

# Relation of Language Features with Maternal Depression, Family Functioning, and Digital Technology Usage in Children with Developmental Language Delay-Comparison with Healthy Controls

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## ABSTRACT

Relation of language features with maternal depression, family functioning, and digital technology usage in children with developmental language delay-comparison with healthy controls

**Objective:** Language and communication are very important in the social, emotional and cognitive development of children. Developmental language delay (DLD) is one of the most frequent developmental problems. This study aims to evaluate and compare language profiles between children diagnosed with DLD and healthy controls. The relation between language development and maternal depression, family functioning, and digital device usage is also evaluated.

**Method:** Eighty-eight children diagnosed with DLD and 92 healthy controls with no developmental delay or chronic diseases attending other polyclinics were included in the study. All the children were in the 24-72 months age interval. Test of Early Language Development was used to evaluate language profiles; the Beck Depression Inventory was used to examine maternal depression; and the McMaster Family Assessment Device was used to evaluate family functioning. The researchers prepared a questionnaire to assess the subjects' digital device usage.

**Results:** The sociodemographic features of the groups were similar. Statistically significant differences were found in all language subscales between groups. Maternal depression level in the DLD group was higher than that of the control group. There were more problems in family functioning in the DLD group than among the controls. Digital technology usage and non-supervised digital technology usage were more than in the control group.

**Conclusion:** Early intervention in DLD is very important. Incorporating mothers in the treatment process, evaluating maternal mental health and informing them about digital technology usage may provide positive results for children diagnosed with DLD.

**Keywords:** Developmental language delay, digital technology usage, family functioning, maternal depression

## ÖZET

Gelişimsel dil gecikmesi tanısı olan çocuklarda dil özelliklerinin teknolojik alet kullanmaları, aile işlevselliği, anne depresyonu ile ilişkisi ve sağlıklı kontrollerle karşılaştırılması

**Amaç:** Çocukların duygusal, sosyal ve bilişsel gelişiminde dil ve iletişimin önemi çok büyüktür. Gelişimsel dil gecikmesi (GDG) çocukluk döneminin en sık görülen gelişimsel sorunlarından biridir. Bu çalışmada GDG tanılı çocukların dil profillerini incelemek ve kontrollerle karşılaştırmak amaçlanmıştır. Dil gelişimi ile annenin depresyonu, aile işlevselliği ve çocukların dijital alet kullanım özellikleri arasındaki ilişki de değerlendirilmiştir.

**Yöntem:** Yaşı 24-72 ay arasında olan ve gelişimsel dil gecikmesi olan 88 çocuk olgu grubu olarak ve gelişimsel gecikmesi veya kronik hastalığı olmayan ve diğer polikliniklere başvuran 92 çocuk kontrol grubu olarak çalışmaya alınmıştır. Dil becerilerini ölçmek için Türkçe Erken Dil Gelişim Testi, annelerin depresyon düzeyini ölçmek için Beck Depresyon Ölçeği ve aile işlevselliğini değerlendirmek için McMaster Aile Değerlendirme Ölçeği kullanılmıştır. Çocukların dijital alet kullanımına yönelik sorular araştırmacılar tarafından hazırlanmıştır.

**Bulgular:** Olgu ve kontrollerin sosyodemografik özellikleri farksızdır. Gruplar alıcı dil ve ifade edici dil becerileri açısından karşılaştırıldığında tüm dil becerileri açısından gruplar arasında anlamlı farklılık saptanmıştır. GDG tanısı olan çocukların annelerinin depresyon düzeyleri sağlıklı kontrollerin annelerinden daha yüksektir ve aile işlevselliğindeki güçlükler daha belirgindir. GDG tanısı olan çocukların dijital alet kullanma süreleri daha fazla ve dijital alet kullanımı sonrasında ebeveyn denetimi daha azdır.

**Sonuç:** GDG yaşayan olguların erken müdahalesi çok önemlidir. Tedaviye annelerini dahil etmek, annelerin ruh sağlığını değerlendirmek ve dijital alet kullanımına dair bilgiler vermek GDG tanısı olan çocuklar için önemli olumlu sonuçlara yol açabilir.

**Ahtar kelimeler:** Gelişimsel dil gecikmesi, dijital teknolojik alet kullanımı, aile işlevselliği, anne depresyonu



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## INTRODUCTION

Language is a distinctive feature, one of the most important capabilities of human beings, which enables to communicate with each other, and which is related with science, art, technology, culture, etc. (1). Besides, the use of language is a complicated social behavior that requires the combination of many motor and perceptual processes (2). Language competency is important in social communication, allowing to initiate and maintain interpersonal relationships, as well as in areas of internal thinking and internal speech (3).

