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(REVIEW ARTICLE)

# The role of digital technologies in Perception's development

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## Abstract

As a thought process and one of the most fundamental cognitive functions, perception is regarded to be an essential scientific topic of research and has thus been the subject of extensive discussion. Here is a review of ICTs' influence on perception in the brain. The value of ICTs for kids with special needs and perception issues is examined, and the contribution of new technology to reading perceptual skills is demonstrated. For the purposes of our study, a thorough analysis of the most pertinent studies from the previous ten years was carried out with regard to the aforementioned factors in order to survey the results.

**Keywords:** ICT; Perception; Language Disorders; Speech Disorders; Assessment; Intervention**.**

## 1. Introduction

People recognize, organize, and interpret input through the process of perception to create a meaningful experience of their surroundings. Our brains are continually overworked, particularly our visual systems. The following are the distinctions between computerized task rules:

Size, Intensity, Frequency, Status, and Contrast of the stimulus are the first four factors. When considering various training benefits, a successful cognition evaluation with improved tasks can support improved brain function [1]. Participants who trained the longest reportedly made the biggest progress [2]. The relevant literature also emphasizes how different expectations and worldviews can lead to quite diverse perceptions of the same things and experiences. There has been a great deal of research done on how perceptional resources are allocated in visual activities. Identification of the ecological and constructivist perspectives on perception was important in order to make this distinction. First off, efferent information is a component of perception because it can be found in stimuli (perception from an ecological perspective) [3]. According to the constructivist viewpoint, perception "goes beyond the information given."

The visual world can be divided into two major areas based on the distribution of study. First, we have our perception of the physical or spatial world, and then we have our view of the world of the practical and important things that we often pay attention to. Colors, textures, surfaces, edges, forms, and slopes are all a part of the first category. The second group contains the elements of our everyday environment (things, locations, people, signals, and written symbols). The former is more continuous in our experience and might influence whether or not a person chooses to engage in a particular activity for getting around, whilst the latter is characterized by an easier changing from time to time. Under those conditions, we do not take in all of the important cues at once. Selected perception is the term used to describe this personal filtering. Our choice stands out from other overlooked aspects in terms of the ongoing brain process because of a certain type of feature. Because of this, perception might occasionally seem distorted and irreversible under this circumstance. Based on the aforementioned characteristics, there are two different forms of perception: the literal type and the schematic type.

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Our scoping study has taken into account the areas highlighted above, as well as national and international publications, research, and experimental findings from the past ten years that center on the use of ICT as an assessment tool for the three most crucial domains of perception: the dissection of perception, perception and special needs, and reading perceptual ability. Additionally, the many perception tests, including the n-back, illusions, and simulation tests, have evolved into exemplary instances of the knowledge gained via this study, where, as before, six different approaches to perception have been addressed during the past century. In that regard, the problems that most preoccupy us are, first, what categories of perceptual phenomena do we employ to construct conjunctions with unique needs, and, second, what are the underlying causes of these fascinating phenomena? The ensuing research show that participants are related to mental processes like verbal or visual processing techniques, as well as their combination, for the purposes of assessments.

## 2. Decomposition of the perceptual process

Management of this complex "immediate process" and its concise presentation is the main goal. Despite the fact that numerous researchers have used these methodologies extensively, they have only a few common fundamental traits. Thus, a distinguished number of brief exposures to displays was used, followed by a short exposure to ambiguous stimuli. Only a portion of the findings from such monitoring trials may be taken into consideration due to their sheer number. The investigations in these areas are categorized either based on the basic principles that apply to perception or on the basis of similar techniques:Linear perspectives [4]. In case we have well organized models in virtual environments the process of perception is more or less automated. [5]

