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The Evaluation of Primary School Readiness Levels of the Children Aged 66 - 72 Months with the Denver II Test

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Abstract

Background: Primary school can lead to compatibility problems in children without an early childhood education because they experience separation from their families for the first time.
Objectives: In order to detect developmental delays that may arise at the school and to plan the necessary support, it was aimed to determine primary school readiness levels of the children aged 66 - 72 months.
Methods: This study included 91 children aged 66 - 72 months who were admitted to the Pediatric Outpatient Clinic of Beyhekim State Hospital between June 2016 and August 2016. The Denver Developmental Screening Test II which consists of 134 items was performed. The Test items are divided into four main sections and surveys whether the chilren are ready for the first grade of primary school. The test results were interpreted as normal, suspect and abnormal.
Results: 36 (39.6%) of 91 patients were female and 55 (60.4%) were male. There was no statistically significant difference between the test results in terms of gender. When examining the distribution of children according to months, there was no statistically significant difference. Data for the child's age, the mother's age, the father's age, duration of breastfeeding, the age (month) at which the child started talking, walking or completed toilet training was expressed as mean ± standard deviation. When these values were examined and also the mean values containing normal and abnormal results were compared, there was a statistically significant difference only between the months when the children started talking. When examining the results of the Denver II test, it was found that 64 (70.3%) children had abnormal development and 27 (29.7%) normal development.
Conclusion: In the study evaluating primary school readiness levels of the children aged 66 - 72 months, the substantial proportion of the children who were admitted to the hospital, had a developmental delay. In light of this study, all pre-school children should be evaluated before admission to primary school.

Keywords: Denver II Test, Children, Preschool, Elementary School

1. Background

Primary school can lead to compatibility problems in children without an early childhood education because they experience separation from their families for the first time. Children who experience intensive separation anxiety have learning challenges because they cannot adapt to a multidisciplinary education. Children go to school life under a certain readiness status with the effects of their developmental levels, family life and environmental stimuli.

With the new education system in Turky, the age of schooling was reduced to sixty-six months and also children aged sixty months can start primary school according to their parents' request. When it is considered that literacy skills are gained at the first grade of primary school, it has led to discussions whether mental and physical readiness level of the children is suitable for starting primary school.

In both routine health controls and the examination of children brought due to complaints, it is an important aspect of clinical examination to determine whether the growth and development are normal for age (1). Evaluation of development includes the early detection of problems as well as screening and follow-up. A more accurate assessment consists of the integration of information obtained from the developmental and social-family history, medical history and clinical examination with the standardized and non-standardized measurements (2).

2. Objectives

In order to detect developmental delays early that may arise at the school and to plan the necessary support, it was aimed to determine primary school readiness levels of the children aged 66 - 72 months.

3. Methods

This study included 91 children aged 66 - 72 months who were admitted to the Pediatric Outpatient Clinic of the Beyhekim State Hospital between June 2016 and August 2016. The DDST II was optionally performed with the intention to find out whether they are ready for the first grade of primary school or it depends on the specific requirements of the child. The children with an abnormal test result were taken to the treatment program by determining the underlying risk factors.

The socio-demographic information of the family and the child were recorded in detail. The information was obtained about the child's calendar age and gender, breastfeeding duration of the child, the month at which the child started talking, the month at which the child completed toilet training and nutritional habits of the child. The information was obtained from the parents about their age, their educational status and occupation, their kinship relations, their marriage or divorce status, their prenatal, natal and postnatal histories were obtained in detail. Their physical and neurological examinations were performed. The height, weight and head circumference of the child were measured and their percentile was recorded. To evaluate the neuromotor development, the information was obtained about time at which the child smiled, held the head, sat up unsupported, started walking and said first meaningful words.

DDST II consists of 134 items which are divided into four main sections:

1. Personal-social development,
2. Fine motor-adaptive development,
3. Language development,
4. Gross motor development.

The test results were interpreted as normal (no delay and no more than one warning), suspect (one delay and/or two or more warnings) and abnormal (two or more delays) (3). Developmental support was recommended for the children with an abnormal test result. Recommendations were presented for delays or alerts of the children with a suspicious test result.