Specific to human beings, with the acquisition of language competence, babies acquire a tool that enables them to communicate with other people and that facilitates learning about the world; they acquire this tool through social interaction with adults (4). With shared activities such as imitation and common attention, adults can direct the attention of the baby towards interesting objects and activities (5-7). Both comprehension and production of language are thought to be developing through social communication skills in the first and second years of life, followed by turn-taking games, joint attention engagement, and using gestures and mimics in expressing their needs and desires (5,8,9).

Developmental language delay (DLD) is an important developmental problem affecting the future life of children. It is defined as the inadequacy of language development with regard to the child's age and has a reported prevalence of 2-9% in 2-7 year-old children (10,11). Delay in the development of communication skills is the most frequent cause of admission among children with developmental difficulties. The level of a child's language development is the most fundamental determinant of the developmental problem. Delay in speech and language development is the most common neurodevelopmental disorder in children with a rate of 6% (12). At the age of two to three years, the problem resolves spontaneously in about 60% of the cases with developmental language delay (13). However, if it persists and is left untreated, it may be harmful at later ages (14). Developmental language delay has been

associated with learning disabilities at school and/or with many behavioral and psychiatric disorders (15,16). Rather than speech delay, delay in language development was found to be associated with academic achievement, and early delay in expressive language was found to be associated with a 40-75% rate of reading difficulty at 8 years of age (17).

Today's children are born into a cyber world, which can result in very diverse experiences and opportunities. Since smart phones and tablets are being introduced from very early ages, children can use digital technology tools anytime and anywhere (18). With the rapid increase in the use of digital technology, pre-school children's (3-6 years) use of video games and education packages has exploded in many societies (19-21). Considering these developments at the beginning of the 21<sup>st</sup> century, it is suggested that digital technology tools will increase and affect our everyday life even more. In a study carried out in Hong Kong, 70-90% of pre-school children were found to have met with the computer either at home or at school (22).

Maternal depression causes both internalizing and externalizing problems in children (23). Pan et al. (24) found that children of depressive mothers possessed fewer vocabulary items at the age of 1-3 years than children of non-depressive mothers, lagging 20 words behind their age-matched peers. The effects of maternal depression on language development may manifest through inadequate mother-child interaction. The mother may not express enough diversity in communication with the child (25,26). Besides, maternal depression may also be related to deterioration in family functioning and the way or the duration of preschool children's use of digital devices. We have not found any study that examines the relationship between mothers' depression, digital tools, and children's language development.

Our hypotheses when designing our study were:

- Children with DLD use more digital devices than controls without developmental retardation.
- Children with DLD have more difficulties in family functioning than controls.
- Mothers of DLD children are more depressed than mothers of controls.

This study aims to compare the duration and the characteristics of digital technology use and family functioning in children with developmental language delay with healthy controls. It was planned to compare the depression level of the mothers of DLD children with that of the mothers of the healthy controls. In addition, we aimed to investigate the relationship of language characteristics with technology tool use, family functioning, and mothers' depression in children with DLD.

## METHOD

The sample of the research was composed of 88 children with DLD, aged 24 to 72 months who had been admitted to Nevsehir State Hospital between September 2015 and September 2016 and 92 children with no chronic disorder or developmental delay who had no language problems among their first-degree relatives. No language other than Turkish was spoken in the homes of either of the groups. Among the patients who presented with speech delay, those who lagged behind their peers in speaking but were comparable in other developmental areas were evaluated by a language and speech disorders specialist, and those diagnosed with DLD were included in the study. Children who had been admitted to other clinics of the hospital and who were comparable with their peers according to the Denver developmental test were selected as control group. In the study, Denver II Developmental Screening Test and Test of Early Language Development-Third Edition (TELD-3) were used. The depression level of the mothers was assessed by the Beck Depression Scale and family functioning was investigated by the Family Assessment Scale. Ethics committee approval was obtained from Nevsehir Haci Bektas Veli University Clinical Research Ethics Committee. Verbal and written consent was obtained from the mothers who participated in the study.

## Measures

**The Denver Developmental Screening Test II (The Denver II):** This test was originally published as the Denver Developmental Screening Test (DDST)

by Frankenburg and Dodds in 1967 and then restandardized in many countries. It was revised and published as Denver II in 1990 (27). DDST was reviewed and standardized in Turkey in 1981. Denver II was reviewed and published in Turkey with the validity and reliability studies by Anlar, Bayoglu, and Yalaz in 1992 and 2009 (28). Denver II is an easily applicable test for children between 0-6 years of age and is an important tool in the early detection of developmental changes and the monitoring of child development in this period. Four areas are evaluated:

Personal-Social: The ability to get along with people, to care for personal needs,

Fine motor: Eye-hand coordination, manipulation of small objects, and problem solving ability,

Language: Hearing, understanding, and using language, receptive and expressive language skills,

Gross motor: Large muscle movement such as sitting, walking, jumping.

