



## The effectiveness of multimedia visual perceptual training groups for the preschool children with developmental delay



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### ABSTRACT

This study compared the effectiveness of three approaches to improving visual perception among preschool children 4–6 years old with developmental delays: multimedia visual perceptual group training, multimedia visual perceptual individual training, and paper visual perceptual group training. A control group received no special training. This study employed a pretest–posttest control group of true experimental design. A total of 64 children 4–6 years old with developmental delays were randomized into four groups: (1) multimedia visual perceptual group training (15 subjects); (2) multimedia visual perceptual individual training group (15 subjects); paper visual perceptual group training (19 subjects); and (4) a control group (15 subjects) with no visual perceptual training. Forty minute training sessions were conducted once a week for 14 weeks. *The Test of Visual Perception Skills*, third edition, was used to evaluate the effectiveness of the intervention. Paired-samples *t*-test showed significant differences pre- and post-test among the three groups, but no significant difference was found between the pre-test and post-test scores among the control group. ANOVA results showed significant differences in improvement levels among the four study groups. Scheffe *post hoc* test results showed significant differences between: group 1 and group 2; group 1 and group 3; group 1 and the control group; and group 2 and the control group. No significant differences were reported between group 2 and group 3, and group 3 and the control group. The results showed all three therapeutic programs produced significant differences between pretest and posttest scores. The training effect on the multimedia visual perceptual group program and the individual program was greater than the developmental effect. Both the multimedia visual perceptual group training program and the multimedia visual perceptual individual training program produced significant effects on visual perception. The multimedia visual perceptual group training program was more effective for improving visual perception than was multimedia visual perceptual individual training program. The multimedia visual perceptual group training program was more effective than was the paper visual perceptual group training program.

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## 1. Introduction

### 1.1. Visual perception problems of children with developmental delays

Developmental delay is defined as significant delay in one or more of the following developmental domains: motor, language/communication, cognition, social/emotion, and activities of daily living for the children aged between 0 and 6 years old. The children are diagnosed as developmental delay (DD) when their clinical syndromes could not be determined as other specific developmental disabilities, such as mental retardation, autism, cerebral palsy.

The reported prevalence of developmental delay (DD) among children varies. [Simeonsson and Sharp \(1992\)](#) reported DD in 5–10% of children; a higher percentage, 13%, was reported by [Rosenberg, Zhang and Robinson, 2008](#). Visual perception disorder is one of the common problems in children with DD ([Case-Smith, 2009](#)).

Problems with visual perception can interfere with the activities of daily living and learning of preschool children ([Case-Smith, 2009](#); [Kramer & Hinojosa, 2010](#)). If visual perception is not fully developed by the time a child is in preschool, his or her ability to read ([Flax, Mozlin, & Solan, 1984](#); [Kulp & Schmidt, 1996a, 1996b](#); [Solan & Ciner, 1989](#)), to spell, to write, and to concentrate ([Borsting, Rouse, & Chu, 2005](#)) may be affected. In daily life, children with visual perception disorders may put their shoes on the wrong feet, put clothing on inside-out, and have problems tying their shoelaces ([Schneck, 2005](#)). They may have difficulty with cutting, coloring, drawing, working with building blocks, and putting together puzzle pieces or parts of toys. They may have also have problems doing their chores and homework ([Borsting et al., 2003](#); [Kulp, 1999](#)).

Disorders in visual perception may also affect cognitive performance; for example, such children may have poor visual memory, often accompanied by poor recognition of objects, pictures and symbols, and poor memory of places and events ([Todd, 1999](#)). And, when they copy material, they must keep referring to the original document while transcribing, a tiring and inefficient method that makes them more prone to errors ([Northway & Dutton, 2009](#)). A deficiency of visual-spatial relationship may increase the chances of reversing letters, numbers, or words. Object permanence problems may lead to inefficient visual discrimination ([Schneck, 2005](#)). [Hung, Fisher and Cermak \(1987\)](#) proposed using a Test of Visual Perception Skills (TVPS) to measure visual perception; in their study, children with DD longer to complete a test and made more mistakes than did normal children. [Hendee \(1997\)](#) suggested that visual perception and cognition have mutual influences.

### 1.2. Approaches to visual perception problems

#### 1.2.1. Multimedia visual-perceptual training

Visual perception can be improved with development, experience, practice, and therapy ([Kramer & Hinojosa, 2010](#)). Currently, clinical interventions of visual perception are divided into two major types: paper activity and multimedia activity. However, children are generally not motivated by paper activities, which also do not encourage a child to continue to participate in an activity. In contrast, computer multimedia provides interesting videos, sounds and lighting, colors and immediate feedback, which can promote the intrinsic motivation of children. Computer multimedia increases attention and continuity of activity participation, and leads to improved learning ([Mayer & Gallini, 1990](#); [Mayer & Sims, 1994](#); [Paivio, 1991](#)). When [Mayer and Sims \(1994\)](#) used computer multimedia as teaching materials, the authors found that integrating pictures and texts improved learning. [Heimann, Nelson, Tjus, and Gillberg \(1995\)](#) used an interactive multimedia program to increase the reading and communication abilities of children with autism, cerebral palsy, or mental retardation, and for normal children as well. As a result, the children had improved reading ability and language skills. [Hutcherson, Langone, Ayres, and Clees \(2004\)](#) used computer-aided teaching to teach 4 students with moderate-to-severe mental retardation to select items from a simulated store. Learning effectiveness and generalizability were then assessed. The study results showed that computer-aided teaching improved the students' accuracy of selecting items from the store. [Poon, Li-Tsang, Weiss, and Rosenblum \(2010\)](#) used computerized visual perception and visual-motor integration training program to train 13 normal schoolchildren (average age: 6.58 years). The training program lasted for 8 weeks. Poon found significant improvement in the students' writing ability, and the level of improvement was greater in the intervention group than in the control group. However, few studies have compared the effectiveness of multimedia training and traditional paper training for improving visual perception.

#### 1.2.2. Group therapy

Currently, the most common training method for children with visual perception involves one-on-one individual training, and group training programs are relatively rare. However, group therapy has several positive functions: (1) mutual help and growth; (2) universality; understanding the universality of the problem and reducing feelings of loneliness and helplessness; (3) altruism: group members can gain self-esteem by giving and cultivate helping behavior; (4) information sharing: the group leader provides correct knowledge or group members provide advices and care; and (5) group cohesiveness: cohesiveness can facilitate self-disclosure and improve attendance. Further, acceptance and mutual support shared by group members help develop significant relationships; (6) participants have deeper self-understanding from the feedback of the group; (7) peer group discipline improves; and (8) participants gain from imitative behavior. An individual one-on-one program cannot provide all these benefits. Group therapy also has

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