International Journal of Languages' Education and Teaching
Volume 8, Issue 2, June 2020, p. 285-303

Received	Reviewed	Published	Doi Number
01.05.2020	03.06.2020	20.06.2019	10.29228/ijlet.43283

The Gender Variable in Language Development in the Early Childhood Period: A Meta-Analysis of the Studies Carried Out In Turkey

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ABSTRACT

The purpose of this study is to investigate the effect of gender variable in studies conducted on language development in the early childhood period and obtain a general point of view on this issue. A meta-analysis method was used in the study. The thesis studies and research articles published in Turkey between 1995 and 2009 on the gender variable in language development in the early childhood period were investigated under the scope of this study. A total of 49 data sets from 36 studies which conformed the inclusion and exclusion criteria of the study were included in the current study. The data analysis was performed through CMA Version 2.0 statistical program. Due to the diversity of the sample sizes of the covered studies, the random-effects model was adopted to calculate and interpret the effect size. The results of the study revealed that the effect of gender on children's language development is quite low. Based on this finding, it can be stated that gender has a negligible effect on children's language development. Therefore it is suggested that later studies on this issue may focus on other primary factors rather than variables such as gender.

Key Words: Language development, gender, early childhood education.

Erken Çocukluk Dönemi Dil Gelişiminde Cinsiyet Değişkeni: Türkiye'de Yapılan Çalışmaların Meta Analizi

ÖZET

Bu çalışmanın amacı, erken çocukluk döneminde dil gelişimi alanında yapılan çalışmalarda cinsiyet değişkenini incelemek ve bu konuda genel bir görüş elde etmektir. Çalışmada meta analiz yöntemi kullanılmıştır. Çalışma kapsamında 1995-2019 yılları arasında Türkiye'de dil gelişimi ile ilgili yapılan çalışmalarda cinsiyet değişkenini inceleyen lisansüstü tezler ve bilimsel makaleler incelenmiştir. Araştırmanın dahil etme ve hariç tutma kriterlerine uyan 36 çalışmanın 49 adet veri seti araştırma kapsamına alınmıştır. Verilerin analizi, CMA Ver. 2.0 istatistik programı ile gerçekleştirilmiştir. Bu çalışmada her bir çalışmanın örneklemi farklı olduğu için etki büyüklüklerinin hesaplanması ve yorumlanmasında rastgele etkiler modeli kullanılmıştır. Araştırma sonuçları, cinsiyetin çocukların dil gelişimleri üzerindeki etkisinin çok düşük düzeyde olduğunu göstermiştir. Bu sonuca dayanarak, cinsiyetin çocukların dil gelişimleri üzerinde önemsiz bir etkiye sahip olduğu söylenebilir. Dolayısıyla araştırmacıların bundan sonra yapılacak olan çalışmalarda bu tür değişkenler yerine daha birincil etkenleri incelemeye yönelmeleri önerilmektedir.

Anahtar Kelimeler: Dil gelişimi, cinsiyet, erken çocukluk eğitimi.

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1. Introduction

Starting from birth individuals use language as a tool to communicate with their environment, understand the situation and events happening around them, get to know the society and take place in the society which they live in. Language is an important means of communication which enables a person to be able to express himself, communicate with others, and transfer the knowledge about the experiences and various cultural heritage (Erdoğan, Şimşek Bekir & Erdoğan Aras, 2005). Children explore the world and acquire the necessary principles, knowledge, words, and structures using the language. The early childhood period covers the ages between 0 and 8, and it is considered as an important period in which the children's character formation starts, and they acquire the basic knowledge, skills, and habits (Ergin, 2012). Language and speaking skills are considered as important developmental skills which affect children's social and academic lives, and even the quality of their lives (Diken, 2009). The first three years is known as the critical period in terms of brain development. Children who are between eight months and 3 years of age experience a rapid process which includes the development of skills as understanding and using language. In this period, the infants switch from syllables to words, and from words to sentences with two-three words. However, the children reach these language development stages at different ages (Karabekiroğlu, 2009).

The components of the language are classified as phonology (phonology), morphology (morphology), syntax (syntax), semantics (semantics) and pragmatic (knowledge of use) according to the psycholinguistic approach (Chomsky, 1963). Slobin (1979) states that infants first learn phonemes which are the smallest units of the language. Morphemes which are words produced through combining phonemes according to certain rules can be seen in the sixth month when they begin producing syllables. Children's producing their first words in 12th-18th months shows that morphemes are acquired. Later between 15th and 18th months when the children use two or more words together, they start acquiring semantics (meaning) and syntax (word order). Using two or more words together requires learning grammar rules. By means of these rules, children can express themselves by forming complex sentences at the age of 4. When they are 5 years old they learn the sentence formation and grammar rules thoroughly (Fletcher and Garman, 1986). Children whose mother tongue is Turkish learn the suffix system of Turkish, which is an agglutinative language, at an early age that corresponds to the age of two and can use these suffixes correctly even when speaking in one word, simple, short expressions (Aksu-Koç & Slobin, 1985). By the age of two children can use word order pragmatically in their speech, and they can comprehend the subject-object-verb (SOV) structure (Slobin & Bever, 1982). Although children usually produce their first words in the 12th month due to genetic and environmental effects this period is accepted between 8th and 18th months. Many studies show a slight difference in the development of vocabulary in favor of girls until the age of two, but boys gradually catch up with them. The physical maturation rate of girls is faster according to the biological view, also it is believed that their brain's left hemispheres develop earlier (Berk, 2006). On the other hand, in the acquisition of language the genetic elements (Chomsky, 1963) and physiologic characteristics such as age and gender (Berk, 2006) of the children are effective. In addition to these, environmental factors that have an impact on language acquisition processes lead to lower levels of language achievement of children who lack environmental stimuli (Slobin & Bever, 1982). It is known that many other variables such as socioeconomic status, educational background of parents, health status, and intelligence level also affect language development (Tümkaya, 2008; Yavuzer, 1993; Öztürk, 1995). For centuries, apart from these factors, whether gender has an impact on individuals' intelligence or academic achievement has been

