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PREVIEW

A Visual Attention Study For Developing Learning Cues

For Individuals With Severe Mental Retardation

by

Roger L. Aveyard

A DISSERTATION

Presented to the Faculty of

The Graduate College at the University of Nebraska

In Partial Fulfillment of Requirements

For the Degree of Doctor of Philosophy

**Interdepartmental Area of
Major: Psychological and Cultural Studies**

Under the Supervision of Professor Kenneth Kiewra

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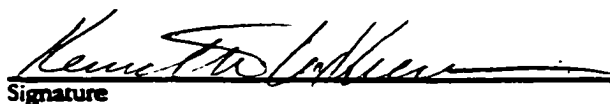
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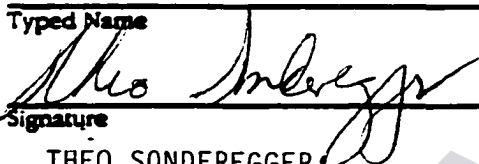


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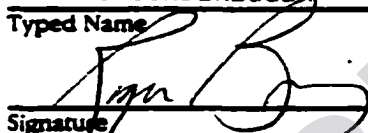


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A Visual Attention Study for Developing Learning Cues
for Individuals with Severe Mental Retardation

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University of Nebraska, 2001

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Individuals with mental retardation, those with Intelligent Quotients (IQ's) below 70 on standardized tests of intelligence, have great difficulty with knowledge and skill acquisition because of deficits in attention span, short-term memory, long-term memory, perception, and other cognitive processes. These deficits are the most pronounced in the two lowest categories of mental retardation, individuals who have Severe and Profound mental retardation, with IQ scores of 20-35, and below 20, respectively.

These individuals have great difficulty attending to even a simple task. The present research study introduces a visual attention aid during a visual attention task. This aid is expected to improve visual attention, and therefore visual performance on the task. Study participants see a visual array on a computer screen and are instructed to focus on the center of the display, which holds a symbol to be remembered. On the next visual display the participants look for and find that symbol among other symbols. There were four groups of participants: Severe Cued, who were given the visual aid, which was the tracing of the symbol with a pointer by the investigator; Severe Uncued; Profound Cued; and Profound Uncued. It was anticipated that visual cueing would

improve the visual attention of the participants who received the cueing, and also that the Severe groups would show better performance than the Profound groups.

Forty-one participants completed three sessions spread over one week. Each session had 20 trials. Analysis of Variance was used to compare the groups by level of retardation and cueing. Other variables were considered.

The two main hypotheses were not supported. The Severe groups did not perform better than the Profound groups, although there was a trend in that direction. In addition, the Cued groups, who received visual assistance to help them attend to and remember the target symbols, did not perform better than the Uncued groups. In fact, the Uncued groups performed significantly better on the last session, the one-week session. These results are analyzed.

PREVIEW

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PREVIEW

CHAPTER I

Introduction

Over the last few decades the treatment and training of individuals with mental retardation, even those living in residential treatment facilities, have improved significantly. Whereas earlier training focused primarily on social and behavioral skills, current best practice assumes that pre-academic training for even the most severely handicapped individuals is possible using proven environmental and behavioral training strategies. Therefore, current training includes improving skills such as attending to a task, listening to instructions, and completing simple sorting and/or packaging tasks. However, significant intellectual limits exist in this population that present a formidable challenge to the improvement of the cognitive abilities of these individuals.

Most people have a general understanding of mental retardation. That is, individuals with mental and/or physical handicaps are seen in school, on television, in neighborhoods, etc. These individuals are “different” in how they speak, how they look, and how they relate to others. They find learning new things difficult, and may have underdeveloped social interaction skills. Unfortunately, individuals with mental retardation are often teased or made fun of. This taunting further isolates them from the mainstream and they miss healthy social interaction. Their education may take place in segregated classrooms, further stereotyping them and lowering their self-esteem.

