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Adaptation, validity, and reliability of the Preschool Language Scale–Fifth Edition (PLS–5) in the Turkish context: The Turkish Preschool Language Scale–5 (TPLS–5)



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ABSTRACT

Introduction: Speech and language assessment is very important in early diagnosis of children with hearing and speech disorders. Aim of this study is to determine the validity and reliability of Preschool Language Scale (5th edition) test with its Turkish translation and adaptation.

Methods and materials: Our study is conducted on 1320 children aged between 0-7 years 11 months. While 1044 of these children have normal hearing, language and speech development, 276 of them have receptive and/or expressive language disorder. After the English-Turkish and Turkish-English translations of PLS-5 made by two experts command of both languages, some of the test items are reorganized because of the grammatical features of Turkish and the cultural structure of the country. The pilot study was conducted with 378 children. The test which is reorganized in the light of data obtained in pilot application, is applied to children chosen randomly with layering technique from different regions of Turkey, then 15 days later the first test applied again to 120 children.

Results: While 1044 of 1320 children aged between 0 and 7 years 11 months are normal, 276 of them have receptive and/or expressive language disorder. While 98 of 103 healthy children of 120 taken under the second evaluation have normal language development, 8 of 9 who used to have language development disorder in the past still remaining (Kappa coefficient:0,468, $p < 0,001$). Pearson correlation coefficient for TPLS-5 standard gauge are; IA raw score:0,937, IED raw score: 0,908 and TDP: 0,887 respectively. Correlation coefficient for age equivalence is found as IA:0,871, IED: 0,896, TDP: 0,887.

Conclusions: TPLS-5 is the first and only language test in our country that can evaluate receptive and/or expressive language skills of children aged between 0-7 years 11 months. Results of the study show that TPLS-5 is a valid and reliable language test for the Turkish children.

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1. Introduction

Nowadays, one of the most important modernity indicators for countries is the value of “disabled” individuals. According to the World Health Organization, 10% of the population in developed countries and 12% of the population in developing countries consists of disabled individuals [1] and in Turkey 12.29% of the total population is disabled [2]. Our country is among those where

congenital hearing loss is most commonly seen (0.1–0.2%), and every year approximately 2500 infants are born with hearing loss [3]. Hearing loss that occurs during infancy and childhood prevents the development of speaking language skills of the child and affects his/her social, emotional, perceptible, and academic development. The most critical period for speaking and language development is during the first two years of life. In this period, infants and children with unidentified hearing loss lose out on the essential speaking and language acquisition that takes place during this time [4–9]. On the one hand, the American Speech-Language-Hearing Association (ASHA) indicates that language disorder prevalence among preschool children is between 2% and 16% [10]. On the other hand, Horwitz et al. examined expressive language disorder in early

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childhood, among children aged 18–39 months, and theorized that its prevalence was 13.5% between 18 and 23 months, 15% between 24 and 29 months, and 18% between 30 and 39 [11]. In two other studies on 5-year-old children, Beitchman et al. revealed that language disorder prevalence is 12.6% [12] on the other hand Tomblin et al. revealed that prevalence of specific language disorder is 7.4% at the preschool stage [13]. In another study on 6–7 years-old children, the median value of this prevalence was found to be 5.5% and 3.1% [14]. In our country, studies about this matter are scarce. According to data provided by the Turkish Statistical Institute (TSI) in 2002, the rate of language and/or speech disability among general population is 0.38%, and the rate of hearing disability is 0.37% [15]. The most important factor for ensuring children with hearing and speaking disorders adapt to normal life is “early diagnosis.” In the literature, this is supported by many studies that suggest that children with hearing loss can catch up with their peers in later years of life, if they are diagnosed early, use appropriate devices, receive regular education support, and continue to undergo language and speaking therapy. With treatment and necessary additional support provided as a result of early diagnosis, children’s quality of life can be improved, social and emotional problems can be precluded, and problems related to academic skills, such as reading and writing, can be prevented. The most important step in the early diagnosis of children with hearing and speaking disorders is educational diagnosis. In educational diagnosis, children’s language and speaking skills are evaluated using formal language tests; according to the result of the tests, an educational diagnosis is made and treatment can begin without delay [16–20].

