International Journal of Progressive Education, Volume 17 Number 1, 2021

An Investigation of the Mediating Role of Various Variables in the Effect of Both Gender and Economic, Social and Cultural Status on Reading Literacy

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Abstract

The present study was based on the Turkish sample in PISA 2009 and PISA 2018. To investigate the effect of both gender and economic, social and cultural status index on reading literacy, the causal mediation effect was utilized in order to test the mediating role of the following variables: enjoyment of reading, the metacognitive strategy of summarizing, and the metacognitive strategy of reading and comprehension. With respect to the effect of the variable of gender on reading literacy, it was revealed in the present research study that all the variables utilized in the study had a statistically significant partial mediating role in the variable of enjoyment of reading, which was the strongest mediator variable. As for the effect of the economic, social and cultural status on reading literacy, it was revealed that there were statistically significant variables that played a mediating role; however, as these variables contributed very little to the explained variance, these variables were concluded to have no mediating role.

Keywords: Causal Mediation Analyses, Direct Effect, Indirect Effect, Reading Literacy

DOI: 10.29329/ijpe.2020.329.24

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INTRODUCTION

Reading is a skill that is essential not only for academic success in education but also for adults' successful participation in the many spheres of daily life (Smith, 1995). The meaning of the reading concept today has undergone changes to meet the needs of the present era and these changes will continue to take place (Contractor, 2016). With these changes, the concept of "reading" has been replaced with a more comprehensive concept, namely "reading literacy." The concept of reading literacy is defined as "the ability to understand and use those written language forms required by society and/or valued by the individual" (Mullis, Kennedy, Martin, & Sainsbury, 2006, p.3). In other words, reading literacy is no longer primarily about extracting information, but also about constructing knowledge, thinking critically and making well-founded judgements (OECD, 2019a). As can be understood from the definitions, the concept of reading literacy, which includes a wide range of cognitive and linguistic competencies, has become a concept extending far beyond the school context. Reading literacy is addressed as an important topic in the international literature on comprehensive assessment studies (Artelt, Schiefele, & Schneider, 2001). Reading literacy has an important place in the Programme for International Student Assessment (PISA), which is one of these assessment studies and which provides guidance for participant countries' own educational policies. PISA is implemented by the Organization for Economic Cooperation and Development (OECD) every three years and assesses 15-year-old students' acquisition of knowledge and skills. Every three years, one of the three domains, either reading literacy, mathematics literacy or science literacy, is selected as the main focus and given a higher weighting. In PISA 2000, PISA 2009 and PISA 2018, the domain in focus was the reading literacy, which was defined in these years in slightly different ways (Contractor, 2016, p.9). In PISA 2000, reading literacy was defined as "understanding, using and reflecting on written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society." In PISA 2009, this definition was expanded with the addition of the phrase, "engagement in reading as part of reading literacy." Then, in PISA 2018, the expression " evaluation of texts as an integral part of reading literacy" was also added to the definition of reading literacy, while the word "written" was removed from the definition. Based on these definitions, it can be claimed that the definition of the reading literacy concept is modified to meet the requirements of the time. As the present study is based on the Turkish sample and since Turkey's first participation in the PISA implementation was in the year 2003, the focus of the present study was on PISA 2009 and PISA 2018.

In studies on PISA, researchers interpret students' scores in the domains of reading literacy, maths literacy, and science literacy by making use of data obtained from various surveys, and they seek to reveal indicators regarding the relationships between students' skills and these variables (MoNE, 2017). In the present study, common variables in the survey data of PISA 2009 and PISA 2019 and those that were believed to have an impact on reading literacy based on the review of literature were used. The gender variable has been addressed in the field of education due to the negativities female students encountered during a large part of the 20th century (MoNE, 2010). However, despite these negativities, female students' reading literacy scores were found to be higher than those of male students in the PISA 2009 and PISA 2018. In a report by the Ministry of Education (MoNE), measures to be taken to increase male students' success in reading skills would have a positive impact on the overall success rates in the country. Hence, the gender variable has been a variable addressed in numerous studies on reading literacy (Brozo, Sulkunen, Shiel, Garbe, Pandian, & Valtin, 2014; Linnakyla, Malin, & Taube, 2004; Rajchert, Żułtak, & Smulczyk, 2014; Stoet & Geary, 2013; Torppa, Eklund, Sulkunen, Niemi, & Ahonen, 2018).

Students' background characteristics can also contribute to the variance in reading literacy (Eryaman, 2007; Netten, Droop, & Verhoeven, 2011). The economic, social and cultural status variable is one of these background characteristics, and is comprised of the student's home and family background characteristics. In the literature on PISA-related studies, it is observed that there are numerous studies on the association between these background characteristics and reading literacy (De Jong & Leseman, 2001; Hawes & Plourde, 2005; Rajchert et al., 2014; Thomson, De Bortoli, & Buckley, 2013; Schulz, 2005) because it is crucial that the impact of socioeconomic status on learning

outcomes in terms of equality in education be kept at a low level (MoNE, 2019). Hence, studies focusing on economic, social and cultural status yield significant data for educational policies.

