

# Visual Perception Skills Among Children of Different Socioeconomic Status

Farklı Sosyoekonomik Düzeylerdeki Çocuklarda Görsel Algılama Becerileri

**Hatice ABAOĞLU<sup>1</sup>, Babak KASHEFIMEHR<sup>2</sup>, Gülfer KATIRCIBAŞI<sup>3</sup>, Esra, AKI<sup>4</sup>**

<sup>1</sup>PT, Ph.D., Faculty of Health Sciences, Occupational Therapy Department, Hacettepe University, Ankara, Turkey

<sup>2</sup>OT, Ph.D., Faculty of Rehabilitation, Occupational Therapy Department, Tabriz University of Medical Sciences, Tabriz, Iran.

<sup>3</sup>PT, MSc, Ministry of Health Ankara Physical Therapy and Rehabilitation Training and Research Hospital, Ankara, Turkey

<sup>4</sup>Ph.D. Prof, Faculty of Health Sciences, Occupational Therapy Department, Hacettepe University, Ankara, Turkey.

## ÖZ

**Amaç:** Bu çalışmanın amacı farklı sosyoekonomik statüye sahip çocuklarda görsel algılama becerileri arasındaki farklılıkları araştırmaktır. **Gereç ve Yöntem:** Çalışmaya yedi ile on yaşları arasında (ortalama =  $9.2 \pm 0.8$ ) toplam seksen üç çocuk katıldı. Görsel algılama becerilerini değerlendirmek için Motor Beceriden Bağımsız Görsel Algı Testi-3 uygulandı. Sosyo-demografik özellikler anket formu ile kaydedildi. **Sonuçlar:** Yüksek gelirli ebeveynlere sahip çocukların, görsel algılama sonuçları, düşük gelir düzeyindeki çocuklara kıyasla belirgin şekilde daha yüksekti. Görsel algılama puanı, eğitim düzeyi yüksek ebeveynli çocuklarda düşük eğitilmiş ebeveynlere göre anlamlı derecede yüksekti ( $p < 0.05$ ). **Tartışma:** Sonuçlar düşük sosyoekonomik statüye bağlı olarak kaynaklara erişimin kısıtlanmasının çocuklarda görsel algılama becerilerini etkileyebileceğini ortaya koymuştur.

**Anahtar Kelimeler:** Görsel algılama; Sosyo-ekonomik faktörler; Çocuk

## ABSTRACT

**Purpose:** The aim of this study is to investigate the differences in visual perception skills among children from different socioeconomic status. **Material and Methods:** A total of eighty-three children between seven and ten years old (mean age =  $9.2 \pm 0.8$ ) participated in the study. The Motor Free Visual Perception Test-3 was administered to examine visual perception skills. Socio-demographic characteristics (age, sex, household income and parents' level of education) were obtained by means of a questionnaire. **Results:** Children with high-income parents had significantly better visual perception outcomes compared to children with low-income parents. Visual perception scores were significantly higher in children with high-educated parents than those with low-educated parents ( $p < 0.05$ ). **Conclusion:** Results revealed that decreased access to resources because of low socioeconomic status might affect visual perception skills in children.

**Key Words:** Visual perception; Socioeconomic factors; Child

**Sorumlu Yazar (Corresponding Author):** Babak Kashefimehr e-mail: babakkashefi@yahoo.com

ORCID ID: 0000-0002- 9249-5746

Geliş Tarihi (Received): 27.09.2017; Kabul Tarihi (Accepted): 10.12.2017

This study was presented as an oral presentation at IV. International Eurasian Educational Research Congress, May 12, 2017, Denizli, Turkey

Socioeconomic status (SES), including family income and parental education is considered as an important determinant of health, cognitive, social and emotional outcomes in children (Bradley and Corwyn, 2002). To date, there are several studies which have reported that SES has a significant influence on child development (Noble, Norman and Farah, 2005; Hackman and Farah, 2009; Otero, 1997). Macintyre, Macdonald and Ellaway (2008) state that families from low socioeconomic circumstances might not have enough sensory inputs because of their restricted access resources and facilities. Socioeconomic status in childhood may affect child's neurocognitive development and even his or her mental health during lifetime (Ochi, Fujiwara, Mizuki et al, 2014). Farah, Shera, Savage et al. (2006), have reported that there is a significant association between SES and neurocognitive development. The results of their study indicated that SES disparities were significant in working memory, cognitive control and especially in language and memory.