subjected to many studies (Fennema, Carpenter, Jacobs, Franke & Levi, 1998). However, differences in abilities that vary depending on gender are not yet fully explained today.

Though many studies in the literature mention gender as a predictor in language development, the studies conducted lately revealed that there exist no statistically significant difference according to gender in the later ages of children (Temel, 2000; Erdoğan et al., 2005). According to the studies on the relationship between gender variable and language development, girls' social interactions are more speaking-oriented compared to boys (Leaper, 1994). Additionally, it is highlighted that the female infants reacted more to verbal stimuli while male infants reacted to visual stimuli. On the other hand, it is stated that since mothers tend to communicate with their daughters mostly through speaking while they tend to communicate with their sons mostly by touching, the language development of girls is faster (Koçak, 2000; Gövsa, 1998). In a study with 2,500 English speaking children who were 8-30 months old, Fenson, Dale, Reznick, Bates, Thal and Pethick (1994) reported that parents used more communicative and symbolic gestures with girls compared to boys, therefore girls had a more comprehensive and meaningful vocabulary. In another study, it was stated that mothers tend to talk more with their daughters than their sons (Leaper, Anderson & Sanders, 1998). In the early years, girls have a higher number of vocabulary than boys. Similarly, the sentences produced by boys were shorter and their grammar structures and pronunciations were faulty compared to girls (Aral, Baran, Bulut & Çimen, 2000). In an investigation of gender differences in cognitive functioning, Maccoby and Jacklin (1974) concluded that girls' verbal abilities mature faster than boys, but they could not find any solid evidence for this deviation before the age of 11. Many studies in the literature revealed that early language development is in favor of girls with a lower but consistent pattern (Wallentin, 2008; Bornstein & Haynes, 1998; Fenson et al., 1994; Eriksson, Marschik, Tulviste, Almgren, Pereira, Wehberg, Marjanovič- Umek, Gayraud, Kovačevič & Gallego, 2012). According to the findings, girls speak earlier, acquire the grammar of the language faster, use longer expressions, and they know more vocabulary throughout early childhood compared to boys. Additionally, girls whose native language is Turkish begin to produce two-word sentences in 14-16 months, while boys start to produce them in 17-22 months (Temel, Bekir & Yazıcı, 2014).

On the other hand, the studies conducted with children in different developmental periods revealed no statistically significant results in favor of either of the genders in language development, even if certain differences were observed. Although the findings of many studies revealed a small but consistent effect of gender on the language development at early ages in favor of girls, it was found out that the size of this effect depends on both the girls'/boys' ages and the measured language skills (Bouchard, Trudeau, Sutton, Boudreault & Deneault, 2009; Simonsen, Kristoffersen, Bleses, Wehberg & Jorgensen, 2014). In a study conducted with infants (16-30 months) gender differences were detected in terms of the number of the words produced (Eriksson et al., 2012); on the other hand, in a study with 8-24 months old infants, small differences were found between girls and boys in the number of vocabulary. Similarly, gender differences were mentioned in children smaller than 36 months in terms of understanding the language, word production, and grammar skills (Zhang, Jin, Shen, Zhang & Hoff, 2008), it is stated that after this period boys reach the same level regarding language skills (Farrant, Mattes, Keelan, Hickey & Whitehouse, 2013; Simonsen et al., 2014). Based on these findings, it is clear that the findings of the previous studies in the literature are not consistent regarding the effect of gender on children's language development. In this respect, it is considered that this study can contribute to the literature in terms of providing a comprehensive investigation of the effect of gender variable on children's language

development in the sample of Turkey, as well as providing a different point of view on this issue. Additionally, it is considered this study will be beneficial since it is the first attempt to conduct a meta-analysis on the studies on the effects gender differences in language development in Turkey and provide suggestions on the issue.

Purpose of the research

The purpose of this study is to investigate the effect of gender variable on language development in early childhood using the meta-analysis method. In this respect, the findings of the studies which were conducted in Turkey between 1995 and 2019 years to determine the effect of gender variable on language development at the early childhood period were analyzed. The answers to the following research questions were sought in this study:

1. Is the effect of gender variable on children's language development significant?

2. Is the age variable a moderator variable for the gender that affects children's language development?

2. Method

Research design

This study adopted a meta-analysis method to determine the effect of gender on the language development of children. Meta-analysis is a method of comparing and analyzing the numerical data of different studies conducted on the same subject and making inferences about the results of these studies (Borenstein, Hedges, Higgins & Rothstein 2013). The meta-analysis method which aims to obtain an overall result merging the results obtained from different studies (Dinçer, 2014) is considered as a powerful approach to summarize and merge the results of studies (Card, 2012). Therefore, under the scope of this study, the findings of the studies on the effect of gender on children's language development were merged and an overall point of view was developed on the issue.