The Preschool Language Scale–Fifth Edition (PLS–5) is the renewed version of the Preschool Language Scale–Fourth Edition (PLS–4) [21]. The PLS–5 is a test applied individually to determine whether children have a language delay or disorder. Unfortunately, in our country there is no current, standard, reliable, and valid test in place to evaluate the receptive and expressive language skills of children aged 0–8 [22]. The aim of our study is to analyze the validity and reliability of the PLS–5 test, a commonly used language education test, by producing a version translated into Turkish and adapted to our circumstances.

2. Methods and materials

The participants in this study were 1320 children between 0:0 and 7:11 (years:months). While 1044 of these children did not have an additional disorder and/or growth deficiency (their native language is Turkish), 276 did have receptive and/or expressive language disorders. While children not diagnosed with such disorders were chosen from a Maternity Hospital Neonatal Unit, kindergarten, preschool, and primary school according to age group, children with language and speech disorders were chosen from the Hacettepe University Vocational School of Health, Hearing and Speech Training Center, who have sought support for language and/or speech disorders. The PLS–4 was used for the diagnosis of children with speech and language problems. In addition to language and/or speech disorders, these children do not have any other problem or disorder. Before the test, family consent and necessary permissions are obtained from educators, and then related individuals are made aware of the aim of the test. Additionally, parents are informed of the situation of their child both before and after the test. Our study began with the Turkish translation and adaptation of the PLS–5, introduced in our country in March 2013. During this period, all the materials were first translated into Turkish by university academicians and experts in related departments of the publishing company, who all had a full working knowledge of both languages. These forms were then again

translated into English in order to examine the consistency of the two forms. Having completed the translation of test materials, any inappropriate questions and pictures in terms of the Turkish language and cultural context were determined and then adapted to Turkish circumstances by expert lecturers in the field of language and speech disorders. Obtained tentative Turkish test materials were applied to 30 children, and incoherent pictures and/or questions were removed and rearranged.

2.1. Data collection tools

2.1.1. Child and family information form

This form was prepared by researchers to gather socio-demographic data aimed at children included in the study and their families. This preliminary information form consists of questions related to variables such as date of birth, chronological age, gender, school, additional disabilities, education and occupation of parents, socioeconomic situation, financial income, and family health insurance.

2.1.2. Preschool Language Scale–Fifth Edition (PLS–5)

Preschool Language Scale–Fifth Edition (PLS–5) is the renewed version of Preschool Language Scale–Fourth Edition (PLS–4) [21,22]. The PLS–5 is a test applied individually to determine whether children have a language delay or disorder. The PLS–5 has been developed to apply to children aged between 0:0 and 7:11 (years: months). The test materials of the PLS–5 consist of the Administration and Scoring Manual, Examiner’s Manual, Picture Manual, Record Form, Home Communication Questionnaire, and manipulatives (teddy bear etc.).

The PLS–5 consists of two standard scales (Auditory Perception and Expressive Language) and three additional measurements (The Language Sample Checklist, Articulation Screener Scale, and Home Communication Questionnaire). The Auditory Comprehension (AC) scale is used to evaluate the child’s language comprehension level. The Expressive Communication (EC) scale is used to determine how the child communicates with others. The PLS–5 submits norm reference scores (standard score, percentage and age value) for AC and EC. The norm referenced total language score can also be calculated [22].

2.2. Application of the test

Studies using the Turkish translation and adaptation of the PLS–5 were implemented between June 2013 and June 2014. A pilot study, as well as validity and reliability applications, was carried out between July 2014 and December 2015.

2.3. Pilot study

Research began with the pilot study of the Turkish Preschool Language Scale–5 (TPLS–5). Before the pilot study, volunteer testers for data gathering were determined, and trained in the test and its application. In this study, 20 testers from the Institute of Health Sciences Audiology and Speech Disorders Program – who were all postgraduates or students and experts in child development, language and speech therapy, and special education – were assigned according to the advice of two expert lecturers. The pilot study was conducted with 378 children aged between 0 and 7 years 11 months, who were selected randomly using a layering technique from both the center and surrounding districts of Ankara, from regions that show socioeconomic differences and differences in terms of the mother’s education level. During the pilot study, test booklets and questions were revised and, based on the guidance and opinions of experts, the final form of the test was produced to

ensure validity and reliability with necessary arrangements.

