mathematic Teacher		30.02	52	.000	.054	3.48	.92	3.91	.86
Math Grade		20.30	53	.000	.037	3.45	1.25	3.96	1.11
Approach Goals in Math		20.41	51	.000	.039	4.08	.86	4.40	.86
Avoidance Goals in Math		8.18	51	.004	.016	3.40	.51	3.65	.42
Academic Self-Efficacy in Math		7.97	53	.005	.015	2.41	.67	2.60	.65
Self-Determined Motivation in Math		26.20	51	.000	.049	2.44	.83	2.65	.86

CHAPTER 4

DISCUSSION

The purpose of the current study was to investigate the relations between the perceived gratification of BPN (autonomy, relatedness, and competence) in relationships with parents and mathematics teacher, and academic outcomes in mathematics among early adolescents in Turkey (Ryan et. al., 2000). Hypotheses were tested by conducting path analyses with observed variables, MANCOVA and Univariate ANCOVAs. Overall, the findings underlined the influence of teacher on outcome variables. Accordingly, perceived gratification of BPN in relationship with math teacher predicted higher levels of academic self-efficacy, approach and avoidance goals towards mathematics, math grade, and self-determined motivation in mathematics. Perceived gratification of BPN in relationship with mother, on the other hand, predicted only higher self-determined motivation; gratification of BPN in relationship with father predicted only approach goal setting. Furthermore, present results showed that there are both direct and indirect relations (via self-determined motivation) between basic psychological need gratification in relationship with mathematics teacher and all the academic outcomes, except avoidance goal setting. The mediational model was not significantly different between the growth and fixed mindset groups. However, when all the variables were compared between the two groups, the growth mindset group had significantly higher scores than the fixed mindset group in each variable.

The relation between BPN gratification and academic outcomes was well studied in the literature. However, studies mostly focused on either the family or the school context (e.g. Church et. al., 2001; Kındap, 2011). Different from the previous studies, the current study focused on both school and family contexts in order to examine their relative effects on the

academic outcomes. Studies in the literature had clearly revealed the links between BPN satisfaction and self-determined motivation as well as self-determined motivation and academic outcomes (e.g., Gottfried, 1990; Pintrich et. al., 1990; Vallerand et al., 1992; Yerlikaya, 2014; Zimmerman et. al., 1990). The current study made a contribution to the literature by examining the mediating role of the self-determined motivation between BPN satisfaction and academic outcomes. Lastly, there were contradictory results about the effects of having different mindsets on academic outcomes in the literature. Results of the current study has revealed that mindset has an influence on academic outcomes among early adolescents in Turkey. Moreover, these results have also indicated that mindset makes a difference in perceived gratification of BPN satisfaction in both family (relationship with mother and father) and school contexts (relationship with teacher), as a novel contribution to the literature.

The present study specifically focused on the early adolescence to examine the relationship between perceived BPN satisfaction in family and school contexts, and academic outcomes. Studies have shown that academic failure and school dropout are observed among students in early adolescence (Gutmann et. al., 2007; Vallerand et. al., 1997). Some of predictors of this academic failure were reported as decreasing intrinsic motivation (Harter, 1981), self-concepts and self-perceptions (Eccles et al., 1993; Eccles, Midgley, & Adler, 1984; Gutmann & Eccles, 2007; Harter, 1981; Preckel, Niepel, Schneider, & Brunner, 2013; Simmons, Blyth, Van Cleave, & Bush, 1979). The fact that these factors which are shown to be linked to the gradual decrease in several indicators of academic motivation during the early adolescence is remarkable. Research has also shown that similar types of changes are observed in the family context for adolescents such as increased family conflict about issues related to autonomy and control during early adolescence years (Buchanan, Eccles, & Becker, 1992; Keijsers, Branje, VanderValk., & Meeus, 2010; Smetana, & Gaines, 1999). The stage-

environment fit theory formulated by Jaqueline Eccles (Eccles et al., 1993; Gutmann et. al., 2007) states that during adolescence some of the negative psychological changes (increased conflict, depression etc.) stem from a mismatch between the developing adolescents' psychological needs and opportunities offered to them in their social environment; and the two main social environments of the adolescents are the family and the school. Thus, when these social environments meet the psychological needs of adolescents, healthy development is facilitated. Eccles and colleagues (1993) highlighted the negative effect of inappropriate family and educational environments on perceived psychological needs gratification as well as behavioral and motivational declines in school-related measures. To examine these factors during early adolescence, the present study investigated the link between the perceived BPN satisfaction in both family and school contexts and academic outcomes in mathematics.

