

Visual perception in deaf children

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Abstract

The study aimed to determine the level of visual perception in deaf children and whether differences are attributable to two variables (spiral implant, age). To achieve the study's objectives, we relied on the descriptive approach, using the Rey Figure complex visual perception test (Figure de Rey) as a study tool on a sample of 38 deaf children who were intentionally selected and studying at the Deaf Children's School in Constantine. The study concluded that the level of visual perception appears to be average. There are differences in the level of visual perception attributed to the variable of age and spiral implantation . Based on these results, the researchers presented some recommendations and suggestions.

Keywords

Visual perception;
Deaf child;
Spiral implant.

الكلمات المفتاحية

الادراك البصري؛
الطفل الأصم؛
الزرع الحلزوني.

الادراك البصري عند الطفل الأصم

ملخص

هدفت الدراسة إلى معرفة مستوى الإدراك البصري عند الطفل الأصم، وإذا كان هنالك فروق تعزى إلى متغيرين (الزرع الحلزوني، السن). ولتحقيق أهداف الدراسة اعتمدنا على المنهج الوصفي مستخدمين اختبار الادراك البصري صورة راي المعقد Figure de Rey كأداة للدراسة، على عينة مكونة من 38 طفل أصم تم اختيارهم بطريقة قصدية يدرسون بمدرسة صغار الصم بقسنطينة. وقد توصلت الدراسة إلى أن مستوى الادراك البصري يظهر بدرجة متوسطة، وأنه توجد فروق في مستوى الادراك البصري تعزى الي متغير السن و الزرع الحلزوني ، و على ضوء النتائج قدم الباحثان بعض التوصيات و الاقتراحات .

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Doi:

1-Introduction:

Human society differs according to its individuals in all aspects, whether mental, physical, or social, and this difference becomes clear during the interaction between the individual and his surrounding environment. The category of people with special needs has witnessed great interest from psychologists, educators, and orthopedists, who seek through their efforts to satisfy the needs of each category on the one hand, as well as to integrate and rehabilitate them on the other hand, in a context that is close to their normal peers, which calls for research within the framework of categories of people with special needs and the nature of each of them and what they require in terms of special care that is consistent with the aspects of the defect or deficiency expressed by the category in particular. The same, including the category of hearing impaired, they are considered individuals with special needs who differ from normal individuals, especially in terms of communication, as hearing impairment is one of the disabilities that need to be dealt with correctly due to the many cognitive and linguistic disorders it causes, as the sense of hearing plays an important role in the process of linguistic communication, and injury to the ear, the organ responsible for this sense, whether external, middle or internal, leads to a hearing impairment that may be a hearing impairment, or in some cases, deafness, which Quigley and Paul (1984) define as a total inability to hear, as the deaf person does not have the full ability to understand speech or other sounds without guidance or education. (Al-Taani, 2014, p. 113) However, through modern science and advanced technology, the invention of the spiral implant device, which contains electrodes implanted inside the cochlea to activate the auditory nerve fibers to develop cognitive and communication skills in people who are deaf or hard of hearing. There is an ongoing debate about the effect of hearing impairment on cognitive development, as some researchers believe that cognitive development does not necessarily depend on language. They confirm that language-related concepts are the only weak ones in deaf people. Some also believe that if there is a difference between deaf people and other people in terms of performance on intelligence tests, this does not necessarily mean that deaf people are less intelligent than others, but this is due to the lack of effective teaching methods. Others believe that cognitive development depends on language. Since language is the weakest among the various aspects of development in the deaf, they believe that their cognitive development will necessarily be affected. (Balkhiri, 2012, p. 239). (M-Bartin, 1979) believes that the difference between a deaf child and a deaf child does not lie in the cognitive structure but rather in the level of the latter's employment. Employment in a deaf child depends mainly on formal aspects, and his delay is not only related to the absence of spoken language. Still, it is more related to the limited physical, social, and linguistic experiences and the lack of experience provided by the environment. Hearing impairment may affect the affected person in performing his needs naturally and make him less able to practice daily activities in a normal way because these disorders are not limited to the sensory aspect only but extend beyond it to neurocognitive disorders, especially in terms of visual perception, which is one of the most common disorders. Visual perception is an active, positive, constructive cognitive process in processing visual information, and it affects and is affected by many other cognitive processes, especially since it is the first step to knowledge that contributes to the acquisition of all skills in a deaf child. This prompted us to ask the following questions: What is the level of visual perception in a deaf child? Are there differences in the visual perception level attributed to the spiral implantation variable (carrier/non-carrier)? Are there differences in the level of visual perception attributed to the age variable?