2.4. Validity and reliability application

Following the pilot study, the TPLS–5 test was applied to 1320 children, 942 of whom were not seen to have such a disorder, and were all aged between 0 and 7 years 11 months. All children were selected randomly from different regions of the country using a layering technique, and largely came from the capital, Ankara. Using a layering technique, the age of the child, the education level of the mother, and the socioeconomic status of the family are taken in consideration. According to this technique, the following factors should be noted:

- In determining the age range of children included in the test, we conform to the original test, according to which age ranges are determined as follows: 0:0–0:2, 0:3–0:5, 0:6–0:8, 0:9–0:11, 1:0–1:5, 1:6–1:11, 2:0–2:5, 2:6–2:11, 3:0–3:5, 3:6–3:11, 4:0–4:5, 4:6–4:11, 5:0–5:5, 5:6–5:11, 6:0–6:5, 6:6–6:11, 7:0–7:5, 7:6–7:11.
- Gender is determined as male and female.
- The education level of the mother is determined as primary education, high school education and undergraduate education.
- Socioeconomic status is determined as lower, middle, or upper class, according to the minimum wage in Turkey at the time of the test.

In order to determine the stability in reliability studies, the test-retest method was applied. 120 children who had previously been tested using PLS–5 were retested again two weeks later.

2.5. Test items adapted to Turkish

In the vast majority of tests, we stuck to the original format in terms of both questions and pictures in Picture Manual. Nonetheless, because of the linguistic, grammatical, and cultural structural differences in the Turkish context, some of the questions and application pictures were adapted. These adapted items include Items 43, 51, and 59 in the Auditory Perception Language Scale, as well as Items 53, 54, 56, and 63 in the Expressive Language Scale.

2.6. Statistical methods

In our study, statistical analysis was conducted using IBM SPSS for Windows Version 22.0. Numeric variables were summarized with average \pm standard deviation. Categorical variables were shown with numbered percentage. The normal distribution of numeric variables was examined using the Kolmogorov Smirnov test, and the homogeneity of variances was assessed by Levene's test. The difference between groups with and without language disorders was examined in independent samples *t*-test, in the case of providing parametric test variances. The test-retest correlation was provided using the Pearson correlation coefficient, Cronbach's alpha coefficient, the intraclass correlation coefficient, and the Kappa coefficient. The difference between the first and the second application was determined with *t*-test in independent groups. The significance level was accepted as $p < 0.05$.

3. Results

Our study was carried out on 1320 children aged between 0 and 7 years 11 months. Exactly 1044 of them were healthy, and 276 had receptive and/or expressive language disorder. Table 1 shows the age range, gender, education of parents, the working status of the mother, and the occupation of the father distribution of the 1320

children. Children participating in this study were examined in 18 age ranges: 0:0–0:2, 0:3–0:5, 0:6–0:8, 0:9–0:11, 1:0–1:5, 1:6–1:11, 2:0–2:5, 2:6–2:11, 3:0–3:5, 3:6–3:11, 4:0–4:5, 4:6–4:11, 5:0–5:5, 5:6–5:11, 6:0–6:5, 6:6–6:11, 7:0–7:5, and 7:6–7:11. According to this data, 655 (49.6%) of the mothers were graduates, 415 (31.5%) were high school graduates, 152 (11.5%) had completed primary school, and 98 (7.4%) had completed secondary school, while the majority of fathers were graduates. Furthermore, 54.6% (N:721) of mothers were working and 45.4% (N:599) were housewives; on the other hand, 43.9% (N:580) of fathers were working as civil servants, 36.5% (N:481) were self-employed, and 0.8% (N:11) were unemployed.

