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IDENTIFYING PATTERNS OF TACTILE EXPLORATORY BEHAVIORS IN CHILDREN WITH VISION IMPAIRMENT AND MULTIPLE DISABILITIES

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Abstract

The research aim of the present study is to identify and describe patterns regarding tactile exploratory behaviors of children with vision impairment and multiple disabilities during active exploration of small 3D objects in terms of their shape. The participants of the study consisted of seventeen children who had vision impairment and multiple disabilities. Their age range was from 5 to 7 years old, and they were all enrolled in a variety of early intervention and special education programs.
The authors observed and recorded the children's tactile behaviors while the latter were exploring actively a series of small 3-D objects in order to trace potential patterns of haptic exploration. For this, the authors developed an observation protocol which was consisted of the following three activities: a. explore and describe shape and properties of spherical items by touch, b. explore and describe shape and properties of cubical items by touch, and c. match objects in terms of their shape. All activities were video recorded after teachers' and parents' consent and the analysis of the data was based on two tools: a. VegasPro 13.0 software to analyze the videos in a quantifiable manner, and b. Atlas.ti to elaborate relevant data from a qualitative point of view. Based on the results, it seemed that some of the children's tactile exploratory behaviors could be considered as tactile exploratory patterns since the frequency of their appearance was quite high and repetitive. The practical implications of the findings are of great importance because they have direct link either to education programs or to early intervention programs. Identifying and analyzing tactile exploratory behaviors and patterns of children with vision impairment and multiple disabilities may lead to alternative "channels of communication" something extremely useful for professionals and parents who work in this sector of Special Education.

Keywords: *Vision impairment and multiple disabilities, tactile exploratory behaviors, tactile patterns.*

1. Introduction

Individuals who have vision impairment and multiple disabilities primarily rely on touch to communicate and interact with their environment (Mammen et al., 2016). According to many researchers, it seems that individuals develop their tactile skills throughout life, beginning very early (Bradley-Johnson et al., 2004; Steri, 2003). Lederman and Klatzky (1987), have researched systematically many aspects of tactile exploratory behaviors of children with vision impairment. They noticed that people with vision impairment, when exploring a variety of objects, they apply a range of strategies, which are usually consisted of repeated motions. According to them, these motions aim to extract information about the objects' properties, such as texture, shape, roughness, weight, and so on. Hence, there is an argument that some of these tactile exploratory behaviors "follow" a specific pattern; in other words, some of these tactile behaviors may compose specific tactile strategies (Argyropoulos & Papazafiri, 2017; McLinden, 2004, 2012; O'Donnell & Livingston, 1991).

The present study aims to trace and describe potential patterns of tactile exploratory behaviors of children with vision impairment and multiple disabilities when they actively explore small 3D manipulative objects trying to figure out their shape.

2. Methodology

2.1. Participants

The participants of the study consisted of seventeen children who had vision impairment and multiple disabilities. Their age range was from 5 to 7 years old (mean=5.88), and they were all enrolled in a variety of early intervention and special education programs. All participants had developed language skills so it was feasible to use the method of oral communication for delivering and conducting the tasks and the activities of the present study.

2.2. Tools

The authors observed and recorded the children's tactile behaviors while the latter were actively exploring a series of small 3-D objects to trace potential patterns of tactile behaviors in terms of shape recognition. For this, the authors developed an observation protocol based on a. the Oregon Project for Preschool Children who are Blind or Visually Impaired (Anderson et al., 2007), which is a skill checklist designed for children who have vision impairments, aged 0-6 years and b. the Use of Sensory Channels: Observation Form (Koening & Holbrook, 2000) which is an observation protocol in the context of the evaluation of learning media assessment and concerns the effective use of sensory channels (i.e. visual, tactile, auditory).

2.3. Research design - activities

The authors designed three structured activities, a. explore and describe shape and properties of spherical items by touch, b. explore and describe shape and properties of cubical items by touch, and c. match objects in terms of their shape. The exercises were carefully planned and tailored to the students' language skills.

1st Activity: Each child was invited to explore a ball and the author(s) asked the child to figure out the shape before placing it in his/her hands.

2nd Activity: In turn, the author(s) placed a cube in the child's hands and asked the child to explore it and find out its shape.

3rd Activity: Finally, the author(s) placed a control object in the child's hands and in front of the child's hands the author(s) placed three other objects with completely different properties apart from one which had the same shape as the shape of the control object. The child was asked to match the shape of the object which was in his/her hands (control object) with one of the shapes of the objects which were in front of him/her.