2-Study hypotheses:

Visual perception shows a low level

- There are statistically significant differences in the level of visual perception attributed to the variable of spiral implantation (carrier/non-carrier)
- There are statistically significant differences in the level of visual perception attributed to the age variable.

3-Study objectives:

- Detecting the level of transmission in the deaf child.
- Detecting the level of retrieval in the deaf child.
- Detecting the level of visual perception in the deaf child.

4-Importance of the study:

- This study is important from a theoretical point of view because it contributes to knowing the level of visual perception in the deaf child, which can help develop a more comprehensive understanding of knowledge and cognitive abilities and how they work, especially in hearing loss.

From a practical point of view, this study's importance lies in helping to design educational and therapeutic interventions that are more appropriate for the deaf child, develop more effective pedagogical curricula and learning tools that take into account the special needs of the deaf child, and help the deaf child gain cognitive abilities that contribute to his integration into society.

5-Definition of terms:

Visual perception:

It is a cognitive, constructive mental process whereby the energy of the stimulus that falls on the sensory receptor (eye) is converted into information and sent to higher stages in the brain to form structures or images of that thing perceived in the mind of the visual recipient. The perception process results from the sensation that records environmental stimuli, and perception interprets them and formulates them into images that can be understood.

Hearing impairment:

Hearing impairment is defined as an injury or loss of the sense of hearing, which varies in severity from simple to moderate, called hearing loss, and severe, called deafness. Hence, deafness is defined as a degree of hearing loss exceeding 70 decibels for the individual, preventing him from relying on the sense of hearing to understand speech with or without headphones.

Deaf child:

He is the one who suffers from very severe hearing loss and cannot hear and understand speech through the sense of hearing whether or not he uses sound pumps (Smith, 2007); he is the one who suffers from a hearing loss of 90 decibels or more and is enrolled in a special school for hard of hearing students. (Laribi Nouria, p. 24)

Cochlear implant:

Brin defines the cochlear implant as a process that combines surgery and preparation that works to convert auditory signals into electrical signals, and the cochlear implant is designed to stimulate the auditory nerve directly with several electrodes implanted inside the cochlea (Brin, 2004, p. 120)

It is a device that enables hearing and improves the ability to communicate verbally for people with severe sensorineural hearing loss and deafness. It consists of an external mobile part and another implanted part.

6-Previous studies:

Sameer Fani's study (2007) entitled "A study of visual recognition and written comprehension in deaf children," the "visual recognition" and "written comprehension" test was applied to a sample of children consisting of (04) deaf children studying in private schools, aged between (13-15) years, a group of children who have profound deafness, a group of children who have mild deafness, and a group of children with normal hearing as a reference sample. The results of this study showed that the degree of hearing impairment has an effect on the process of visual recognition and written comprehension and that the increase in response time and the decrease in the success rate are due to the type of mental representation that is specific to the person with hearing impairment and the cognitive strategies that he uses.

Salihi Tariq's study (2013), entitled "A study of cognitive abilities in a child with a spiral implant," focused on applying three exercises that test the cognitive and auditory abilities of implanted children. The study was implemented over three months and concluded that children who underwent a cochlear implant showed gradual progress in dealing with sounds, reaching levels similar to normal children in acquiring auditory and speech skills.

Atwi Salma's study (2022), entitled The Relationship of Visual Perception to Learning to Write in Students with Cochlear Implants in the Third Year of Primary Education, aimed to identify visual perception and its role in learning to write in children with cochlear implants. The researcher relied on the simple Ray test and the writing test. She applied these two tests to a group of students with cochlear implants in the third year of primary school. The results of the study concluded that there were differences between students who appeared through distortions in their writing, as the more difficult the visual perception was, the more numerous and varied the errors in writing were in these children.