Based on the data derived from the implementation of PISA by OECD, one of the most important individual characteristics indicating higher levels of success is students' enjoyment of reading (OECD, 2010a). In other studies in the literature, it was revealed that there is a relationship between the enjoyment of reading condition and students' level of reading performance (Neff, 2015; Perkins, Moran, Shiel, & Cosgrove, 2011; Petscher, 2009; Schiefele, 2009; Shiel, 2009). This variable - enjoyment of reading - was also examined in the OECD (2011a) report with respect to gender and economic, social and cultural status. It was revealed that female students were more advantaged than male students in terms of socio-economic status, and that advantaged students had higher levels of enjoyment of reading when compared to disadvantaged students. For this reason, in the present study, this variable was addressed as a mediator variable for the variables of gender and economic, social and cultural status.

Students' acquisition of the skill to "learn how to learn" has an important place among learning outcomes. Students who have an awareness of and can make use of learning strategies know how to learn effectively (Phakiti, 2006). The metacognition strategy, which is a learning strategy, refers to the individual's ability to reflect on and control his/her reading comprehension strategies (Contractor, 2016). Metacognition strategies include strategies that are employed to summarize, understand and remember.

As metacognitive strategies, summarizing is based on comprehending the text more effectively by identifying and paraphrasing the main ideas of a text, while the strategy of understanding and remembering is based on the ability to identify and memorize the most important parts of a text (Muszyński & Jakubowski, 2015). It was revealed that there was a relationship between students' scores in reading and their metacognition, which refers, in numerous studies, to an awareness and understanding of how one develops an understanding of texts and uses reading strategies (Artelt et al., 2001; Chiu, Chow, & Mcbride-Chang, 2007; Contractor, 2016; Muszyński & Jakubowski, 2015; Säälik, 2015).

The present study

Considering that reading literacy is a fundamental skill that is essential for to keeping pace with the continuously developing world, it can be asserted that studies aiming to increase literacy is considerably important. In PISA, which includes many different definitions of literacy, the participants of different countries direct their own educational policies based on the findings that PISA implementations yield. In the present study, the responses to the following research questions were sought:

1. Is the mediating role of the variables of enjoyment of reading, the metacognitive strategy of summarizing, the metacognitive strategy of reading and comprehension, and teachers' stimulation of students' participation in reading as perceived by students in the effect of the gender variable on reading literacy in the Turkish sample of PISA 2009 and PISA 2018 significant?

2. Is the mediating role of the variables of enjoyment of reading, the metacognitive strategy of summarizing, the metacognitive strategy of reading and comprehension, and teachers' stimulation of students' participation in reading as perceived by students in the effect of the economic, social, and cultural status index variable on reading literacy in the Turkish sample of PISA 2009 and PISA 2018 significant?

METHOD

Database and sample

In the present study, the data obtained from the reading literacy cognitive test and the student questionnaire administered in PISA 2009 and PISA 2018 for the Turkish sample were utilized. The data were downloaded from the official web page of OECD (https://www.oecd.org/pisa/data/). The present study was based on the Turkish samples of PISA 2009 and PISA 2018. The method of stratified sampling was used to identify the samples of schools to participate in PISA. Initially, the Turkish samples of schools to participate in were selected based on the Statistical Regional Units Classification of Turkey; subsequently, the students to participate in the administration were selected via random sampling. 4996 students (48.9% females, 51.1% males) from 170 schools and 6890 students (49% females, 50.4% males) from 186 schools participated in PISA 2009 and PISA 2018, respectively (MoNE, 2010; MoNE, 2019).

Measures

In the present study, the measures obtained from the reading literacy cognitive test and the student questionnaire administered in PISA 2009 and PISA 2018 for the Turkish sample were utilized.

Reading Literacy Value

Students do not respond to all the questions in the cognitive tests owing to the use of an incomplete test design in the PISA. Instead, multiple imputation is done for each student and the plausible value (PV) is predicted. These PVs are random numbers obtained from the marginal posterior distribution of students' abilities measured in each domain based on the item response theory (IRT) (OECD, 2011). They can be defined as the range of values that the plausible value test scores can assume (OECD, 2002). The reading skill is a highly broad concept and requires the measurement of numerous sub-skills. Many physical and affective conditions during the administration of the test have a significant impact on students' reading performance. For these reasons, defining a range for reading literacy seems to be a plausible approach. In PISA 2009, five (PV1READ – PV5READ) and in PISA 2018, ten (PV1READ – PV10READ) plausible values were obtained for students' reading literacy scores.