Exactly 660 (50%) of the children were male and 660 (50%) were female. Further, 582 (44.1%) of these children were not attending school, 406 (30.8%) were attending kindergarten, 197 (14.9%) were attending preschool, and 135 (10.2%) were attending primary school. In addition, children in both groups were monolingual and did not have any additional disorder or disability.

Table 2 shows the distribution of children according to the social status of their parents and financial income. In our study, families were organized into 6 categories according to their social status. 0.4% (N:5) of parents were in the highest socio-economic category, group A. 10.5% (N:138) of parents were in the second highest socio-

Table 1

Age range, gender, education of parents, working status of mother and occupation of father distribution of children (N: 1320).

Age	Female	Male	Total	Total
	N	N	N	%
0:0–0:2	20	20	40	3,0
0:3–0:5	20	20	40	3,0
0:6–0:8	20	20	40	3,0
0:9–0:11	20	20	40	3,0
1:0–1:5	50	50	100	7,6
1:6–1:11	50	50	100	7,6
2:0–2:5	50	50	100	7,6
2:6–2:11	50	50	100	7,6
3:0–3:5	50	50	100	7,6
3:6–3:11	50	50	100	7,6
4:0–4:5	50	50	100	7,6
4:6–4:11	50	50	100	7,6
5:0–5:5	50	50	100	7,6
5:6–5:11	50	50	100	7,6
6:0–6:5	20	20	40	3,0
6:6–6:11	20	20	40	3,0
7:0–7:5	20	20	40	3,0
7:6–7:11	20	20	40	3,0
Total Sample	660	660	1320	100,0
			N	%
Education of mother	Primary school	152	11,5	
	Secondary school	98	7,4	
	High school	415	31,5	
	Undergraduate	655	49,6	
	Total	1320	100,0	
Education of father	Primary school	77	5,8	
	Secondary school	103	7,8	
	High school	412	31,2	
	University	728	55,2	
	Total	1320	100,0	
Working status of mother	Working	721	54,6	
	Housewife	599	45,4	
	Total	1320	100,0	
Occupation of father	Civil servant	580	43,9	
	Worker	230	17,4	
	Self-employed	481	36,5	
	Retired	18	1,4	
	Unemployed	11	0,8	
	Total	1320	100,0	

Table 2
Distribution of children according to socio-economic status of parents and financial income.

	Level	N	%
Socio-economic status	A	5	0,4
	B	138	10,5
	C1	472	35,7
	C2	399	30,2
	D	202	15,3
	E	104	7,9
	Total	1320	100,0
<hr/>			
		N	%
Financial income	Less than minimum wage	11	0,8
	Minimum wage	73	5,5
	Minimum wage x 2	318	24,1
	Minimum wage x 3–4	496	37,6
	Minimum wage x 5	420	31,8
	More than five times the minimum wage	2	0,2
	Total	1320	100,0

economic category, group B. Most of the parents (35.7%) were in upper-middle socio-economic category, group C1. This group, consisting of people in learned profession and directors, and group C2 (30.2%) encompassed the majority of parents. Only 7.9% (N:104) of parents fell into the lowest socioeconomic category, group E. In light of this, it can be seen that 37.6% (N:496) of parents were earning 3–4 times the monthly minimum wage.

Table 3 displays the average scores and standard deviation values children gained in the TPLS–5 according to the 18 age ranges. These age ranges determined in accordance with the original test (PLS-5). The original test items are presented in accordance with these ranges for both auditory comprehension and the expressive language areas. From this table, it can clearly be seen that in all ranges up until 6:0–6:5, Auditory Comprehension (AC) raw scores are higher than Expressive Communication (EC) raw

scores; however, after this age range, EC raw scores are higher than AC raw scores. This result is not the same for AC and EC standard scores. The Total Language Score (TLS) raw score averages increase regularly with increasing age. There is a similar situation for AC, EC, and TLS age equivalence.

In our study, 1044 of 1320 children did not have a language and/or speech disorder, while 276 did have a language and/or speech disorder. In order to determine the validity and reliability of the test, 120 children were selected at random, according to age range, and were retested 15 days after the first test. In Table 4, the consistency of test results is shown according to the first and the second evaluation results. It can thus be seen that 98 of the 103 children not seen as having a disorder were again evaluated as normal in terms of language development, while 8 of the 9 children with a language development disorder again showed evidence of a

Table 3
Score average and standard deviation values of children gained from TPLS-5 according to 18 age ranges.