The BPN theory within the framework of SDT (Ryan & Deci, 2000) examines the link between BPN of autonomy, competence and relatedness and psychological well-being and optimal functioning. It focuses on social-contextual factors that support or thwart these needs (Deci et al., 1991). Family and school are the two main environments in relation to adolescent development (La Guardia & Ryan, 2002). If these BPN are not supported in the environment, self-determined motivation and well-being of adolescence can be undermined. La Guardia and Ryan (2002) stated that, in early adolescence, although adolescents start to spend less time with their parents and more time with their peers and other adults, they still need to have structured environment at home which is provided by parents and involvement of parents in their daily activities to satisfy their BPN. Parents' and adolescents' relationship requires a deeper level of trust and more open communication during early adolescence by maintaining reasonable limits, providing optimal challenges, allowing them to self-initiative activities and to explore new challenges. These positive relations help to satisfy BPN of adolescents in the early adolescence in the family context. La Guardia and Ryan (2002) also suggested that

school is another central domain for adolescents for engaging in the tasks of development. When adolescents feel autonomy, belongingness and competence in the school, they are more likely to have higher self-determined motivation to learn, and higher engagement in school-related tasks. Therefore, satisfaction of BPN in the family and school environment plays a fundamental role in the academic life in early adolescence (Church et. al., 2001; Kındap, 2011; Ryan et. al., 1986; Tiam & Huebner, 2014). Findings of the present study will be discussed in detail below.

4.1 The Relations Between Basic Psychological Needs Gratification and Academic Outcomes Hypothesis-1

Although correlational analyses indicated that perceived gratification of BPN of autonomy, relatedness, and competence in relationships with parents and math teacher are positively linked to all of the academic outcomes examined in the present study, when their effects are examined together in a path model, only the perceived gratification of BPN in relationship with math teacher predicts each academic outcome. There are only two significant links between gratification of needs in relationships with parents and academic outcomes: The perceived BPN gratification in relationship with father plays a significant role in approach goals; and perceived BPN in relationship with mother has a positive effect only on math grade (self-determined motivation). Overall, these findings emphasize the importance of having autonomy support, emotional support, and competence feedback in both family and school contexts. But the findings underscore the crucial role played by the subject teacher in a specific domain such as the subject course (e.g., mathematics). Hence, it can be said that secondary school students firstly need to feel that especially their teacher grants them autonomy, emotional support (relatedness) and that they are getting competence feedback

from their teacher. The present results do not deemphasize the importance of the family context, but highlights that when we zoom into specific domains, some relationships may be relatively more powerful in influencing the psychological outcomes as compared to the other ones.

Previous research has emphasized the importance of school context in support of psychological needs. For example, Tian and Huebner (2014) reports that satisfaction of perceived psychological needs is an essential contributor to school success of adolescents. In another study, perceived BPN gratification in school has been found to be related with positive academic outcomes (perceived autonomy support and higher levels of classroom engagement) (Jang et. al., 2012). Studies also support the finding that BPN support from teachers influences the students' self-determined motivation and GPA (Church et. al., 2001; Kındap, 2011; Ryan et. al., 1986) as well as achievement goals (Church et. al., 2001). As mentioned before, in a longitudinal study in Turkey, Kındap (2011) has found that autonomy need satisfaction in the family increases self-determined motivation, grade and academic self-efficacy in mathematics. These results are supported by the findings of the current study. Additionally, the present study examined these relationships in relationships with both parents; and included all three BPN together. In addition to the study of Kındap, the current study has also highlighted that teachers have an essential role in support of the BPN that are linked to better their academic outcomes.

In the present study, there were also findings that were contrary to expectations. The expectation was that BPN satisfaction in both family and school contexts would predict higher approach goals and lower avoidance goals in mathematics. However, results have indicated that approach and avoidance goals are positively correlated. Results have also shown that for the approach goals in mathematics, BPN gratification in relationship with both father and mathematics teacher is crucial whereas only the perceived psychological needs gratification in

relationship with mathematics teacher is effective for the avoidance goals. These findings suggest that it is possible for early adolescents to mix the different goals (Elliot & Church, 1997; Midgley, Kaplan, Middleton, Maehr, Urdan, Anderman, & Roeser, 1998). Moreover, students need to have more support from different domains to have higher approach goals than avoidance goals. In other words, approach and avoidance goal settings have different valence; while behavior is driven by a desirable possibility in approach goals, in avoidance goals behavior is driven by an undesirable possibility (Elliot, 1999). That is, as students perceive more autonomy support, emotional support, and competence feedback in their communication with their father and mathematics teacher, they show higher approach motivation, that is, they aim to understand the subjects of mathematics deeply and try to get better performance. Yet, as students perceive more support from their math teacher, they also show higher avoidance motivation, that is, they avoid to learn less than they are able to and they study because they avoid to be unsuccessful as compared to other students.