- An object's size or shape that can be easily perceived [6]. As a result, we act toward an item and alter the information it provides based on our perceptions and beliefs [7].
- The phenomenon that things appear to move relative to one another when the observer moves—even simply his head or eyes—through an otherwise immobile environment [8],[9]. It is referred to as the motion parallax effect by researchers [10].
- The laying of one object on top of another. In this situation, placing something between two other items can reduce the visibility or clarity of objects that are farther away. According to researchers, an indication of distance is how complete an object is [11]. The object that is more complete and has regular outline tends to be the closest one.
- The alteration in color can be utilized to distinguish objects at a distance. Hue and saturation alterations can make 2D images appear 3D, although their accuracy in observing background and depth is less than ideal [12].
- Just as essential as similar stimulus modifications (such as background and depth), the rate at which an object's angular speed and size, or both of them, change in the visual field gives information [13].
- The relative luminance of several things. According to research, the intensity of an object's retinal picture decreases in a normal environment as its distance from us does (sometimes mistakenly) [14]. We only think about this concept in terms of point sources; reflecting surfaces, on the other hand, are not covered by this rule [15].
- The relationship between an object's light area and its shadow (also known as contrast sensitivity) has been thought of as a depth indicator [16].
- The effect of the binocular discrepancies as a discriminative stimulus on their depth analysis [17]. Numerous descriptions of texture, size, and binocular disparity variations have been provided. The retinal blur phenomenon has been noted by researchers as another source of perception data that produces perception cues even with a single eye [18].
- The convergence is the angle at which the item being examined and our eyes are fixed. The closer the observed object is, the higher degrees of convergence we have [19].

## 3. Perception And Special Needs

The purpose of this article, as noted above, is to identify and investigate any advancements made in tasks with static patterns related to ICTs and individuals with special needs. To take that direction, we have concentrated on comprehending some of the most recent findings on each perceptual skill. These latter ones focus on particular traits or different stimuli including brightness, colors, shape, object, and shapes.

Recently, scholars have tended to focus on the initial events that occurred on the retina before providing theories that also include subsequent phases of the physiological process of vision. Numerous sources have regularly identified the

regions of the brain where various factions are represented, despite the fact that not all findings agree with one another, particularly in relation to the hierarchy of variants. For instance, research suggests that responses from V1-V3 neurons are consistently linked with brightness stimuli [20]. It should be noted that these circumstances include a stimulus where brightness modulation influences how adjacent or overlapping surfaces are perceived. The former involves research on how people with mental illnesses, learning difficulties, and autism respond to static stimuli [21],[22]. Utilizing static data that varied in the intricacy of the aforementioned situations, the latter were evaluated. The next logical feature of perception that we looked at after moving along the visual pathway was color. Previous research has shown that participation of diverse coloring in the same texture causes object discrimination to occur, notably with regards to faces [23],[24]. According to physiological research on face recognition, distinct inferior regions of the extrastriate visual cortex, whose placements differ between people, are specialized for identifying faces [25]. A lower visual acuity in the perception of colors has also been found in the research of individuals with autism [26]. The research of clinical populations, such as dyslexic youngsters who struggle with tasks requiring static pattern recognition skills, is likewise essential and merits similar approaches [27]. Both the backdrop luminosity ratio and the colors of the text on a screen have long been thought to be connected to dyslexia [28].

Shape stands out among the characteristics that academics take into account in the study of perception. Shape comes from a gradual process that starts in upper brain centers and eventually addresses the control of lower brain areas [29]. Contrarily, a bottom-up process begins with exogenous inputs and moves through perceptual analysis without taking into account feedback data [30]. Utilizing both bottom-up and top-down processes simultaneously is one strategy used in contemporary research. It has long been understood that the latter process, which takes place in illusions, is valuable for describing how the brain works. The autistic spectrum is a subject of increased interest. Despite having a lesser degree of integration in high-level perceptual processes than ordinary people, autistic people appear to be almost more susceptible to shaping perception in low-level processes [31].