Lina Awra's study (2023), entitled Study of Visual Perception and Problem Solving - A Comparative Study between Deaf and Normal Children - The researcher applied two tests (the similar matrices test to measure visual perception, and the triangles test to measure problem-solving) on a sample of 40 children (20 deaf children and 20 hearing children) belonging to the age group (7-11) years. The study concluded that there is a correlation between the process of perception and problem-solving and the differences between deaf and normal children in the process of visual perception and problem-solving.

7-Methodological procedures for the study:

7-1-Study method:

In this study, we used the descriptive method to reveal the level of visual perception in deaf children. This method collects data and information about the phenomenon, describes it accurately, and expresses it quantitatively and qualitatively.

7-2-Study limits:

-Spatial limits:

We conducted this study at the Bashir Boutaba School for the Hearing Impaired - Constantine.

-Time limits:

This study was conducted in the period from March 2024 to May 2024

7-3-Study tool:

We applied the Rey complex test (Figure de Rey), which is a test consisting of a geometric figure consisting of two figures, Figure (A) and Figure (B), and is used to assess cognitive activity and visual memory for children and adults. In it, Ostreith divided the Rey complex geometric figure (A) into 18 parts, following three criteria in each part: presence or absence, correct transfer, and position (good or bad). The final values range from (0.5, 1, 2). In this way, we collect the marks for each part, which reach a maximum of 36 in the case of transfer and re-transfer (retrieval), and on the other hand, it allows us to know the time taken to transfer the figure in minutes.

We applied the Rey complex test Figure (A) to the study sample.

7-4-Study sample:

A purposive sample consisting of 38 deaf children was selected.

7-4-1-Sample characteristics:

Table No. (01) shows the characteristics of the sample individuals according to the spiral implant variable (pregnant/not pregnant)

Spiral implantation	Spiral implant holders	Non-spiral implant holders
Frequency	21	17
Percentage	55.26	44.73

Table No. (02) shows the characteristics of the sample members according to the age variable

Age	10years	11years	12years	13years
Frequency	12	04	11	11
Percentage	18.27	22.06	19.77	23.29

7-5- Statistical methods:

- Frequency and percentages.
- Arithmetic mean.
- T-test for two independent samples
- F-test for independent samples

8-Discussion of results:

8-1- Presentation and discussion of the results of the visual perception test:

8-1-1- Presentation and discussion of the results of the level of visual perception in the deaf child:

Table No. (03): Shows the total score of the visual perception test for Ray

	Total Test Score	Visual Perception	
		Transfer	Retrieval
n	38	38	38
Mean	15.51	20,55	10,47
Standard Deviation	3.51	4,48	3.86
Low Score	9,78	10,50	3
highest degree	22,38	27	20

From Table No. (03), it is clear to us that there is a difference between the arithmetic averages of the test dimensions, as it appears first after transfer with an average of 20.55, then after retrieval with an average estimated at 10.47, and it is also clear to us that the total score for visual perception came out weak with an arithmetic average estimated at 15.51, which is a value that shows visual perception at a weak level, and this indicates that the level of visual perception in the deaf child appears at a weak degree, as the researcher attributes these results to the fact that visual perception in the deaf child is affected as a result of the loss of the sense of hearing, especially since in the field of development, early environmental stimulation appears in organizing the functions of the various senses, through the interaction and compatibility of the inputs of the latter with each other, as the presence of a defect in a sense affects the rest of the functions of the other senses, as the loss of the sense of hearing affects the visual perception of the deaf child, which is similar to many studies, including the study (Tharpeet et al) in 2002, where it is believed that if there is a defect in one of the senses, it will result in a deficiency in the functions of the other senses due to The different senses depend on each other to perform their functions in the required manner. Also, the results show a difference in the arithmetic averages between transfer and retrieval, as the average transfer is greater than retrieval. These results are attributed to visual discrimination appearing more than visual memory in the deaf child. According to (Proksh and Bavlier), deaf children rely on the visual method to receive and communicate information. This may also be due to compensating the senses, which the compensatory theory showed, meaning that the loss of one sense can be met with greater reliance on the remaining senses and thus enhance them. This explains the average score obtained by deaf children in the transfer process.

