Turkish Journal of Forest Science
Available online at dergipark.gov.tr/turkjforsci

AN INVESTIGATION OF VISUAL DESIGN CRITERIA OF WOODEN TOYS FOR CHILDREN WITH LEARNING DISABILITIES

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Please cite this article as: Açık C. (2025) An investigation of visual design criteria of wooden toys for children with learning disabilities, *Turkish Journal of Forest Science*, 9(1), 1-11.

ESER BİLGİSİ / ARTICLE INFO
Araştırma Makalesi / Research Article
Geliş 6 Temmuz 2023 / Received 6 July 2023
Düzeltmelerin gelişi 10 Mart 2025 / Received in revised form 10 March 2025
Kabul 12 Mart 2025 / Accepted 12 March 2025
Yayımlanma 30 Nisan 2025 / Published online 30 April 2025

ABSTRACT: In this study, it was tried to determine whether visual features are effective in the wooden toy preferences of children with educable intellectual disabilities. The dynamics of this study are the fact that cognitive disability have the highest number among the educable disability groups, the use of toys as educational materials in this target group, and the limited academic studies on this type of disability. Three different toy groups were manufactured from pine wood for the study. Each group consists of four toys whose surface treatment is colored in four different ways. These toys are offered periodically to cognitive disability children of different genders, disability rates, and ages. From the data obtained, it was concluded that the gender, and disability rates were significantly effective in the wooden toy color preferences of individuals, still the effect of age differences was insignificant.

Keywords: Wooden toys, visual design, disabled children

ÖĞRENME GÜÇLÜĞÜ OLAN ÇOCUKLAR İÇİN AHŞAP OYUNCAK GÖRSEL TASARIM KRİTERLERİNİN ARAŞTIRILMASI

ÖZET: Bu çalışmada eğitilebilir düzeyde öğrenme güçlüğü bulunan çocukların ahşap oyuncak tercihlerinde görsel özelliklerin etkili olup olmadığı tespit edilmeye çalışılmıştır. Öğrenme güçlüğüne sahip çocukların, eğitilebilir engel grupları içinde en fazla sayıya sahip olması, oyuncakların bu hedef kitlede aynı zamanda eğitim materyali olarak da kullanılması ve bu engel türüne yönelik akademik çalışmaların oldukça kısıtlı olması bu çalışmanın dinamiğini oluşturmuştur. Çalışma için çam ağacından üç farklı oyuncak grubu üretilmiştir. Her grup farklı üst yüzey işlemi yapılmış dört çeşit oyuncaktan oluşmaktadır. Bu oyuncaklar periyodik sürelerde farklı cinsiyet, engel oranı ve yaşa sahip bireylerin beğenisine sunulmuştur. El edilen verilerden bireylerin cinsiyet ve engel oranlarının ahşap oyuncak tercihlerinde anlamlı olarak etkili olduğu, ancak yaş farklarının etkisinin anlamsız olduğu sonuçlarına ulaşılmıştır.

Anahtar kelimeler: Ahşap oyuncak, görsel tasarım, engelli çocuklar

INTRODUCTION

Children with intellectual disabilities are children who differ by two standard deviations from the average compared to their normally developing peers in terms of mental functions, and accordingly have deficiencies or limitations in conceptual, social, and practical adaptation skills, and need special education, and supportive education services. Children with intellectual disabilities who need special education have some characteristics that are different from those with normal development after birth. One of the common characteristics of children without disabilities that they need to play. The has an important role in discharging their inner energies, gaining experience, and supporting their development in general (Özyürek, and Akça 2015).

Among the many factors that will affect children's preferences, the biggest share is usually the features that determine the appearance of the toy. The most important criteria that determine the appearance properties of game materials are material, and color. As children's tastes, and preferences become clear during their physical, and mental development, their views, and understandings about color begin to form. The colors they want to be around reflect their inner world, and reveal the psychological state of the child. Age is an important factor in color preference, and color preference changes with age and maturity. There is no consistency in color preference in children before the age of three. Color is an element that should be emphasized in design because of its psychological effect on people. This effect is also very important in toys that children will use (Elibol *et* al. 2006).