The influence of SES on academic indicators and school achievement has long been recognized as an important aspect of cognitive neuroscience and social sciences (Hackman and Farah, 2009; Bradley and Corwyn, 2002). Noble, Farah and McCandliss (2006) investigated one hundred sixty-eight 1st graders from a wide range of socioeconomic backgrounds in their study. Results showed that children from lower socioeconomic backgrounds had disadvantages in terms of reading outcomes. Further, Ayoub, O'Connor, Rappolt-Schlichtmann et al (2011), examined cognitive performance of children living in poverty. They found that cognitive performance scores decreased significantly from one to three years of age in comparison to national norms. Additionally, recent studies have highlighted that children's educational attainment and performance on tests of cognitive ability vary with SES. Children from disadvantaged homes have lower cognitive achievement than children from advantaged homes (Ayoub, et al, 2011, Christensen, Schieve, Devine et al, 2014).

People receive large amounts of sensory inputs from the surrounding environment in order to integrate and organize new incoming information. The various sensory inputs to the development of children's visual perception are related to environmental characteristics such as economic status and educational level of parents. (Pienaar, Barhorst and Twisk 2013, Newell, Herdtner and Lough, 1968, Butun Ayhan, Aki, Mutlu et al, 2015). Socioeconomic status is inversely correlated with exposure to suboptimal environmental conditions that may cause adverse health consequences. In other words, the reduced family income is associated with the poorer-quality of specific

settings such as the home, school and neighborhood (Evans and Kantrowitz, 2002).

Although the literature supports the existence of a significant association between SES and various factors such as neurocognitive development and academic ability, there is no comprehensive study that investigates the effect of SES on visual perception skills. The present study hypothesized that there would be significant differences in visual perception skills among children from different socioeconomic status.

## **MATERIAL AND METHODS**

### **Design and Participants**

A descriptive correlational study design was used to examine the association between visual perception skills and socioeconomic status. Eighty-three primary school children (41 boys, 42 girls) were included in the study. Their ages ranged from 7-10 years (Mean=9.2 SD=0.8). Children were randomly selected from four public schools located in Ankara, Turkey. Based on the information received from the school administration, subjects were excluded from the study if they had cognitive, emotional and behavioral problems that might impede participation. Subjects with uncorrected visual impairment were also excluded.

### **Measures**

Socio-demographic characteristics, Socio-demographic characteristics such as age, sex, household income and parents' level of education were recorded. Data were collected from teacher reports and school records. For this study, two indicators were used to characterize family SES: parental education and income. Bulletin of the Confederation of Turkish Trade Unions was considered as a reference in classifying family income level. Accordingly, the lower income level corresponds to the hunger limit of 1130.37 TL and below, the middle income level to a limit between 1130.37 and 3681.99 and the upper income level to 3681.99 and above (Bulletin of the Confederation of Turkish Trade Unions, 2014). Parental education was classified into 3 groups: group 1; illiterate or completed primary school, group 2; secondary school or high school and group 3; university and post-graduation.

Visual Perceptual Skills, the Motor Free Visual Perception Test-3rd Edition (MVPT-3) was used to measure visual perceptual skills of children. The MVPT-3 measures visual perceptual ability of individuals ages 4 years 0 months through 95 years old and above. Psychologists, occupational therapists, educational specialists and others commonly use it for screening, diagnostic and research purpose. The MVPT-3 composes of 65 items and black-white line drawing where the individual selects the correct response from four

choices. Visual perceptual tasks of the test consist of six categories: spatial relationships, visual discrimination, form constancy, visual memory, and visual closure and figure-ground. With children ages 4 through 10, start with the first item and administer items 1-40. For those older than age 10 start with the example for item 14 and administer items 14-65. The raw score of the MVPT-3 can be converted to an age equivalent score and percentile ranks using the norms tables in the test manual. The MVPT-3 is highly valid and reliable measure of visual perceptual processing ability in children and adults ( $r= 0,72-0,83$ ) (Brown and Elliott, 2011; Colarusso and Hammil, 2003). The psychometric properties of the Turkish version of the MVPT-3 was examined (Metin and Aral, 2013).