8-1-2-Presentation and discussion of the results of differences in the level of visual perception in the deaf child according to the variable of spiral implantation (carrier, non-carrier):

Table (04) represents the results of the differences in the level of visual perception according to the variable of spiral implantation (carrier, non-carrier)

Variable	Spiral Implant	N	Mean	T	(p)
Transport	Carrier	21	19.27	0,94	0,04
	Non-Carrier	17	22,14		
Retrieval	Carrier	21	10,47	0,4	0,99
	Non-Carrier	17	10,47		
Visual Perception	Carrier	21	14,86	1,26	0,21
	Non-Carrier	17	16,30		

From the table, it is clear that there are statistically significant differences between deaf children who have a spiral implant and those who do not have a spiral implant in the level of transmission in favor of deaf children who do not have a spiral implant, as the calculated "t" value is equal to (0.94) and the value (P= 0.04) is less than the significance level (P= 0.05) and therefore "t" is statistically significant at the significance level (P= 0.05).

From the table, it is clear that there are no statistically significant differences between deaf children who have a spiral implant and those who do not have a spiral implant in the level of retrieval in favor of deaf children who do not have a spiral implant, as the calculated "t" value is equal to (0.4). The value (P= 0.99) is greater than the significance level (P= 0.05), and therefore, "t" is not statistically significant at the significance level (P= 0.05).

Also, from the table, it is clear that there are no differences Statistically significant between deaf children with and without a cochlear implant in the level of visual perception, as the calculated "t" value is equal to (1.26) and the value

(0.21 = P) is more than the significance level (0.05 = P) and therefore "t" is not statistically significant at the significance level (0.05 = P)

These results indicate that deaf children without a cochlear implant excel in the level of transmission (which is an aspect of visual perception) over their peers with a cochlear implant, and this can be explained by the fact that children without a cochlear implant have developed superior visual abilities as a compensatory mechanism for hearing loss, which is in line with the theory of sensory compensation proposed by the scientist Lev Vygotsky as part of his research on children with disabilities, as he assumes that individuals who have a disability in one of the senses can develop superior abilities in the other senses as a compensatory mechanism. The timing of intervention may also play a role in children with spiral implants who received the implant relatively late, which affected the development of their visual abilities. These differences may also be attributed to the influence of sign language, as children without spiral implants are more dependent on sign language, which may enhance their visual and spatial abilities. This is consistent with the study by Emmorey et al. (1993), who studied the visual imaginative abilities of American Sign Language users and their ability to generate, maintain, and rotate visual mental images in three categories of deaf people: American Sign Language users, hearing American Sign Language users who have deaf parents and hearing non-sign language users. The results of this study showed that.

The result that there are no statistically significant differences between deaf children who have a cochlear implant and deaf children who do not have a cochlear implant in their level of retrieval ability indicates that the cochlear implant, which aims to improve the auditory abilities of people who are deaf or hard of hearing, may not significantly affect the retrieval skills associated with visual memory. In other words, whether the deaf child has a cochlear implant, his ability to retrieve information associated with visual perception remains similar.

This result may be because retrieval depends on factors other than auditory abilities only, such as visual and tactile experiences and educational and environmental experiences to which children are exposed. The lack of differences may be because the cochlear implant improves hearing but does not directly affect the development of spatial skills or the ability to retrieve information. This is consistent with studies that indicate that auditory improvements from the cochlear implant are not always associated with improvements in other cognitive functions, such as spatial retrieval.

8-1-3-Presentation and discussion of the results of differences in the level of visual perception in deaf children according to the age variable:

Table (05) represents the results of differences in the transmission level according to the age variable.

Variable		N	mean	Variance	Sum of squares	df	F	) p(
Transport	10years	12	18.27	Between groups	161.04	3	3.12	0.03
	11years	04	22.06	Within groups	584.13	34		
	12years	11	19.77					
	13years	11	23.29					
	Total	38	20.55	Total	745.17	37		
Retrieval	10years	12	10.68	Between groups	58.54	3	1.34	0.276
	11years	04	10.06	Within groups	493.67	34		
	12years	11	8.81					
	13years	11	12.04					
	Total	38	10.47	Total	552.22	37		
Visual perception	10years	12	14.47	Between groups	81.54	3	2.46	0.07
	11years	04	16.06	Within groups	374.65	34		
	12years	11	14.29					
	13years	11	17.67					
	Total	38	15.51	Total	456.19	37		

From the table, it is clear that there are statistically significant differences between deaf children in the level of transmission according to the age variable in favor of deaf children who are 13 years old, as the calculated "F" value is equal to (3.12). The value (P=0.03) is less than the significance level (P=0.05), and therefore "F" is statistically significant at the significance level (P=0.05). The table also shows no statistically significant differences between deaf children in the transmission level according to the age variable, as the calculated value of "F" equals (1.34). The value (P = 0.27) is greater than the significance level (P = 0.05), and therefore "F" is not statistically significant at the significance level (P = 0.05).