Data collection

The studies included in the analysis are the studies that present statistical data to determine the effect of gender variable on language development in early childhood. In order to determine these studies YÖK (Council of Higher Education) National Thesis Center, ERIC, ULAKBİM (Turkish Academic Network and Information Center), and Google Scholar databases were used. During the search, the keywords as "language and gender", and "early childhood education and language" were used in both Turkish and English, while the keywords as "child and gender", "language development and gender" were used only in Turkish. The studies published before the 31st of January, 2019 were included in the study. Inclusion and exclusion criteria determined in the selection of studies are listed below:

Inclusion criteria

- The studies conducted in Turkey between 1995 and 2019 years which investigate the effect of gender variable on the language development of 0-8-year-old children with normal development,
- Articles published in peer-reviewed scientific journals, and published master's or doctoral theses in the fields of education, psychology, and linguistics,
- The studies to be included in the study need to include the necessary statistical values in terms of the gender variable. Therefore, studies using quantitative or experimental research methods,

- Since experimental studies reveal the language development of children more effectively experimental group results or posttest findings according to the gender variable were included in the analysis.

Exclusion criteria

- Studies examining the gender variable separately on the basis of the dimensions of the scales were not included in the analysis.
- In the studies using scales measuring more than one development area, only the findings of the scales measuring the area of language development were included in the analysis. In the studies using multiple language development scales, the findings indicated for each scale were analyzed separately. In this respect, more than one set of data were included in the analysis. That's the reason why the number of studies included in the analysis and the number of data sets analyzed do not match.
- The theses which are not open access on YÖK (Council of Higher Education) database and the articles derived from the open access theses were not included in the analysis.

After determining the inclusion and exclusion criteria of the study, the researchers started the review of the literature. In order to determine the studies to be included in this study, first, the keywords were entered and searched in the related databases. All of the studies which included the keywords in their titles or abstracts were downloaded and saved as PDF. In this way, 183 studies were accessed among which 98 were graduate theses from the YÖK (Council of Higher Education) Thesis database, and 85 were articles from other databases. First, the abstract sections of these studies were investigated, and the ones which do not conform with the purpose of this study were eliminated. Secondly, the remaining studies were investigated one by one according to the inclusion criteria and the unsuitable studies were eliminated. The inclusion process of the accessed studies as a result of the literature review is presented in the following diagram:

