EVALUATING PERFORMANCE AFTER TRAINING: THE RECOGNITION OF PICTURES BY TOUCH

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Abstract

The present study evaluated the performance of congenitally blind people at recognizing two-dimensional picture by touch, after a 45 hour training. Totally blind individuals served as observers in a haptically recognition task, both, before and after being trained at naming two-dimensional raised-line drawings. Statistical analysis showed a significant effect of training with planar configurations. Visual mediation was proved not necessary for picture recognition, since blind individuals had a cogent development at naming picture by touch. Some suggestions for improving blind people's performance at recognizing raised-line drawings are offered.

A number of studies have been carried out in order to understand the sense of touch, due to the importance of this sense to the human life. Those interested in the area are referred to Heller (2000, 1991), Millar (1991), Katz (1989) Loomis and Lederman (1986), Schiff and Folke (1982) for a comprehensive presentation and discussion of the latest researches on the haptic system.

Though considered by Aristotle as the most necessary sense, the sense of touch was also considered as a secondary sense by that philosopher, to whom vision is superior to all senses, since it is the sense that best judges and gives the most important and precise details about space, pictures etc (in Aquinas, 1995).

This view is not too different from that of the laymen, to whom the lack of vision of the blind individuals means that these people are disabled, deficient and piteous, nor is it too different from that of the scientists, who have been studying the haptic sense.

There have been very few studies on touch, if compared with the innumerous researches on vision. Most of the few researches on touch come to conclusions that can be divided into three camps. "One group suggests that vision is the spatial sense par excellence. This group suggests that congenitally blind individuals (blind from birth) are incapable of spatial thought because they have never experienced the perceptual processes (e.g., vision) necessary to comprehend spatial arrangements. Another group suggests that people with visual impairments can understand and mentally manipulate spatial concepts, but because information is based upon auditory and haptic cues this knowledge and comprehension is inferior to that based upon vision. The third group suggests that visually impaired individuals

possess the same abilities to process and understand spatial concepts and that any differences, either in quantitative or qualitative terms, can be explained by intervening variables such as access to information, experience or stress" (Kitchin, Blades & Golledge, 1997).

A series of these studies compare blindfolded sighted subjects with congenitally blind individuals. According to Heller (1991), he interest in the congenitally blind people is because these individuals have had no vision experience and are touch dependant to acquire knowledge from the world.

Many experiments, including those of psychophysics, require in one way or the other, knowledge or abilities, which are most commonly developed in the sighted. For instance, the ability of using maps, drawings, pictures and other two-dimensional patterns to represent tangible or non-tangible 3D objects.

In tasks of picture recognition, drawings are made tangible for experimenting with blind subjects. However, It is not known whether this is enough for making these configurations more comprehensive for the haptic system and the blind.

Blind individuals are invariably compared with blindfolded sighted subjects who have a whole life of experience with recognizing or making pictures and other complex planar configurations. For the most part, however, the visually impaired people have never been taught how to recognize pictures by touch or how planar configurations can be used to represent the 3dimensional world with its conventions and pictorial language.

Among the facts that can interfere in a task is the recruiting of the subjects. Some of the blind observers have been recruited from institutions. These people may have a rather different, limited living experience compared with that of the blind individuals who live with their families or by themselves and interact more with the sighted and the sighted world. This living experience may help these people to better understand visual explanations of the task, that is these people may better understand what a sighted person means by, for example, perspective view a bird's eye view foreshortening etc.

Social linguistics has shown the importance of language register when answering a demanded task. A blind person may not understand fully what is being requested for he may not be sharing the same vocabularies, though he may know what that word means in the dictionary.

Touch is known to be slower than vision for acquiring some information due to the fact that it obtains information sequentially (Loomis, Klatsky & Lederman, 1991). However, some of the raised-line patterns used in haptic recognition tasks are made in rather large-scale drawings, which may cause a burden on memory. In fact, it is not known which size picture is better for tactile recognition, nor is it known what details should be included or excluded for a better haptic recognition.