Indices from Student Questionnaire

Various indices are calculated by means of related questions in student questionnaire. These indices are scaled by using the weighted maximum likelihood estimate under the one-parameter item response model for two-category items and the Partial Credit Model for items of more than two categories (OECD, 2004, p.306). For each index, a standard score with an average value of 0 and a standard deviation of 1 is obtained. The indices obtained from and used in this questionnaire are as follows:

Economic, Social and Cultural Status. One of the dependents of the current study, the economic, social and cultural status index (ESCS) captures a range of aspects of a student's home and family background that combines information on parents' education and occupations and home possessions (OECD, 2010c, p.29). In the formation of this index, a basic constituent analysis is performed based on three different indices: the highest occupational status of parents (HISEI), highest educational level of parents in years of education according to ISCED (PARED) and home possessions (HOMEPOS) (OECD, 2010a, p.110).

Enjoyment of Reading Activities. The PISA index of enjoyment of reading (JOYREAD) is obtained from students' levels of agreements ("strongly disagree", "disagree", "agree", "strongly agree") to some given statements addressing their attitude to reading (e.g. I only read if I have to). High values in this index obtained from the responses made to five statements in PISA 2009 and PISA 2018 indicate higher levels of enjoyment of reading (OECD, 2010a; OECD, 2019b). This variable was taken as the mediator variable in the present study.

Metacognition Strategies: Summarizing. The index of summarizing (METASUM) was derived from students' reports on the usefulness of the following strategies for writing a summary: (i) I write a summary. Then I check that each paragraph is covered in the summary, because the content of each paragraph should be included; (ii) I try to copy out accurately as many sentences as possible; (iii) before writing the summary, I read the text as many times as possible; (iv) I carefully check whether the most important facts in the text are represented in the summary; and (v) I read through the text, underlining the most important sentences, then I write them in my own words as a summary (OECD, 2010a, p. 113). Students are asked to evaluate these five statements by marking the degree of usefulness on a 6-point likert scale, ranging from 1- not useful at all to 6-very useful. A high index value indicates high student perception regarding the usefulness of this strategy. In the present study, this variable was taken as the mediator variable.

Metacognition Strategies: Understanding and Remembering. The index of understanding and remembering (UNDREM) was derived from students' reports on the usefulness of the following strategies for understanding and memorizing the text. (i) I concentrate on the parts of the text that are easy to understand; (ii) I quickly read through the text twice; (iii) After reading the text, I discuss its content with other people; (iv) I underline important parts of the text; (v) I summarize the text in my own words; and (vi) I read the text aloud to another person (OECD, 2010a, p. 113). Students are asked to evaluate these five statements by marking the degree of usefulness on a 6-point likert scale, ranging from 1- not useful at all to 6-very useful. A high index value indicates high student perception regarding the usefulness of this strategy. In the present study, this variable was taken as the mediator variable.

Data Analysis

The latent variable obtained from the plausible values of reading literacy constitutes the dependent variable of the present study. Studies in the literature report that secondary analyses conducted by selecting one of the plausible values or by taking the average of these values are biased (Laukaityte & Wiberg, 2017) because individual plausible values include random error variance and should not be treated as regular test scores (OECD, 2012). Hence, it was decided in the present study that instead of using a random PV, a latent variable representing students' reading literacy was to be used. By applying the basic constituent analysis to the possible values belonging to 5 reading skills of PISA 2009 and 10 reading skills of PISA 2018, these values were reduced to a single constituent. This basic constituent is referred to as reading literacy. In the present study, gender and economic, social and culture status (ESCS) were selected as independent variables, while the variables of JOYREAD, METASUM and UNDREM were selected as mediator variables. For the missing data in the variables used, the average assignment method was utilized.

In the present study, the causal mediation effect was used to test the mediation model. By analyzing the direct and indirect effects, causal mediation analysis (CMA) determines the total impact level on the dependent variable. While performing mediation analysis, the independent variable (X), the dependent variable (Y) and the mediator variable (M) are utilized. Figure 1 portrays a general form of the model constructed for the mediation analyses performed in the present study.