**Test of Early Language Development-Third Edition (TELD-3):** TELD-3 is a norm-referenced measure developed in the USA by Hresko et al. (29) in order to measure the receptive and expressive language skills of children aged between 2 years 0 months and 7 years 11 months. It is widely used for purposes such as to diagnose children with language disorders in the early stages, to show weak and strong aspects of their language development, to give information about the development process, and to conduct research (30). In terms of ease of use in Turkey, the test was adapted with the title of Turkish Early Language Development Test (TEDIL). TEDIL, which comprises three of the five basic components of language, measures semantic knowledge, syntax, and format knowledge with its subtests and test items. TEDIL contains two sub-tests: receptive language and expressive language. Form A of the Receptive Language Subtest contains 24 items that measure semantic knowledge and 13 items that measure syntax knowledge, Form B of the Receptive Language Subtest contains 25 items measuring semantic knowledge and 12 items that measure syntax knowledge. Form A of the Expressive Language Sub-Test contains 22 items that measure semantic

knowledge and 17 items that measure syntax knowledge; Form B of the Expressive Language Sub-Test contains 24 items that measure semantic knowledge and 15 items that measure syntax knowledge. If the pass criteria specified for each item are met the item is scored 1; if not, it is considered wrong and is scored 0 (or fail). The raw scores are converted to standard scores using the tables found at the end of the Practitioner Handbook. TEDIL Form A was used in the study.

**The Beck Depression Inventory (BDI):** This test was developed by Beck et al. (31) in 1961 with the purpose of including the most common emotional, somatic, cognitive, and motivational symptoms of depression. The BDI is a measure with a higher emphasis on cognitive and emotional symptoms of depression and with little emphasis on somatic symptoms (only loss of appetite, weight loss, and reduced libido are included). The validity study of the scale in Turkey was performed by Hisli (32). BDI is a self-report scale consisting of 21 items. The items of the scale are scored between 0 and 3. The lowest total score that can be obtained from the scale is 0, and the highest total score is 63. The higher the total score, the higher is the severity of depression (31).

**The McMaster Family Assessment Device (FAD):** The seven-part scale was developed by Epstein et al. (33) in 1983. The first part measures problem-solving skills, the second part family communication, the third part the roles within the family, the fourth part affective responsiveness to emotions such as sadness, anger, fear, joy, love, interests, the fifth part affective involvement of family members, the sixth part behavioral control, and the seventh part covers general family functioning. There are 60 items in total. The items are marked as “Strongly Agree / Agree / Disagree / Strongly Disagree “. Scoring is as follows: “Strongly Agree: one (1) point”, “Agree: two (2) points”, “Disagree: three (3) points”, “Strongly Disagree: four (4) points”. The questionnaire is filled out by the parents. A Turkish validity and reliability study was executed by Bulut et al. (34).

**Sociodemographic Data Form:** This form was designed by the authors, based on the relevant literature, in order to collect information about the sociodemographic characteristics of the children and their parents. The form consisted of questions regarding the child’s age, sex, how many hours a week the child watches television, how many hours the child spends with computer, smart phone and tablet, how much time the parent spends with the child, and also the parents’ age, education, and occupation.

### Statistical Analysis

SPSS (Statistical Package for the Social Sciences) 18.0 software was used for the statistical analysis of the data obtained in the study. Some of the clinical and the sociodemographic categorical variables of the case and control group were evaluated as number and percentage values. A Chi-square test was used to compare categorical variables. The distribution of data was evaluated by the Kolmogorov-Smirnov test. Since the distribution of the variables were normal, two independent samples t tests were performed. Pearson’s correlation coefficient was used to determine the relationship between continuous variables. A value of  $p < 0.05$  was considered statistically significant.

## RESULTS

The mean age of the children diagnosed with DLD was  $48.75 \pm 8.73$  months and the mean age of the control group was  $48.06 \pm 11.89$  months. There was no statistical difference between the groups ( $p = 0.66$ ;  $t = 0.44$ ). There was no difference between the groups in terms of sex distribution, mother’s age, mother’s education, and mother’s occupational status. The sociodemographic characteristics of the groups are shown in Table 1. The total score of the Denver II and the score of the Language Subscale by months are also shown in Table 1. When the groups were compared by parametric test in terms of receptive and expressive language skills, there was a significant difference between the groups in terms of both language skills. The values obtained for

language skills are shown in Table 2. There was a statistically significant difference between the groups in terms of weekly TV watching time, the time spent with technological equipment other than TV, and the

ratio of digital technology use with parents to total time of digital technology use.