The exclusion criteria of this study were neuromotor development delay, central nervous system diseases, history of severe prematurity, presence of severe illness during the test, history of congenital malformation, perinatal asphyxia and chronic illness.

This study was approved by the Ethics Committee of Selcuk University Faculty of Medicine. Consent was obtained from the families for all evaluations.

SPSS 15.0 software was used for statistical analysis of the data. Statistical methods of the descriptive data were shown as mean $\pm$ standard deviation. While the parametric data were analyzed using the Student t-test, the nonparametric data were analyzed using the Chi-square test and the Mann-Whitney U test. The significance level for statistical tests was accepted as $P < 0.05$.

4. Results

Thirty-six (39.6%) of 91 patients were female and 55 (60.4%) were male. There was no statistically significant difference between the test results in terms of gender (P = 0.16). The comparison of the Denver II test according to socio-demographic characteristics including gender, maternal and paternal educational level, as well as father's occupation is shown in Table 1. The age distribution of the patients was between 66 - 72 months and the mean age was 69.62 $\pm$ 1.56 months. When examining the age distribution of the children in the study, 33.0% were 70 months and 19.8% were 69 months old. When examining the distribution of the children according to months, there was no statistically significant difference (P = 0.51). Data for the child's age, the mother's age, the father's age, duration of breastfeeding, the month at which the child started talking, walking and completed toilet training are shown as mean $\pm$ standard deviation in Table 2. When these values were examined and also the mean values containing normal and abnormal results were compared, there was a statistically significant difference only between the months at which the children started talking (P = 0.02).

The mean age of mothers in the study was 33.01 $\pm$ 4.50 years. There was no statistically significant difference in the age distribution of the mothers (P = 0.11). When examining the distribution of the educational status of the mothers of the children in study, 44.0% of the mothers graduated from primary school, and 23.1% from university. When the maternal educational levels were compared, the normal test results of the children of the mothers with university education were significantly higher (P = 0.001), and the abnormal test results of the children of the mothers with primary education were significantly higher (P = 0.001). When examining the occupational distribution of the mothers, 78.0% of the mothers were housewives, and

Table 1. The Comparison of the Denver II Test According to Socio-Demographic Characteristics[a]

	Denver 2 Test			
	Normal	Abnormal	Total	P
Gender				0.16
Female	14 (51.90)	22 (34.40)	36 (39.60)	
Male	13 (48.10)	42 (65.60)	55 (60.40)	
The educational status of the mothers				0.001
Illiterate	-	2 (3.10)	2 (2,20)	
Primary school	-	40 (62.50)	40 (44.40)	
Secondary school	-	7 (10.90)	7 (7.70)	
High school	3 (11.10)	14 (21.90)	17 (18.70)	
University	24 (88.90)	1 (1.60)	25 (27.50)	
Occupation of the mothers				0.001
Housewife	9 (3.30)	62 (96.90)	71 (78.00)	
Worker	2 (7.40)	1 (1.60)	3 (3.30)	
Public personnel	16 (59.30)	1 (1.60)	17 (18.70)	
The educational status of the fathers				0.001
Primary school	1 (3.70)	24 (37.50)	25 (27.50)	
Secondary school	-	11 (17.20)	11 (12.10)	
High school	3 (11.10)	13 (20.30)	16 (17.60)	
University	23 (85.20)	16 (25.00)	39 (42.90)	
Occupation of the fathers				0.001
Self-employed	1 (3.70)	18 (28.10)	19 (20.90)	
Worker	4 (14.80)	30 (46.90)	34 (37.40)	
Public personnel	21 (77.80)	11 (17.20)	32 (35.20)	
Tradesman	1 (3.70)	5 (7.80)	6 (6.60)	
Consanguinity				0.009
Presence	1 (2.00)	50 (98.00)	51 (56)	
Absence	27 (67.50)	13 (32.50)	40 (44)	

[a] Values are presented as No. (%).