According to OECD (Organization for Economic Development and Cooperation) - EU (European Union) and Turkey data, approximately 15% of the world's population is made up of disabled people. In other words, there are 1 billion disabled people in the world. According to the Turkish Disabled and Elderly Statistics Bulletin, the number of disabled people in 2021 is 2,511,950 people, of which 1,414.643 are men, and 1,097,307 are women. 40.63% of the total disabled population is chronic, 17.07% is mental, 13.78% is orthopedic, 9.53% is sight, 7.97% is hearing, 7.57% is mental, and emotional, 1.49% language, and speech, and 1.96% other disabilities. (URL-1, 2022). According to the educable groups other than chronic disease, the type of disability with the highest number of disabilities among mental, orthopedic, speech, and visual disabilities is the type of mental disability. On the other hand, it has been reported that 90% of intellectual disabilityhave mild mental retardation at a trainable level (Güller, 2014). Therefore, it can be said that the most crowded group among the disability types is mild intellectual disability and the group that needs the most academic work.

Many studies have been done on toys or wooden toys in the literature. In one of these studies, Usta (2022) introduced wooden toys by naming them in 27 categories and 118 sub-categories for pre-school children aged 0-6 (0-72 months). However, very limited studies have been conducted on the toy preferences of children with disabilities. Beşirik, and Türkmen (2021) examined the factors affecting the toy selection of physically handicapped children. They determined that being physically disabled affects the toy selection of children, and especially mothers. Özyürek, and Akça (2015) examined the types of toys most and least owned by individuals and families affected by intellectual disability. They also stated that these children first preferred cars, and baby toys. Patrizia et. al (2009) designed a robot to meet the heterogeneous needs of children with autism, children with moderate intellectual disability, and children with severe motor disabilities. In the experiments, they stated that the robot could

be used for special training, and guidance. Er and İlik (2022) examined the relationships between the type of disability, and learning disability, the mother's right to choose when buying toys for her child, and the toy type variables. Arai *et* al. (2017) created a toy model for disabled children with 3D computer graphics. Experiments confirmed that children with disabilities significantly improved their spatial cognition. Deshpande, and Ranavaade (2021) conducted a study on the importance of toy play in the education of the disabled.

In one of these studies, Usta (2016), wood is a natural, and readily available material. Wood has been one of the basic raw materials used in toy making since ancient times. Wood is also an indispensable material in meeting many needs of human beings. One of the biggest reasons for this is that wood is a renewable, and sustainable material. Wood, which is of great importance in all areas of life, is also used as a manufacturing, and building material because it is manufactured from wood, which is a natural material. Wood; It is among the most used materials in the toy industry, with its easy shape, chemical composition, and anatomical structure, advantage of its mechanical, and physical properties, and being able to be used in harmony with different materials (Onur, and Öndoğan, 2020). PVC toys are extremely harmful to the environment. Low-quality PVC is also harmful to baby's health. Low-cost PVC Toys, in particular, contain toxic chemicals that harm children in more than allowed quantities. All these factors show that PVC toys cause irreversible damage to the environment, and human health. (Biswas, 2021).

Elements such as form, color, texture, durability, reliability, and usefulness are taken into account in industrial product designs. However, it has been determined in the literature that visual perceptions are more effective in the product preferences of intellectual disability individuals. On the other hand, toys are used in many educational methods for the mentally handicapped. Toys for educational material purposes are quite common. Studies on the effects of visual features on people, their use in education, and treatment, and their use in the design of games, and educational materials are increasing day by day. However, studies in this field have not focused enough on wood materials with sustainable, healthy, ecological, and economic properties. The aim of this study is to investigate whether there is an interaction between the demographic characteristics of individuals, and toy visuals in the wooden toy concentration of educable intellectual disability children. Within the scope of the study, it is thought that the reasons for the preference of wooden toy images that children prefer can be used as product design criteria, and that children with the same characteristics will increase their concentration on play, and education.

MATERIAL AND METHOD

Material

In this study, it was tried to determine the wooden toy design criteria for children with intellectual disabilities. For this, wooden toys were manufactured in three different groups from pine wood. In terms of the reliability of the findings, it was tried not to choose toy groups that directly appeal to a gender.

Group 1: It is a pull toy. When this toy is pulled from the rope, the tail, body, and head parts move eccentrically as the wheel axles are off-center. The pulling toy is shown in Figure 1.a below.

Group 2: It is a clown toy. In this toy, when the clown's head is touched, it somersaults, and moves forward. Then he does a backflip, and then stops doing somersaults. The clown toy is shown in Figure 1.b below.