When the depression levels of the parents and the family assessment scale subscales were compared

**Table 1: Comparison of chronological age, Denver II total scores, language subscale scores, and sociodemographic data between groups**

	DLD	Control	t/ $\chi^2$	p
<b>Chronological age*</b> (Mean±SD)	48.75±8.73	48.06±11.89	0.44	0.660
<b>Denver II total score*</b> (Mean±SD)	43.01±7.52	47.41±10.95	-3.10	0.002
<b>Denver II language subscale score*</b> (Mean±SD)	37.98±6.85	47.41±10.94	-6.83	<0.001
<b>Sex**</b>	33 woman	29 woman	0.92	0.390
	53 man	63 man		
<b>Maternal age*</b> (Mean±SD)	32.79±3.77	32.33±5.06	0.67	0.500
<b>Maternal education**</b>				
<8 years	51	52		
>8 years	35	40	0.14	0.710
<b>Maternal occupation**</b>				
Housewife	47	50	0.02	0.970
Employed	39	42		

DLD: Developmental language delay, \*Student's t test, \*\*Chi-square test used, SD: Standard deviation

**Table 2: Comparison of groups in terms of language subtests and technological device use**

	DLD		Control		t	p
	Mean	SD	Mean	SD		
<b>Receptive language semantic knowledge</b>	14.22	1.87	19.96	3.52	-13.45	<0.001
<b>Receptive language syntax knowledge</b>	10.14	2.37	11.02	1.76	2.79	0.006
<b>Receptive language total</b>	24.16	3.32	30.11	4.74	-8.02	<0.001
<b>Receptive language standard</b>	113.85	8.31	131.90	9.93	-13.10	<0.001
<b>Expressive language semantic knowledge</b>	13.56	2.63	19.42	3.05	-13.65	<0.001
<b>Expressive language syntax knowledge</b>	8.00	1.91	13.66	3.18	-14.27	<0.001
<b>Expressive language total</b>	21.56	3.23	32.73	5.30	-16.80	<0.001
<b>Expressive language standard</b>	92.40	9.45	135.50	10.93	-28.03	<0.001
<b>TV</b>	6.24	2.59	2.96	1.46	10.57	<0.001
<b>Other than TV (tablet, smart phone, computer, etc.)</b>	4.97	1.77	3.22	1.40	7.34	<0.001
<b>Total</b>	11.22	2.94	6.17	2.48	12.40	<0.001
<b>Supervised/Total</b>	0.17	0.06	0.49	0.21	-13.50	<0.001

TV: Television DLD: Developmental language delay parametric t test was used

**Table 3: Comparison of groups in terms of mothers' McMaster Family Assessment Device and Beck Depression Inventory scores**

	Developmental Language Delay		Control		t	p
	Mean	SD	Mean	SD		
<b>FAD</b>						
<b>Problem solving</b>	1.87	0.41	1.96	0.49	-1.361	0.170
<b>Communication</b>	1.82	0.39	1.80	0.54	0.019	0.990
<b>Roles</b>	2.18	0.39	1.57	0.42	10.083	<0.001
<b>Affective responsiveness</b>	1.75	0.48	1.72	0.49	0.407	0.690
<b>Affective involvement</b>	2.44	0.44	1.61	0.47	12.107	<0.001
<b>Behavioral control</b>	2.14	0.34	1.60	0.47	9.618	<0.001
<b>General functioning</b>	1.83	0.37	1.81	0.39	0.347	0.730
<b>Beck Depression Inventory</b>	9.76	5.37	4.95	4.49	6.511	<0.001

FAD: The McMaster Family Assessment Device parametric t test was used

**Table 4: The relationship of mothers' depression and digital device use with receptive and expressive language skills**

	BDI	TV	Other digital devices	Supervised/Total
<b>Receptive language</b>	$r=-0.37$ $p<0.001$	$r=-0.41$ $p<0.001$	$r=-0.29$ $p<0.001$	$r=0.48$ $p<0.001$
<b>Expressive language</b>	$r=-0.43$ $p<0.001$	$r=-0.54$ $p<0.001$	$r=-0.39$ $p<0.001$	$r=0.61$ $p<0.001$

BDI: Beck Depression Inventory, TV: Television, Pearson correlation coefficients were calculated

with the parametric t test, there was a statistically significant difference between the groups in terms of depression levels and roles, affective responsiveness to emotions, and behavioral control subscales of FAD. No significant difference was found in other FAD subscales. The results are shown in Tables 3 and 4.

Significant relationships were found when mothers' depression, TV watching time, the use of digital device other than TV, and supervised use were compared with receptive and expressive language skills. The correlation results are shown in Tables 4 and 5.