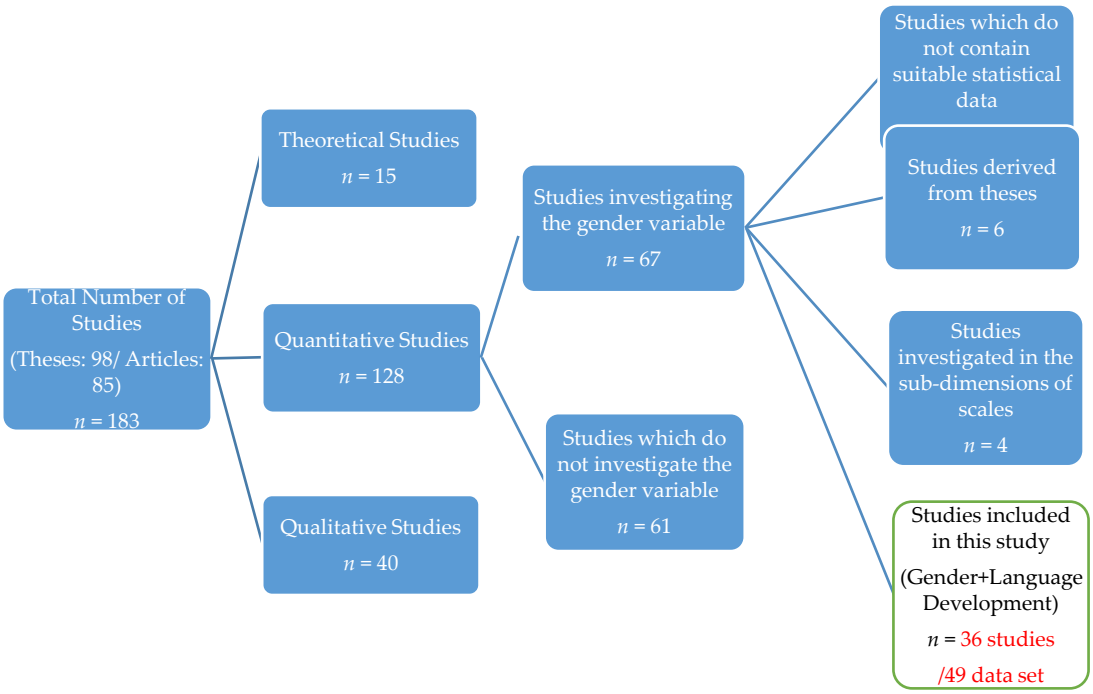

Figure 1. Flow diagram of the studies included in this study

Coding the data

First of all, all of the studies were saved in PDF file format. Later, each study is listed by the author's name in a Microsoft Excel file. The data gathered under the scope of the study were coded in two stages. In the first stage, meta-data information of the studies, and the content of the studies were presented in eight sub-categories. These categories are author name, year of publication, type of publication, sample region, sample size, method of study, sample group (age group) and measurement tool used in the study. For each of these sub-categories, one column was spared in MS Excel and the categories of each column were determined. Later, the categorical data of each study were coded into the relevant columns. In the second stage, the number of the participants, mean scores, standard deviation, t-value and p-value which will be used in the meta-analysis are included. As in the first stage, one column for each category was spared in MS Excel and the quantitative data of the related studies were entered in these columns. The effect size for each study and the overall effect size including all studies were calculated using the data obtained during the coding process. Accordingly, information on the studies to be included in the current study is presented in Table 1.

Table 1. *Information on the studies included in the meta-analysis*

Studies	Year	Publication Type	Age Group	Type of the Scale
1.Doğru et al., 2010	2010	article	4-6 years	Peabody Picture Vocabulary Test
2.Erdoğan,Şimşek Bekir,Erdoğan Aras,2005 a	2005	article	4-6 years	Descoeudres Language Test, Peabody Picture Vocabulary Test
3.Erdoğan,Şimşek Bekir,Erdoğan Aras,2005 b	2005	article	4-6 years	Descoeudres Language Test, Peabody Picture Vocabulary Test
4.Erdoğan,Şimşek Bekir,Erdoğan Aras,2005 c	2005	article	4-6 years	Descoeudres Language Test, Peabody Picture Vocabulary Test
5.Erkan,2011	2011	article	7-8 years	Metropolitan School Readiness Test
6.Ersan,2015	2015	article	0-3 years	Peabody Picture Vocabulary Test
7.Gökçay et al.,2000	2000	article	0-3 years	Denver II Developmental Screening Language Sub-Scale
8.İpek,Bilgin,2007	2007	article	7-8 years	Peabody Picture Vocabulary Test
9.Kandır, Orçan,2009	2009	article	4-6 years	Early Learning Skills Assessment Scale Language Sub-Test
10.Koçak,Ergin,Yalçın,2014	2014	article	4-6 years	Descoeudres Dictionary Test
11.Önder,Gülay,2010	2010	article	4-6 years	Marmara Developmental Scale
12.Özekes,2016 a	2016	article	4-6 years	Peabody Picture Vocabulary Test
13.Özekes,2016 b	2016	article	4-6 years	Peabody Picture Vocabulary Test

14.Özkara,2014	2014	article	4-6 years	Peabody Picture Vocabulary Test
15.Taner and Başal,2005	2007	article	7-8 years	Peabody Picture Vocabulary Test
16.Taşkın,Tuğrul,2014	2014	article	4-6 years	Bracken Basic Concept Test, Peabody Picture Vocabulary Test
17.Tepeli and Karadeniz,2013	2013	article	7-8 years	Peabody Picture Vocabulary Test
18.Yaman, Danacı, Eran, 2015	2015	article	4-6 years	Denver II Developmental Screening Test
19.Yıldırım Doğru, Alabay Kayılı, 2010	2010	article	4-6 years	Peabody Picture Vocabulary Test
20.Yıldırım et al., 2010	2010	Article	4-6 years	Peabody Picture Vocabulary Test
21.PhD-Keklik,2009 a	2009	thesis	7-8 years	Achievement Test
22. PhD -Keklik,2009 b	2009	thesis	7-8 years	Achievement Test
23.PhD-Şimşek Bekir, 2004	2004	thesis	4-6 years	Peabody Picture Vocabulary Test, Descoeudres Dictionary and Language Test
24.MA-Ünüvar,2006 a	2006	thesis	4-6 years	Limbosh and Wolf Dictionary and Language Test
25.MA-Ünüvar,2006 b	2006	thesis	4-6 years	Limbosh and Wolf Dictionary and Language Test
26.MA-Tulu,2009 a	2009	thesis	4-6 years	Peabody Picture Vocabulary Test, Descoeudres Dictionary, Limbosh and Wolf Dictionary Test
27.MA-Tulu,2009 b	2009	thesis	4-6 years	Peabody Picture Vocabulary Test, Descoeudres Dictionary, Limbosh and Wolf Dictionary Test
28.MA-Akay, 2017	2017	thesis	4-6 years	Marmara Readiness Test, Mental and Language Development Sub-Scale
29.MA-Emre Bolatbaş,2017 a	2017	thesis	0-3 years	GEÇDA (Gazi Early Childhood Assessment Tool) - Language
30.MA-Emre Bolatbaş,2017 b	2017	thesis	0-3 years	GEÇDA (Gazi Early Childhood Assessment Tool) - Language
31.MA-Kaçar,2016	2016	thesis	4-6 years	Peabody Picture Vocabulary Test and Language Use Scale
32.MA-Önkol Şengül, 2007	2007	thesis	4-6 years	Language Use Scale
33.MA-Şeker,2010 a	2010	thesis	4-6 years	Language Use Scale
34.MA-Şeker,2010 b	2010	thesis	4-6 years	Language Use Scale
35.MA-Kefi, 1999	1999	thesis	4-6 years	Portage Early Childhood Education Language Checklist