Group 3: The wheel is a toy. It consists of two wooden wheels, and 3 wooden supports that guide them. An object is needed to make tires, and weights. Metal apparatus is used as a weight in this toy. When the toy is pushed by hand, the wheels turn, and move forward. However, the metal apparatus prevents the tire from turning, and the tire bends, and collects the potential energy. In this way, the wheel pushed forward stops after a while, and comes back on its own thanks to the flexing, and bending tire. The returning wheel toy is shown in Figure 1.c below.

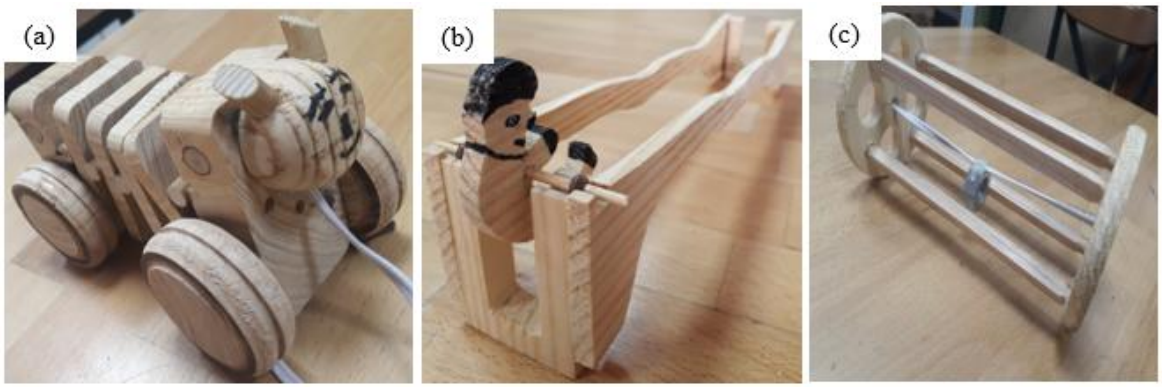

Figure 1. (a) Pull Toy **(b)** Clown Toy **(c)** Wheel Toy

There are four toys in each group. The toys in each group are the same in shape, and form. However, the surface treatments at the toy production stage are different. In other words, their visual features are differentiated. Each of the three toys in each group was coated with red, blue, and yellow water-based semi-covering paints. The fourth toy is covered with acrylic-based transparent varnish. The natural state of the wood looks bright on the varnished toy. In toys that are covered with semi-covering paints, the wooden material texture of the toy is painted in such a way that it does not disappear. In order not to complicate the decisions of cognitive disability individuals in choosing toys, only four different surface treatments were preferred. The reason why the toy colors are chosen as yellow, blue, and red is that these colors form the main colors. Other colors consist of a combination of primary colors. In addition, varnished transparent wooden textured toys, which is a common toy production method, are offered as an alternative.

Method

The research is in a descriptive survey model, and aims to reflect a situation. In the determination of the study group, the easily accessible sampling method was used, in which the sample consisted of participants that the researcher could easily reach. The study group of the research consisted of 58 cognitive disability children studying at 125. Yıl Special Education Primary, and Secondary School in Onikisubat district of Kahramanmaraş province. During the experiment design phase, and the implementation of the experiment, conformity approval was obtained from the guidance, and special education teachers who are experts in their fields. In the study, there are three groups of toys: pull toys, clown toys, and wheel toys. Each group of toys was presented to the preference of individuals at one-week intervals. The purpose of presenting the same images to a different group every week is to ensure that the individual

makes his choice independently of his previous choice. The individual was first shown how to play with the toy. The individual was then allowed to play in the same way. In the next step, the following questions were asked respectively. Once a reliable answer was received, the next question was not moved on.

1- Which of these toys is better?
2- Which of these toys would you like to have?
3- If these toys were sold in the market, which one would you buy?

At this stage, the individual's special education teacher was also present. This stage was carried out in a separate environment so that other individuals were not affected by the individual's response. The special education teacher helped the process run smoothly when needed. Below are the pull toy group in Figure 2.a, the clown toy group in Figure 2.b, and the wheeled toy group in Figure 2.c.