## DISCUSSION

This is the first study to evaluate the relationship between mother's depression, digital instrument use, and family functioning in children diagnosed with DLD.

The American Academy of Pediatrics recommends limiting the use of digital technology equipment in children to two hours, though it has been reported that this time is exceeded by about 50% in many societies (35). In our study, the weekly use of digital devices was found to be more than 2 hours both in DLD cases and healthy controls. Digital technology may have positive as well as negative effects on pre-school children. It can have negative effects on physical, psychological, and social development of children in the pre-school period. It may cause decreased physical activity, which may result in obesity or musculoskeletal disorders (36). In psychological aspects, children who spend too much time with digital technology are increasingly likely to develop addiction, depression, aggression, and violent behaviors. It has also been shown that pre-school

children have difficulties distinguishing the real world from the virtual world (37). In social aspects, it may lead to a decrease in the time spent with the family and communication within the family, increase social isolation, and may harm pre-school children's interpersonal skills (38). It may cause communication problems and speech delay in the pre-school period. It has been shown that parental modeling with proper behavior is an important factor in the safe use of digital equipment in pre-school children (39,40). Given the adverse effects caused by digital devices, it is thought that families should protect their children from these effects. However, parents' different attitudes towards children's use of digital technology can also affect children's behavior towards digital devices. For example, Yen et al. (41) reported that there is a direct relationship between internet addiction and parents' attitudes towards internet use. Family attitudes and maternal depression may also affect the duration and context of digital technology use in pre-school children. We have not found any study on the relationship of family functioning, technology use, and language development in the pre-school period in the literature.

Depression levels in mothers of DLD cases were found to be higher than in mothers of children with healthy development. There are studies showing that maternal depression affects language development from early ages on (24,42-45). It has been shown that between the ages of 1-5, children of mothers with depression grow more slowly and their speech skills develop more slowly than in children of mothers without any psychiatric disorder (24). The effects of the mother-child interaction on the child's language development have been evaluated in previous studies and it has been shown that the child's language

development is delayed when the mother is less perceptive to the child (e.g., due to depression) (46). Parental stress, which begins as soon as the child arrives, increases over time (47). Changes in the family structure, newly acquired roles, values, boundaries of family members, and difficulties or changes in the parents' personal life can lead to parental stress as well (48). Increased parental stress can reduce parents' positive perceptions of their parenting role and affect family functioning (49). Besides, studies have shown that stress leads parents to express inappropriate parental attitudes (50). In particular, mothers' mental health problems and depression are among the most important risk factors for the child's social, emotional and cognitive development (25,51).

The effects of maternal depression on language development may manifest as a result of inadequate mother-child interaction. The mother may not show enough variety in her communication with the child (26,52). Depressed mothers may also have less control over the child's use of digital devices or allow longer use of digital devices. This can lead to deterioration in family communication and a delay in the child's speech development.

Previous studies have shown that the interactions between depressive mothers and their children are lacking continuity, sensitivity, and consistency, as mothers are more irritable and destructive (42-45). These features may cause difficulties in reception and recurrent difficulties in language development. As a result, depression in the mother impairs verbal communication with the children and these children speak less than children with healthy development (42,43).

Difficulties in family functioning have been shown in previous studies to make children vulnerable to gaming and internet addiction (36,53). Problems in family functioning in the pre-school period may also be related to the duration of children's use of digital technology. The results of our study support the findings of previous studies. Early interventions in family functioning can help the children develop adequate habits of digital technology use. The association of unhealthy family relationships and family conflicts with excessive and inappropriate use

of the Internet in children has also been demonstrated in a large sample by Yen et al. (36). It has been shown that family violence and lack of communication are related to internet misuse in children and adolescents. In order to prevent internet addiction, it has been suggested to incorporate families in the treatment process (53). Insecure mother-child attachment and difficulties in mother-child interaction have been previously shown to be related to many addictions (38-40). A relationship between anxious or ambivalent parental attachment and internet addiction has been shown in recent studies (54). Mental health problems of mothers and difficulties in family functioning may disrupt the mother-child interaction and cause excessive use of digital technology devices. By treating mothers' mental health, it may be possible to help children use digital technology in a more appropriate way, for shorter periods of time, and under parental supervision.

In the "Roles" sub-section of the FAD, an assessment is made regarding specifying and fulfillment of the duties of family members. More depressed mothers may cause difficulties and instability in motherhood roles. "Affective Responsiveness" comprises family members' interest, care and love, and it is very important that these are sufficient. The more depressed state of the mothers' of DLD cases may prevent them from enjoying and spending quality time with the children. "Behavior Control" comprises assessment of the discipline that parents administer. It is asked whether the control is flexible, firm, relaxed, or irregular. If the mothers acquire "effective discipline methods", develop the ability to respond timely and appropriately, and adopt more positive responding skills, this can contribute positively to the children's language development.

