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The Effects of Student and School Level Characteristics on Academic Achievement of Middle School Students in Turkey *

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Abstract
The purpose of the study was to examine the student-level and school-level variability that affect middle school students' academic achievement. Student background and school context on student academic achievement were examined. Participants of the study consisted of 1053 seventh and eighth grade middle school students from 10 schools in the cities of Ankara and Sinop, Turkey. The research study analysed using two-level hierarchical linear modeling (HLM). Data were analysed with three HLM models: (1) random effects one-way ANOVA model, (2) random coefficients regression model, (3) intercepts and slopes-as outcomes model. The results of the analyses showed that at the student level, gender, SES, and number of siblings were found to have statistically significant effects on student GPA. When considering the practical importance of student level variables, SES, and number of siblings have small effects, but gender has a moderate effect on students' school achievements. On average, female students perform higher than male students in terms of their GPA scores. At the school level, educational school resources have a significant effect on predicting academic achievement. It has been shown that school resources have a moderate effect on students' academic achievements.

Key Words: Hierarchical linear modeling, academic achievement, student GPA, gender, SES, school resources.

INTRODUCTION

Academic achievement is one of the most important determinants of education quality. Educational researchers agree that many factors have an impact on students' achievements (Börkan & Bakış, 2016; Coleman et al., 1966; Engin-Demir, 2009; Gelbal, 2008). To monitor the quality of education, educational assessment studies associated with academic achievement are taken into consideration in many countries. Therefore, studies related to the determinants of student achievement are dramatically increased over several decades. Student achievement depends on several factors, such as individual factors, family factors, school factors.

The research studies have shown that student characteristics such as gender, age, motivation, attitudes towards courses, self-efficacy, students' efforts, being bullied at school have significant impacts on academic achievement (Engin-Demir, 2009; Gevrek & Sieberlich, 2014; Ma, 2001; Özberk, Atalay-Kabasakal & Boztunç-Öztürk, 2017, Yavuz, Demirtaşlı, Yalçın, & İlgün-Dibek, 2017). Family background characteristics such as family socioeconomic status (SES), family size or number of children in the family, and parental education are related to educational achievement (Alacacı & Erbaş, 2010; Börkan & Balkış, 2016; Downey, 2001; Engin-Demir, 2009; Kalender & Berberoglu, 2009; Ministry of National Education-MoNE, 2007). The students whose families have a lower status, a lower level of education, and a bigger size are more likely to have lower academic performance in schools (Gamboa & Waltenberg, 2012; Willms, 1996). On the other hand, some students with low SES are able to show much higher academic performance than their peers with high SES (Erberber et al., 2015; Organisation for Economic Co-operation and Development-OECD, 2011; Özberk et al., 2017). These students are

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called as academically resilient students. Research studies have shown that family characteristics are strong effects on student achievement whereas school characteristics have weak effects (Baker, Goesling, & Letendre, 2002; Brooks-Gunn and Duncan, 1997; Coleman et al., 1966; Heyneman & Loxley, 1983). However, there has been considerable debate on whether school characteristics have a significant effect on student outcomes (Chevalier & Lanot, 2002; Hanushek, 1997). Several research implied that in some contexts, school resources and teacher characteristics have a significant impact on student achievement (Atar, 2014; Bilican-Demir, 2018; Darling-Hammond, 2000; Glewwe, Kremer, Moulin & Zitzewitz, 2004; Leon & Valdivia, 2015; Phan, 2008; Sweetland & Hoy, 2000; Tavşancıl & Yalçın, 2015; Yavuz et al., 2017). School characteristics, especially in developing countries, determine the school quality. To examine school effects, different strategies can be used in the studies such as student-teacher ratio, school size, class size, instructional materials, teacher quality, school resources (libraries, labs, computers, etc.) (Leon & Valdivia, 2015; Willms & Somers, 2001). The results indicated that schools with better physical facilities (e.g., libraries, labs, textbooks) and qualified teachers, especially for developing countries, contribute positively to increase student achievement (Alacacı & Erbaş, 2010; Baker et al., 2002).

Assessment of Student Achievement

Several methods can be used to assess student achievement. Final grades or grade point average (GPA) are generally used for students' achievements at school. On the other hand, standardized achievement tests are also used to assess student achievement (Petrill & Wilkerson, 2000). International educational large-scale assessments such as The Trends in International Mathematics and Science Study (TIMSS), Programme for International Student Assessment (PISA), and Progress in International Reading Literacy Study (PIRLS) and national large-scale assessments are generally used to evaluate student achievement. Numerous studies have been conducted in Turkey to examine student achievement on TIMSS, PISA, or PIRLS data (Akyüz, 2014; Alacacı & Erbaş, 2010; Anıl, 2009; Atar, 2014; Atar & Atar, 2012; Dincer & Uysal, 2010; Özberk et al., 2017; Özdemir, 2016; Yalçın, Demirtaşlı, İlgün-Dibek, & Yavuz, 2017). However, a few studies conducted in Turkey to examine student academic achievement on national large scale assessment such as Placement Test Results (SBS), Student Achievement Determination Exam (ÖBBS), Transition from Primary to Secondary education (TEOG) or on students' GPA in schools (Börkan & Bakış, 2016; Çiftçi, 2015; Engin-Demir, 2009; Gelbal, 2008; Yavuz, Tan & Atar, 2019).