Even if there was no specific hypothesis about the differences between fixed and growth mindset groups in the path model examining the relations BPN gratification and academic outcomes, it was examined in the present study. Results showed that there is no difference between the two groups in the relationships proposed in the model.

To sum up, it was expected that that higher levels of satisfaction of BPN in the family and school would predict higher grade, higher levels of self-efficacy, higher self-determined motivation and approach goals, and lower avoidance goals in math. Results partially support the hypothesis. While BPN satisfaction from math teacher positively predicts all the academic outcomes in math, needs satisfaction in the family predicts just self-determined motivation and approach goals. Students need to feel support from both family and school contexts for self-determined motivation and approach goals but for better the math grade, avoidance goals

and academic self-efficacy, they need to feel supported in the school context. Furthermore, none of the contexts predict the avoidance goals negatively. As it was mentioned before, a mixture of different goals can be pursued at the same time for early adolescents. Both avoidance and approach goals are achievement goals, and in early adolescence, the valence of these goals may not be salient.

4.2 Mediational Model of Self-Determined Motivation in the Relation between Basic Psychological Needs Gratification and Academic Outcomes-Hypothesis 2 & 3

There was partial support for the hypothesized mediational role of self-determined motivation in the relation between BPN satisfaction and academic outcomes. Findings have shown that BPN support from only mathematics teacher has a direct and also indirect effect on academic outcomes in mathematics; math grade, academic self-efficacy and approach goals through self-determined motivation. This finding means that having self-determined motivation about mathematics- related subjects is essential and it does matter in the relation between perceived needs satisfaction from math teacher and academic outcomes because self-determined motivation gives direction to this relation. More specifically, the perceived gratification of the need for autonomy, emotional support, and competence in the relationship with math teacher directly contributes to better academic outcomes; but it also betters off the outcome variables by increasing the level of self-determined motivation towards studying and learning mathematics.

Previous studies have revealed the positive relation between BPN and self-determined motivation (Kowal et. Al., 1999; Ryan et. al., 2000). The concept of needs has been accepted

as required to have meaningful explication and implementation for self-determined motivation (Deci et. al., 1980). Deci and Ryan (2000) also state that to have self-determined motivation, it is essential to feel that BPN are gratified, that is one makes choices volitionally, that he/she has been accepted and given emotional support and that he/she receives competence feedback and informational feedback in case of failure. Literature has also shown that motivation is an important contributor of academic outcomes (Burton et. al., 2006; Miserandino, 1996). The present study examined the mediational role of self-determined motivation which has not been studied before. Hence, the current study reveals that having self-determined motivation in math is a facilitator factor to have better academic outcomes when the early adolescents feel BPN satisfaction from math teacher.

4.3 Mindset Group Differences in All the Study Variables- Hypothesis 4

The examination of mindset group differences in all the study variables revealed that the growth mindset group had higher levels of perceived BPN gratification in relationship with mother, father and math teacher as compared to the fixed mindset group. Moreover, as expected, the growth mindset group had higher grade in math, higher academic self-efficacy and self-determined motivation, and higher approach goals than the fixed mindset group. In contrast to the hypothesis, the growth mindset group had also higher avoidance goals than the fixed mindset group. These results indicated that adolescents who believed that intelligence is malleable and can be improved by practice feel more satisfaction of their BPN in both family and school context, and better academic and motivational outcomes in mathematics class than adolescents who believe that intelligence is a constant trait.

