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AUTHOR Andrulis, Richard S.; Alio, Jeanne P.
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ABSTRACT

In 1974-1975, a preliminary study was undertaken to investigate the presence of learning disabilities in adults. Previously completed research studies have focused entirely upon the child and adolescent, with a direct concentration on remediation of this problem. Learning disabilities, currently estimated to afflict ten million school-aged children, have not been viewed from either the adult vantage point nor has research concentrated on the etiology and diagnosis of this affliction. The research reported in this paper utilized an adapted version of the Wechsler Adult Intelligence Scale in a preliminary attempt to develop an adult diagnostic tool. Results suggest that based upon the Wechsler Adult Intelligence Scale adaption, considerable flexibility in modality capabilities may be a possible avenue toward eventual diagnosis of adult learning disabilities. (Author)

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Preliminary Investigation into Learning Disabilities in Adults

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Richard S. Andrulis and Jeanne P. Alio

The American College

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Introduction

Since 1969, learning disabilities have emerged nationally as a problem existing with elementary and secondary school children. At that time, educators and parents throughout the country began working to raise the level of awareness of school officials, educators, and government agencies to characteristics of the learning disabled child and also to initiate requests for federal support to increase the development of research efforts into the etiology and remediation of this problem. Current estimates are that up to ten million elementary and secondary school children possess one or more types of learning disabilities (Lev, 1974, p. 9). Learning disabilities are found in boys at a ratio of four to one (Kushnick, 1974, p. 59). The child diagnosed as being learning disabled typically possesses an average or above average intelligence. Many of these children are judged to be emotionally disturbed upon cursory diagnosis because maladaptive behavior is one of their most prominent characteristics. As these children mature into adulthood, a simple but yet complex question arises. Do children with learning disabilities evidence these disabilities as adults?

Defining Learning Disabilities

Initially the term learning disabilities was used to describe children who were sensorily intact and demonstrated normal intelligence but were deficient in certain specific skill or ability areas or showed behavioral and psychological difficulties which caused them to be unable to adjust or to learn by ordinary school methods. The learning disabilities label encompassed a wide variety of diverse problems. This

fact inevitably has led to considerable confusion. It has become necessary to make a distinction between the learning disturbed who merely exhibit underachievement and the learning disabled who have severe perceptual language-processing problems (Sabatino, 1973).

The problem of identifying learning disabled individuals can be approached either by looking for the underlying causes within the individual or by identifying behavioral manifestations. Educators, interested principally in remediation of learning disabilities, have had little interest in neuropsychological research. The emphasis of recent research on learning disabilities is slanted toward the behavioral manifestations.

Identification of learning disability must be based primarily on the evaluation of present behavior in the areas where disturbed function is known to correlate with the presence of learning disability. However, one should bear in mind that individual characteristics are not independent factors but are interrelated in the behavior of the individual. The symptoms of learning disabilities in both children and adults are widely variable. Although there is a large body of research with children, relatively few attempts have been made to assess learning disabilities in adults. The difficulty in dealing with the adult lies in the fact that the basic handicap arises early in life and becomes obscured by compensating mechanisms which develop to help him cope with his problems. Efforts at diagnosis, especially in the adult, should take into account each of three broad areas in which symptoms can arise: 1) neurological, 2) intellectual, 3) emotional, even though the symptoms

of a given individual may be concentrated substantially in only one area.

Neurological. The term learning disability attempts to describe a specific type of problem and does not apply to all who experience difficulty with academic or social adjustment. Most researchers agree that specific learning disabilities probably arise from underlying neurologic disturbances, however, neurological evaluations on students with learning disabilities fail to support the supposition of Central Nervous System (CNS) impairment. For this reason many researchers and educators do not include CNS dysfunction as a criterion for diagnosis of learning disabled children (Myers & Hammill, 1969, pp. 4-5). Neurological impairment is not easily remedied and perhaps because of this efforts at diagnosis have been directed more toward the behavioral manifestations of learning disabilities. In school children the term learning disabled describes those of average or above average I.Q. who have problems in perceptual language -- processing ability and related communications skills.

Intellectual. Learning disabilities may be thought of as a deficit and/or dysfunction or as a dysfunction which arises from an early deficit. They are manifested as a disorder of audio and visual ". . . . information processing in sensory-motor channels, or a disturbance of psychoneurology at perceptual, integrative or expressive levels" (Jacobsen, 1974, p. 192). Learning disability is manifested as a basic disorder of the learning process which may or may not be accompanied by demonstrable CNS dysfunction. The basic learning processes in which difficulties occur are those necessary for perception (visual perception, auditory perception, tactile perception), integration (integrating all the pieces

of information from eyes, ears, touch, and past memory into a meaningful concept), memory (storing, retrieving information), and output (expressing thoughts in spoken words or writing) (Silver, 1974, p. 106). Put another way, an individual can be said to have impairment or disruption of his decoding (receptive) pathways, his encoding (expressive) pathways, or any of the possible combinations and associations between combinations of encoding and decoding (Myers & Hammill, 1969, p. 6). In children these problems interfere with acquisition of language skills such as reading, writing, and with social interactions and development as well.