The literature showed that academic achievement and its relationship with student characteristics and school characteristics is one of the enduring issues. Student characteristics such as gender, SES, number of siblings were examined in the study since these variables are mostly used contextual variables and likely to influence educational achievement. To determine whether school characteristics make a difference in student achievement, three categories (school size, student-teacher ratio, school resources) were measured. Therefore, the aim of the study was to provide empirical evidence on the relationship between student and school characteristics and student GPA in Turkey. Multilevel modeling was used to assess these factors on student achievement. Four research questions were investigated in the study:

1. How much do schools differ in their mean academic achievements?
2. How much do schools differ regarding the association between student level variables (i.e., gender, SES, number of siblings) and academic achievement?
3. Are school level variables (school size, student-teacher ratio, school resources) significant predictors of mean academic achievement?
4. Are school level variables (school size, student-teacher ratio, school resources) significant predictors of within school associations?

METHOD

Sample and Data

The study group included 1053 Grade 7 and Grade 8 students from 10 public middle schools in the cities of Ankara and Sinop, Turkey. A typical case sampling method was used to represent the average of middle school students in the province of Ankara and Sinop (Büyüköztürk, Çakmak, Akgün, Karadeniz & Demirel, 2008). The participants consisted of 512 females (48.6%) and 541 males (51.4%). The average age was 13.46 years, and age range was between 12-15.

Data Collection Instrument

1053 middle school students in 10 schools have completed survey questions which including only demographic questions. Several demographic questions (gender, SES, number of siblings) were asked to the students in the survey. While some of the variables were categorical, some others were continuous. Variables that are thought to affect student achievement were determined. Gender, SES, and the number of siblings were assigned as student level variables. School size, student-teacher ratio, and educational resources were assigned as school level variables. School level variables were obtained from the Ministry of National Education (MEB) e-school system. Students' GPA as composite achievement scores were obtained from school administrative records. In schools, teacher-based exams are applied to students and GPA affects students' high school placement results.

Students' GPA scores were included as a continuous dependent variable in the HLM analyses. Since gender is a dummy variable, female students were coded as 1, and male students were coded as 2. SES was measured with parental income. Students were asked to provide information about their family's SES in the survey. SES was ranged from lower to upper as low SES, lower-middle SES, middle SES, upper-middle SES, and high SES. This variable was coded as *low* = 1, *lower-middle* = 2, *middle* = 3, *upper-middle* = 4, and *high* = 5. Educational resources (e.g. music room, art room, computer lab, science lab, library, conference room, atelier, sports room) in schools were examined. Scoring school resources was ranged from the highest score (8) to the lowest score (1). Schools' scores between 7-8 score, 5-6 score, 3-4 score, and 1-2 score were categorized as *a lot* (4), *some* (3), *little* (2), and *very little* (1), respectively. Therefore, SES and educational resources have been considered as ordinal variables. The number of siblings, school size, and student-teacher ratio were continuous variables in the study. School size was measured by the number of students per school. The student level and school level variables have shown in Table 1. The mean values of categorical variables such as gender, SES, and educational resources represent the proportion of frequency of these variables in Table 1.

Table 1. Descriptive Statistics for Variables

Variables	N	Mean	Sd
Student level			
Gender	1053	1.51	0.50
SES	1053	3.36	0.76
Number of Siblings	1053	2.34	0.96
School level			
School Size	10	492.30	181.37
Student-teacher ratio	10	13.40	1.77
Educational resources	10	2.70	0.82
Outcome variable (GPA)	1053	83.94	12.10

Design of the Study

This study aimed to examine the effects of variables at the student level and school level on middle school students' academic achievement in Turkish public schools. Due to the nested nature of data, the

Hierarchical Linear Modeling methodology was used in the present study. Conducting HLM analysis for nested structure of data helps to prevent making a Type I error and biased results (Gill, 2003; Osborne, 2000; Raudenbush & Bryk, 2002). HLM helps to determine the direct effects of variables at individual level and student level (Hox, 1995). For HLM analysis, adequate sample sizes must be obtained. There are several suggestions about the number of groups required for multilevel model (MLM) studies. The minimum cluster size of 20 (Tabachnick & Fidell, 2014), cluster size of 30 (Kreft, 1996), or even cluster size of 50 (Hox, 1998, 2010) is recommended in MLM studies. Moreover, the simulation studies advise that multilevel model should not be used if the number of clusters less than 10 (McNeish & Stapleton, 2016; Snijders & Bosker, 1993). When using small sample size for MLM studies, restricted maximum likelihood or Kenward-Roger adjustment is recommended to reduce biased estimates (Boedeker, 2017; McNeish & Stapleton, 2016). In this study, maximum and minimum number of students in schools was 235 and 68, respectively. Two-level models are analyzed using restricted maximum likelihood estimation by default in HLM 7 software (Raudenbush, Bryk, Cheong, Congdon & du Toit, 2011).