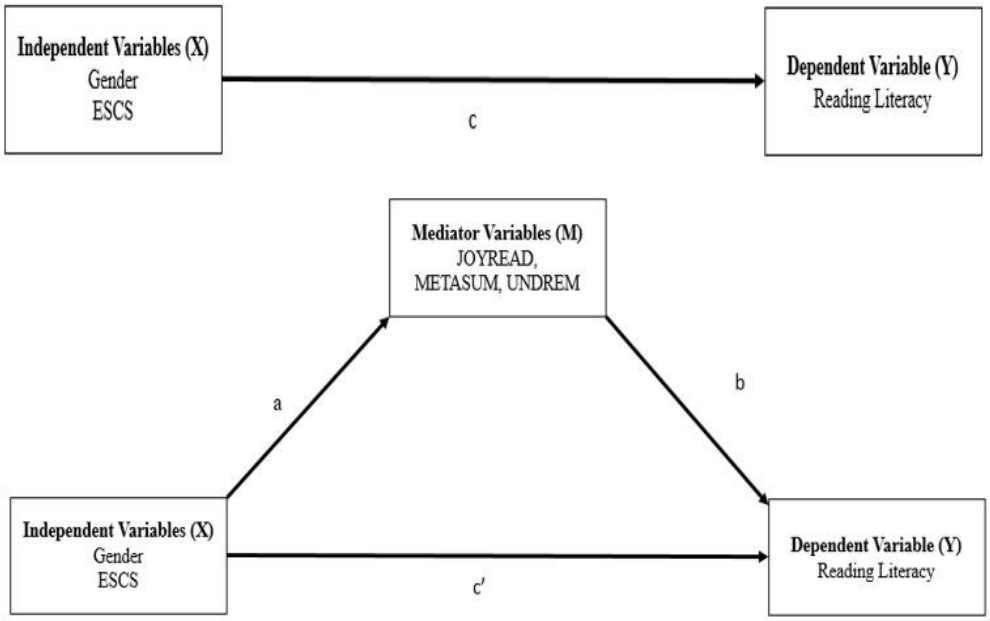

Figure 1. Mediation analysis

In Figure 1, c represents the total effect of X → Y; c'represents the direct effect of X → Y after controlling for the proposed mediator, *a* represents the effect of the independent variable on the mediator, *b* represents the relation of mediator variable (M) to dependent variable (Y) adjusted for the independent variable (X) (MacKinnon et al., 2007). Baron and Kenny (1986) proposed a framework for mediation analysis, which is based on the following system of linear equations: All the text must be written using single line spacing, including the reference list. The article should normally consist of the following parts: introduction, context and review of literature, method, findings, discussion and conclusion.

$$Y = i_1 + cX + e_1 \quad (1)$$

$$M = i_2 + aX + e_2 \quad (2)$$

$$Y = i_3 + c'X + bM + e_3 \quad (3)$$

The term in the equalities is a coefficient estimate of the intercept, and the term e is the regression error term. To conduct a mediator analysis, the *a*, *b*, and *c* coefficients in these equalities need to be significant (Baron & Kenny, 1986). After this condition is secured, mediation effects can be tested. Obtained with the multiplication of the coefficients *a* and *b*, CME is shown in equation 4. This value, calculated by means of *ab* and which is generally the same as the value obtained with c-c', indicates the indirect effect in the model (Rucker et al., 2011). In the present study, four stages were followed: (1) Model-1: The model in which Equation-1 was tested (the condition of the independent variable having a significant effect on the dependent variable), (2) Model-2: The model in which Equation-2 was tested (the condition of the independent variable having a significant effect on the mediator variable), (3) Model-3: The model in which Equation-3 was tested (the condition of a mediator variable significantly predicting a dependent variable) and (4) the identification of whether or not the mediating variable was a partial or full mediator. These models were established and tested 18 times for the two independent variables obtained from the PISA 2009 and PISA 2018 data sets for the four mediator variables. Analyses in the present study were performed via the R software mediation 4.5 package (Tingley, Yamamoto, Hirose, Keele, & Imai, 2014). Thanks to this package, the causal

mediation effect, the direct effects and the total effect could be reported. Moreover, the causal mediation approach has sequential ignorability assumptions, and these cannot be tested. Sequential ignorability is a strong assumption, and therefore a sensitivity analysis is recommended (Tingley et al., 2014, p.13). Therefore, a sensitivity analysis should be conducted for each model constructed. To this end, the sensitivity parameter (ρ) obtained from the correlation between the residuals of the mediator and outcome regressions and the R^2 statistic obtained based on coefficient ρ were examined (Imai, Keele, & Yamamoto, 2010).

FINDINGS

The findings related to the mediating roles of the variables of JOYREAD, METASUM and UNDREM in the effect of the gender variable on reading literacy in the Turkish sample of PISA 2009 are presented in Table 1.

Table 1. Findings regarding the mediating role of the effect of gender on reading literacy in the Turkish sample of PISA 2009

		B	SE(B)	t	p	CME[1] (p)	DE[2] (p)	TE[3] (p)	ab/c[4]
JOYREAD	Model-1 (G -> R)	-.54	.03	20.01	.000	12.6% (.000)	41.9% (.000)	54.5% (.000)	23.1% (.000)
	Model-2 (G -> M)	-.61	.02	26.74	.000				
	Model-3 (G -> R)	-.42	.03	14.62	.000				
	Model-3 (M -> R)	.21	.17	12.40	.000				
METASUM	Model-1 (G -> R)	-.54	.03	20.01	.000	11.7% (.000)	42.8% (.000)	54.5% (.000)	21.5% (.000)
	Model-2 (G -> M)	-.32	.03	11.81	.000				
	Model-3 (G -> R)	-.43	.03	16.64	.000				
	Model-3 (M -> R)	.37	.01	27.67	.000				
UNDREM	Model-1 (G -> R)	-.54	.03	20.01	.000	5.7% (.000)	48.8% (.000)	54.5% (.000)	10.5% (.000)
	Model-2 (G -> M)	-.19	.03	7.04	.000				
	Model-3 (G -> R)	-.49	.03	18.68	.000				
	Model-3 (M -> R)	.30	.01	21.98	.000				

[1]Causal mediation effect (*ab*). [2]Direct effect (*c'*). [3]Total effect (*c*). [4]The ratio of the mediating variable in the total explained variance.