36.MA-Koç, 2009	2009	thesis	4-6 years	Peabody Picture Vocabulary Test
37.MA-.Çat Şahin,2009 a	2009	thesis	4-6 years	Dictionary and Language Test, Descoeudres Language Test, Peabody Picture Vocabulary Test
38.MA-Çat Şahin,2009 b	2009	thesis	4-6 years	Dictionary and Language Test, Descoeudres Language Test, Peabody Picture Vocabulary Test
39.MA-Çat Şahin,2009 c	2009	thesis	4-6 years	Dictionary and Language Test, Descoeudres Language Test, Peabody Picture Vocabulary Test
40.MA-Uğurtay Üstünel, 2007 a	2007	thesis	4-6 years	Bracken Basic Concept Scale
41.MA-Uğurtay Üstünel, 2007 b	2007	thesis	4-6 years	Bracken Basic Concept Scale
42.MA-Uğurtay Üstünel, 2007 c	2007	thesis	4-6 years	Bracken Basic Concept Scale
43.MA-Yıldırım,2008 a	2008	thesis	4-6 years	Limbosh and Wolf Dictionary Language Test
44.MA-Yıldırım,2008 b	2008	thesis	4-6 years	Limbosh and Wolf Dictionary Language Test
45.MA-Ergin, 2012	2012	thesis	4-6 years	Peabody Picture Vocabulary Test
46.MA-Çoban Söylemez, 2016 a	2016	thesis	4-6 years	Bracken Basic Concept Scale
47.MA-Çoban Söylemez, 2016 b	2016	thesis	4-6 years	Bracken Basic Concept Scale
48.MA-Koşan,2015 a	2015	thesis	7-8 years	Peabody Picture Vocabulary Test
49.MA-Koşan,2015 b	2015	thesis	7-8 years	Peabody Picture Vocabulary Test

Data analysis

The data analysis of this study was conducted through CMA Version 2.0 [Comprehensive Meta-Analysis] statistical program. At the end of the meta-analysis of the data the mean effect size, general effect size, confidence intervals for effect size, the significance value (p), and test of homogeneity were conducted for each study. In the calculation of effect size "Hedge's g" value was used and the significance level of statistics was determined as 95%.

Meta-analysis studies are analyzed according to two main approaches; fixed effects model and the random effects model each of which has different assumptions in terms of the statistical process. Since the sample of each study is different and it is aimed to reveal this difference between the studies the current study adopted the random effects model in the calculation and interpretation of effect sizes. The experimental group in this study was selected as girls while the control group included boys. Therefore,

the positive effect size will be interpreted in favor of girls, while any negative result will be interpreted in favor of boys. At the end of meta-analysis, the interpretation of the obtained effect sizes can be interpreted according to the categorization. The present study adopted the following effect size categorization by Cohen (1992):

- If between 0.20 and 0.50 there is a small effect.
- If between 0.50 and 0.80 there is a medium effect.
- If higher than 0.80 there is a large effect.

Publication bias

Publication bias occurs when the results of the published studies do not represent all of the findings of the study (Littell, Corcoran & Pillai, 2008). The basic reasons for publication bias are including studies in the meta-analysis by focusing on a single topic or studies that are gathered through a narrow review of the literature. In studies focusing on a single topic, the researchers only include the studies which revealed significant findings or the studies revealed quite a high effect size in their analysis processes. On the other hand, researchers covering limited literature may impede revealing the general effect. Therefore, in the meta-analysis, the most valuable result is the one representing the population and it should be kept in mind that finding an insignificant effect is also an important finding (Dinçer, 2014). In the meta-analysis studies, certain calculation methods are used to determine the publication bias. In this study Funnel Plot, and Duval and Tweedie trim-and-fill method were employed in order to determine the publication bias.

3. Findings

This section presents the descriptive data of the studies included in meta-analysis, effect size, and moderator analysis findings.

Descriptive data of the studies included in the meta-analysis

In this section, the descriptive data on the research designs of studies included in the meta-analysis (Table 2) and the scales used in these studies (Table 3) are presented.

Table 2. *The research design used in the studies*

Research design	f	%
General Survey Model	20	55.5
Experimental Model	6	16.6
Correlational Survey Model	5	13.8
Descriptive Survey Model	3	8.3
Mixed Model	1	2.7
Scale validity and reliability study	1	2.7

As can be seen in Table 2 the studies included in this study used mostly general survey model (55.5%). Additionally, the experimental model (16.6%), correlational survey model (13.8%), and a descriptive survey model (8.3%) were also used in this study. It can be seen that one of these studies was conducted with a mixed model and one was a scale development study (2.7%).

Table 3. *Scales used in the studies*

Scales	f	%
Peabody Picture Vocabulary Test	17	47.2
Descoeudres Language Test	5	13.8
Limbosh and Wolf Dictionary and Language Test	5	13.8
Bracken Basic Concept Scale,	3	8.3
Denver II Developmental Screening Test	2	5.5
Marmara Readiness Test, Mental and Language Development Sub-Scale	2	5.5
Language Use Scale	2	5.5
Metropolitan School Readiness Test	1	2.7
Early Learning Skills Assessment Scale Language Sub-Test	1	2.7
GEÇDA (Gazi Early Childhood Assessment Tool) -Language	1	2.7
Portage Early Childhood Education Language Checklist	1	2.7
Achievement Test (Antonym/synonym vocabulary list)	1	2.7

Table 3 reveals that the 36 studies included in the meta-analysis used 12 different scales. Among these scales, the researchers most frequently preferred Peabody Picture Vocabulary Test (47.2%). Additionally, the total frequency of tests is higher than the number of studies since a study may use more than one assessment tool.