### Procedure

The study was approved by the National Ministry of Education, Department of Education, Research and Development and was presented to the school administrators. Researchers obtained written informed consent from parents and verbal assent from children. All measures were conducted in compliance with the Helsinki Declaration. The MVPT-3 was administered according to standardized protocol as described in the test manual.

### Analysis

One-way analysis of variance (ANOVA) was used to compare age variable among groups. Raw scores of the MVPT-3 were calculated for analyses. Nonparametric tests were applied in order to

analyze the differences among variables with non-normal distribution. The Mann-Whitney U Test was used to compare the MVPT-3 scores between the genders. Data were analyzed using the Kruskal Wallis Test followed by Bonferroni/Dunn Post Hoc Test for group comparisons. All analyses were performed using SPSS software (Statistical Package for the Social Sciences) version 21.0. P value of 0.05 or less was regarded as significance.

### RESULTS

The mean ages were  $9.5\pm 0.5$ ,  $9.0\pm 0.9$  and  $9.1\pm 0.9$  years in the low-, middle- and high-income groups, respectively. There was no statistically significant difference among the groups (parental education and income) in terms of age variable (One-way ANOVA,  $p<0.05$ ). No significant gender-related difference was found in the MVPT-3 scores (Mann Whitney U Test,  $p<0.05$ ).

Significant differences were observed in visual discrimination, visual memory, visual closure and total scores of MVPT-3 among three income groups ( $p<0.05$ ). Children with high-income parents had significantly better visual perception scores than children with low-income parents (Bonferroni-Dunn Post Hoc,  $p=0.001$ ). These results are presented in Table 1.

When visual perception skills were compared in three mother and father education groups, there were significant differences in both groups ( $p<0.05$ ) (Table 2). High-level education group scores were higher than low-level education group scores (Bonferroni-Dunn Post Hoc,  $p=0.007$ ,  $p=0.010$ ).

**Table 1.** The comparison of MVPT-3 scores in income level groups

MVPT-3	Low-income	Middle-income	High-income	Kruskal Wallis Test	
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Chi-Square	p
Visual discrimination	11.35 $\pm$ 1.88	12.07 $\pm$ 1.18	12.6 $\pm$ 1.35	8.461	.015*
Form constancy	4.26 $\pm$ 1.22	4.75 $\pm$ 0.75	4.52 $\pm$ 0.96	5.637	.060
Visual memory	6.66 $\pm$ 1.49	7.28 $\pm$ 0.93	7.48 $\pm$ 0.82	8.730	.013*
Visual closure	8.42 $\pm$ 2.41	9.39 $\pm$ 2.75	10.6 $\pm$ 1.82	9.673	.008*
Total	30.48 $\pm$ 5.44	32.29 $\pm$ 6.93	35.28 $\pm$ 3.80	14.218	.001*

\*The mean difference is significant at the 0.05 level.

**Table 2.** The comparison of MVPT-3 scores in mother and father education level groups

MVPT-3		Low-level education	Middle-level education	High-level education	Kruskal Wallis Test	
		Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Chi-Square	p
Mother	Visual discrimination	11.59 $\pm$ 1.81	12.11 $\pm$ 1.23	12.58 $\pm$ 1.28	6.349	0.042*
	Form constancy	4.42 $\pm$ 1.13	4.61 $\pm$ 0.84	4.62 $\pm$ 0.96	1.924	0.382
	Visual memory	6.94 $\pm$ 1.06	7.33 $\pm$ 0.84	7.50 $\pm$ 0.83	6.600	0.037*
	Visual closure	8.45 $\pm$ 2.39	9.72 $\pm$ 2.56	10.62 $\pm$ 2.16	12.143	0.002*
	Total	31.67 $\pm$ 3.83	33.58 $\pm$ 4.22	34.08 $\pm$ 7.51	9.384	0.009*
Father	Visual discrimination	11.38 $\pm$ 1.96	12.19 $\pm$ 1.30	12.48 $\pm$ 1.35	5.810	0.055
	Form constancy	4.54 $\pm$ 1.14	4.38 $\pm$ 1.05	4.72 $\pm$ 0.89	2.270	0.321
	Visual memory	6.86 $\pm$ 1.24	7.16 $\pm$ 0.82	7.48 $\pm$ 0.82	5.016	0.081
	Visual closure	8.47 $\pm$ 2.40	9.03 $\pm$ 2.66	10.72 $\pm$ 2.05	11.474	0.003*
	Total	31.47 $\pm$ 3.86	32.90 $\pm$ 4.20	34.08 $\pm$ 7.51	8.818	0.012*

\*The mean difference is significant at the 0.05 level

## DISCUSSION

The purpose of the present study was to examine visual perceptual skills in school-age children from different SES. Socioeconomic status has many dimensions and can be examined in multiple ways. Family income level and parental education were investigated as indicators of SES in this study.