Henderson and Dweck (1990) has shown that junior high school students with growth mindset has an essential advantage for having higher grades than students with fixed mindset. Moreover, Blackwell and colleagues (2007) conducted a longitudinal study among adolescent

sample which revealed that while fixed mindset group had no improvement on mathematics achievement, students with growth mindset had improvement in their math grades over the two years of junior high school. Contrary to these findings, Leonardi and Gialamas (2002) found that having a different mindset was not related to academic success in elementary school. The current study had a supportive result to Henderson and Dweck (1990), and Blackwell and the colleagues' (2007) studies that growth mindset group had higher grade in math than the fixed mindset group. For the other academic outcomes, the present study had a contribution to the existing literature that adolescence with growth mindset had better results in self-determined motivation, academic self-efficacy, and approach and avoidance goals in math. These research confirms that, those who encourage more of malleable intelligence also encourage stronger learning goals, positive beliefs about effort, higher grades, self-determined motivation and academic self-efficacy. Hence, when students believe that intelligence can grow, their performance increases accordingly.

4.4 Implications

The present study had several implications. In the examination of the BPN satisfaction, it was beneficial to focus on multiple social contexts; family and school, and their effects on the academic outcomes. Results showed that, the school context is more influential on the school-related issues as compared to family. Studying the mediational model and observing direct and indirect effects between BPN satisfaction from math teacher and academic outcomes through self-determined motivation was another contribution of the present study to the literature. With the light of this information, teachers need to consider that while meeting students' BPN in the school context, they not only directly help their students to increase their goals setting attitudes towards their course, their sense of self-efficacy in the subject and contribute to better grades but also they achieve this via increasing their students'

volitional engagement of studying the subject. Furthermore, parents may support their children's motivation by supplying different kinds of tools about mathematics as well as meeting their needs in the family context. Finally, investigating the mindset effect in these relations was the last implication of this study. Interventions about importance of having a growth mindset can be conducted in the schools for students as Blackwell and colleagues (2007) have suggested. Moreover, subject teachers can prepare more open tasks for children rather than short and closed questions with right or wrong answers in order to offer opportunities for learning and support students' effort (Black & William, 1998).

4.5 Limitation and Future Directions

The current study had also a number of limitations. Firstly, even though the sample consisted of secondary school students from two different schools, all the schools were in the same city of Turkey. Thus, this might affect the generalizability of the study findings. In the future studies, the data can be collected from different regions of the country to have more generalizable results.

 Secondly, only adolescents self-report measures were used in the study. In the future studies, multiple measures including observations and open ended questions can be used as a measurement tool in order to avoid social desirability bias.

Another limitation of the current study was about one of the most important socializing environments of adolescents: peer relations. Literature suggested that thoughts of peers have an essential influence on teens during adolescence (Larson & Richards 1991; Jarvinen & Nicholls, 1996) and peer relations are positively related with better adjustment to the environments and psychological health (La Greca & Harrison, 2005; Yeung & Leadbeater, 2010). In addition to parents' and teachers' effect, the effect of BPN satisfaction from peers on the academic outcomes would be meaningful to investigate.

Lastly, the current study was conducted in only one-time point. Perceived psychological needs satisfaction can change over the time as well as the academic outcomes. Hence, by conducting the study in multiple time points, cause and effect relationships between the variables can be traced. A longitudinal study can be performed in order to see individual processes while students grow.

APPENDIX A

(Demographics Questionnaire)

1- Cinsiyetin: Erkek (   )   Kız (   )

2- Sınıfın: 5 (   )   6 (   )   7 (   )   8 (   )

3- Babanın Eğitim Durumu: Okur-Yazar   (   )

                      İlköğretim   (   )

                      Lise   (   )

                      Üniversite   (   )

                      Yüksek Lisans / Doktora   (   )

4- Annenin Eğitim Durumu: Okur-Yazar   (   )

                      İlköğretim   (   )

                      Lise   (   )

                      Üniversite   (   )

                      Yüksek Lisans / Doktora   (   )

5- Babanın mesleği: …………………..

6- Annenin mesleği: …………………..

7- Kardeş Sayısı: ....

8- Sana ait bir çalışma odan var mı ?   Evet (   )   Hayır (   )

9- Anasınıfı ya da anaokuluna gittin mi ?   Evet (   )   Hayır (   )

APPENDIX B
(Basic Psychological Needs Scale-Family Version)

Aşağıdaki ifadelerin <u>anne ve babanla olan ilişkinde</u> senin hislerini ne kadar doğru ifade ettiğini, lütfen verilen 5'li ölçeğe göre değerlendir.