Findings regarding publication bias

The Funnel plot revealing the findings on publication bias of the studies included in the present study is presented in Figure 2. The Y-axis of the funnel plot shows the standard error value (SE), while the X-axis shows the effect size (ES). Studies with smaller standard error values are gathered towards the top of the funnel shape and close to the mean effect size. However, in studies with smaller samples, since there is a higher sample variance in the prediction of effect size and a higher standard error value, they are gathered towards the bottom of the shape (Borenstein et al., 2013). The spread of the studies symmetrically on both sides of the vertical line shows the combined size of the effect means that there is no evidence of publication bias (Borenstein et al., 2013).

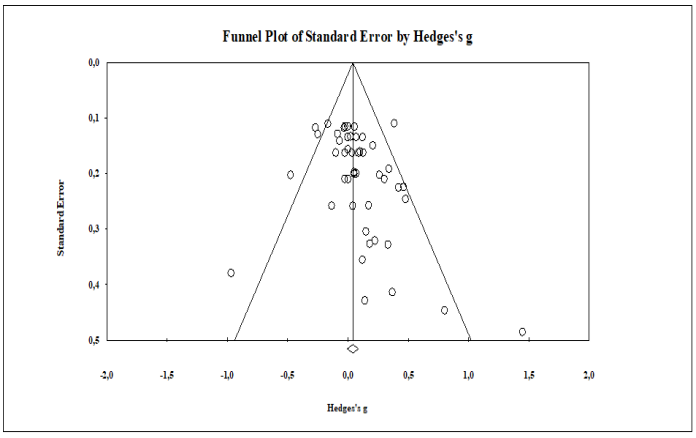

Figure 2. Funnel plot

When the funnel plot in Figure 2 is examined, it can be seen that even if the studies are mostly gathered at the top of the plot, certain studies did not spread symmetrically at both sides of the vertical line and certain studies included in the current study in order to determine the combined effect size calculated according to the gender variable were placed out of the pyramid. In this respect, it can be seen that there is proof regarding publication bias in the studies included in the analysis. As a result of the findings in

the funnel plot regarding publication bias, Duval and Tweedie's trim-and-fill tests were also performed in order to reveal the publication bias in detail (Table 4).

Table 4. *Duval and Tweedie's Trim-and-Fill Test Results*

Variables	Excluded Study	Point Estimation	CI (Confidence Interval)		Q
			Sub-Limit	Upper Limit	
Gender					
Observed values		.056	-.00	.119	76.49
Adjusted values	16	-.034	-.104	.036	146.41

As can be seen in Table 4 the results of Duval and Tweedie's trim-and-fill test revealed a difference between the observed effect size and the virtual effect size which was generated to adjust the effect stemming from the publication bias. The reason behind this difference is that the studies do not gather on both sides of the central line symmetrically. Therefore, lost data can be seen on the right and left sides of the central line.

Findings on effect size and moderator analysis of studies

In order to calculate the effect size of children's gender on language development, the combined mean effect size forest plot according to the random-effects model is presented in Figure 3.