Data Analysis

For HLM analysis, the two-level model was applied that student level was at the first level, and school level was at the second level. Student variables as the lowest level of the hierarchy are nested within schools (level 2). Analyzing the level 1 (student level) and level 2 (school level) regression relationship helps to determine the relationship between the predictors and outcome variables (Woltman, Feldstain, MacKay & Rocchi, 2012). Each level in the hierarchical structure has its own sub-model that explains the relationships among the variables. The student level factors in the HLM analyses included gender, SES, and family size (number of siblings). School level factors were school size, student-teacher ratio, and educational recourses. Before the analysis, the assumptions of HLM were checked. The normality of error terms (level 1 residuals and level 2 residuals) was assessed (Raudenbush et al., 2011). QQ plots showed that the residuals are normally distributed.

The HLM modelling consisted of three steps. In the first step, null (unconditional) model with random effects ANOVA model was created with only student level outcome variable but not included predictors at student level and school level. It gives the proportion of variance in middle school students' academic achievement among schools. The variance of students' GPA scores was analyzed at the individual level and also at school level. Student level variables were centered around their group means, and school level variables were centered around their grand means in the HLM analysis. Centering can help the interpretation of the model intercepts easily by transforming these scores (Enders & Tofighi, 2007; Raudenbush & Bryk, 2002).

Random effects one-way anova model

Equations for random effects Anova model regarding this study are as follows:

Level 1 Model (Student Level): $Y_{ij} = \beta_{0j} + r_{ij}$

Level 2 Model (School Level): $\beta_{0j} = \gamma_{00} + u_{0j}$

In student level model, Y_{ij} refers to GPA of student *i* in school *j*. β_{0j} refers to the mean of student GPA in school *j*, and r_{ij} refers to deviation of student GPA in school *j* from mean student GPA of school *j*. γ_{00} is the grand mean of student *GPA of j* schools, *and* u_{0j} is the deviation of the mean of student GPA of school *j* from grand mean of student GPA.

Random coefficient regression model

In the model, the independent variables (gender, SES, number of siblings) were examined to determine whether they have a significant effect on students' GPA, on average. Equations for random coefficient regression model are as follows:

Level 1 model:

$Y_{ij} = \beta_{0j} + \beta_{1j}(gender_{ij}) + \beta_{2j}(SES_{ij}) + \beta_{3j}(number\ of\ sibling_{ij}) + r_{ij}$

Level 2 model*:*

$\beta_{0j} = \gamma_{00} + u_{0j}$

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

$\beta_{3j} = \gamma_{30} + u_{3j}$

Intercepts and slopes-as outcomes model

Intercept and slope coefficients are outcomes in the model. This model also called as full model since both student level and school level variables were included. Equations for intercepts and slopes-as outcomes model regarding this study are as follows:

Level 1 model:

$Y_{ij} = \beta_{0j} + \beta_{1j}(gender_{ij}) + \beta_{2j}(SES_{ij}) + \beta_{3j}(number\ of\ sibling_{ij}) + r_{ij}$

Level 2 model:

$\beta_{0j} = \gamma_{00} + \gamma_{01}(schoolsize) + \gamma_{02}(student - teacher\ ratio) + \gamma_{03}(school\ recources) + u_{0j}$

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

$\beta_{3j} = \gamma_{30} + u_{3j}$

RESULTS

Results of The First Research Question (How much do schools differ in their mean academic achievements?):

The random-effects Anova model determines whether there is enough school variance to justify the use of multilevel analysis for data set. None of the predictors at level 1 and level 2 here are included in the null (unconditional) model. The result of the one way ANOVA with random effects were presented in Table 2.

Table 2. Estimation of Fixed Effect on Anova Model

Fixed Effect	**Coefficient**	**Standard Error**	**t ratio**	**df**
Average GPA,, γ_{00}	83.07	1.52	57.59**	9

** $p < .001$

Table 3. Estimation of Random Effects Anova Model

Random effect	**Variance**	**χ2**	**df**
School level, u_{0j}	21.54	116.07**	9
Level 1 effect, r_{ij}	133.67		

** $p < .001$

According to Table 2, overall school mean was 83.07 with 1.52 standard error. And in Table 3, the within-school variance was estimated as 133.67. The between-school variance was estimated as 21.54. The results showed that school level variance was statistically significant ($\chi^2_{(9)}$ = 116.07, p < .001). Indicating that mean student GPA was significantly varied among schools. The null model also provides the estimate of the intraclass correlation coefficient. The intraclass correlation coefficient (ICC) was calculated to indicate the proportion of variance in student GPA among schools. The intraclass correlation was calculated as $\rho\rho = \tau_{00} / (\tau_{00} + \sigma^2)$ = 21.54 / (21.54 + 133.66) = .14 which indicated that 14% of total variance in student GPA was accounted for by differences among schools. 86% of the variability in student GPA resulted from the within-school variance. It has been found that estimated ICC value was larger than threshold of 5% (Bliese, 2000). The result suggested that HLM analysis is necessary for the nested data.