Prior to the design of the activities, an initial stage was carried out. In this stage, the researchers observed the children's interaction with different objects while they were participating in their regular educational or occupational activities. This methodological "step" enabled the authors to construct friendly and familiar activities with objects resulting in children's active participation and positive engagement. Individuals with vision impairment and multiple disabilities are frequently described as having tactile defensiveness in the literature (Yip & Moore, 2017). To ensure that the participants will enjoy and easily get involved in the activities, they were designed to be both entertaining and not complicated. Moreover, the materials used were tailored to suit the age, unique requirements, and interests of the participants. Because such children may find it challenging to grasp or interact with certain materials, it was extremely important to ensure that the children in question will be able to effectively participate in activities; hence, the selection of appropriate materials was of utmost importance (Downing & Chen, 2003).

2.4. Data analysis

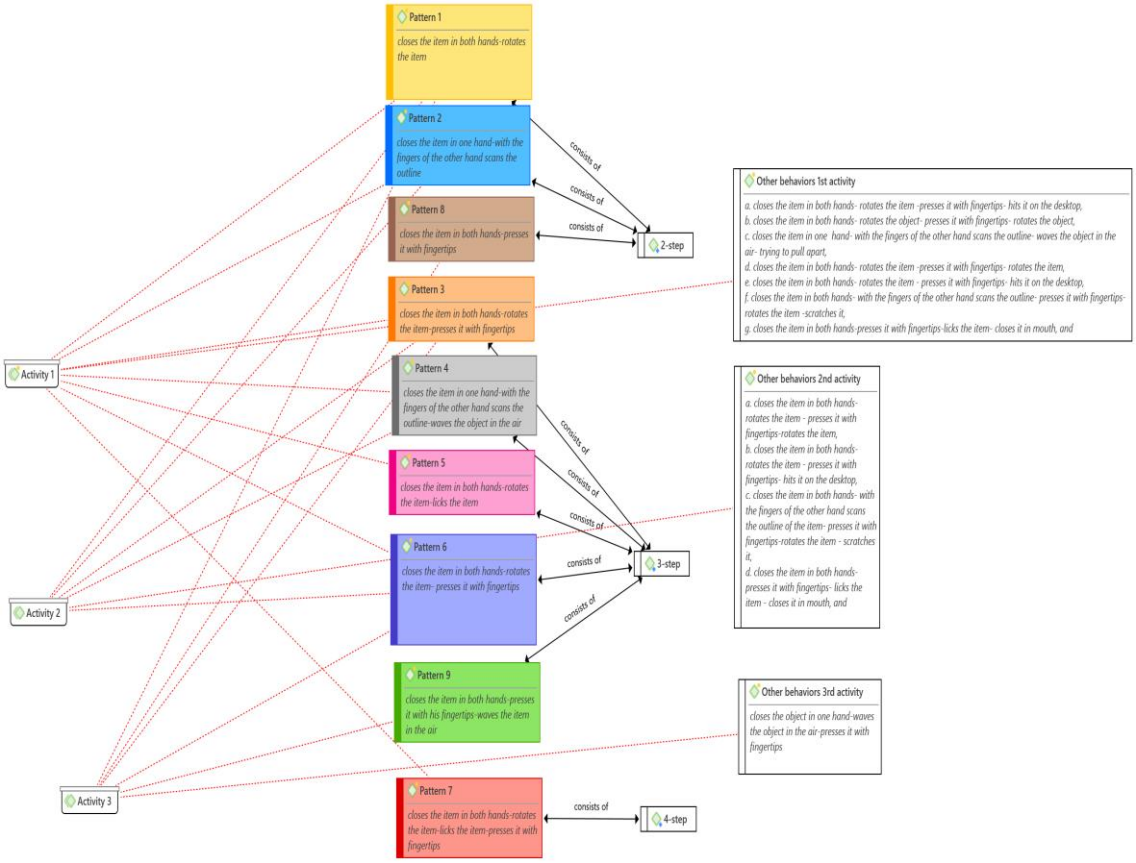
All activities were video recorded after teachers' and parents' consent and the analysis of the data was based on two tools: a. VegasPro 13.0 software to analyze the videos in a quantifiable manner, and b. Atlas.ti to elaborate relevant data from a qualitative point of view.