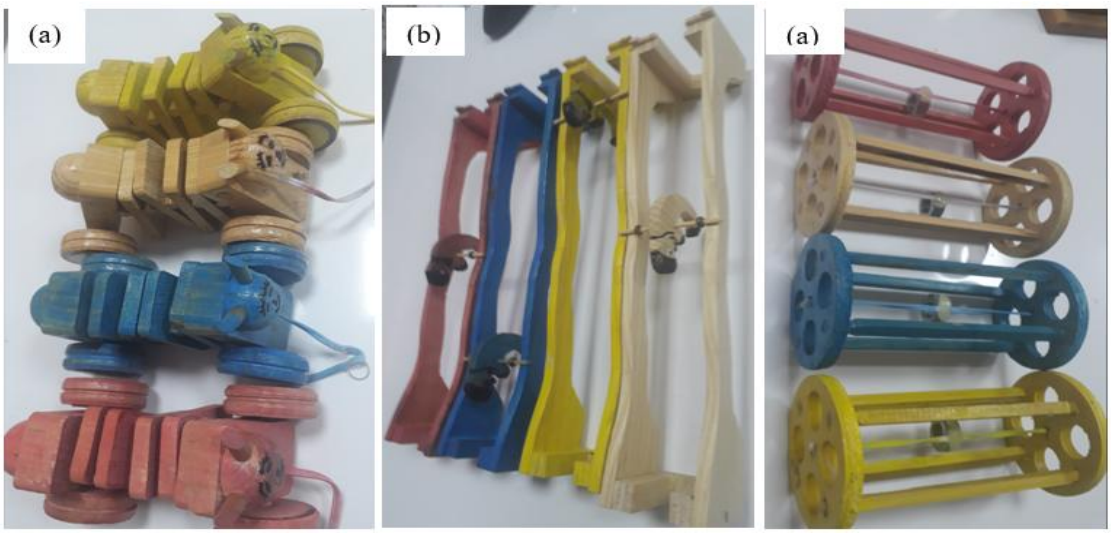

Figure 2. (a) Pull Toy Group (b) Clown Toy Group (c) Wheel Toy Group

Data collection and analysis

The data on the age, gender, and disability rates of the individuals were obtained from the reports of the classroom teachers. In these reports, the provisions of the regulation on the "assessment of the special needs of children" published jointly by the Ministry of Labor, and Social Services of the Republic of Turkey, and the Ministry of Health in the Official Gazette dated 20/02/2019, and numbered 30692 were taken as reference. According to these provisions, the cognitive disability rate of the individual was evaluated as 20-39% with special needs, 40-49% with mild special needs, and 50-59% with moderate special needs. For the purpose, and sub-purposes of the research, the data consisting of the preferences taken from the questions asked to the individuals were recorded in the computer environment. Frequency, and percentage values were calculated in the analysis of the data. Correlation analysis and, Kruskal-Wallis test were performed in the statistical program.

RESULTS

In order to determine the wooden toy design criteria for cognitive disability children, demographic characteristics of individuals, and preference data for different toy types were examined. There are 58 individuals in total, 24 girls, and 34 boys in the study group. Among these children, the rate of the mentally disabled of 15 people is 20-39%, the rate of mentally disabled of 23 people is 40-49%, and the rate of mental disability of 20 people is 50-59%. 16 of the individuals are in the 7-9 age group, 13 are in the 10-12 age group, and 29 are in the 13-15 age group. Three responses (repeats) were obtained from each individual. A total of 174 data were obtained. In the total data, blue-colored toys were preferred 55 times, yellow-colored toys 47 times, red-colored toys 41 times, and varnished transparent toys 31 times.

The effect of gender characteristics on individuals' preference for wooden toy colors was investigated. The biggest difference occurred in the choice of red color. While 30% of girls preferred red toys, 19% of boys preferred red toys. The least difference in color preferences according to the gender characteristics of the individuals was the blue-colored toys. While 32% of girls preferred blue toys, 31% of boys preferred blue toys. On the other hand, 21% of boys preferred transparent toys with, natural wooden appearance, while 14% of girls preferred transparent it. The fact that boys prefer natural wooden-looking toys more can be interpreted as they tend to make more original choices. On the other hand, while 24% of girls preferred yellow toys, 29% of boys preferred yellow toys. Regardless of gender, 32% of the individuals preferred blue-colored toys, 27% yellow-colored toys, 23% red-colored toys, and 18% transparent wooden-looking toys. Güller (2014) stated that children with mild mental retardation mostly prefer orange, and then blue. Since the color blue was preferred most in this study, it can be said that the results in these two studies are close to each other. Akdere (2006) stated that there is no significant difference between the visual discrimination skills of intellectual disability children of different genders. However, Çelik (2009) stated that the color red is mostly preferred for both genders of cognitive disability children of different genders. Since the blue toy is the most preferred, the findings in this study do not coincide with the findings in the literature. Below Figure 3.a shows the toy preference rates of boys, Figure 3.b shows the toy preference rates of girls, and Figure 3.c shows the toy preference rates of all individuals.