This mode states that the perception of objects and forms has been linked to specific temporal brain areas being activated [32]. According to recent research, the perception of an item and, ultimately, its recognition, are linked to some sort of compromise between our impression of the object's attributes and its "reality" as it actually exists. Interactions between the temporal and other inferior frontal regions of the brain are affected by this reduced functioning [33]. The perception of items in children with autism has been the subject of extensive investigation. According to growing evidence from such studies, people with ASD retain the roots of object perception but do not easily adjust them.

## 4. Reading Perceptual Ability and the role of Digital technologies

The capacity to read with perception is a very fundamental and significant method that has garnered acceptance from scientists in recent years. The results imply that any language used activates particular parts of the brain. As is obvious, our ability to perceive information aids in reading. By doing so, we are able to differentiate between the lexical process and the comprehension process. But many of the functions that go into reading are adversely impacted in dyslexic people. To measure and enhance the reading ability through memory processes, a plethora of computer tests have been created. the following categories apply to the former:

- Exercises that improve phonological awareness. For measuring it, two techniques have been used. The first tests ask for the number of distinct sounds made by the reader as they read words with varied semantic connotations, while the second tests ask for the proper reading of words for which the sounds have been eliminated [34].
- Phonological reading is another. Children are asked to read random words that aren't sentences to gauge their level of competence. Some of these words are challenging, while others are simple [35, 36].
- Third, phonological coding. It also contains a recall of the sounds made by bead strings of letters, often in a random arrangement or occasionally containing words' constituent elements [37, 38].
- Lexical access is the skill of retrieving words and their meaning from long-term memory [39]. It is unclear how quickly this can happen and how long it will take.

In contemporary literature, working memory, receptive language, and visual analysis have all been related to dyslexia. Therefore, the three aforementioned components are included in any endeavor to lessen the detrimental impacts of dyslexia. Several interventions have also been made, with pedagogical ones being the most successful [40, 41]. According to the studies on dyslexia cited above, the difference in the amount of time between the stimulus and the response for similar and dissimilar things shows how quickly people react. This means that those with low verbal processing skills, such dyslexics, take longer to complete tasks than people with good or typical verbal skills.

Finally, we must highlight the productive and effective role of all digital technologies in the field of education. These technologies, which include mobile devices (42-43), a variety of ICTs (44-55), AI & STEM ROBOTICS (56-59), and games (60), facilitate and improve educational procedures such as assessment, intervention, and instruction. In addition, the use of ICTs in conjunction with theories and models of metacognition, mindfulness, meditation, and emotional intelligence cultivation [61-72], accelerates and enhances educational practices and outcomes, particularly in perception and mental abilities development.

## 5. Conclusion

This study's goal was to demonstrate whether and how ICTs can assess people with perception issues and how modern technology may be used to enhance this brain function. In terms of special needs schooling, we have come to the conclusion that computers can make up for and enhance any shortcomings, such as filling out assessments remotely and within specific time constraints.

As a quick summary of our objectives for a potential future research project, we would also want to add the following:

- A further mapping of sophisticated perceptions, such as how moving stimuli are processed.
- The still-developing synchronization of audio and visual perception in people with special needs.
- The discovery of textbooks designed for people with reading, writing, reasoning, and other abilities that are referred to as academic abilities or skills. Given that learning disabilities usually co-occur with other deficiencies, such as intellectual disabilities, emotional illnesses, and neurological abnormalities, more modern interventions aim to address the semantic, phonological, and visual-perceptual issues.

In addition, beginning with the primary characteristics of visual perception, we have provided a number of data specifically related to a person's cognitive condition in the hopes that this data will aid us in focusing our future research on observation as well as on training techniques for people with special needs using ICTs. Last but not least, we would like to state that we believe additional study is needed, particularly in the area of intervention, in the areas of perception and special education and how these relate to ICTs. However, we hope that the findings of the present study are convincing enough to lead to a consensus that ICTs must be used extensively in the study of perception as a crucial brain function.

## Compliance with ethical standards

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### *Disclosure of conflict of interest*

The Authors proclaim no conflict of interest.

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