Most definitions of specific learning disability currently accepted exclude learning problems primarily due to visual, hearing, or motor handicaps, to mental retardation and environmentally caused emotional disturbance (Dykman, 1971, p. 85).

Recently, Roscoe A. Dykman and his associates have come to believe that the difficulties exhibited by learning disabled children are surface traits dependent on a more basic deficit. The deficit they refer to is faulty attention, particularly becoming alert and focusing. They believe that defective attention is the primary symptom of a specific learning disability syndrome. Results of Dykman's experimental studies with learning disabled children tend to support his hypothesis. These studies indicate that the attentional deficits of learning disabled children appear to be linked to neurological immaturity (Dykman, 1971, p. 88). It is not known whether such deficits persist into adulthood. However, since neural maturation depends at least in part on the interaction between biological structure and environment it seems unlikely that the neurologically immature child will develop to his full capability

without special training. The inability to attend may persist into adulthood as part of established habit patterns and continue to interfere with successful learning.

It is commonly noted that the learning disabled exhibit very uneven development. Wide gaps exist between their best capacities and their poorest capacities, between what they are judged capable of doing and what they actually achieve. They have difficulty learning in the normal school environment and tend to be poorly adjusted both emotionally and socially in a variety of ways.

Emotional. The learning disabled individual may be explosive, hyperactive, and unpredictable or, in some cases, hypoactive. Often he evidences poor control over his own impulses, has a low frustration threshold and is prone to stress. His attention span is short and he adapts poorly to stress or change. The disabled learner has a poor self-image and expects to fail. He is frequently lonely and unhappy because his lack of confidence makes it difficult to relate to others. The young adult with learning disabilities may have expressive language problems and appear at first to be very quiet. In attempting to avoid frustration and failure he may withdraw passively into daydreams. He may, on the other hand, be irritable and aggressive. Frequently, when frustration and anger cannot safely be directly expressed, the individual will exhibit a passive-aggressive reaction. He doesn't "do" anything; yet he makes one angry. Some individuals may try to avoid failure by adpoting a passive-dependent behavior, which can develop into a lifestyle where he never takes initiative and just sits waiting for others to do something for him.

It is important to remember that the emotional problems of the learning disabled are caused by the frustrations and stress resulting from the disabilities and are not the cause of the disabilities (Silver, 1974, p. 118).

We see then, that there are three broad spheres in which the symptoms of learning disability occur. They are: 1) Neurological (central nervous system), 2) Intellectual (capabilities that enable the individual to deal with his environment symbolically), and 3) Emotional (coping strategies adopted to deal with frustration and stress). In addition, recent research indicates that attentional deficits are significant correlates to learning disability (Dykman, 1971).

Statement of Problem

Although definitive population percentages have not yet been established, learning disabilities, as distinct from learning disorders, are estimated to occur to a significant degree (Tillery & Frank, 1975). Even though much effort has been expended on this problem in the last decade there is still no general agreement as to what constitutes effective and appropriate training for the learning disabled. Many different techniques have been tried with varying degrees of success. Remediation, however, remains a problem. In spite of the considerable efforts being made on behalf of the learning disabled individual there are as yet no generally accepted effective programs for education of the learning disabled. It remains very probable that a number of learning disabled adolescents complete school undiagnosed and that many of those who are identified graduate without having been able to successfully overcome their disability.

The present research investigation was undertaken to determine the existence of learning disabilities in adults by 1) ascertaining the existence of different modality strengths, and, 2) determining whether these modality strengths were related to performance on examinations with The American College's Chartered Life Underwriter program (CLU). It was not expected that this initial phase of research would be conclusive. It was suggested, however, that such a research effort could attempt to define the existence of learning disabilities in adults and determine whether or not this disability was related to measures of achievement, which would be seriously effected by the presence of these disabilities. The questions raised in the context of this research were as follows: Utilizing the instruments described in the following section on research methodology, could significant differences be noted between the audio and visual capabilities of individuals? 2) Were these differences between audio and visual capabilities related to performance on the CLU examination? 3) Did individuals who performed at the extremes of success and failure on the CLU examinations indicate differences in the type as well as the quality of their audio and visual capabilities?