Age	AC-RS	AC-SS	EC-RS	EC-SS	TLS-RS	TLS	TLS-SS	AC-AE	EC-AE	TLS-AE
0:0–0:2	5,6 ± 1,4	104,2 ± 11,6	5,1 ± 1,8	93,7 ± 13,1	10,7 ± 2,9	192,9 ± 29,6	96,3 ± 15,9	2,2 ± 0,7	1,8 ± 1	1,7 ± 0,8
0:3–0:5	8 ± 2,2	95,7 ± 15,1	7,5 ± 1,8	93,5 ± 10	15,5 ± 3,7	191 ± 25,1	95,1 ± 13,4	4,1 ± 1,9	3,4 ± 1,6	3,5 ± 1,6
0:6–0:8	12,9 ± 1,9	106,5 ± 10	11,7 ± 2,5	98,4 ± 11,6	24,6 ± 4,2	204,9 ± 20,4	102,5 ± 11	8,9 ± 1,9	7 ± 2,2	7,6 ± 2
0:9–0:11	14,7 ± 1,5	99 ± 7,9	13,8 ± 3,3	89,7 ± 14	28,5 ± 4,3	188,7 ± 19,5	93,9 ± 10,3	10,6 ± 1,5	9,1 ± 3	9,5 ± 2,1
1:0–1:5	19,2 ± 2,7	100,6 ± 11	18,7 ± 3,3	91,9 ± 13,1	38,1 ± 5,8	192,6 ± 23,3	96 ± 12,5	15,4 ± 2,8	13,6 ± 3,4	14,3 ± 3,2
1:6–1:11	25,7 ± 3,6	105,2 ± 12,8	23,7 ± 3	111,6 ± 11,9	49,3 ± 6,1	212,9 ± 29,9	106,8 ± 16,1	22,3 ± 4,1	18,8 ± 3,5	20,6 ± 3,4
2:0–2:5	31,7 ± 5,2	105,5 ± 15,4	30,2 ± 5,1	101 ± 16,3	61,6 ± 9,2	206,5 ± 29,7	103,4 ± 16	29,7 ± 6,3	27,2 ± 7,5	28,2 ± 6,2
2:6–2:11	36,2 ± 3,2	104 ± 9	35,5 ± 5	104,8 ± 14,1	71,7 ± 8	208,8 ± 22,2	104,7 ± 12	35,1 ± 4,4	35 ± 7,5	35,2 ± 5,7
3:0–3:5	39,8 ± 4,3	102 ± 11,5	39 ± 5	102,4 ± 12,6	78,7 ± 8,9	204,4 ± 22,6	102,3 ± 12,2	40,2 ± 6	40 ± 7,2	40,1 ± 6,4
3:6–3:11	44,1 ± 4,9	101,9 ± 12,2	43,6 ± 4,4	102,7 ± 10,5	87,7 ± 8,7	204,6 ± 20,9	102,4 ± 11,3	46,1 ± 7	46,8 ± 6	46,4 ± 5,9
4:0–4:5	47,9 ± 6,7	101,9 ± 15,9	46,2 ± 6,4	99,3 ± 14,2	93,7 ± 12,4	199,5 ± 30,4	99,7 ± 16,2	51,7 ± 9,8	50,2 ± 9,1	50,6 ± 8,7
4:6–4:11	52 ± 6	101,2 ± 14,1	49,7 ± 5,9	97,5 ± 12,3	101,4 ± 11,1	198,8 ± 24,8	99,4 ± 13,3	58,4 ± 9,3	55,2 ± 8,8	56,2 ± 8,5
5:0–5:5	52,5 ± 5,6	94,5 ± 13,2	51,2 ± 5,1	92,9 ± 9,9	103,5 ± 10,1	187,4 ± 22,1	93 ± 11,8	59,2 ± 10	57,1 ± 7,4	57,9 ± 8,1
5:6–5:11	56,7 ± 5,9	97,5 ± 13,7	55,9 ± 5,1	95,4 ± 10,6	112,6 ± 10,5	192,9 ± 22,9	96,1 ± 12,1	67,9 ± 11,5	64,6 ± 8,6	65,7 ± 9,2
6:0–6:5	57,1 ± 4,1	92 ± 11,7	57,2 ± 5,5	92,9 ± 13,6	114,3 ± 9,5	186,1 ± 24,4	92,7 ± 13	68,4 ± 10,5	68,4 ± 12,4	68,6 ± 11,8
6:6–6:11	62,3 ± 2,3	104 ± 11	63,5 ± 2,6	103,5 ± 10,4	125,8 ± 4,5	207,5 ± 19,9	103,8 ± 10,3	84,2 ± 9,4	85,9 ± 10,4	85,3 ± 9,7
7:0–7:5	64,2 ± 1,3	108,2 ± 9,3	65,5 ± 1,7	109,4 ± 8,6	129,7 ± 2,7	217,6 ± 16,5	109,3 ± 8,9	91,7 ± 5,3	91,9 ± 5,5	91,8 ± 5
7:6–7:11	64,4 ± 1,4	106,4 ± 10,1	65,5 ± 2	106,5 ± 9,6	129,9 ± 3,3	213,7 ± 19,3	107,3 ± 10,4	92,7 ± 5,7	92,1 ± 6,4	92,3 ± 6,1