These questions illustrate the need for a more complete study to learn weather blind people can really make sense of a two-dimensional picture, since just comparing their performance in naming drawings with that of the blindfolded sighted subjects would give a rather restrict understanding of the haptic sense and of the capability of the blind in resolving picture recognition tasks.

In order to address some of these questions, we investigated the capability of blind people in recognizing picture by touch, by comparing their own performance before and after training them with planar configurations.

If the blind individuals showed a significant development in picture naming, after being trained with two-dimensional patterns, this would indicate that visual mediation is not necessary for making sense of raised-line drawing and that touch can be trained to resolve picture recognition task.

Method

Subjects

Eight congenitally blind observers (6 women and 2 men with median-age 15 years, varying between 8 and 23 years), all naive for this task served as observers in this experiment.

The congenitally blind subjects were recruited from two public schools in São Paulo, Brazil and varied in school education and visual disorder as shown in table 1. None of them had any other known disability other than visual impairment. They were experienced Braille users or were learning it. The younger subjects wrote and read their names and simple sentences in Braille.

Table 1- Education background of the subjects and their visual disorders

Subjects	Education Background	Visual Disorders
S1	Preparatory grade	Retinopathy of prematurity
S2	Preparatory grade	Retinopathy of prematurity
S3	Second grade	Retinopathy of prematurity
S4	Preparatory grade	Bilateral Retinoblastom
S5	Junior High School	Tumor on the optic nerve
S6	Junior High School	Glaucoma
S7	Junior High School	Retinosis
S8	Junior High School	Leucoma

Materials and Procedure

A total of thirty-three drawings were depicted using the so-called M/H (1.0) raised-line drawing pen, described in Lima and Da Silva's study (Lima and Da Silva, 2.000).

The drawings were, divided in two sets of pictures. The first, as most of the drawings were geometric shapes was called Geometric set and included: cylinder (8X6cm), circle (8cm), heart (8X9cm), cube (8X8cm), star (7.5X8cm), hexagon (7X8cm), lozenge (8X8cm), octagon (8X8cm), oval (8.5X5cm), parallelogram (6X8), pentagon (7.5X8cm), square (8X8cm), rectangle (6X8cm), semicircle (4X8cm), trapezium (6X8cm) and triangle (8X8cm). The second set of pictures was called the Object set and included: barrel (9.5X6.5cm); padlock (10X8.5cm); mug (7.5X8cm); key 1 (3.5X10cm); key 2 (4X10); cross (8X8cm); fire extinguisher (8X9.5cm); lighten match (6X10cm); bottle (12X4cm); electric guitar (11X4cm); can of paint (8X6cm); frame (8X8cm); piano (11X10cm); plate with fork and knife (7X9.5cm); cup (10X4.5cm); guitar (5.5X12.5cm); cup on a saucer (8X9.5cm).

Each of the drawings was displayed on a 15x21cm ink jet film transparency, 100 micra. The observers were instructed to haptically examine and name each of the pictures, before moving to the next. Each one of them was informed that he or she could observe the drawing the way he wished, for as long as he wished, but could not use fingernails in order to

avoid deleting the raised-lines. They were also encouraged to give a response even when they were not sure of the correct name of the depicted object.

The subjects examined the drawings without receiving category information or any other instruction, both before (test) and after training with the pictures (retest).

No time limit was imposed for the observation of the pictures nor was any feedback given to the subjects as to whether their answers were right or wrong. The answers were considered as correct when the expected name for the drawing was achieved. Otherwise they were considered wrong for statistical analysis.

All subjects were tested and retested, after training, with all 33 pictures. The training included picture matching, picture naming and picture making tasks in the form of games. Instructions on how to make pictures, on what each part of a drawing meant or on how that part related to the 3D object were provided. Simple pictorial conventions were taught to the blind subjects as well. The full training time was of 45 hours, divided in weekly meetings of two hours each, from April to June and from August to October, 2.000.