Results of the Second Research Question (How much do schools differ regarding the association between student level variables (i.e., gender, SES, number of siblings) and academic achievement?):

Table 4 and Table 5 showed that the results obtained from the random coefficient model analysis.

Table 4. Estimation of Fixed Effects on Random Coefficient Model

Fixed effect	Coefficient	Standard Error	t-ratio	df	Effect size
Average GPA, γ_{00}	83.07	1.43	57.84**	9	
Gender, γ_{10}	-4.82	1.17	-4.09*	9	.43
SES, γ_{20}	1.08	0.44	2.42*	9	.10
Number of Sibling, γ_{30}	-1.28	0.47	-2.74*	9	.11

**p < .001; *p<.05

Table 5. Estimation of Variance Components on The Random Coefficient Model

Random effect	Variance	Standard Deviation	χ2	df
School level, u_{0j}	21.46	4.63	121.48**	9
Level 1 effect, r_{ij}	124.94	11.17		

** p < .001

The findings indicated that the mean effects of the gender, SES, and number of siblings on student GPA were statistically significant. The independent variables had a significant effect on students' GPA scores at the student level. The mean slope values associated with the independent variables were estimated as -4.82, 1.08, -1.28, respectively. Negative coefficient value for gender suggests that on average, female students' GPA scores were about five points higher than male students when holding other variables constant (γ_{10}= -4.82). And also on average, one unit increase in number of siblings, student GPA score decreased one point when controlling all other variables (γ_{30} = -1.28). It indicated that number of siblings was negatively correlated with student GPA score. On the other hand, SES positively contributed to students' GPA scores (γ_{20} = 1.08). The effect size of each variable was also estimated to interpret the practical significance of variables (Kelley & Preacher, 2012). The effect size of each variable was estimated as .43, .10, and .11, respectively. Female students' GPA on average is 0.43 standard deviation higher than that of male students. It means that gender variable has moderate effect on student GPA. On the other hand, SES and number of siblings variables on academic achievement have a small effect (Cohen, 1992).

After student level variables were added to the model, within-school variance was reduced from 133.67 to 124.94. The results suggested that these variables in students' GPA scores explain only 7% of within-school variability (r^2= .07).

Results of the Third Research Question (Are school level variables (school size, student-teacher ratio, school resources) significant predictors of mean academic achievement?)

The results of the intercepts and slopes as outcomes model for fixed effects were presented in Table 6.

Table 6. Results of The Fixed Effect in the Full Model

Fixed effect	Coefficient	Standard Error	t-ratio	df	Effect Size
Intercept (GPA), γ_{00}	83.03	1.24	66.65**	9	
Student level					
Gender, γ_{10}	-4.66	1.04	-4.44*	9	-.40
SES, γ_{20}	1.07	0.44	2.39*	9	.09
Number of Sibling, γ_{30}	-1.25	0.48	-2.60*	9	-.10
School level					
School size, γ_{01}	0.003	0.005	0.67	6	
Student-teacher ratio, γ_{02}	-0.79	0.36	-2.19	6	
School resources, γ_{03}	3.11	1.00	3.09*	6	.27

** $p < .001$; *$p < .05$

At the student level, gender, SES, and the number of siblings were found to have a significant impact on student GPA. The coefficient values of independent variables were estimated to be -4.66, 1.07, and -1.25, respectively. Negative coefficient value for gender suggests that on average, female students' GPA scores were about five points higher than male students when holding other variables constant (γ_{10}= -4.66). And also on average, one unit increase in number of siblings, student GPA score decreased one point when controlling all other variables (γ_{30}= -1.25). It indicated that number of siblings was negatively correlated with student GPA score. On the other hand, SES positively contributed to students' GPA scores. At the school level, only school resources found to have statistically significant effect on mean academic achievement (p = 0.021). It suggested that school educational resources were positively related to students' academic performance. And also the effect sizes of the variables at student level and school level were estimated. Effect sizes for student variables were found -0.40, 0.09, and -0.10, respectively. While gender variable had medium effect on student GPA, SES and number of siblings variables had small effect on student GPA. At the school level, effect size of school resources indicated that an increase of one standard deviation in school resources would result in an increase of 0.27 standard deviation in the school mean student GPA. It showed that school resources had approximately medium effect on academic achievement.

Results of the Fourth Research Question (Are school level variables (school size, student-teacher ratio, school resources) significant predictors of within school associations?)