In the Turkish sample of PISA 2009, the effect of the gender variable on reading literacy was found to be statistically significant (B = -.54, t = 20.01, p < .001) (Model-1). The effect of the gender variable on the mediator variable of JOYREAD was also found to be statistically significant (B = -.61, t = 26.74, p < .001) (Model-2). In the last model, Model-3, the effect of JOYREAD as a mediator variable on reading literacy was also found to be significant (B = .21, t = 12.40, p < .001). Thus, all the criteria of the mediation model were found to be obtained. The gender variable was found to account for 54.5% of the variance in reading literacy, and while 23.1% of this variance was accounted for by the dependent variable of JOYREAD, 76.9% of it was explained by the independent variable of gender.

The effect of the gender variable on the mediator variable of METASUM was statistically significant (B = -.32, t = 11.81, p < .001) (Model-2). In the last model constructed as Model-3, the effect of the mediator variable of METASUM on reading literacy was also found to be significant (B =

.37, t = 27.67, p < .001). Thus, all the criteria of the mediation model were found to be obtained. The gender variable was found to account for 54.5% of the variance in reading literacy, and while 21.5% of this variance was accounted for by the mediator variable of METASUM, 78.5% of it was explained by the independent variable of gender.

The effect of the gender variable on the mediator variable of UNDREM was statistically significant (B = -.19, t = 7.04, p < .001) (Model-2). In the last model, constructed as Model-3, the effect of the mediator variable of UNDREM on reading literacy was found to be statistically significant (B = .30, t = 21.98, p < .001). Thus, all the criteria of the mediation model were found to be secured. While 10.5% of the explained variance (54.5%) was accounted for by the mediating variable of UNDREM, 89.5% of it was accounted for by the independent variable of gender.

All Sobel tests are significant at the significance level of .001. Each mediation model expressed partial mediation since the mediator variables explained only one part of the variance in the dependent variable of reading literacy, which was accounted for by the gender variable.

The findings related to the mediation roles of the variables of JOYREAD, METASUM, and UNDREM in the effect of ESCS index variable on reading literacy in the Turkish sample of PISA 2009 are presented in

Table 2. Findings regarding the mediating role of the effect of economic, social and cultural status index on reading literacy in the Turkish sample of PISA 2009

		B	SE(B)	t	p	CME[1] (p)	DE[2] (p)	TE[3] (p)	ab/c[4]
JOYREAD	Model-1 (ESCS -> R)	.37	.01	35.05	.000	.3% (.300)	36.7% (.000)	37.0% (.000)	.8% (.300)
	Model-2 (ESCS-> M)	.01	.01	1.03	.304				
	Model-3 (ESCS -> R)	.37	.01	36.15	.000				
	Model-3 (M -> R)	.29	.01	20.14	.000				
METASUM	Model-1 (ESCS -> R)	.37	.01	35.05	.000	3.7% (.000)	33.3% (.000)	37.0% (.000)	10.1% (.000)
	Model-2 (ESCS-> M)	.11	.01	9.42	.000				
	Model-3 (ESCS -> R)	.33	.01	33.70	.000				
	Model-3 (M -> R)	.35	.01	28.51	.000				
UNDREM	Model-1 (ESCS -> R)	.37	.01	35.05	.000	1.8% (.000)	35.2% (.000)	37.0% (.000)	5.0% (.000)
	Model-2 (ESCS-> M)	.06	.01	5.61	.000				
	Model-3 (ESCS -> R)	.35	.01	34.92	.000				
	Model-3 (M -> R)	.29	.01	22.99	.000				

[1]Causal mediation effect (ab). [2]Direct effect (c'). [3]Total effect (c). [4]The ratio of the mediating variable in the total explained variance.

The effect of the ESCS index variable on reading literacy was found to be statistically significant (B = -.37, t = 35.05, p <.001) in the Turkish sample of PISA 2009 (Model-1). On the other hand, the effect of ESCS index variable on the mediator variable of JOYREAD was not found to be statistically significant (B = .01, t = 1.03, p = .304) (Model-2). In the last model constructed as Model-3, the effect of the mediating variable of JOYREAD on reading literacy was found to be significant (B = .29, t = 20.14, p <.001). In this case, not all the criteria of the mediation model were secured. ESCS index variable accounted for 37.0% of the variance in reading literacy, and .8% of this variance is

accounted for by the mediating variable of JOYREAD and 99.2% by the independent variable of ESCS index. In this case, it was found that the mediation model constructed for JOYREAD was not confirmed.