AC: Auditory Comprehension, EC: Expressive Communication, TLS: Total Language Score, RS: Raw Score, SS: Standard Score, AE: Age Equivalent.

Table 4
Consistence of first and the second evaluation in children.

First evaluation		Second evaluation	
		Normal language development	Language and/or speech disorder
Normal language development	Language and/or speech disorder	98 (95,1%)	5 (4,9%)
	Normal language development	9 (52,9%)	8 (47,1%)

Kappa coefficient:0,468 (p < 0,001).

Table 5

Score average comparison of children with and without language and/or speech disorder.

Score area	Children with normal language development (N:1044)	Children with language and/or speech disorder (N:276)	p
AC-RS	39,9 ± 16,9	38,1 ± 17,6	0,139
AC-SS	105,4 ± 12,4	100,6 ± 13,1	<0,001
EC-RS	39,3 ± 17,2	36,1 ± 17,7	0,008
EC-SS	100 ± 17,9	99,5 ± 12,4	0,645
TLS-RS	79 ± 34	74,1 ± 34,9	0,037
TLS	205,4 ± 25,7	199,5 ± 25,7	0,001
TLS-SS	102,9 ± 13,8	99,6 ± 13,8	0,001
AC- AE	43,8 ± 25,1	41,3 ± 25,2	0,142
EC-AE	42,7 ± 25,3	38,3 ± 24,9	0,011
TLS-AE	43,2 ± 25,2	39,3 ± 24,6	0,024
DS	5 ± 3,4	16,7 ± 4,7	<0,001

AC: Auditory Comprehension, EC: Expressive Communication, TLS: Total Language Score, RS: Raw Score, SS: Standard Score, AE: Age Equivalent, DS: Difference Score.

language development disorder (Kappa coefficient: 0.468, <0.001). Table 5 shows the score average comparison of children with and without language and/or speech disorder and standard deviation values. From the table, a statistically significant difference can be seen in terms of the AC standard, the TLS, the TLS standard score, and the DS average.

Table 6 displays the first and second test score averages, the statistical significance level between scores, and the influence quality of 120 children chosen according to age range among children participating in the study. According to this table, a statistically significant difference is not found in terms of the TPLS–5, AC, EC, and TLS raw scores, as well as the TLS, AC, EC, and TLS standard scores, the AC, EC, TLS age equivalence, and the importance of difference. This is one of the most important results in terms of showing the validity and reliability of the test. Table 7 shows the TPLS–5 test-retest correlations according to the Pearson correlation coefficient, the Cronbach's alpha coefficient, and the intraclass correlation coefficient. The correlation coefficients for AC raw scores were found to be 0.937, 0.968 and 0.937; for EC raw scores they were found to be 0.908, 0.952, 0.908; and for TLS raw scores they were found to be 0.926, 0.962 and 0.926 respectively. Similarly, when AC, EC, and TLS age equivalence correlation coefficients are examined, it can be seen that the TPLS–5 has high validity and reliability findings.