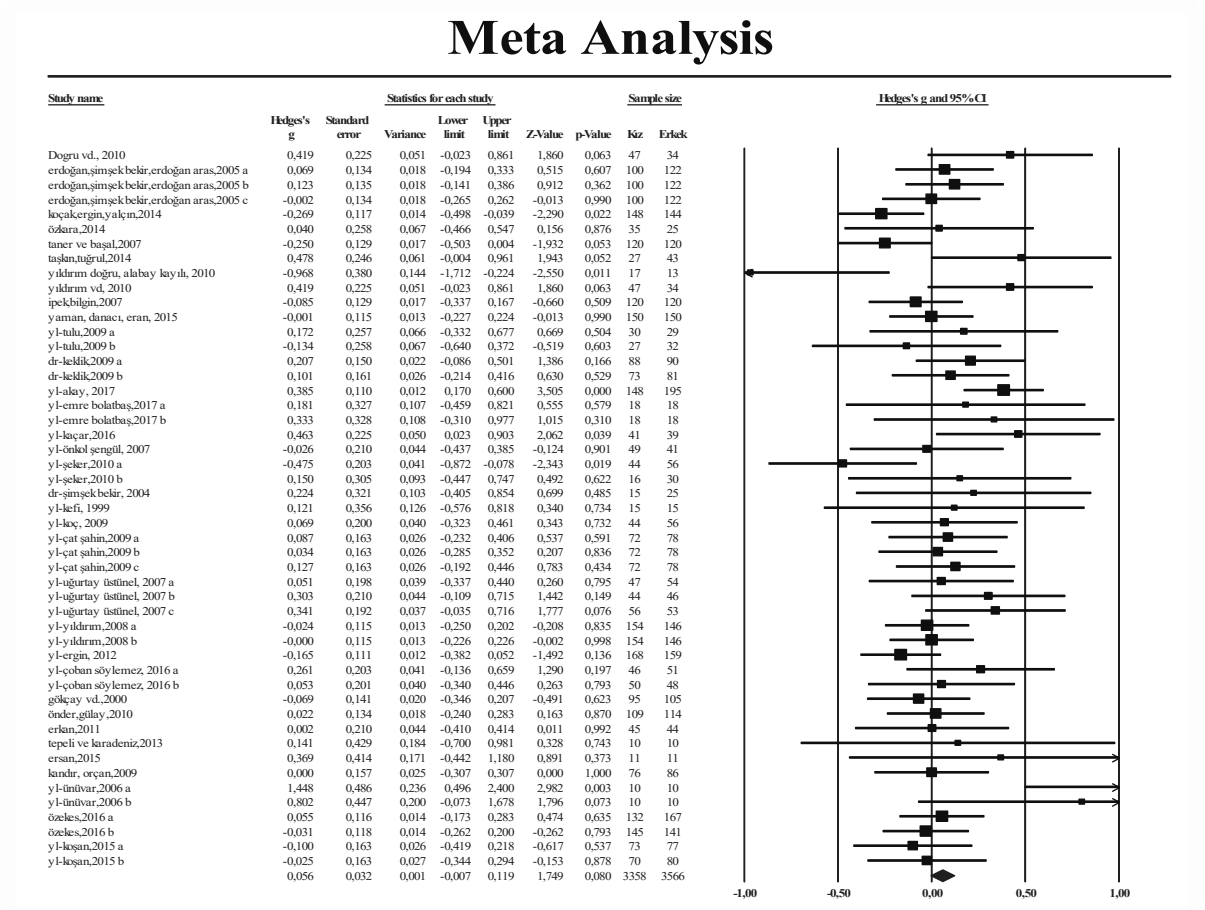

Figure 3. Forest plot

The size of black boxes in the forest plot is calculated through the ratio of the sample of a study to the overall size of the sample. The size of the box is also related to the information obtained from a particular study. The length of the horizontal lines going through the boxes shows the confidence interval. If these lines are short the confidence interval is narrow, but the precision is high. If they are long the confidence interval is wide, but the precision is lower. The bottom diamond shows the overall effect size. In this plot (Figure-3), the effect sizes calculated for each study and the general effect size values are shown. Table 5 presents the combined mean effect size values according to the random effects model to calculate the effect size of children's gender on language development.

Table 5. *The effects of children's gender on language development: meta-analysis results*

Variable	k	n_{girls}	n_{boys}	g	CI (Confidence Interval)		Q	Q_b
					Sub-Limit	Upper Limit		
Gender	49	3358	3566	.056	-.007	.119	76,490	
Moderator [Age Group]								2.622
0-3 years	4	142	152	.046	-.18	.273		
4-6 years	37	2617	2792	.077	.00	.153		
7-8 years	8	599	622	-.035	-.147	.077		

Note: k = Number of studies, n = Sample size, g = Hedge's g (SOF), CI = Confidence Interval, Q = Heterogeneity coefficient, Qb = Coefficient of heterogeneity between studies

Table 5 reveals that in the meta-analysis study conducted according to the random effects model, the general effect size of gender effect on children's language development (Hedge's g) was found as .056 [SE = .03; CI = (-.01, .12)]. It can be said that the value of effect size is small according to Cohen's (1992) categorization. Accordingly, it can be stated that the effect of gender on children's language development is quite low. Among the studies included in the current study 33 (67.35%) of them had a positive effect size value. A positive mean effect size value showed that the effect of the procedure was in favor of the experimental group (girls) but was not statistically significant ($p > .05$). As a result of the analyses conducted in order to determine whether age variable is a moderator on the effect of gender on children's language development, it was found out that age variable is not a moderator on the effect of gender on children's language development ($Qb = 2.62$, $p > .05$). Therefore, it can be stated that children's age does not play a moderator role on the effect sizes.

4. Conclusion

The current study aimed to determine the effect of gender variable on language development in early childhood. Under the scope of the study, 49 findings from 36 studies that conform to the inclusion and exclusion criteria were investigated. In the analysis of the data 49 effect sizes were calculated belonging to a sample composed of 6924 participants from 49 study findings. At the end of the effect size and moderator analyses, although the 67.35% of the findings' effect sizes were in favor of girls, the result was not statistically significant. The findings revealed that as a result of the combining according to the random effects model small and statistically insignificant effect size was achieved. Considering the mentioned findings, it can be stated that gender has an unimportant effect on children's language development. However, Erkan's (2011) study revealed that the girls obtained higher scores from the language test when girls' and boys' mean scores were compared, and stated that this variation may be