It is possible to change the developmental path of children with early interventions. Early intervention may be beneficial both for language and speech, as well as for other symptoms that may accompany. In the treatment of language and speech, attention should also be paid to the mother-child interaction (23,46). Improving child-centered communication of the parent has been shown to have positive effects on both the receptive and the expressive language (55).

Previous studies have shown that parental involvement in the treatment, e.g. increasing the number of games parents play with the child, positively affects the child's developmental and behavioral problems (56-58). An increase in the number of games parents play with their child can lead to a decrease in the use of digital devices by the child and increased communication within the family. In a study conducted by Dunst et al. (59), it has been shown that parent and child co-participation in home activities where parents responded appropriately under the leadership of the child showed a positive contribution to the child's language development. In a study by Garcia et al. (23), it was found that parent-child interactive game therapy had positive effects on the child's receptive and expressive language skills.

The fact that we obtained the information only from mothers is the main limitation of our study; mental health of the mothers participating in the study could be just as well assessed by semi-structured interview. Mothers may be biased in reporting the technological device use of children with DLD. Other factors associated with the family and the child that could cause language delay could be just as well investigated. Characteristics such as father-related factors, sibling status, family structure, and mental and physical disorders in the family could also be included.

In conclusion, children with DLD have to cope

with many problems during their developmental period and are at risk of behavioral or emotional disorders (60). This fact shows how important early intervention in DLD cases is. Waiting for a spontaneous recovery of language delay may lose benefits of early intervention. As soon as DLD is recognized, it may lead to significant positive outcomes for the affected children to be given treatment, including their mothers in the treatment process, assessing the mothers' mental health, and to provide information about making good use of digital technology.

Contributions category	Authors name
Development of study idea	G.O.
Methodological design of the study	G.O., C.D.E.
Data acquisition and process	G.O., C.D.E.
Data analysis and interpretation	G.O.
Literature review	C.D.E.
Manuscript writing	G.O.
Manuscript review and revision	C.D.E.

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## REFERENCES

- Aksan D. All aspects of language-mainlines of linguistics, Ankara: TDK Yayinlari, 1998. (Turkish)
- Jacob P. Embodied cognition, communication and the language faculty. In Coello Y, Bartolo A (editors). Language and action in cognitive neuroscience. First ed. New York: Psychology Press, 2013; 3-29.
- Marton K, Abramoff B, Rosenzweig S. Social cognition and language in children with specific language impairment (SLI). *J Commun Disord* 2005; 38:143-162. [\[CrossRef\]](#)
- Kuhl PK. Is speech learning "gated" by the social brain? *Dev Sci* 2007; 10:110-120. [\[CrossRef\]](#)
- Baldwin DA. Understanding the link between joint attention and language. In C. Moore & P. J Dunham (editors). Joint attention: its origins and role in development. Hillsdale, NJ: Lawrence Erlbaum, 1995, 131-158.
- Bruner J. Child's talk: learning to use language. New York: Norton, 1983.
- Gergely G, Egyed K, Kiraly I. On pedagogy. *Dev Sci* 2007; 10:139-146. [\[CrossRef\]](#)
- Carpenter M, Nagell K, Tomasello M, Butterworth G, Moore C. Social cognition, joint attention, and communicative competence from 9 to 15 months of age. *Monogr Soc Res Child Dev* 1998; 63:1-174. [\[CrossRef\]](#)