The results of the intercepts and slopes as outcomes model for random effects were presented in Table 7.

Table 7. Estimation of Variance Components on the Full Model

Random effect	Variance	Standard Deviation	χ^2	df
School level, u_{0j}	19.23	4.38	122.92**	6
Level 1 effect, r_{ij}	124.96	11.17		9

**$p < .001$

According to Table 7, adding student level and school level variables to the null model decreased school variability from 21.54 to 19.23. This finding indicated that school level variables explained 11% of the between-school variability in students' GPA scores. And also student variance in the full model

decreased between from 133.67 to 124.96. It showed that student level variables explained 7% of the within-school variability in students' GPA scores. In comparison with the null model, final model explained approximately 7% of the variance at the student level, and 11% of the variance at the school level and remaining variability is still statistically significant ($p < .001$).

DISCUSSION and CONCLUSION

This study empirically investigated the effects of student characteristics and school characteristics on the academic achievement of middle school students in Turkey. The findings indicated that student characteristics including gender, SES, and the number of siblings have significant effects on academic achievement. Student variables explained 7% variance in academic achievement. Gender has strongly significant effect on student academic achievement. Female students had higher average GPA scores than male students after controlling other variables. This finding is consistent with several studies (Börkan & Bakış, 2016; Dayioğlu & Türüt-Aşık, 2007; Engin-Demir, 2009; Ferreira & Gignoux, 2010; Gevrek & Seiberlich, 2014; Güvendir, 2014; Van Houtte, 2004). For example, Engin-Demir (2009) studied with sixth, seventh, and eighth grade students to investigate factors influencing their academic success by using their GPA. This study found that gender is the most important factor among student characteristics. On average, female students had higher achievement scores than male students in that study. Dayioğlu and Türüt-Asık (2007) examined the gender gap in academic performance for undergraduate students. They found that female students outperform male students in cumulative GPA, but the gender gap in university entrance exam scores was in reverse. Several reasons may explain why female students outperform male students in schools. Their attitudes and self-efficacy toward school, sense of school belongings, academic motivation, their efforts toward courses influence female and male students' academic achievement differently (Batyra, 2017; Engin-Demir, 2009; Gevrek & Seiberlich, 2014; Johnson, Crosnoe & Elder 2001; OECD, 2016; Van Houtte, 2004; Veenstra & Kuyper, 2004). Besides, gender equity for school achievement is very important. Turkey has made great efforts to advance gender equity since 2000. Since school enrollment, especially for females, has increased in primary and secondary education, gender differences in academic achievement are disappearing progressively in Turkey. The result of the present study may also show the positive effects of projects related to gender equity in schools throughout Turkey (The United Nations Children's Fund-UNICEF,2016). On the other hand, female students tend to show lower performance than male students in some subjects, especially in science and maths (Atar & Atar, 2012; Berberoğlu, 2004; Chiu & Xihua, 2008; Farkas, Sheehan, & Grobe, 1990; Wößmann, 2003). Literature generally showed that gender differences exist in academic performance of students all around the world. Therefore, more research is needed to examine gender gap in academic achievement for gender equity in education.

Although effect sizes are small, the effects of the number of siblings and SES on academic achievement were significant. It was found that low SES students are more likely to get a lower GPA. Similarly, vast majority of research revealed that the students living in a low socio-economic status family show poorly performance in schools (Alacacı & Erbaş, 2010; Atar & Atar, 2012; Aypay, Erdogan, & Sozer, 2007; Bellibas, 2016; Dincer & Uysal, 2010; Flores, 2007; Gelbal, 2008; Kalaycıoğlu, 2015; Ma & Klinger, 2000; Perry & McConney, 2010; Sirin, 2005; Smits & Hosgör, 2006). Sirin (2005) used meta-analysis to examine the family effects on academic achievement. The results showed that socioeconomic structure has a medium to strong impact on academic achievement. The author suggested that to prevent overestimating the effects of SES using multiple components of SES (e.g. income, education, and occupation) is important. The present study also showed the negative siblings effects on academic achievement. Especially in developing countries and western countries, a negative relationship exists between large number of siblings and educational outcomes (Buchmann & Hannum, 2001; Downey, 2001; Gelbal, 2008).