Results

Training with raised-line pictures proved to have a cogent effect on the performance of the blind individuals at naming the geometric drawings **(Wilcoxon, p<0,01),** and at recognizing the object drawings **(Wilcoxon, p<0,01)**, (after they were trained with two-dimensional pictures, compared with that of when they received no training.

Figure 1 illustrates the significant statistical difference between test and retest, after treatment.

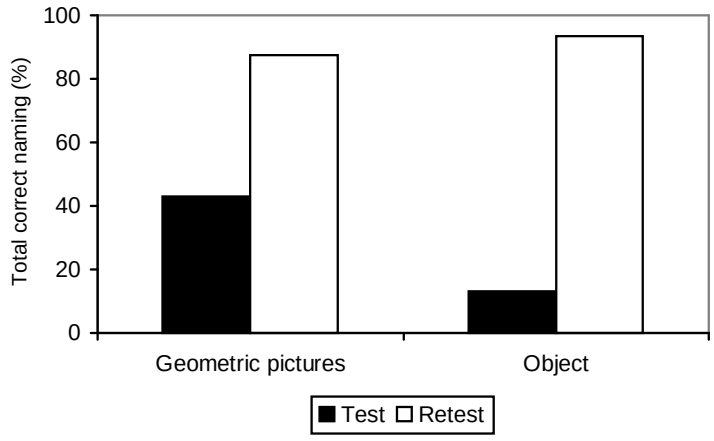

Figure 1 – Performance of congenitally blind individuals at recognizing picture by touch, after training with planar configuration.

These results strongly support theories that claim that blind people can make sense of two-dimensional pictures, above all if they are trained to do so. The training should start as soon as possible, when the child is still very young and not only after they enter school. Training should include books with tangible pictures, the use of games with two-dimensional configurations, information about how to produce a "visual" (two-dimensional) picture, instructions on what each part of the picture means, in comparison to the 3D object, a large amount of raised-line configurations are to be made available to blind people everywhere, all the time. Active touch should be encouraged. Small-scale pictures should be used at first, taking in to account the age of the child, larger pictures can be used for older subjects.

Visual mediation or visual imagery was found not necessary for picture recognition since the subjects weren't sighted or had any visual experience.

The use of children in the study showed that when they are trained for certain tasks, children can perform very satisfactory, e.g., in tasks of picture recognition.

It is injudicious to generalize from the low performance of the blind in tasks where vision is compared with touch since visual impaired people are very heterogeneous (they vary in age, education level, social and living experience, and cannot be compared with blindfolded-sighted people, in equal terms), and such tasks may reflect the introspection of the sighted. At the same time, it is wise to appreciate the performance of the blind, according to the specific modality of the haptic sense and of the blindness.

Notwithstanding the drawings used here were those representing visual depiction of 3D objects, congenitally blind people were capable of correct naming them after they were trained with planar configurations. This shows that touch can acquire knowledge from two-dimensional patterns and that blind people can gain abilities, more commonly developed in the sighted individuals, if the formers are given adequate time and practice.

Training with raised-line pictures may have strongly helped them memorize the configurations and to develop a pictorial memory which enabled them to recognize the pictures, even when these pictures were in a different orientation.

As subjects were trained, they started making sense of the pictures even when they only touched a part of it. This suggests that some parts of a drawing can be mean full enough to allow individuals to make sense of the complete picture, without having to go over it all.

We believe that more long-term studies should be carried out in order to see if these findings are confirmed, as well as to check what is most relevant for a tactile recognition in a tangible drawing, by the blind.

It is advisable that a haptic, pictorial language be developed to help blind individuals learn the visual pictorial language with its conventions and peculiarities.

As every one else, the congenitally blind people have potentials that can and may be developed, whether these potentials have already been manifested or not. Among these potentials, it is the ability of making sense of two-dimensional pictures. It is our duty to help them develop such ability, providing them with proper tools and knowledge to learn and/or develop strategies that will enable them to reach such goal.

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