Understanding how a test relates to other tests, in order to create identical or similar constructs, provides additional evidence regarding the validity of a test. The PLS–4 test was used for this purpose in our study and the correlation between the two test results was examined. Table 8 shows the correlations between TPLS–5 and PLS–4 scores. Adjusted correlations between TPLS–5

Table 6

Test and retest score averages statistical significance level between scores and influence quality.

Score area	Test score	Retest score	p	Influence quality
AC-RS	50,6 ± 11,3	50,9 ± 11,3	0,307	–0,075
AC-SS	102 ± 14,9	102,5 ± 14,6	0,674	–0,039
EC-RS	50 ± 11,6	50,7 ± 11,8	0,117	–0,139
EC-SS	101,2 ± 14,7	102,2 ± 14,1	0,423	–0,077
TLS-RS	100,3 ± 22,9	101,5 ± 23	0,161	–0,136
TLS	203,2 ± 28,5	204,9 ± 27,7	0,456	–0,070
TLS-SS	101,7 ± 15,3	102,5 ± 14,8	0,493	–0,062
AC- AE	60 ± 21,8	60,7 ± 22	0,434	–0,070
EC-AE	59,2 ± 21,8	60,2 ± 21,9	0,290	–0,090
TLS-AE	59,3 ± 21,7	60,2 ± 21,8	0,337	–0,087
DS	5,9 ± 5,2	5,6 ± 4,6	0,431	0065

AC: Auditory Comprehension, EC: Expressive Communication, TLS: Total Language Score, RS: Raw Score, SS: Standard Score, AE: Age Equivalent, DS: Difference Score.

Table 7

Test-retest correlations of TPLS–5.

Score area	Pearson correlation coefficient	Cronbach alpha	ICC
AC-RS	0,937**	0,968	0,937**
AC-SS	0,638**	0,779	0,638**
EC-RS	0,908**	0,952	0,908**
EC-SS	0,596**	0,747	0,596**
TLS-RS	0,926**	0,962	0,926**
TLS	0,629**	0,772	0,629**
TLS-SS	0,634**	0,776	0,634**
DS	0,563**	0,716	0,563**
AC- AE	0,871**	0,945	0,871**
EC-AE	0,896**	0,931	0,871**
TLS-AE	0,887**	0,940	0,887**

**p < 0,001.

AC: Auditory Comprehension, EC: Expressive Communication, TLS: Total Language Score, RS: Raw Score, SS: Standard Score, AE: Age Equivalent, DS: Difference Score, ICC: Intraclass Correlation Coefficient.

and PLS–4 are 0.82 (Auditory Comprehension), 0.80 (Expressive Communication), and 0.84 (Total Language); these scores indicate a high correlation between the two tests.

4. Discussion

Early diagnosis of hearing loss is particularly important given its effect on development areas especially speech and language development of children negatively. Late diagnosis of or undiagnosed hearing and speech disorders can cause many problems, such as speech and language skill deficiency, weaker academic performance, personal and social mismatch, and emotional problems, all of which can have a lifelong impact on children. Therefore, early diagnosis of hearing and speech disorder can be lifesaving, and language and speech tests play an important role in this early diagnosis [5,23–25]. In our study, 1320 children were chosen randomly by considering some variables such as age range, gender, the education level of the mother, and socioeconomic status. These children were evaluated using the TPLS–5, a version of the PLS–5 translated and adapted into Turkish. 20.9% of these children had language or speech disorders and 79.1% did not. A pilot study of the original PLS–5, in other words the English version, was conducted between February 2009 and July 2009. In this study there were two samples: a nonclinical sample consisting of 455 children aged 0:0–7:11 and a clinical sample consisting of 169 children diagnosed with language disorders, aged 2:0–7:11. Children taking part in the clinical sample (N = 169), were identified as those with receptive, expressive, or receptive-expressive language disorders by using 77 score segment in disorder fields in standard language test [22]. Similarly, in our study, 276 children were determined as belonging to the group with language and speech disorders. Normative scores of English PLS–5 were taken from a sample representing the child population of USA, aged 0:0–7:11. Standardization began on January 2010 and continued until September 2010. The PLS–5 standardization research involved a normative sample consisting of 1400 children and additional samples related to validity and reliability studies. For the youngest age range (from 0:0–0:11 months) in the normative sample, 50 children took part at each trimester age range. For children aged 1:0–5:11 in the normative sample, 100 children took part in each six-month age range. For elder children (aged 6:0–7:11) in the normative sample, 50 children took part in each six-month age range [22]. Similarly, in our study of 40 children from the youngest and the oldest age groups, our validity and reliability studies are performed with 100 children from each group between the age of 1:0–5:11, totaling 1320 children. One