9. McMurray B. Defusing the childhood vocabulary explosion. *Science* 2007; 317:631. **[CrossRef]**
10. Boyle J. Speech and language delays in preschool children. *BMJ* 2011; 343:d5181. **[CrossRef]**
11. Burden V, Stott CM, Forge J, Goodyer I. The Cambridge Language and Speech Project (CLASP). I. Detection of language difficulties at 36 to 39 months. *Dev Med Child Neurol* 1996; 38:613-631. **[CrossRef]**
12. Law J, Garrett Z, Nye C. Speech and language therapy interventions for children with primary speech and language delay or disorder. *Cochrane Database Syst Rev* 2003; 3:CD004110. **[CrossRef]**
13. Law J, Boyle J, Harris F, Harkness A, Nye C. Screening for speech and language delay: a systematic review of the literature. *Health Technol Assess* 1998; 2:1-184. **[CrossRef]**
14. Sundheim ST, Voeller KK. Psychiatric implications of language disorders and learning disabilities: risks and management. *J Child Neurol* 2004; 19:814-826. **[CrossRef]**
15. Johnson CJ, Beitchman JH, Young A, Escobar M, Atkinson L, Wilson B, Brownlie EB, Douglas L, Taback N, Lam I, Wang M. Fourteen-year follow-up of children with and without speech/language impairments: speech/language stability and outcomes. *J Speech Lang Hear Res* 1999; 42:744-760. **[CrossRef]**
16. Catts HW, Fey ME, Tomblin JB, Zhang X. A longitudinal investigation of reading outcomes in children with language impairments. *J Speech Lang Hear Res* 2002; 45:1142-1157. **[CrossRef]**
17. Simms MD, Schum RL. Language development and communication disorders. In Kliegman RM, Behrman RE, Jenson HB, Stanton BF (editors). *Nelson Textbook of Pediatrics*. Nineteenth ed. Philadelphia: Saunders Elsevier, 2011, chap32. **[CrossRef]**
18. Strader TJ: Digital technology in the 21st century. In *Digital Product Management, Technology and Practice: Interdisciplinary Perspectives*. Edited by Troy JS. Hershey: Business Science Reference, 2011, 235-262. **[CrossRef]**
19. Prensky M. Digital natives, digital immigrants Part 1. *On The Horizon*, 2001; 9:1-6. **[CrossRef]**
20. Vandewater EA, Rideout VJ, Wartella EA, Huang X, Lee JH, Shim MS. Digital childhood: electronic media and technology use among infants, toddlers, and preschoolers. *Pediatrics* 2007; 119:1006-1015. **[CrossRef]**
21. Vandewater EA, Lee SJ. Measuring children's media use in the digital age: issues and challenges. *Am Behav Sci* 2009; 52:1152-1176. **[CrossRef]**
22. Johnson GM. Young children's internet use at home and school: patterns and profiles. *J Early Child Res* 2010; 8:282-293. **[CrossRef]**
23. Garcia D, Bagner DM, Pruden SM, Nichols-Lopez K. Language Production in Children With and At Risk for Delay: Mediating Role of Parenting Skills. *J Clin Child Adolesc Psychol* 2015; 44:814-825. **[CrossRef]**
24. Pan BA, Rowe ML, Singer JD, Snow CE. Maternal correlates of growth in toddler vocabulary production in low-income families. *Child Dev* 2005; 76:763-782.
25. Gelfand DM, Teti DM. The effects of maternal depression on children. *Clin Psychol Rev* 1990; 10:329-353. **[CrossRef]**
26. Stein A, Malmberg LE, Sylva K, Barnes J, Leach P; FCCC team. The influence of maternal depression, care giving, and socioeconomic status in the post-natal year on children's language development. *Child Care Health Dev* 2008; 34:603-612. **[CrossRef]**
27. Frankenburg WK, Dodds J, Archer P, Shapiro H, Bresnick B. The Denver II: a major revision and restandardization of the Denver Developmental Screening Test. *Pediatrics* 1992; 89:91-97.
28. Anlar B, Yalaz K. Denver II Gelişimsel Tarama Testi. *Türk Çocuklarına Uyarlanması ve Standardizasyonu*. Hacettepe Çocuk Nörolojisi Gelişimsel Tıp Araştırmaları Grubu, Ankara, 1996.
29. Hresko WP, Reid DK, Hammill DD. *Test of Early Language Development (TELD)*. Third ed. PRO-ED, Austin:Texas, 1999.
30. Topbas S, Guven S. *Test of Early Language Development: Turkish (Teld3: T)*. Turkish Early Language Development Test (TEDIL). Ankara, Detay Publishing, 2011. (Turkish)
31. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. *Arch Gen Psychiatry* 1961; 4:561-571. **[CrossRef]**
32. Hisli N. A study on validity of Beck depression Inventory. *Turkish Journal of Psychology* 1988; 6:118-126. (Turkish)
33. Epstein NB, Baldwin LM, Bishop DS. The McMaster family assessment device. *J Marital Fam Ther* 1983; 9:171-180. **[CrossRef]**
34. Bulut I. *Family assessment scale manual*. Ankara: Ozguzelis Press, 1990. (Turkish)
35. Council on Communications and Media. From the American Academy of Pediatrics: Policy statement-media violence. *Pediatrics* 2009; 124:1495-1503.