a result of the difference in girls' and boys' thinking and learning styles. The idea that boys are at a lower level compared to girls in terms of language development may stem from the difference in adults' relationship to them (Çoban Söylemez, 2016). McCarthy (1972) explained this situation as there is no difference in the early years of language development between genders, and children start to spell out by imitating their mothers. However, after a while, girls start to model their mothers, while boys start to model their fathers. Since fathers spend more time out of their homes because of their jobs, boys find less chance to model their fathers. Therefore, since girls are in constant communication with their role models, they have a higher chance to improve their language skills compared to boys. However, mothers' participation in business life due to the ongoing social and economic developments caused changes in parenthood roles. Father participation in childcare, spending time with the child, and housework which were previously considered as women's job are also increased (Kuzucu, 2011; Cox & Paley, 1997). Therefore, along with the change in social roles, children do not spend more time with one of their parents. Additionally, Shaywitz, Shaywitz, Pugh, Constable, Skudlarski and Fulbright, (1995) who claim that gender may have an effect on language development stated that gender differences in language development may partly because of the differences in the brain structure, development speed, and the functions underlie language processes. Girls have 11% more neurons compared to boys in the hearing and language centers of the brain. Therefore, it is stated that the brain network for language processing and observing others' emotions are larger in girls (Brizendine, 2007). When this situation is considered, the literature shows that girls start producing language before boys at early ages, however, this situation does not continue and boys achieve girls' development level in a short time (Öztürk, 1995). Additionally, throughout their educational lives, children attend the same schools and classes, they receive similar stimuli in common environments, and they interact with the environment to the same extent. Therefore, it is stated that gender does not play a predictive role in language development, while the environmental factors are more effective on language development (Tepeli & Karadeniz, 2013; İpek Bilgin, 2007). Another factor affecting the language development of children is their interaction with their mothers. Therefore, it is stated that children's vocabulary depends on mother's verbal stimulation, vocabulary, explanatory behaviors towards the child, and mother's warmth and sensitivity (Ekerim & Selçuk, 2017; Baydar, Küntay, Yağmurlu, Aydemir, Çankaya, Göksen & Cemalcilar, 2014). Therefore, it can be concluded that there is no meaningful result between girls and boys because the environmental factors that develop or prevent the language are more effective than gender (İpek & Bilgin, 2007).

The findings of a meta-analysis study conducted by Hyde and Linn (1988) including 165 studies that investigated samples composed of children and adults support the findings of the current study. Under the scope of the study different language skills such as vocabulary, reading comprehension, and verbal communication were investigated. At the end of the study, an improvement in favor of girls was seen in 27% of the investigated studies, while 66% of them revealed that gender has no significant effect on language skills. Additionally, at the end of these analyses, the researchers stated that gender has a small effect on language skills and this effect can be considered as zero. The findings of another meta-analysis of the gender variable in the language development of children showed that the effect size of gender on the language of children and adolescents was largely dependent on their age and the language dimension being measured. Therefore, it was concluded that gender has either insignificant or no effect on children's language (Marjanovič-Umek & Fekonja-Peklaj, 2017). On the other hand, some researchers (Barbu, Nardy, Chevrot, Guellaï, Glas, Juhel & Lemasson, 2015; Bornstein, Cote, Maital, Painter, Par, Pascual, Pêcheux, Ruel, Venuti & Vyt, 2004; Lovas, 2011) highlight the importance of socialization factors in gender differences, such as gender roles and parental expectations regarding parents' and

children's gender-specific behaviors. Wallentin (2008) argues that cultural explanations should also be considered in the investigation of possible gender differences. However, in the meta-analysis of 26 neuroimaging studies, Sommer, Aleman, Bouma, and Kahn (2004) reported that although many of the studies, particularly those with small samples, revealed gender differences in brain functioning, it is stated that gender had no significant effect on language lateralization in children or adults. Many studies were conducted to find out whether the gender variable has an effect on individuals' intelligence and academic achievement or not. Even in studies conducted in the fields where actual gender differences are suspected, the effect sizes of the detected differences were found to be very small (Fennema, Carpenter, Jacobs, Franke & Levi, 1998). The results of this study revealed that gender is not a predictor in children's language development.

The current study aimed to determine whether the language development of preschool children varies according to gender. Since the results of the studies revealed no significant differences, the gender variable may not be considered as an important independent variable in future studies. Additionally, the moderator analysis conducted to explain the small effect size of gender on children's language development revealed that the age variable is not a moderator. Therefore, it was concluded that gender is not a significant variable on age groups. There exist many studies that investigate children's language development considering gender as an independent variable. Contrary to the theoretical literature, considering that gender variable does not have a predictive effect on language development, it may be suggested that researchers may consider investigating primary factors rather than such variables. Additionally, it was found out that most of the studies included in the present study used Peabody Picture Vocabulary Test to evaluate the language development of children. Peabody Picture Vocabulary Test was developed by Dunn in 1959 and adapted for Turkish society by Katz, Önen, Demir, Uzunkaya and Uludağ in 1974. An update on the adaptation may be beneficial as the studies (Taner & Başal, 2005, Yıldırım Doğru et al., 2010, Erbay & Öztürk Samur, 2010) still use the version adapted in 1974. The findings obtained during the individual implementations in studies using this scale show that the old version of this test is quite different from today's standards (Özekes, 2013). Therefore, the development and use of up-to-date tests to measure children's language development levels in future studies are considered important in terms of obtaining more valid and reliable results. There exist certain limitations of these studies that need to be mentioned. Publication bias is a serious threat to meta-analysis studies. Publication bias is an important limitation especially because the studies with the desired statistical findings are more likely to be published (Borenstein et al., 2013; Card, 2012). The analyses conducted in the current study to determine publication bias revealed clues on the presence of publication bias. This situation may be considered as a limitation for this study.

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Note: The studies included in the meta-analysis are shown with an asterisk (*).

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