On a more positive note, American society has reversed much of this discrimination. For example, what used to be called the “State Hospital For Idiots and

Feeble-minded” in Beatrice, Nebraska is now called the “Beatrice State Developmental Center” (BSDC). It is one of the premier training and treatment centers for developmentally disabled individuals in the nation. “Clients” at BSDC receive excellent medical care, a variety of recreational activities, a “normalized” living environment, and both educational and vocational training. In addition, some former BSDC clients now live in small group homes in the local community. In fact, across the nation, large institutions have been depopulated significantly or closed down. Overall, individuals with mental retardation are now given ample opportunities to improve their place in society. As a result, a better understanding of mental retardation has emerged, and the following definition of mental retardation is now universally accepted: Mental retardation is characterized by “subaverage general intellectual functioning” (Criterion A, p. 39, 1996, Diagnostic and Statistical Manual of Mental Disorders, DSM-IV) and significant limitations in adaptive functioning in at least two of the following skill areas: communication, self-care, home living, social/interpersonal skills, use of community resources, self-direction, functional academic skills, work, leisure, health, and safety (Criterion B). The onset must occur before age 18 years (Criterion C). Mental retardation is classified as either Mild, with an Intelligence Quotient (IQ) of 70-85 as measured on a standardized IQ test such as the Weschler Adult Intelligence Test (WAIS); Moderate, with an IQ of 55-70; Severe, with an IQ of 35-55; and Profound, with an IQ of 20-35. The latter two classifications of Severe and Profound now

comprise most of the population living in residential facilities for individuals with mental retardation.

Individuals with mental retardation can benefit from formal training. To do so, they must demonstrate prerequisite skills that are taken for granted among individuals without mental retardation. For example, they must first be able to sit still at a training table and listen to instructions. This behavior requires a modicum of social interaction skills and a willingness to engage in a task. Next, the individuals must comprehend the trainer's instructions. If individuals have a short-attention span --a characteristic of mental retardation--they may not understand the trainer's instructions unless they are presented in brief and simple terms, and repeated a few times. The trainer might, in fact, have to reteach the entire lesson or activity. Depending on the task, trainees must also be able to remember the instructions while engaging in the task. In addition, because learning new tasks has been difficult for this population in the past, trainees must be reinforced frequently with praise, touch, or some other individualized reinforcement. If the individual has visual or auditory problems, which are also commonplace in individuals with mental retardation, special instructional techniques must be employed to overcome those deficits. For example, the training materials might need to be physically repositioned in front of the trainee so that the trainee can see the material better and/or be able to reach it more easily. The loudness of verbal instructions from the trainer may also have to be modified so that each trainee can hear effectively. Tasks may have to be broken down into many small, simple steps so that progress can be

achieved and reinforced. In addition, because memory is deficient in the population of individuals with mental retardation, the trainer may have to repeat instructions, or restate them in a slightly different manner, even when it would seem redundant to do so. Another important point is that the surrounding environment must be devoid of distracting stimuli, such as brightly colored objects, radios, or even food. However, from a training perspective, the most difficult challenges involve cognitive deficits.

Because there are so many pervasive cognitive deficits in the population of individuals with mental retardation, it is difficult to decide which cognitive deficit should be treated. In fact, neurological research (Edelman, 1992; and Petri & Mishkin, 1994) suggests that brain damage across many cerebral areas accounts for the pervasive quality of the cognitive deficits characteristic of mental retardation. Research on attention span (Ashcraft, 1994; Ellis, 1982; Merrill & Peacock, 1994; and others) suggests that improving attention span may not be possible due to this brain damage. Perhaps cognitive deficits become “hard-wired” in neuronal circuits in the brain. If this is true, any adult with mental retardation who has had a reasonable amount of academic, vocational, and other training may have already reached his/her maximum level of knowledge and skills, such that further training is essentially for maintenance purposes rather than skill or knowledge acquisition. Nevertheless, it is appropriate to pursue cognitive research that may result in learning-ability improvement among individuals with mental retardation.