The impacts of school variables on academic achievement were examined. The findings revealed that approximately 11% of the variation in student GPA was explained by differences among schools. School quality was measured with school size, teacher-student ratio, and school resources. The effect of educational resources of schools (e.g., library, computer labs, science labs, music room) on academic achievement was moderate. School size and teacher-student ratio had no statistically significant effect

on student achievement. The research findings showed that the effect of school resources on academic achievement was significant. However, there is no consensus about the effect of school resources on academic achievement. While most of the research found that school characteristics do not have significant effect on educational achievement research in developed and developing countries (Coleman et al.,1966; Hanushek, 1997; Hanushek & Luque, 2003), some research emphasized that school resources are associated with student outcomes especially in developed countries (Card & Krueger, 1996; Fuller & Clarke, 1994; Glewwe et al.,2004; Leon & Valdivia, 2015; Özberk et al., 2017). Leon and Valdivia (2015) concluded that when the distribution of schools was unequal, the influence of school characteristics on academic achievement was significant in developing countries. The authors suggested that improving school quality especially in poorer areas can help to close gender gap and socioeconomic gap in student achievement. The school with better physical environment is positively related to student outcomes (Adeogun & Osifila, 2008; Krueger, 2003; Parcel & Dufur, 2001). The present study showed that increases in educational resources in schools have a significant impact on student academic achievement. Therefore, this study suggests that investigating the determinants of student achievement is crucial to increase quality of education. More progress should be made to decrease the achievement gap in schools with educational policy movements in Turkey.

The study has also some limitations. Not many variables at student level and school level that effect student GPA were examined in this study. Student characteristics were measured with middle school students' background (demographic variables). However, it is also useful to examine the effect of other student variables on academic achievement (e.g. personality, intelligence). To determine the quality of schools, numerous resources can be considered such as teacher quality, institutional quality, physical resources, etc. School characteristics were measured into three categories in the present study. More variables should also be considered to measure school quality in further studies. School SES, geographical distribution of schools, school types, which may also potentially impact educational attainment, can also be considered in further studies. More research is needed to investigate the determinants of student achievement. Another limitation of this study was using self-reported data except students' GPAs. And also in the study, acceptable low limit to sample size at group level was used. Since getting larger groups is difficult for several reasons, the number of groups is usually a methodological concern in multilevel studies (Maas & Hox, 2005). Therefore, further studies should be conducted to larger number of schools.

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Türkiye'de Öğrenci ve Okul Özelliklerinin Ortaokul Öğrencilerinin Akademik Başarılarına Etkileri

Giriş

Akademik başarı eğitim sisteminin niteliğine yönelik en önemli belirleyicilerden biridir. Birçok faktörün akademik başarıyı etkilediği görülmektedir (Börkan & Bakış, 2016; Coleman ve diğerleri, 1966; Engin-Demir, 2009; Gelbal, 2008). Araştırmalar sadece aile özelliklerinin değil aynı zamanda okul ve öğrenci özelliklerinin de öğrenci başarısını etkileyen önemli faktörler olduğunu göstermektedir (Alacacı & Erbaş, 2010; Bellibaş, 2016; Börkan & Bakış, 2016; Engin-Demir, 2009; Kalender & Berberoglu, 2009; MEB, 2007).

Cinsiyet, yaş, motivasyon, derslere yönelik tutumlar, öz-yeterlik, öğrencilerin çabaları, okulda zorbalığa uğramak gibi birçok öğrenciye ait bireysel özellikler olup akademik başarı üzerinde anlamlı etkilere sahiptir (Engin-Demir, 2009; Ma, 2001; Özberk, Atalay-Kabasakal & Boztunç-Öztürk, 2017; Yavuz, Demirtaşlı, Yalçın, & İlgün-Dibek, 2017). Ailenin sosyo ekonomik özellikleri, aile büyüklüğü ya da ailedeki kardeş sayısı, ebeveynlerin eğitim düzeyi öğrenci başarısında etkili olabilmektedir (Alacacı & Erbaş, 2010; Börkan & Balkış, 2016; Downey, 2001; Engin-Demir, 2009; Kalender & Berberoglu, 2009; MEB, 2007). Okul ve öğretmen özellikleri de öğrenci başarısında etkili faktörlerdir (Atar, 2014; Bilican-Demir, 2018; Darling-Hammond, 2000; Phan, 2008; Tavşancıl & Yalçın, 2015; Yavuz ve diğerleri, 2017). Öğrenci başarısı üzerinde sınıf büyüklüğü, okul büyüklüğü, okulun bulunduğu bölge, ortalama SES (Sosyo-Ekonomik Statü), öğretmen öğrenci oranı, öğretmen niteliği, eğitim kaynakları, çevre gibi faktörler okullar arasında farklılık oluşturabilmektedir (Leon & Valdivia, 2015; Willms & Somers, 2001).