1	2	3	4	5
Hiç Doğru Değil	Pek Doğru Değil	Biraz Doğru	Çoğunlukla Doğru	Tamamen doğru

	Annemle birlikte iken	Babamla birlikte iken
1. kendim gibi olmak konusunda rahat hissederim	(1) (2) (3) (4) (5)	(1) (2) (3) (4) (5)
2. kendimi yetkin/yeterli bir kişi gibi hissederim	(1) (2) (3) (4) (5)	(1) (2) (3) (4) (5)
3. sevildiğimi ve kollandığımı hissederim	(1) (2) (3) (4) (5)	(1) (2) (3) (4) (5)
4. kendimi genellikle yetersiz ve beceriksiz hissederim	(1) (2) (3) (4) (5)	(1) (2) (3) (4) (5)
5. söz hakkım vardır ve fikirlerimi ifade edebilirim	(1) (2) (3) (4) (5)	(1) (2) (3) (4) (5)
6. aramızda büyük bir mesafe olduğunu hissederim	(1) (2) (3) (4) (5)	(1) (2) (3) (4) (5)
7. kendimi oldukça yetenekli ve etkin hissederim	(1) (2) (3) (4) (5)	(1) (2) (3) (4) (5)
8. yakınlık ve içtenlik hissederim	(1) (2) (3) (4) (5)	(1) (2) (3) (4) (5)
9. nasıl biri olmam/nasıl davranmam gerektiği konusunda kontrol edildiğimi ve baskı altında olduğumu hissederim	(1) (2) (3) (4) (5)	(1) (2) (3) (4) (5)

APPENDIX C
(MATH GRADE QUESTION)

<u>Bu sayfadan itibaren sorulacak tüm sorular MATEMATİK DERSİ ile ilgili olacaktır.</u>

- Sence matematik dersi ne kadar zor bir derstir? Lütfen sana en uygun   cevabı işaretle.

(1)   Çok Kolay

(2)   Kolay

(3)   Biraz Kolay

(4)   Biraz Zor

(5)   Zor

(6)   Çok Zor

- Geçtiğimiz eğitim-öğretim döneminde aldığın matematik dersi karne notun nedir? Lütfen doğru cevabı işaretle.

(1)   (2)   (3)   (4)   (5)

- Geçtiğimiz eğitim-öğretim dönemine ait genel karne notu ortalaman kaçtı? Lütfen rakamla

yaz.

APPENDIX D
(Academic Self-Efficacy Scale)

Lütfen aşağıdaki sorulara <u>MATEMATİK</u> dersi için sana en uygun gelen şıkkı işaretleyerek cevap ver.

1. Kendimi yaşıtlarımla karşılaştırdığımda, bu derste iyiyim.

A- Doğru   B- Biraz Doğru   C- Biraz Yanlış   D- Yanlış

2. Bu derste hep yüksek notlar alırım.

A- Doğru   B- Biraz Doğru   C- Biraz Yanlış   D- Yanlış

3. Bu derste başarılı olma umudum yoktur.

A- Doğru   B- Biraz Doğru   C- Biraz Yanlış   D- Yanlış

4. Bu derste konuları çabucak öğrenirim.

A- Doğru   B- Biraz Doğru   C- Biraz Yanlış   D- Yanlış

5. Bu dersi şimdiye kadar hep iyi yaptım.

A- Doğru   B- Biraz Doğru   C- Biraz Yanlış   D- Yanlış

6. Bu derse çalışmak benim için çok kolaydır.

A- Doğru   B- Biraz Doğru   C- Biraz Yanlış   D- Yanlış

APPENDIX E
(Basic Psychological Needs Scale-Math Teacher Version)

Aşağıdaki ifadelerin, <u>MATEMATİK</u> dersini düşünerek, senin hislerini ne kadar doğru ifade ettiğini, lütfen verilen 5'li ölçeğe göre değerlendir.

1	2	3	4	5
Hiç Doğru Değil	Pek Doğru Değil	Biraz Doğru	Çoğunlukla Doğru	Tamamen doğru