The effect of the ESCS index variable on the mediator variable of METASUM was found to be statistically significant (B = -.11, t = 9.42, p <.001) (Model-2). In the last model constructed as Model-3, the effect of the mediator variable of METASUM on reading literacy was also found to be significant (B = .35, t = 28.51, p <.001). In this case, all the criteria of the mediation model were secured. ESCS index variable accounts for 37.0% of the variance in reading literacy, and 10.1% of this variance was accounted for by the mediator variable of METASUM and 89.9% by the independent variable of ESCS index.

The effect of the ESCS index variable on the mediator variable of UNDREM was found to be statistically significant (B = .06, t = 5.61, p <.001) (Model-2). In the last model constructed as Model-3, the effect of the mediator variable of UNDREM on reading literacy was also found to be significant (B = .29, t = 22.99, p <.001). In this case, all the criteria of the mediation model were secured. Of the explained variance (37.0%), 5.0% was accounted for by the mediator variable of UNDREM, and 95.0% was accounted for by the independent variable of ESCS index.

None of the Sobel tests was significant at the significance level of .001. Since only the mediator variables of METASUM and UNDREM accounted for only one part of the variance in the dependent variable of reading literacy, which was accounted for by the ESCS index variable, the mediation model constructed for these two variables indicated partial mediation.

Table 3 presents the findings related to the mediating roles of the variables of JOYREAD, METASUM and UNDREM in the effect of the gender variable on reading literacy in the Turkish sample in PISA 2018.

Table 3. Findings of the mediation test regarding the effect of gender on reading literacy in the Turkish sample of PISA 2018

		B	SE(B)	t	p	CME[1] (p)	DE[2] (p)	TE[3] (p)	ab/c[4]
JOYREAD	Model-1 (G -> R)	-.32	.02	13.36	.000				
	Model-2 (G -> M)	-.74	.02	34.41	.000				
	Model-3 (G -> R)	-.16	.03	6.41	.000	15.6% (.000)	16.2% (.000)	31.8% (.000)	49.0% (.000)
	Model-3 (M -> R)	.21	.01	16.09	.000				
METASUM	Model-1 (G -> R)	-.32	.02	13.36	.000				
	Model-2 (G -> M)	-.42	.02	18.88	.000				
	Model-3 (G -> R)	-.17	.01	7.24	.000	15.2% (.000)	16.6% (.000)	31.8% (.000)	47.7% (.000)
	Model-3 (M -> R)	.36	.01	29.76	.000				
UNDREM	Model-1 (G -> R)	-.32	.02	13.36	.000				
	Model-2 (G -> M)	-.39	.02	17.79	.000				
	Model-3 (G -> R)	-.21	.02	8.87	.000	10.9% (.000)	20.8% (.000)	31.8% (.000)	34.4% (.000)
	Model-3 (M -> R)	.28	.01	22.21	.000				

[1]Causal mediation effect (ab). [2]Direct effect (c'). [3]Total effect (c). [4]The ratio of the mediating variable in the total explained variance.

The effect of the gender variable on reading literacy was found to be statistically significant (*B* = -.32, *t* = 13.36, *p* <.001) in the Turkish sample of PISA 2009 (Model-1). The effect of the gender variable on the mediator variable of JOYREAD was found to be statistically significant (*B* = -.74, *t* = 34.41, *p* <.001) (Model-2). In the last model constructed as Model-3, the effect of the mediator variable of JOYREAD on reading literacy was also found to be significant (*B* = .21, *t* = 16.09, *p* <.001). In this case, all the criteria of the mediation model were secured. The gender variable was found to account for 31.8% of the variance in reading literacy; of this variance, 49.0% was accounted for by the mediator variable of JOYREAD, and 51% was accounted for by the independent variable of gender.

The effect of the gender variable on the mediator variable of METASUM was found to be statistically significant (*B* = -.42, *t* = 18.88, *p* < .001) (Model-2). In the last model constructed as Model-3, the effect of the mediator variable of METASUM on reading literacy was also found to be significant (*B* = .36, *t* = 29.76, *p* < .001). In this case, all the criteria of the mediation model were secured. The gender variable was found to account for 31.8% of variance in reading literacy; of this variance, 47.7% was accounted for by the mediating variable of METASUM, and 52.3% was accounted for by the independent variable of gender.

The effect of the gender variable on the mediator variable of UNDREM on reading literacy was found to be statistically significant (*B* = -.39, *t* = 17.79, *p* < .001) (Model-2). In the last model constructed as Model-3, the effect of the mediator variable of UNDREM on reading literacy was also found to be significant (*B* = .28, *t* = 22.21, *p* <.001). In this case, all the criteria of the mediation model were secured. Of the explained variance (31.8%), 34.4% was accounted for by the mediating variable of UNDREM, and 65.6% was accounted for by the independent variable of the gender variable.