Bowman and Wallace (1990) hypothesized that preschool children from a higher socioeconomic group would perform significantly higher than preschool children from a lower socioeconomic group on hand size and strength, vestibular function, visuomotor integration and praxis tests. The data showed that the scores for hand size and strength, visuomotor integration, praxis were significantly better in higher socioeconomic group. Forns, Torrent, Garcia-Esteban et al (2012), showed that earlier socio-environmental characteristics such as parental social class, education level, maternal mental health and siblings at birth were associated with inattention and impulsivity. In the present study, when the results were analyzed in terms of income level, the differences were found to be significant in all subtests of MVPT-3 except form constancy. In other words, children who had lower socioeconomic backgrounds showed reduced visual perception ability. This study is consistent with previous studies in the literature, which confirm the importance of socio-environmental factors on children's cognitive development.

The main strength of this study is that results revealed a clear stepwise increase in scores from lower to middle to higher income and education, as shown in Table 2. The underlying reasons for the defined association between family income level and visual perceptual skills are complex and probably multifactorial. Those with high family income level may access more written, visual or technological materials in comparison to others. Moreover, it is likely that because low-income families have so little money to spend on any kind of product for their children, they may not provide visually stimulating materials or activities for their children. As a result; it has been thought that the child was successful at visual perception ability in that he managed to store a great number of visual inputs in his visual memory.

Stevens, Lauinger and Neville (2009) pointed that children whose mothers had lower levels of education showed reduced selective attention and neural process because of a reduced ability to filter irrelevant information. In parallel with previous suggestions, in this study, it is determined that the visual perception scores are higher in children with high-educated parents than those with parents. Because of their awareness of child development, high-educated parents may provide more opportunities for their children. Facing with more visual stimuli may support being interested in and focusing on a stimulus.

Enhancing visual perceptually stimulating

factors in home environment is thought to support prevention and intervention programs on child development. On the other hand, physical features of home and school environments and resources are the factors that likely influence visual perception ability. To closing the socioeconomic gap, further investigations might focus on parent-child interaction, objectives of families and material choosing. Certainly, there is a need for more research with wider samples in which socioeconomic disparities and related factors are assessed comprehensively.

### Limitations

There were some limitations of the current study. The children have been evaluated in school settings. The potential that the children will display in their own surrounding will be more realistic. Therefore, further studies should be planned to investigate the identification and inter-relations of other environmental factors, which might influence visual perception skills. Another limitation was that the time that the families spend with their children could not have been evaluated. It has been thought that this time period has great importance in the visual perception of the child. The studies ahead should be planned so as that these limitations are supposed to be overcome.

### Conclusion

In conclusion, the development of visual perception is very important in school-age children, so early evaluation and intervention approaches should be taken in account. It is suggested that future research should be designed to provide opportunity for students with low socioeconomic status to receive occupational therapy screening, assessment and intervention (if needed). In addition, research is needed to investigate cost-effective intervention programs to improve visual perceptual skills of children from lower socioeconomic backgrounds.