Table 2. The Demographic Characteristics of the Participants[a]

	Normal	Abnormal	Total	P
The age of the children, month	69.33 ± 1.68	69.75 ± 1.56	69.62 ± 1.56	0.24
The age of the mothers, y	34.18 ± 3.56	32.51 ± 4.78	33.01 ± 4.50	0.10
The age of the fathers, y	38.29 ± 4.20	36.39 ± 5.66	36.95 ± 5.30	0.11
Breastfeeding duration of the children, month	14.48 ± 8.29	17.11 ± 7.89	16.30 ± 8.06	0.15
The age at which the children started talking, month	14.51 ± 4.13	18.21 ± 7.83	17.12 ± 7.12	0.02
the age at which the children started walking, month	13.11 ± 3.06	14.75 ± 4.58	14.26 ± 4.23	0.92
the age at which the children completed toilet training, month	30.84 ± 9.30	30.30 ± 9.40	30.45 ± 9.32	0.89

[a] Values are presented as mean ± SD.

18.7% were public personnel. The normal test results of children of the mothers who were public personnel were significantly higher (P = 0.001).

The mean age of the fathers in the study was 36.95 ± 5.32 years. There was no statistically significant difference in the age distribution of the fathers (P = 0.08). 36.3% of the mothers graduated from university, and 27.5% primary school education. The normal test results of the children of the fathers with university education were significantly higher (P = 0.001). The abnormal test results of the children of the fathers with primary school education were significantly higher (P = 0.001). 37.4% of the fathers were workers and 35.2% were public personnel. The normal test results of children with fathers working as public personnel were significantly higher (P = 0.001).

There was a relationship between the parents of 50 children with an abnormal test result with no statistically significant difference (P = 0.009).

When examining previous breastfeeding experience and breastfeeding duration of the children, 27 (29.7%) chil-

dren were breastfed until 18 months, 19 (20.96%) children were breastfed until 24 months and 3 (3.3%) children were not breastfed. The mean duration of breastfeeding was 16.30 $\pm$ 8.06 months and there was no statistically significant difference in terms of breastfeeding duration (P = 0.176). 48 (52.7%) children started talking at 12 months old, 19 (20.9%) children at 24 months old and 5 (5.5%) children started talking later. The mean age at which children started talking was 17.12 $\pm$ 7.12 months. There was a statistically significant difference in terms of the age at which the children started talking (P = 0.032). Walking began in 43 (47.3%) children 12 months old, 17 (18.7%) children started walking at 18 months old and 5 (5.5%) children started talking later than 24 months. There was no statistically significant difference in terms of the age at which the children started walking (P = 0.085). Toilet training was completed in 20 (22%) children 36 months old, in 20 (22%) at 30 months old and 6 (6.6%) children have not completed toilet training yet. There was no statistically significant difference in terms of the age at which the children completed toilet training (P = 0.089).

When examining the results of the Denver II test, it was found that 64 (70.3%) children had abnormal development and 27 (29.7%) children had normal development. 54 (59.3%) children had limitations in personal-social skills, 39 (42.8%) in fine motor skills and 40 (43.95%) children in the field of language development. According to test results, distribution of the causes of the reports is shown in Table 3. An abnormal test result was found in 23 of 30 children aged 70 months, and in 11 of 18 children aged 69 months. The distribution of the test results according to the ages of the children in the study are shown in Table 4. The majority of 21 children with a normal test result consisted of the children aged 69 months and 72 months. There was no statistically significance difference between the age groups (P = 0.51).

5. Discussion

Social, cognitive, physical and language developments of children must be evaluated at regular intervals for the early detection of developmental delays. Early diagnosis is equivalent to early treatment, and also it would help to prevent the possible problems and to detect developmental delays early that occur due to environmental and biological causes which the child may encounter. However, developmental delays cannot be identified in the early childhood (4).

A development process is a dynamic event. Development monitoring is to follow any progression in the stages of child development (5). Developmental screening is defined as the identification of individuals at risk for the developmental delay with standardized tools. Most clinicians evaluate developmental delay as a routine but most of them do not use a standardized tool for this. Mostly it is decided based on received information from families, a list of development stages and observations (6). As a result of the previous studies, while detection rate for children with developmental delay was found to be 30% with the clinical judgment without using any tool (5, 7), it was found to be 70 - 80% with both the clinical judgment and the use of any tool (7).