Öğrenci başarısı değerlendirilirken birkaç yöntem kullanılmaktadır. Genel olarak final notları ya da not ortalamaları dikkate alınmaktadır. Standartlaştırılmış başarı testleri de öğrenci başarısı değerlendirilirken kullanılabilmektedir (Petrill & Wilkerson, 2000). Uluslararası geniş ölçekli değerlendirme (örneğin; The Trends in International Mathematics and Science Study-TIMSS, Programme for International Student Assessment-PISA, and Progress in International Reading Literacy Study-PIRLS) ve ulusal geniş ölçekli değerlendirme ile öğrenci başarısı değerlendirilmektedir. Türkiye'de öğrenci başarısı üzerine birçok çalışmanın uluslararası TIMSS, PISA veya PIRLS veri setleri kullanılarak gerçekleştiği görülmektedir (Akyüz, 2014; Alacacı & Erbaş, 2010; Anıl, 2009; Atar, 2014; Atar & Atar, 2012; Dincer & Uysal, 2010; Özdemir, 2016; Özberk ve diğerleri, 2017; Yalçın ve diğerleri, 2017). Ancak Türkiye'de akademik başarıya yönelik sadece birkaç çalışmada ulusal geniş ölçekli değerlendirmenin (örneğin; SBS, ÖBBS, TEOG) ya da başarı ortalamalarının kullanılarak gerçekleştiği görülmektedir (Börkan & Bakış, 2016; Çiftçi, 2015; Engin-Demir, 2009; Gelbal, 2008; Yavuz, Tan & Atar, 2019). Bu çalışma ortaokul öğrencilerinin akademik başarılarını etkileyen öğrenci ve okul özelliklerinin incelenmesini amaçlamaktır. Akademik başarı öğrencilerin genel not ortalamaları ile ölçülmüştür. Bu çalışmada dört araştırma sorusuna yanıt aranmıştır.

1. Okullar öğrencilerin ortalama akademik başarılarında ne kadar farklılık oluşturmaktadır?
2. Okullar öğrenci düzeyindeki değişkenler (örneğin, cinsiyet, SES, kardeş sayısı) ve akademik başarı arasındaki ilişkiye bağlı olarak ne kadar farklılık oluşturmaktadır?

3. Okul düzeyinde değişkenler (okul büyüklüğü, öğrenci-öğretmen oranı, okul kaynakları) ortalama akademik başarının anlamlı yordayıcıları mıdır?
4. Okul düzeyinde değişkenler (okul büyüklüğü, öğrenci-öğretmen oranı, okul kaynakları) okullar arası ilişkide anlamlı yordayıcılar mıdır?

Yöntem

Bu çalışmada öğrenci düzeyinde ve okul düzeyinde değişkenlerin öğrenci başarısı üzerindeki etkilerini incelemek için hiyerarşik linear modelleme (HLM) yöntemi kullanılmıştır. İç içe gruplanmış yapıdaki veriler için HLM analizi kulllanılması Tip I hata yapmayı ve yanlı sonuçların önlenmesini sağlamaktadır (Gill, 2003; Osborne, 2000; Raudenbush & Bryk, 2002). Çalışma grubunu, Ankara ve Sinop il merkezlerinde 10 ortaokula devam eden toplam 1053 yedinci sınıf ve sekizinci sınıf öğrencisi oluşturmuştur. Katılımcıların 512'sini (% 48.6) kız öğrenciler, 541'ini (% 51.4) ise erkek öğrenciler oluşturmuştur. Ortalama yaş 13.46 olup yaş aralığı 12 ile 15 arasında değişmektedir. Ortaokul öğrencilerine anket aracılığı ile çeşitli demografik sorular (cinsiyet, yaş, SES, kardeş sayısı) ve akademik başarı ortalamaları sorulmuştur. Veri analizi için HLM 7 kullanılmıştır. İki düzeyli HLM modeli kullanılarak öğrenci düzeyindeki ve okul düzeyindeki değişkenlerin akademik başarı üzerindeki etkileri incelenmiştir. Cinsiyet, SES ve kardeş sayısı öğrenci düzeyindeki değişkenleri oluştururken okul büyüklüğü, öğrenci-öğretmen oranı ve okul kaynakları okul düzeyindeki değişkenleri oluşturmuştur. Çalışmada öğrencilerin okullardaki dağılımı incelendiğinde, en yüksek öğrenci sayısının 235 ve en düşük öğrenci sayısının 68'dir. Çalışmada iki düzeyli model, HLM 7'nin hesapladığı sınırlandırılmış maximum olabilirlik ölçümü kullanılarak analiz edilmiştir (Raudenbush, Bryk, Cheong, Congdon & du Toit, 2011).