Table 8
Correlation of TPLS and PLS–4 scores.

PLS–4	TPLS–5					
	Auditory Comprehension		Expressive Communication		Total Language	
	<i>r</i>	<i>Adj r</i>	<i>r</i>	<i>Adj r</i>	<i>r</i>	<i>Adj r</i>
Auditory Comprehension	0.80	0.82	0.66	0.67	0.78	0.80
Expressive Communication	0.67	0.69	0.78	0.80	0.76	0.79
Total Language	0.76	0.78	0.79	0.81	0.82	0.84

All scores are based on age norms and values are standard scores.

Adj: Adjusted.

way to examine reliability is to calculate the test-retest stability. Test-retest stability corresponds to the correlation between test and retest scores and measures the test stability directly [26,27]. To measure the test-retest stability, a test is applied to a child twice under as similar circumstances as possible. Test-retest stability in PLS–5 is calculated with data gathered from 195 children chosen from the normative sample. The average corrected stability coefficient differs between 0.86 and 0.95 in different age ranges; this shows that PLS–5 scores have a stability rating between good and excellent [22]. In our study, the test-retest Pearson correlation coefficients gained by evaluating 120 children were found to be 0.937 for AC raw scores, 0.908 for EC raw scores, and 0.926 for TLS raw scores. In addition, adjusted correlations between TPLS–5 and PLS–4 were found to be 0.82 (Auditory Comprehension), 0.80 (Expressive Communication), and 0.84 (Total Language); these scores indicate a significant correlation between the two tests. Similarly, when AC, EC, and TLS age equivalence correlation coefficients are examined, it is clear that TPLS–5 has the highest validity-reliability findings.

Generally, receptive language and expressive language are represented by interrelated content, form, and usage factors [28]. A child, through the course of competent language usage, learns to comprehend and express the content or meaning transferred by language. In PLS–5, a child understands and usage of semantics, structure, and language skills integration is evaluated. A child's semantics accumulation is evaluated using articles focusing both on vocabulary and concept, while language structure is evaluated using articles focusing on morphology and syntax, and language skills integration is evaluated using articles focusing on practical language skills. In addition to these language skills, there are new articles in the PLS–5 in terms of issues such as a child's comprehension of gestures, playing games, developing literacy, phonological awareness, and theory of mind [22]. The way in which children display these skills, the development of their language following predicted patterns, or any language disorder they may have are all considered to be indicators of diagnosis. Additionally, most of these skills are positive indicators related to future academic success [28–31].

PLS–5 is an international language test. There are currently two language versions of the test (in English and Spanish). PLS–5 can be used to determine language delay/disorder, receptive and/or expressive language delay/disorder, and eligibility for early intervention or speech and language services. It can also measure the efficacy of speech and language treatment [32,33]. In the Turkish translation, adaptation, and validity-reliability study of the PLS–5, our country is provided with a Turkish language test, which can be used to evaluate and diagnose children with hearing and speech disorders, in terms of their receptive and expressive language skills, particularly between the neonatal stage and the age of 7 years 11 months. Through the PLS–5, children can benefit from an increased likelihood of early diagnosis and intervention related to language delay and/or disorder.

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