In order to provide a solid background of relevant cognitive information for this research study, a literature review is presented comparing the overall cognitive characteristics of individuals with mental retardation to individuals without mental retardation. This review appears in its entirety in Chapter II. However, the matrix shown here summarizes the results of this review. Table 1 presents cognitive information in three categories: Sensory Memory, Working Memory, and Social Memory. Sensory Memory means the perceptual, highly automatic, sensory processes that begin all mental processing. Perception is the process that assigns meaning to sensory stimuli. Previous experience and expectations also influence the interpretation of this stimuli. This process is automatic and leads to an allocation of attention that is conscious and deliberate. Working Memory refers to post-perceptual mental processes that direct attentional resources and are conscious. This allocation of attentional resources, which are cerebral processes, is neurologically based. The product of attention is memory, both short-term and long-term. Short-term memory is established by the “encoding” of information in the brain. Working memory then transfers these memories into long-term memory. These memories are subject to change by ongoing cognitive processes and brain diseases such as Alzheimer’s Disease. Social Memory refers to environmental and social influences on mental processes that involve expectations and contextual variables.

The categories of Sensory Memory, Working Memory, and Social Memory are descriptive and useful for understanding cognitive processes, but they are not mutually

Table 1

**Comparison of Sensory, Working, and Social Memories of Individuals With and
Individuals Without Mental Retardation**

Sensory Memory	With Retardation	Without Retardation
Attention/Vigilance	short span	sufficient memory span
Perception	undeveloped organization	organization well-developed
Prototypes	difficult to identify	easy to identify/maintain
Recognition Memory	need semantic aid	no assistance needed
Stimulus Attributes	not well learned	sufficient recall
Forgetting	very high	not problematic
Context	presents confusion	not problematic
Working Memory	With Retardation	Without Retardation
Rehearsal	poor when present	used proficiently
Strategy Use	insufficient for task	adequate
External Strategies	need low load	only high load

(table 1 continues)

Social Memory	With Retardation	Without Retardation
Social Adaptation	poor social reasoning	good social reasoning
Interpersonal relationship	more responsive to peer pressure	more independent

exclusive. Rather, they represent processes that interact and are interdependent.

However, these categories do highlight the primary cognitive and social deficits of individuals with mental retardation. These deficits provide the challenges as well as the limitations that must be addressed while developing training procedures that successfully strengthen attention and memory processes among this population.

Table 1 shows that there are pervasive cognitive and social deficiencies in individuals with mental retardation. These deficiencies interfere with progress in learning new skills and acquiring knowledge.

Early research on perception and attention in individuals with mental retardation produced clear evidence of both qualitative and quantitative deficiencies in this population compared to individuals without mental retardation. These results provided the impetus for more cognitive research, especially in the areas of visual and auditory attention. My experiences as a psychologist working with individuals with mental retardation exposed me to the difficulties these individuals have in learning new, simple

tasks that involve visual and auditory attention. As a result, the present study in visual attention was conducted as an attempt to introduce a new strategy or instructional aide that improves visual attention and, ultimately, the overall learning abilities of individuals with mental retardation. However, before looking at visual attention, it is important to examine three primary cognitive deficits in individuals with mental retardation: memory span, mental rehearsal, and strategy use. These three deficits have been found to be particularly deficient among individuals with mental retardation, and in this study an attempt was made to minimize the effects of these deficits on the study's participants.

Memory Span Deficit

The average short-term memory span of an individual without mental retardation is seven, plus or minus two (Miller, 1956, cited in Ashcraft, 1994). This means that about seven numbers or letters can be held in short-term memory. The best example of this limit is a telephone number. If the number is repeated over and over again it can be remembered, as long as there is nothing competing for the individual's attention. However, Miller also showed that items in memory could be "chunked", or separated into cognitively-meaningful bits, thereby increasing the total amount of information remembered. For example, an area code of 649 could be remembered as one item (six-hundred and forty-nine) instead of three.

The average memory span of individuals with mental retardation is much smaller than seven. Anders (1971) found an average of 2-3 items in memory for individuals with mental retardation. Winters and Semchuck (1986) showed that the forgetting rates of