---

### REFERENCES

---

- Ayoub, C., O'connor, E., Rappolt-Schliemann, G., Vallotton, C., Raikes, H., & Chazan-Cohen, R. (2009). Cognitive skill performance among young children living in poverty: Risk, change and promotive effects of Early Head Start. *Early Childhood Research Quarterly*, 24, 289-305. doi:10.1016/j.ecresq.2009.04.001
- Bowman, O. J., & Wallace, B.A. (1990). The Effect of Socioeconomic Status on Hand Size and Strength, Vestibular Function, Visuomotor Integration and Praxis in Preschool Children. *The American Journal of Occupational Therapy*, 44(7), 610-620.
- Bradley, R.H., & Corwyn, R.F. (2002). Socioeconomic status and child development. *Annual Review of Psychology*, 53,371-399. doi:10.1146/annurev.psych.53.100901.135233
- Brown, T., & Elliott, S. (2011). Factor structure of the Motor-Free Visual Perception Test-3rd edition (MVPT-3). *Canadian Journal of Occupational Therapy*, 78, 26–36. *Bulletin of the Confederation of Turkish Trade Unions*, February 2014. Retrieved from <http://www.turkis.org.tr/dosya/MAY1RsoddqWy.pdf>
- Butun Ayhan, A., Aki, E., Mutlu, B., & Aral, N. (2015). A Study of Conceptual Development and Visual Perception in Six-Year-Old Children. *Perceptual & Motor Skills*, 121(3), 832-839. doi:10.2466/24.10.PMS.121c22x7
- Christensen, D. L., Schieve, L. A., Devine, O., & Drews-Botsch, C. (2014). Socioeconomic status, child enrichment factors, and cognitive performance among preschool-age children: Results from the Follow-Up of Growth and Development Experiences study. *Research in Developmental Disabilities*, 1-13. doi:10.1016/j.ridd.2014.02.003
- Colarusso, R. P. & Hammil, D.M. (2003). *Motor-Free Visual Perception Test, Third Ed.* California, Academic Therapy Publications.
- Evans, G. W., & Kantrowitz, E. (2002). Socioeconomic status and health: the potential role of environmental risk exposure. *Annual review of public health*, 23(1), 303-331.
- Farah, M. J., Shera, D. M., Savage, J. H., Betancourt, L., Giannetta, J. M., Brodsky, N. L., et al. (2006). Childhood poverty: Specific associations with neurocognitive development. *Brain Research*, 1110, 166-174. doi:10.1016/j.brainres.2006.06.072
- Forns, J., Torrent, M., Garcia-Esteban, R., Cáceres, A., Pilar Gomila, M., Martinez, D., et al. (2012). Longitudinal association between early life socio environmental factors and attention function at the age 11 years. *Environmental Research*, 117, 54 –59. doi:10.1016/j.envres.2012.04.007
- Hackman, D. A., & Farah, M. J. (2009). Socioeconomic status and the developing brain. *Trends in Cognitive Sciences*, 13(2), 65-73. doi:10.1016/j.tics.2008.11.003.
- Macintyre, S., Macdonald, L., & Ellaway, A. (2008). Do poorer people have poorer Access to local resources by area deprivation in Glasgow, Scotland. *Social Science & Medicine*,67(6),900-914. doi:10.1016/j.socscimed.2008.05.029
- Metin, Ş., & Aral, N. (2013). Motor beceriden bağımsız görsel algı testi-3: Geçerlik güvenilirlik çalışması. *Çankırı Karatekin Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 4(2), 57-72.
- Newell, T. G., Herdner, T. J., & Lough, L. (1968). Perceptual and socio-economic variables, instruction in body-orientation, and predicted academic success in young children. *Perceptual and Motor Skills*, 26, 1175-1184. doi: 10.2466/pms.1968.26.3c.1175
- Noble, K. G., Farah, M. J., & Mccandliss, B.D. (2006). Socioeconomic background modulates cognition-achievement relationships in reading. *Cognitive Development*, 21, 349-368. doi: 10.1016/j.cogdev.2006.01.007
- Noble, K.G., Norman, M. F., & Farah, M.J. (2005). Neurocognitive correlates of socioeconomic status in kindergarten children. *Developmental Science*, 8(1), 74-87. doi:10.1016/S0013-4694(97)95213-9
- Ochi, M., Fujiwara, T., Mizuki, R., Kawakami, N., & World Mental Health Japan Survey Group. (2014). Association of socioeconomic status in childhood with major depression and generalized anxiety disorder: results from the World Mental Health Japan Survey 2002-2006. *BMC*

Public Health, 14, 359. doi:10.1186/1471-2458-14-359

Otero, G. A. (1997). Poverty, cultural disadvantage and brain development: a study of pre-school children in Mexico. *Electroencephalography and Clinical Neurophysiology*, 102, 512-516. doi:10.1016/S0013-4694(97)95213-9

Pienaar, A. E., Barhorst, R., & Twisk, J. W. (2013). Relationships between academic performance, SES school type and perceptual-motor skills in first grade South African learners: NW-CHILD study. *Child Care Health and Development*, 40(3), 370-378. doi:10.1111/cch.12059