A child with developmental delay may sometimes be considered as normal by parents or physicians in the early period. It is also common that many developmental delays are noticed by the lack of walking and talking at two years old or low school performance in later stages. However, the child's potential is utilized at the highest level by supporting the development with early diagnosis and treatment.

Developmental delays are one of the most common problems in children within the first 6 years. In several studies, it is reported to be between 3 - 25% in the society (8). Developmental disorders may be overlooked during normal examination especially in infancy and early childhood. Moreover, it is difficult to describe without a standard assessment. Healthy children should undergo a developmental screening test between 12 - 18 months, 2 - 3 years and 5 - 6 years, including certainly once between 0 - 6 months (8). Based on this, the DDST II which was standardized as scale and gives tips to practitioners about the general development characteristics of the child is used as a screening test in this study.

The DDST is a simple method used in the assessment of the development of infants and preschool children (9, 10). It has an important role especially in the monitoring of the development of infants and in the early detection of developmental deviations. Thus, it is possible to begin rehabilitation in the early period (9-11). The DDST was first used in 1967, and also it is a screening test which was developed to help health personnel to understand developmental problems in children between 0 - 6 years (12). The DDST was revised by Frankenburg et al. in 1990 and so the Denver II test was formed (13). The Denver II test was standardized by adapting to different societies in many countries. In Turkey, the Denver II test has been standardized by the Department of Child Neurology of Hacettepe University Faculty of Medicine in 1980 (14). The test can be used as a developmental screening tool but it cannot be used as an intelligence test (15). It can be applied by persons who have received training and passed the proficiency exam.

Socio-demographic factors have a significant impact on children's development. Neuromotor development is a systematic change which occurs within the time. Neuromotor development of the healthy child is influenced by

Table 3. The Distribution of Report Causes According to the Test Results of Children Participating in the Study[a]

Report Cause	Abnormal	Normal
Personal-social skills	54 (59.30)	37 (40.70)
Fine motor skills	39 (42.80)	52 (57.20)
Language development skills	40 (43.90)	51 (56.10)
Gross motor skills	-	91 (100)
Personal-social skills-fine motor skills	12 (13.10)	-
Personal-social skills-language development skills	16 (17.50)	-
Language development skills-fine motor skills	2 (2.10)	-
Personal-social skills-language development skills- fine motor skills	19 (20.80)	-

[a] Values are presented as No. (%).

Table 4. The Distribution of the Test Results According to the Ages of the Children Participating in the Study[a, b]

Age, month	Test Results		
	Normal	Anormal	Total
66	2 (11.10)	3 (3.10)	5
67	-	1 (1.60)	1
68	4 (14.80)	11 (17.20)	15
69	7 (25.90)	11 (17.20)	18
70	7 (25.90)	23 (35.90)	30
71	3 (11.10)	4 (6.30)	7
72	3 (11.10)	12 (18.80)	1

[a] Values are presented as No. (%).
[b] P = 0.51.

many environmental factors. The knowledge of these factors and their impact contributes to follow-up and guidance of the child's neuromotor development. In our study, we have detected significant findings in terms of parents' education level, parents' work status, consanguineous marriage and the month at which the child started talking. However, we have not detected significant findings in terms of age, gender, parental age, breastfeeding duration, the month at which the child started walking and the month at which the child completed toilet training.

It is well-known that developmental disorders are more common in men. Men are more likely to have abnormal findings on the DDST results compared to women. In the literature, there are different reports about the effect of gender on the development. Brito et al. found that in pre-school children male gender was associated with cognitive and neuromotor delays (16). In a study performed by Gokcay et al. the girls had better results compared to boys (17). In a study made using the DDST II in 1176 Turkish children by Epir and Yalaz development of the girls was better than that of the boys (18). However, a study performed in children by Ozkan et al. revealed that there was no significant difference between the genders in terms of the DDST results (19). Moreover, in a study using DDST II in 1091 Turkish children by Duimazlar et al. no significant difference between the genders was found (20). In our study, there was no significant difference between the genders with regard to DDST results.