1. Bu derste öğretmenime karşı, kendim gibi olmak konusunda rahat hissederim	(1)	(2)	(3)	(4)	(5)
2. Bu derste kendimi yetkin/yeterli bir kişi gibi hissederim	(1)	(2)	(3)	(4)	(5)
3. Bu derste öğretmenim tarafından sevildiğimi ve kollandığımı hissederim	(1)	(2)	(3)	(4)	(5)
4. Bu derste kendimi genellikle yetersiz ve beceriksiz hissederim	(1)	(2)	(3)	(4)	(5)
5. Bu derste söz hakkım vardır ve fikirlerimi ifade edebilirim	(1)	(2)	(3)	(4)	(5)
6. Bu derste öğretmenimle aramızda büyük bir mesafe olduğunu hissederim	(1)	(2)	(3)	(4)	(5)
7. Bu derste kendimi oldukça yetenekli ve etkin hissederim	(1)	(2)	(3)	(4)	(5)
8. Bu derste öğretmenime karşı yakınlık ve içtenlik hissederim	(1)	(2)	(3)	(4)	(5)
9. Bu derste öğretmenim tarafından nasıl biri olmam/nasıl davranmam gerektiği konusunda kontrol edildiğimi ve baskı altında olduğumu hissederim	(1)	(2)	(3)	(4)	(5)

APPENDIX F
(Goal Setting Scale)

MATEMATİK dersini düşündüğünde aşağıdaki ifadelerin seni ne kadar doğru ifade ettiğini, lütfen verilen 5'li ölçeğe göre değerlendir.

1	2	3	4	5
Hiç Doğru Değil	Pek Doğru Değil	Biraz Doğru	Çoğunlukla Doğru	Tamamen doğru

1. Derste anlatılan konuları tamamen öğrenmeyi amaçlarım	(1) (2) (3) (4) (5)
2. Dersin içeriğini anlamak için gayret sarf ederim	(1) (2) (3) (4) (5)
3. Dersin süresi içinde mümkün olduğunca fazla şey öğrenmeyi amaçlarım	(1) (2) (3) (4) (5)
4. Öğrenebileceğimden daha az şey öğrenmekten kaçınırım	(1) (2) (3) (4) (5)
5. Derste anlatılan konuları eksik öğrenmekten kaçınırım	(1) (2) (3) (4) (5)
6. Bir konuyu olabildiğinden daha az öğrenmekten kaçınırım	(1) (2) (3) (4) (5)
7. Sınıfımdaki öğrencilere göre daha iyi performans göstermeyi amaçlarım	(1) (2) (3) (4) (5)
8. Diğer öğrencilere göre daha başarılı olmak için gayret ederim	(1) (2) (3) (4) (5)
9. Diğer öğrencilerden daha iyi performans göstermeyi hedeflerim	(1) (2) (3) (4) (5)
10. Diğer öğrencilere göre başarısız görünmekten kaçınmaya çalışırım	(1) (2) (3) (4) (5)
11. Diğer öğrencilerden daha kötü performans göstermemeye gayret ederim	(1) (2) (3) (4) (5)
12. Diğer öğrencilerden daha kötü performans göstermemeyi amaçlarım	(1) (2) (3) (4) (5)

APPENDIX G
(SELF-DETERMINED MOTIVATION SCALE)

Aşağıda, <u>MATEMATİK dersi</u> ile ilgili çeşitli ifadeler verilmiştir. Söz konusu ifadeye hangi oranda katılıyorsan, lütfen karşısındaki ilgili sütunu "X" ile işaretle.

	Evet	Fikrim Yok	Hayır
A1. Bu ders ile ilgili çalışmalarımı ya da ödevlerimi kendi iyiliğim için yapıyorum.			
A2. Bu ders ile ilgili ödev ve sorumluluklarımı yapıyorum ancak bana ne yarar sağlayacağını bilmiyorum.			
A3. Bu ders ile ilgili ödevlerimi, öğretmenim ve ailem istediği için yapıyorum.			
A4. Bu ders ile ilgili verilen ödevlerimi yapınca mutlu oluyorum.			
B1. Kendi iyiliğim için bu dersi çalışıyorum			
B2. Bu dersi çalışıyorum ancak bana ne yarar sağlayacağını bilmiyorum.			
B3. Bu dersi öğretmenim ve ailem istedikleri için çalışıyorum			
B4. Bu dersi çalışıyorum çünkü bu dersi çalıştığımda mutlu oluyorum.			
C1. Bu derste öğretminimin sınıfta anlattıklarını kendi iyiliğim için dinliyorum.			
C2. Bu derste öğretmenimin sınıfta anlattıklarını dinliyorum ancak bana ne yarar sağlayacağını bilmiyorum.			
C3. Bu derste öğretmenimin sınıfta anlattıklarını, öğretmenim ve ailem istediği için dinliyorum.			
C4. Bu derste öğretmenimin sınıfta söylediklerini dinlediğimde mutlu oluyorum.			

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