The table also shows that there are no statistically significant differences between deaf children in the level of visual perception according to the age variable, as the calculated value of "F" is equal to (2.46), and the value (P = 0.07) is greater than the significance level (P = 0.05). Therefore, "F" is not statistically significant at the significance level (P = 0.05).

These results indicate that deaf children in the 13-year-old age group may show a higher level of transmission compared to deaf children at other ages. This may be due to several factors, including cognitive development and emotional maturity, that occur at this age, which help children deal with information more effectively.

Studies show that children in this age group are in a stage of cognitive and emotional maturity that can enhance their ability to transfer from one information to another or from one situation to another. For example, Sibley et al. (2008) found that children in this age group significantly improve their cognitive and communication abilities, which may contribute to improving their transfer level.

Based on the above, statistical analyses are expected to show significant differences between deaf children in the age group of 12 to 13 years compared to other ages in the transfer level, which supports the importance of this age group in improving the transfer abilities of deaf children.

The study also concluded that these results show that the ability to retrieve, which is the process of retrieving information from memory, is not significantly affected by the age factor among deaf children in the age groups studied. This means that deaf children, regardless of age, show similar ability to retrieve information.

Research in this area has shown mixed results, with some studies finding that age may affect retrieval while others have found no significant differences. For example, Horgan et al. (2011) found that differences in retrieval abilities among deaf children may be limited when age is taken into account, supporting the hypothesis that there are no significant differences in retrieval levels based on age.

Based on these results, statistical analyses are expected to confirm no significant differences among deaf children in retrieval levels by age, suggesting that retrieval abilities may be independent of age changes in this sample.

These results may be because the ability to create or retrieve objects or information does not change significantly among deaf children based on their age. In other words, deaf children of different age groups show similar retrieval levels, and there is no statistical evidence that age significantly affects this ability.

Research in this area has shown mixed results, with some studies suggesting that mental imagery can be affected by age, while others find no significant differences. For example, Miller et al. (2009) found that differences in recall ability among deaf children were not significant when age was taken into account, consistent with the hypothesis that there are no statistically significant differences by age.

9-Conclusion:

Based on these results, visual perception appears to be at a low level in deaf children, and statistical analyses confirmed the absence of significant differences between deaf children in the level of visual perception according to age, indicating that this ability may be constant across different age groups within the studied sample. The study also found no differences in the level of visual perception according to the variable of spiral implant holders or non-carriers. Still, the difference appears at the level of transfer. These results highlight the complex effects of hearing impairment and spiral implants on visual perception and memory. While children who do not have spiral implants show superiority in some visual-spatial tasks, the differences in other aspects are not clear. Understanding the cognitive development of deaf children and the potential effects of spiral implants is important. It is important to conduct more research to understand the precise mechanisms behind these differences and their effects on children's overall cognitive development.

Thus, our study, which aimed to evaluate visual perception in deaf children, has achieved the hypothesis that the level of visual perception is low in deaf children. In continuation of this study, and based on its results, we had to point out the importance of early intervention in developing the visual skills of deaf children, whether they are carriers of a spiral implant or not, and the extent to which the timing of the spiral implant affects the development of visual abilities, and explore how auditory perception acquired through the spiral implant interacts with visual abilities.

We suggest exploiting the strengths of deaf children who learn sign language, as it positively impacts other aspects of learning and perception. Thus, appropriate educational strategies can be developed for them.

Further research is needed to study cognitive abilities across different developmental stages of deaf children, thus opening new horizons for understanding and enhancing the cognitive development of hearing-impaired children.

As well as designing educational programs that should develop the visual abilities of deaf children who do not have a spiral implant while working to enhance these abilities in children with the implant.

10-References:

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