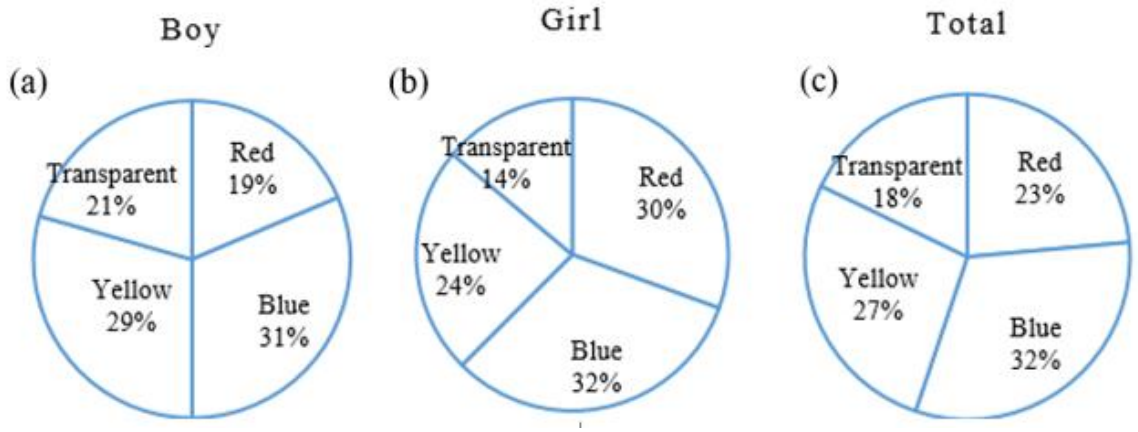

Figure 3. (a) Boys' Toy Preferences (b) Girls' Toy Preferences (c) All individuals' Toy Preferences

The effects of 20-39%, 40-49%, and 50-59% mental disability levels on individuals' different wooden toy preferences were investigated. The biggest difference was in the selection of

transparent varnished toys. As the disability rate of individuals increased, their preference for toys with natural wood appearance decreased. This situation can be interpreted as the inability of individuals with high disabilities to grasp the unique features of wood. On the other hand, as the disability rate increased, individuals preferred more blue-colored toys. A close distribution was obtained in all obstacle ratio groups for red, and yellow-colored toys. Akdemir (2006) reported that individuals with intellectual disabilities, and different levels of learning disability groups differentiate their visual perceptions in terms of visual discrimination skills. The findings in the literature are consistent with the findings in this study. Figure 4 below shows disability rates, the of individuals, and the of toy preferences.