Social, economic and cultural level of family is among the most important factors that affect child's growth and development. Home environment, parental intelligence, time devoted to child, parent involvement in child care, and health service for child are important in child development (15). The early detection of developmental deviations in children, the identification of underlying risk factors and taking children into treatment programs are very important.

It has been reported in previous studies that maternal education is an important factor in child development (19, 20). Studies show that children of mothers with low educational level have the stimulating challenges due to insufficient developmental gains (21). In a study conducted in the Philippines, there was a relationship between maternal education and place of birth and the DDST results. Children of mothers living in urban area and having high education level had better results (22). Lejarraga et al. found a significant relationship between maternal education and children's developmental status after the first year of life (23). Moreover, Barnes and Stark using DDST in 206 children found no relationship between child development and maternal education level (24). In accordance with previous studies that have emphasized the importance of maternal education level, the recent studies report that parental education levels are an important factor for the level of child development (25). Our study supports that parental education levels have a significant impact on the development of the child.

Gokcay et al. examined the factors affecting development in 200 children in their study and they found that there was no a relationship between mother's work status and the child's neuromotor development (17). Dincer and Demiriz found that the children of working mothers had a significantly higher performance in the self-care skills such as eating, dressing unaided, organization and learn-

ing the toilet habits (26). In our study, we found that the parents who were public personnel had positive effects on their children's development.

There are studies establishing a significant relationship between socioeconomic status and the results of the Denver II test in children. Bayoglu et al. investigated whether the risk of school failure can be revealed with the DDST II made in preschool period in 980 children. They found that the children with an abnormal test result had significantly lower socioeconomic status (27). In our study, could not obtain information on the economic level. However, if assumed that parents having a job are better in economic terms, we found a significant relationship between socioeconomic status and the results of the Denver II test.

It is known that consanguineous marriage increases the risk of mental retardation and some inherited diseases. Our findings showed that consanguineous marriage had a negative effect on the children's developmental level. It is impossible to compare the findings of the study, with those of the literature because there is no enough data describing the relationship between early development and kinship.

Breast milk is known to be a positive protective factor for early childhood development. Many studies support the developmental and mental benefits of breastfeeding (28). They have reported that there is an inverse relationship between breastfeeding duration and developmental delay (29). Gokcay et al. examined the factors affecting the development within the first two years in 200 children aged 18 - 24 months and stated that infants who are breastfed for at least 4 months walked unsupported earlier. There were no significant differences in terms of other skills (17). Only breastfeeding duration was statistically higher in the children with a normal result on the Denver II test compared to the children with an abnormal and suspect result on the Denver II test. In a study performed in Denmark, it was shown that only breast-feeding had the positive effects on the neurological development of the infants independently of the effect of the factors affecting breast-feeding (30). In our study, we did not detect a significant relationship between breastfeeding duration and the DDST results.

It was observed that the majority of the families participating in the study were concerned due to the deficiencies in self-care skills of their children. The obtained test results confirm these concerns of the families. The majority of the children with an abnormal test result had delays in self-care skills and other accompanying skills. It was observed that they had limitations in independent dressing, buttoning and going to the toilet alone. 39 of the children in the study had limitations in fine motor skills, and also they had delays when they were asked to draw a shape shown or a picture of a child. 40 of the children in the study had limitations in the area of language development, especially in one concept and opposite concept in asked questions. In the light of the obtained information, the report has been prepared regarding the child receiving support in conceptual and self-expression areas and so continuing pre-school education instead of the first grade of primary school.

Based on the test and observations, 64 of 91 children participating in the study had delays and limitations in various areas. This result suggests that the potential problems in the school life of other children starting school without an assessment should not be ignored.

5.1. Conclusion

In the study related to the evaluation of primary school readiness levels of the children aged 66 - 72 months, a substantial proportion of the children admitted to the hospital, had a developmental delay. In light of this study, all preschool children should be evaluated before starting primary school. We suggest that families should be urged to pass a general health control in children before starting primary school, with evaluation of overall development as well as hearing and vision screening after which the school registration should be done.

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