All of the Sobel tests were found to be significant at the significance level of .001. Since the mediator variables accounted for only one part of the variance in the dependent variable of reading literacy, which was accounted for by the gender variable, each mediating model indicated partial mediation.

Table 4 presents the findings related to the mediating roles of the variables of JOYREAD, METASUM and UNDREM in the effect of ESCS index variable on reading literacy in the Turkish sample in PISA 2018.

Table 4. Findings regarding the mediating role of the effect of economic, social and cultural status index on reading literacy in the Turkish sample of PISA 2018

		B	SE(B)	t	p	CME[1] (p)	DE[2] (p)	TE[3] (p)	ab/c[4]
JOYREAD	Model-1 (ESCS -> R)	.30	.01	3.88	.000	.8% (.000)	28.9% (.000)	29.7% (.000)	2.5% (.000)
	Model-2 (ESCS -> M)	.04	.01	3.58	.000				
	Model-3 (ESCS -> R)	.29	.01	3.87	.000				
	Model-3 (M -> R)	.23	.01	2.0	.000				
METASUM	Model-1 (ESCS -> R)	.30	.01	3.88	.000	2.6% (.000)	27.1% (.000)	29.7% (.000)	8.9% (.000)
	Model-2 (ESCS -> M)	.08	.01	7.81	.000				
	Model-3 (ESCS -> R)	.27	.01	29.91	.000				
	Model-3 (M -> R)	.35	.01	31.11	.000				

UNDREM	Model-1 (ESCS -> R)	.30	.01	3.88	.000	.8% (.000)	28.9% (.000)	29.7% (.000)	2.5% (.000)
	Model-2 (ESCS -> M)	.03	.01	2.72	.007				
	Model-3 (ESCS -> R)	.29	.01	31.42	.000				
	Model-3 (M -> R)	.29	.01	25.12	.000				

[1]Causal mediation effect (*ab*). [2]Direct effect (*c'*). [3]Total effect (*c*). [4]The ratio of the mediating variable in the total explained variance.

The effect of the ESCS index variable on reading literacy was found to be statistically significant ($B = .30$, $t = 3.88$, $p < .001$) in the Turkish sample of PISA 2018 (Model-1). The effect of ESCS index variable on the mediator variable of JOYREAD was also found to be statistically significant ($B = .04$, $t = 3.58$, $p < .001$) (Model-2). In the last model constructed as Model-3, the effect of the mediator variable of JOYREAD on reading literacy was also found to be significant ($B = .23$, $t = 2.0$, $p < .001$). In this case, all the criteria of the mediation model were secured. ESCS index variable was found to account for 29.7% of variance in reading literacy; of this variance, 2.5% was accounted for by the mediator variable of JOYREAD, and 97.5% was accounted for by the independent variable of ESCS index.

The effect of ESCS index variable on the mediator variable of METASUM was found to be statistically significant ($B = .08$, $t = 7.81$, $p < .001$) (Model-2). In the last model constructed as Model-3, the effect of the mediator variable of METASUM on reading literacy was also found to be significant ($B = .35$, $t = 31.11$, $p < .001$). In this case, all the criteria of the mediation model were secured. ESCS index variable was found to account for 29.7% of the variance in reading literacy; of this variance, 8.9% was accounted for by the mediator variable of METASUM, and 91.1% was accounted for by the independent variable of ESCS index.

The effect of the ESCS index variable on the mediator variable of UNDREM was found to be statistically significant ($B = .03$, $t = 2.72$, $p = .007$) (Model-2). In Model-3, the effect of the mediator variable of UNDREM on reading literacy was also found to be significant ($B = .29$, $t = 25.12$, $p < .001$). In this case, all the criteria of the mediation model were secured. Of the explained variance (29.7%), 2.5% was accounted for by the mediating variable of UNDREM, and 97.5% was accounted for by the independent variable of ESCS index.

All Sobel tests were significant at the significance level of .05. Since the mediator variables accounted for one part of the variance in the dependent variable of reading literacy, which was accounted for by ESCS index variable, the mediation model constructed for each variable indicated partial mediation.

The ρ value for the sensitive analysis performed for each model constructed was also analyzed. Even though it is accepted that when $\rho \neq 0$, the sequential ignorability assumption is violated (Imai et al., 2010), there is no certain cutoff value for this statistic (Zhang et al., 2016). The magnitude of this correlation coefficient represents departure from the ignorability assumption (Imai et al., 2010). In the present study, it was found that the ρ coefficient obtained for each model was different from zero. Hence, the model can be said to include unmeasured confounders. As it is difficult to interpret this value, the R^2 statistic, which refers to "the proportions of original variances explained by the unobserved confounder" was developed. In the present study, the R2 value obtained from the models constructed ranged between .10 and .05. For this reason, it was concluded in the present study that the effect of the unmeasured confounders in the models constructed was small and sensitivity was partially secured in all of the models.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

In the present study, whether or not various variables had a mediating role in the effect of the gender and ESCS index variables on reading literacy in the Turkish sample of PISA 2009 and PISA 2018 was investigated. The causal mediation effect was utilized in testing the mediation model constructed. Since it displays both direct and indirect effects, causal mediation analysis is utilized in many studies conducted in many different fields of study (Keele, Tingley, & Yamamoto, 2015; VanderWeele, 2011; Walters, 2011).