36. Bremer J. The internet and children: advantages and disadvantages. *Child Adolesc Psychiatr Clin N Am* 2005; 14:405-428. **[CrossRef]**
37. Subrahmanyam K, Kraut RE, Greenfield PM, Gross EF. The impact of home computer use on children's activities and development. *Future Child* 2000; 10:123-144. **[CrossRef]**
38. Jackson LA, Eye A, Fitzgerald HE, Witt EA, Zhao Y. Internet use, videogame playing and cell phone use as predictors of children's body mass index (BMI), body weight, academic performance, and social and overall self-esteem. *Comput Human Behav* 2011; 27:599-604. **[CrossRef]**
39. Van den Bulck J, Van den Bergh B. The influence of perceived parental guidance patterns on children's media use: gender differences and media displacement. *J Broadcast Electron Media* 2000; 44:329-348. **[CrossRef]**
40. Livingstone S, Helsper EJ. Parental mediation of children's internet use. *J Broadcast Electron Media* 2008; 52:581-599. **[CrossRef]**
41. Zhao S. Parental education and children's online health information seeking: beyond the digital divide debate. *Soc Sci Med* 2009; 69:1501-1505. **[CrossRef]**
42. Yen JY, Yen CF, Chen CC, Chen SH, Ko CH. Family factors of internet addiction and substance use experience in Taiwanese adolescents. *Cyberpsychol Behav* 2007; 10:323-329. **[CrossRef]**
43. Brennan PA, Hammen C, Andersen MJ, Bor W, Najman JM, Williams GM. Chronicity, severity, and timing of maternal depressive symptoms: relationships with child outcomes at age 5. *Dev Psychol* 2000; 36:759-766. **[CrossRef]**
44. Horwitz S, Irwin JR, Briggs-Gowan MJ, Bosson Heenan JM, Mendoza J, Carter AS. Language delay in a community cohort of young children. *J Am Acad Child Adolesc Psychiatry* 2003; 42:932-940. **[CrossRef]**
45. Murray L, Fiori-Cowley A, Hooper R, Cooper P. The impact of postnatal depression and associated adversity on early mother-infant interactions and later infant outcome. *Child Dev* 1996; 67:2512-2526. **[CrossRef]**
46. Delaney EM, Kaiser AP. The effects of teaching parents blended communication and behavior support strategies. *Behav Disord* 2001; 26:93-116.
47. Glading ST. *Family Therapy-History, theory, and practice*. Translated by Ibrahim Keklik and Ibrahim Yildirim, PDR Publishing, 2012.(Turkish)
48. McKenry PC, Price SJ. Families coping with change: a conceptual overview. Families and change. In: *Coping with stressful events and transition* (Eds.). McKenry PJ and Price SJ Sage Publications, California, 2005, 1-25.
49. Respler-Herman M, Mowder BA, Yasik AE, Shamah R. Parenting beliefs, parental stress, and social support relationships. *J Child Fam Stud* 2012; 21:190-198. **[CrossRef]**
50. Azar ST, Weinzierl KM. Child maltreatment and childhood injury research: a cognitive behavioral approach. *J Pediatr Psychol* 2005; 30:598-614. **[CrossRef]**
51. Linderkamp F. Komorbidität und elterliche Psychopathologie bei externalisierenden Verhaltensstörungen im Kindesalter. *Z Entwicklungspsychol Pädagog Psychol* 2006; 38:43-52. (German) **[CrossRef]**
52. Murray L. The impact of postnatal depression on infant development. *J Child Psychol Psychiatry* 1992; 33:543-561. **[CrossRef]**
53. Weems DM, Rogers C. America's next top model: parent behaviors that promote reading. *Child Educ* 2007; 84:105-106. **[CrossRef]**
54. Valcke M, Bonte S, De Wever B, Rots I. Internet parenting styles and the impact on internet use of primary school children. *Comput Educ* 2010; 55:454-464. **[CrossRef]**
55. Roberts MY, Kaiser AP. The effectiveness of parent-implemented language interventions: a meta-analysis. *Am J Speech Lang Pathol* 2011; 20:180-199. **[CrossRef]**
56. Eyberg SM, Nelson MM, Boggs SR. Evidence-based psychosocial treatments for children and adolescents with disruptive behavior. *J Clin Child Adolesc Psychol* 2008; 37:215-237. **[CrossRef]**
57. Kaminski JW, Valle LA, Filene JH, Boyle CL. A meta-analytic review of components associated with parent training program effectiveness. *J Abnorm Child Psychol* 2008; 36:567-589. **[CrossRef]**
58. Webster-Stratton C, Reid MJ, Hammond M. Treating children with early-onset conduct problems: intervention outcomes for parent, child, and teacher training. *J Clin Child Adolesc Psychol* 2004; 33:105-124. **[CrossRef]**
59. Dunst CJ, Raab M, Trivette CM. Characteristics of naturalistic language intervention strategies. *J Speech Lang Pathol Appl Behav Anal* 2011; 5:8-16.
60. Lindsay G, Dockrell JE, Strand S. Longitudinal patterns of behaviour problems in children with specific speech and language difficulties: child and contextual factors. *Br J Educ Psychol* 2007; 77:811-828. **[CrossRef]**