3. Results

3.1. Observed patterns

Nine patterns were traced during the activities (see Figure 1). More specifically, it was found that the children used some sort of repetitive tactile motions which could outline a pattern. The patterns were discerned in two, three and four steps respectively. The patterns which consisted of two steps were the following: Pattern 1 (hold the object with both hands-rotate the object), Pattern 2 (hold the object with one hand-investigate the outline of the object with the fingers of the other hand), Pattern 3 (hold the object with both hands-rotate the object by exerting pressure on it using the fingertips), and Pattern 8 (holds the object with both hands-explore its properties with fingertips). The patterns which were consisted of three steps were the following: Pattern 3 (hold the object with both hands-rotate the object-exert pressure with fingertips), Pattern 4 (hold the object with one hand-investigate the outline of the object with the fingers of the other hand-wave the object in the air), Pattern 5 (hold the object with both hands-rotate the object-lick the object), Pattern 6 (hold the object with both hands-rotate the object-exert pressure with fingertips), and Pattern 9 (holds the object with both hands-exert pressure with fingertips-wave the object in the air). Finally, only one pattern was traced consisted of four steps; that was Pattern 7 (holds the object with both hands-rotate the object-lick the object-exert pressure with fingertips).

Figure 1. Observed tactile patterns during the activities.



3.2. Observed patterns per activity

Activity 1

During the 1st activity children were asked to identify a sphere (see 2.3). In total, seven patterns were identified (see Figure 1). Two of them were 2-step patterns (Pattern 1 and 2), four were 3-step patterns (Pattern 3,4,5, and 6) and one was a 4-step pattern (Pattern 7).

The majority of the children (52.9%) applied combination of patterns such as Pattern 1 and 6, Pattern 1, 5 and 7, Pattern 1 and 3, and Patterns 2 and 4. The 35.3% of the participants used a combination of patterns and other tactile behaviors which did not encompass a pattern, whereas the 11.8% applied tactile behaviors without repeating them on a constant level. Such examples are provided below: a. hold the object with both hands-rotate the object-exert pressure with fingertips-hit the object on the table, b. hold the object with both hands-rotate the object-exert pressure with fingertips-rotate the object, c. hold the object with one hand-explore the outline of the object with the other hand-wave the object in the air-try to separate parts of the object, d. hold the object with both hands-investigate the outline of the object with the fingers of the other hand-exert pressure with fingertips-rotate the object-scratch the object, e. holds the object with both hands-exert pressure with fingertips-lick the object- put the object in the mouth, and f. hold the object with both hands-exert pressure with fingertips-scratch the object.

Activity 2

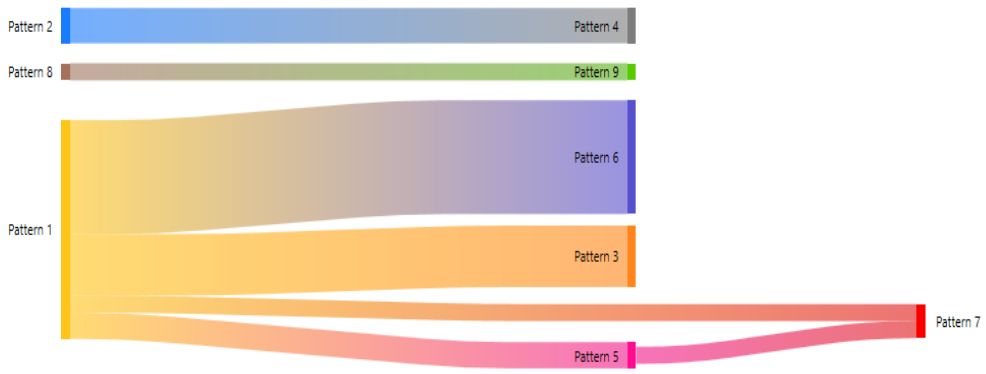
During the 2nd activity the children were asked to identify a cube (see 2.3). Five patterns were identified (see Figure 1). Two of them were 2-step patterns (Pattern 1 and 2) and three of them were 3-step patterns (Pattern 3, 4, and 6). A relatively large percentage of the children (41.2%), applied combination of patterns to recognize the cube such as Pattern 1 and 6, Pattern 1 and 3, Pattern 2 and 4, Pattern 1 and 5. The 47.1% used a combination of patterns accompanied with other tactile behaviors and the 11.8% performed tactile behaviors which did not encompass elements of patterns, such as: a. hold the object with both hands-rotate the object-exert pressure with fingertips-rotate the object, b. hold the object with both hands-rotate the object-exert pressure with fingertips-bang the object on the table, c. hold the object with both hands-explore the outline of the object using the other hand-exert pressure with fingertips-rotate the object-scratch the object, d. hold the object with both hands- exert pressure with fingertips-lick the object-put the object in the mouth, and e. hold the object with both hands-wave the object in the air-scratch the object.