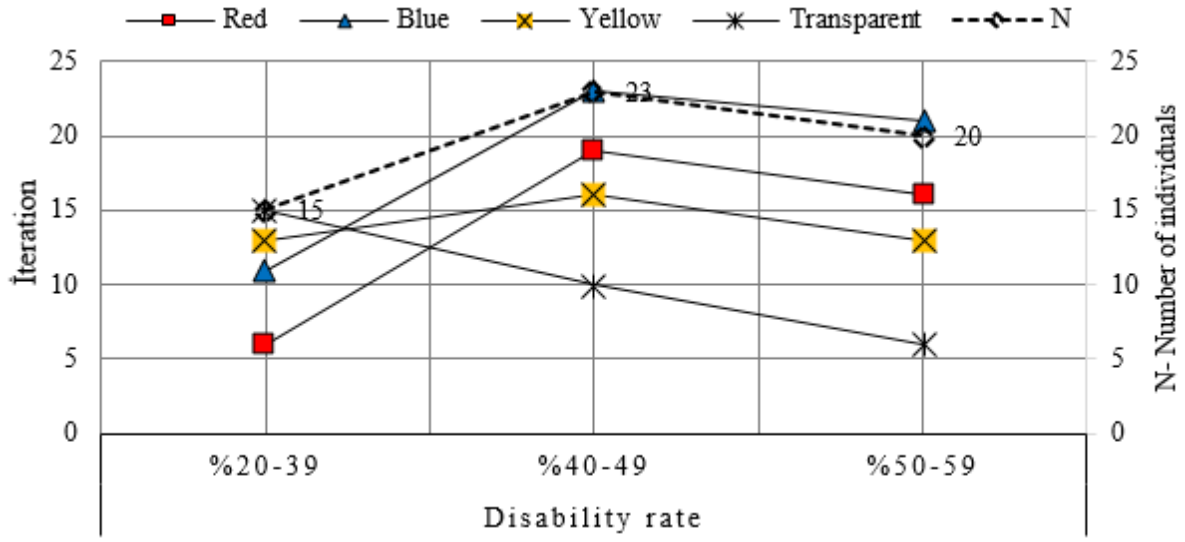

Figure 4. The Tendency of The Number Of Individuals, and Toy Preferences of Disability Groups

The effect of 7-9 age, 10-12 age, and 13-15 age groups on the color preferences of individuals' wooden toys was investigated. The most unstable choice was experienced in the selection of red toys. Individuals aged 7-9 preferred the least red toys after the transparent toys. While at the age of 10-12 they preferred the most red toys, at the age of 13-15 they preferred the least red toys again. The rate of individuals aged 10-12 preferring blue toys is lower than those aged 7-9, and 13-15. On the other hand, individuals in transparent, and yellow-colored toys showed a close distribution in all age groups. No statistically significant relationship was found between age groups, and toy preferences in the correlation analysis performed below. Akdemir (2006), reported that there was no significant difference between the visual discrimination skills of students with mental disabilities aged 6-12, categorized as under 9, and over 10 years old. The findings in the literature are consistent with the findings in this study. Figure 5 below shows the trend in the number of individuals, and toy preferences of age groups.

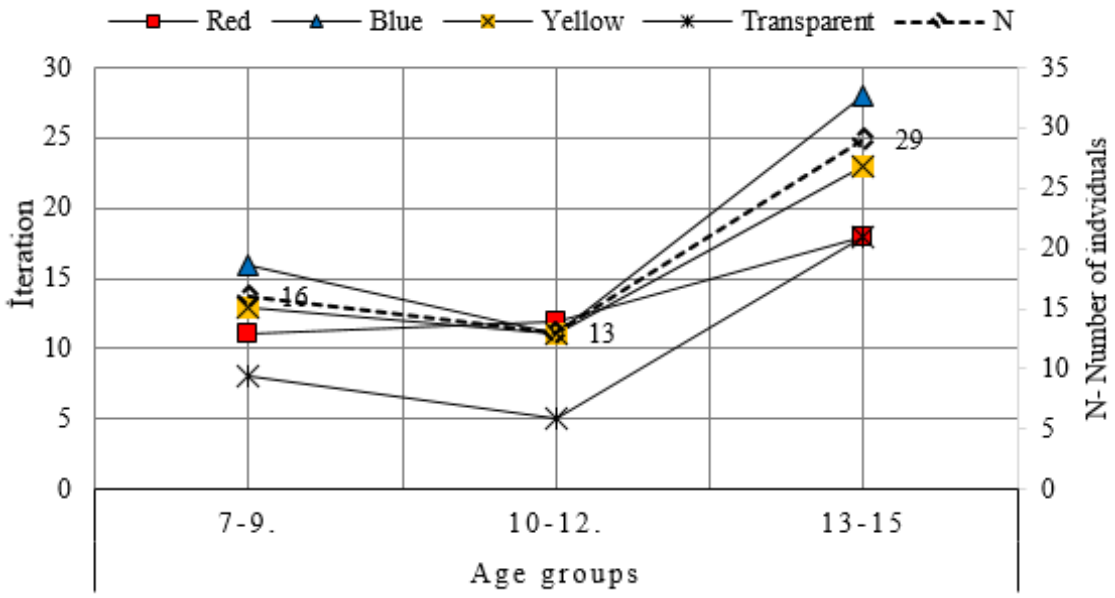

Figure 5. The Trend of The Number of Individuals, and Toy Preferences of Age Groups

Statistical analysis

In the study, Spearman correlation analysis was performed to determine the statistical relationships between the independent variables of gender, age, and disability ratio, and the option-dependent variable. Test results are given in Table 1 below.