Sonuç ve Tartışma

Bu çalışmada Türkiye'deki ortaokul öğrencilerinin akademik başarılarını etkileyen öğrenci ve okul özellikleri incelenmiştir. Araştırma bulguları, öğrenci özelliklerinin (cinsiyet, SES ve kardeş sayısı) ortaokul öğrencilerinin akademik başarıları üzerinde istatistiksel olarak anlamlı etkiye sahip olduğunu göstermiştir. Öğrenci değişkenlerinin akademik başarı üzerinde açıkladığı varyans oranı %7'dir. Cinsiyetin öğrenci başarısı üzerinde güçlü bir etkiye sahip olduğu ortaya çıkmıştır. Diğer değişkenler kontrol edildiğinde, kız öğrenciler erkek öğrencilere göre daha yüksek başarı ortalamasına sahiptir. Bu araştırma sonucu diğer araştırma sonuçları ile benzerlik göstermektedir (Börkan & Bakış, 2016; Güvendir, 2014; Engin-Demir, 2009; Van Houtte, 2004). Araştırmalar bazı sebeplerden dolayı kız öğrencilerin erkek öğrencilere göre daha iyi performans gösterdiklerini ortaya koymaktadır. Öğrencilerin tutumları, öz-yeterlikleri, okula bağlılıkları, akademik motivasyonları, derslerdeki çabaları kız ve erkek öğrencilerin akademik başarılarını farklı şekilde etkilemektedir (Batyra, 2017; Engin-Demir, 2009; Gevrek & Seiberlich, 2014; Van Houtte, 2004; Veenstra & Kuyper, 2004). Ayrıca, cinsiyet eşitliği okul başarısı için çok önemlidir. Türkiye'de 2000 yılından itibaren cinsiyet eşitliğini arttırmak adına önemli çalışmalar yapılmıştır. İlkokul ve ortaokulda özellikle kız öğrencilerin okullaşma oranları arttırılarak kız ve erkek öğrencilerin akademik başarıları arasındaki farklılık önemli ölçüde azalmıştır. Bu araştırma sonucunun da Türkiye'de okullarda cinsiyet eşitliğine yönelik yapılan projelerin olumlu etkilerini gösterdiği söylenebilir(The United Nations Children's Fund-UNICEF, 2016). Diğer taraftan kız öğrencilerin bazı alanlarda özellikle fen ve matematikte erkek öğrencilere göre daha düşük performans gösterme eğiliminde oldukları görülmektedir (Berberoğlu, 2004; Chiu & Xihua, 2008; Farkas, Sheehan & Grobe, 1990; Wößmann, 2003). Alan yazın genel olarak öğrencilerin akademik performanslarının cinsiyetlerine göre farklılık gösterdiğini ortaya koymaktadır. Bu nedenle, bu alana yönelik daha fazla çalışma yapılması oldukça önemlidir.

Etki büyüklüğü düşük olmasına rağmen, kardeş sayısı ve SES değişkenlerinin akademik başarı üzerinde anlamlı etkiye sahip olduğu ortaya çıkmıştır. Düşük SES'e sahip öğrencilerin daha düşük akademik ortalamaya sahip olma ihtimalinin daha yüksek olduğu bulunmuştur. Benzer şekilde, birçok araştırma düşük sosyo ekonomik statüye sahip aile ile yaşayan öğrencilerin okullarda düşük performans

gösterdiklerini açığa çıkarmıştır (Alacacı & Erbaş, 2010; Atar & Atar, 2012; Aypay, Erdogan, & Sozer, 2007; Bellibas, 2016; Dincer & Uysal, 2010; Flores, 2007; Gelbal, 2008; Kalaycıoğlu, 2015; Perry & McConney, 2010). Aynı zamanda bu araştırmada, kardeş sayısının akademik başarı üzerindeki negatif etkisi ortaya çıkmıştır. Özellikle gelişen ülkeler ve batı ülkelerinde, çok sayıda kardeş ve eğitim çıktıları arasında negatif yönde ilişki bulunmaktadır (Buchmann & Hannum, 2001; Downey, 2001; Gelbal, 2008).

Araştırmada okul değişkenlerinin akademik başarı üzerindeki etkileri incelenmiştir. Öğrenci başarı ortalaması üzerinde yaklaşık %11 oranında varyans, okullar arasındaki farklılıklar aracılığı ile açıklanmaktadır. Okulun niteliği, okul büyüklüğü, öğretmen-öğrenci oranı ve okul kaynakları gibi değişkenler ile ölçülmüştür. Okul kaynaklarının (örneğin, kütüphane, bilgisayar laboratuvarı, fen laboratuvarı, müzik odası gibi) öğrenci başarısı üzerinde etkisi orta düzeydedir. Ancak okul büyüklüğü ve öğretmen-öğrenci oranının öğrenci başarısı üzerinde istatistiksel olarak anlamlı bir etkiye sahip olmadığı ortaya çıkmıştır. Alan yazın incelendiğinde okul kaynaklarının akademik başarı üzerindeki etkisine yönelik ortak bir görüş olmadığı görülmektedir. Bazı çalışmalar okul kaynaklarının akademik başarı üzerinde etkisinin olmadığını göstermektedir (Coleman ve diğerleri,1966; Hanushek, 1997; Hanushek & Luque, 2003). Diğer taraftan bazı çalışmalar, okul kaynaklarının öğrenci çıktıları ile ilişkili olduğunu ortaya koymuştur (Card & Krueger, 1996; Fuller & Clarke, 1994; Özberk ve diğerleri, 2017). Daha iyi fiziksel ortama sahip bir okul, öğrenci başarısını pozitif yönde etkileyebilmektedir (Adeogun & Osifila, 2008; Krueger, 2003; Parcel & Dufur, 2001). Bu çalışmada da, bu araştırmaları destekleyen bulgulara ulaşılmıştır.