In the present study, which was based on the data sets of PISA 2009 and PISA 2018 since it was in those PISA administrations when a higher weighting was placed on reading literacy and in which a sample of Turkish students participated, the same results were obtained for both years in the models where the independent variable was the gender variable. In the effect of the gender variable on reading literacy, the variables of JOYREAD, METASUM, and UNDREM had a partial mediating role, and the effects obtained from these models were significant.

OECD (2010b) reports that there is a significant gender gap in students' reading performances and that girls consistently score ahead of boys. In a study conducted by Klecker (2006), it was revealed that this gender gap increased as the level in grade at school increased. One of the reasons of this gap, as identified in numerous studies, can be attributed to the fact that female students enjoy reading activities more than male students do (Clark & Foster, 2005; Clark & Rumbold, 2006; OECD, 201b) because in the literature, it is reported that students who enjoy reading tend to have a higher level of reading performance (Neff, 2015; Perkins et al., 2011; Schiefele, 2009). For example, in a study conducted by Shiel (2006), it was found that there was a positive relationship between frequency of reading and reading performance and that those students who engaged in reading in their leisure time had a significantly higher mean score on the PISA reading literacy. Chiu and McBride-Chang (2006) used the PISA data set to examine the variance accounted for by gender in reading performance and enjoyment in reading and found that enjoyment in reading had a mediating role accounting for 42% of the gender gap. In the present study, it was revealed that the gender variable accounted for a significant part of the variance in reading literacy. Taken as a mediator variable in the present study, the variable of JOYREAD had a higher level of contribution to the revealed variance than the other mediator variables. That is, in the present study, the most powerful mediator variable used in the effect of the gender variable on the reading literacy of the Turkish students participating in PISA 2009 and PISA 2018 is enjoyment of reading. It was revealed that the other mediator variables also had a mediating role in both years. The order of importance of the mediator variables is as follows: METASUM and UNDREAD.

The variable of ESCS, which was taken as the independent variable in the present study, is a variable that is taken into consideration in educational research (Thomson et al., 2013; Schulz, 2005). As this variable can lead to an achievement gap among students' levels of achievement, it was also taken into consideration in the present study. Depending on the data set used in the models constructed with ESCS, different results were obtained. In the model constructed for the Turkish sample in PISA 2009, it was revealed that ESCS accounted for variance in reading literacy to a great extent, but the mediator variables accounted for the variance at very low degrees. Thus, even though the variables of METASUM and UNDREAD were mediator variables of statistical significance, it can be stated that none of the mediator variables could show a mediating role between ESCS and reading as the explained variance was very low.

In the model constructed for the Turkish sample of PISA 2018, it was revealed that ESCS accounted for reading literacy to a great extent but its accountability of the variance in the PISA 2009 administration fell. This finding can be interpreted as a slight drop in the effect of socioeconomic status on educational outcomes. It was revealed that the mediator variables used for the PISA 2018 data accounted for the variance at very low rates. Thus, even though the variables of JOYREAD, METASUM and UNDREAD were mediator variables of statistical significance, none of the mediating

variables could display a mediating feature between ESCS and reading as the variance accounted for was very low.

In conclusion, in the development of reading literacy, not only acquisition of skills and knowledge, but also cognitive and non-cognitive attributes are quite effective (Guthrie & Wigfield, 2000). Educational plans should be done to reduce the impact of these conditions leading to variance in students' reading performances and particularly conditions of usage of metacognitive strategies and enjoyment of reading and to minimize variance in conditions of the use of metacognitive strategies and enjoyment in reading based on the variable of gender. For the inequalities that can be experienced in terms of gender and socioeconomic status in reading literacy, teachers and educational practitioners can be recommended to show the required interest in such conditions as enjoyment of reading, use of metacognition strategies and teachers' stimulation of students. One of the greatest disadvantages is conducting an analysis by using secondary data. More plausible results could be arrived at with analyses to be conducted by taking under control the variables that are very important for the study. The fact that PISA 2009 was a paper and pencil test and PISA 2018 was a computer based test may have caused unpredicted effects on the results of the study. This study can be replicated by using different countries to conduct comparative studies. Various variables that can affect especially the independent and dependent variables in the study can be added to the mediation models established in the study as covariate variables. Thus, more accurate predictions of the revealed variance values related to the mediation model can be made.

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