Table 1. The Toy Preference Analysis Of The Independent Variables of The Individuals

Variables	*n*	**p*	r	sd
Gender	174	0,049	-0,150	0,074
Age	174	0,467	0,055	0,074
Disability Rate	174	0,007	-0,205	0,076

* *p≤0,050*

In the analysis, a statistically significant, and negative relationship was found between the genders of the individuals, and their options. That is, boys made more meaningful choices than girls. As a matter of fact, Akdere (2006) observed that female students' visual discrimination skills were lower than male students. An insignificant, and positive relationship was found between the ages of the individuals, and their options. In other words, as the age of the individuals increased, they made more meaningful choices. A statistically significant, and negative relationship was found between the disability rates, and options of individuals. In other words, as the disability rate of individuals increased, they made more meaningless choices. Demographic information, and number of option preferences of the study group are given in Table 2 below.

Table 2. Demographic Information, and Toy Preferences Of Individuals In The Study Group

Veriables	Groups	N*	Red	Blue	Yellow	Transparent
Gender	Boy	34	19	32	30	21
	Girl	24	22	23	17	10
Disability rate	20-39	15	6	11	13	15

(%)	40-49	23	19	23	16	10
	50-59	20	16	21	13	6
	7-9	16	11	16	13	8
Age grubu	10-12	13	12	11	11	5
	13-15	29	18	28	23	18
Total		174	41	55	47	31

*Number of individuals

There were statistically significant differences between the gender independent variable, and the option-dependent variable of the individuals. However, since there were only two groups in the gender variable, no tests were performed to determine the groups that made a difference, and that did not. The Kruskal-Wallis Post Hoc test was used to determine the statistically significant, and undifferentiated groups of the disability ratio variable. Test results are given in Table 3 below. According to the data in group mean differences, there is no statistically significant difference between the disability rates of 20-39%, and 40-49%. However, the 50-59% disability rate was significantly different from the other groups.

Table 3. Group Comparisons of Disability Rate Variable

Veriables	Binary Groups	Mean Differences	Adjusted Severity	*n*	Groups	homogeneity groups
Hurtle Rate	%50-59 %40-49	1,741	1.000	174	%20-39	a
	%50-59 %20-39	27,683	0.012	174	%40-49	a
	%40-49 %20-39	25,942	0.016	174	%50-59	b

CONCLUSION

In this study, some wooden toys, and course material visual design criteria were tried to be determined for educable children with mild intellectual disability. As a result of the research, it was determined that the girls preferred the red toys that showed the most difference compared to the boys. Boys, on the other hand, preferred transparent varnished toys, which is the biggest difference from girls. On the other hand, regardless of gender, individuals preferred the most comprehensive blue toy, while they preferred the least transparent lacquered toys.

As individuals' disability rates increased, their preference for transparent lacquered toys decreased, while their preference for blue toys increased. It was observed that disability rates did not affect red, and yellow toy preferences. Age differences of individuals did not give a significant result in their preferences for red, and blue toys. It was determined that age differences did not change the preference distribution of yellow, and transparent varnished toys.

Red toys for girls, and blue toys for boys are recommended to designers, and manufacturers of wooden toys, and materials for intellectual disability children. Transparent varnished wooden toys can be preferred for slightly disabled boys. It is recommended that they prefer blue-colored products as the most inclusive option in terms of gender, age, and disability rate. As the Usta (2021) stated, this study will help children with learning difficulties to enjoy wooden toys more.

ACKNOWLEDGMENT

I would like to thank the teachers, and administrators of the 125th Year Special Education Vocational High School for their moral contributions to this study.

AUTHOR CONTRIBUTIONS

Only one author contributed to this study.

FUNDING STATEMENT

The study received no financial support.

CONFLICT OF INTEREST STATEMENT

The author declare no conflict of interest.

ETHICS COMMITTEE APPROVAL

This study requires ethics committee approval. Ethics committee approval was received on 22.06.2023 from 125th Year Special Education Vocational High School with the document number of E-78789831-903.01-78900735.

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