Activity 3

During the 3rd activity the children were asked to compare and find the same object based on its shape amongst others (see 2.3). Five patterns were identified (see Figure 1). Two of them were 2-step patterns (Pattern 1 and 2) and three of them were 3-step patterns (Pattern 3, 6, and 9). The majority of the children (35.3%) applied a combination of patterns for this activity (i.e., matching in terms of similar shape) such as Pattern 1 and 6, Pattern 1 and 3, and Pattern 1 and 9. Also, the 11.8% used the Pattern 8, the 35.3% applied combination of patterns in conjunction with other tactile behaviors and finally the 17.6% used only tactile behaviors which did not contain any element of pattern. Such examples may be the following: a. hold the object with one hand-wave the object in the air-exert pressure with fingertips, b. hold the object with both hands-rotate the object-exert pressure with fingertips-bang the object on the table c. hold the object with both hands-rotate the object-exert pressure with fingertips-rub the object with fingertips, d. hold the object with both hands-rotate the object-exert pressure with fingertips-wave the object in the air-try to separate parts of the object, e. hold the object with one hand-explore the outline of the object with the other hand-wave the object in the air, f. hold the object with both hands-rotate the object in the air-try to separate parts of the object, g. hold the object with both hands-exert pressure with fingertips-lick the object, etc.

It was observed that common patterns of tactile exploration behaviors were applied in Activities 1 and 2, whereas different patterns were performed in Activity 3. More particularly, Pattern 1 was primarily used in conjunction with Patterns 6 (13 times), 3 (7 times), 5 (3 times), and 7 (2 times). Pattern 2 was used only in combination with Pattern 4, Pattern 3 only with Pattern 1, Pattern 5 with Pattern 1 (3 times) and with Pattern 7 (3 times), Pattern 6 only with Pattern 1, and Pattern 8 only with Pattern 9.

Figure 2. Visualization of pattern combinations (extract from Atlas.ti).



4. Discussion

The aim of the present study was to trace potential tactile patterns in a broad set of observed tactile behaviors performed by children with vision impairment when they were exploring 3-D manipulative objects giving emphasis on their shape. It was found that nine different patterns dominated most of the children's tactile behaviors. In addition, the authors were able to trace combinations of patterns which were applied by the children when they focused on shape. It is argued that these findings are of great importance because they may reveal common strategies and techniques that children with vision impairment and multiple disabilities are using to acquire knowledge when interacting with their environment (Simcock, 2020). The enhancement of their sense of touch is crucial because it may decrease potential touch defensiveness and therefore increase their will and ability to get involved in more active way with their surroundings. These interactions will lead to cognitive growth and more sophisticated communication (Bara, 2013).

Piaget's theory of cognitive development suggests that children's comprehension of their surroundings progresses in stages. One of the crucial concepts in this theory is that children form mental schemas or patterns of thought to arrange and comprehend their experiences (Lefa, 2014). The role of patterns is fundamental in Piaget's theory, as they represent an aspect of mental schemas. According to Piaget, children develop mental schemas by identifying and organizing patterns in their experiences (Bormanaki & Khoshhal, 2017). In general, Piaget's theory emphasizes the significance of patterns in the cognitive growth of children and the necessity of providing them with opportunities to explore and experiment in order to foster the development of their mental schemas (Lefa, 2014). By acknowledging and categorizing patterns in their interactions, children can enhance their comprehension of the world in a more sophisticated manner. Hence, patterns of tactile exploration behaviors play a very important role in

the development of this population of children and the study of tactile patterns of exploratory behaviors is essential. Patterns of tactile exploratory behavior can provide significant educational and developmental advantages for children who have vision impairment and multiple disabilities because patterns allow them to explore and learn about their environment through touch, providing them with a unique opportunity to develop cognitive, motor, and social skills.

Finally, it can be argued that more studies are required to be conducted on tactile exploratory activities in individuals with vision impairment and multiple disabilities, in order to deepen our understanding in the development of their somatosensory system and therefore design and conduct more effective personalized and early intervention programs (Villwock & Grin, 2022; Withagen et al., 2010).

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