Research Methodology

In order to permit an identification of the academic problem areas of students in the CLU program and effective advising of the students entering the program, this investigation of cognitive and learning factors was undertaken. The investigation gathered data from a battery of psychological tests and various performance indicies from the CLU program on a large sample of CLU students. The instruments included three cognitive style measures, category width, reflection-impulsivity, and

field dependence-independence. Although not currently reported in the results section of this paper, this data will be analyzed and reported upon in future reports.

The instrument that became the focus of attention for this particular aspect of research and is subsequently reported in the results section is an adaptation of the Wechsler Adult Intelligence Scale (WAIS). The adaptation was made based upon knowledge of the Illinois Test of Psycholinguistic Abilities (ITPA) as a model from which areas of strengths and weaknesses in the verbal functioning of adults could be utilized and assessed in the CLU population. The concentration of the assessment of modality strength focused upon audio and visual functions with special attention paid to decoding (the individual's ability to comprehend written and auditory symbols), and to encoding (the ability to speak and to write). Permission was sought and granted from The Psychological Coporation to use and adapt the WAIS. The Wechsler Scale consists of a verbal section containing six subtests and a performance section containing five nonverbal tests. For the purposes of this study each subtest of the verbal test only was divided into two tests of equal length using alternate items. The resulting halves of each subtest were designated as either audio or visual. The audio tests were administered in the conventional manner whereas the visual subtests were administered in such a way that the subject read the directions and the item and answered questions by writing his response. Tests on the performance scale were unaltered.

Selection of Subjects

The subjects of this program were 112 students enrolled in the Chartered Life Underwriter program at The American College in Bryn

Mawr, Pennsylvania. All of the students that were invited to take part in the study were located within a seventy mile radius of the Bryn Mawr campus. Approximately 350 students received an invitation letter which indicated that the college was undertaking a research project, the purpose of which was to isolate certain specific characteristics of adult learners, and told how much time would be required. Of the 350 invitees 103 men and 9 women agreed to take part. Ninety-five of the 112 completed all aspects of the entire battery of tests. The age of the participants ranged from 25 to 57, the educational level ranged from high school through graduate school. The data was collected in one, two and one half hour sessions either at The American College or at the individual's office with advance materials being sent to the student, completed and returned prior to their individual testing. In addition, background information, biographical information, and test anxiety scores for each one of the individuals were also collected.

Results

One immediate interest of this study focused upon the reliabilities of the six subtests for the adjusted verbal portion of the WAIS, due to the division of items into a visual or audio subtest. The initial reliabilities and reduced reliabilities are reported in Table 1. These reliabilities were calculated by the Spearman-Brown Prophecy Formula. Table 1 also provides the number of items for each one of the adjusted subtests. Table 2 provides the means and standard deviations for the audio and visual scores for each one of the six subtests of the verbal portion of the WAIS for the total sample of 112 subjects.

Table 3 reports the t-test differences between the audio and visual subtests means for each one of the six scales of the verbal portion of the WAIS. Initially the results from Table 3 indicate that the composite sample of 112 CLU students possesses significantly higher mean audio scores for the areas of comprehension and vocabulary. One can suggest that audio comprehension and speaking vocabulary are at a significantly higher level than visual capabilities in the same areas. For the areas of arithmetic and similarities, the visual mean scores significantly surpassed the audio mean scores which, given the abstract nature of both arithmetic and similarities, is not a surprising finding. For information and digit span, there were no differences between the visual and auditory capabilities. This data supports the contention that adults manifest different modality strengths.

Table 4 reports on the correlations of each one of the six subtests of the verbal scale of the WAIS by modality (either audio or visual) with CLU examination scores. It is interesting to note that the correlations generally are at a significant level, supporting the concept that modality capability is an important aspect of academic achievement. The fairly surprising finding is that the strength of the visual comprehension score of the WAIS correlated with CLU examination scores. The correlation value of .3389 is highly significant ($p < .01$, $df = 110$) and does indicate the presence of visual comprehension components in the CLU examination.

Although these results have not been subject to further analysis to indicate the degree of variance existing between the audio and visual components with CLU examinations, the strength of the correlations between the audio and visual components does suggest, in most cases, that there is little unique variance being accounted for by utilizing

the audio or visual channels separately. That is, intelligence, a major component of the WAIS itself, appears to account for performance in the CLU examinations.

However, to further explore the possible relationship between modality capabilities and academic performance, the bottom 20th percentile and the top 80th percentile and above of CLU examination scores were selected for further analysis. T-tests of the difference in mean scores between the two groups, those with CLU exam scores of 70 and below (20th percentile) and those with 83 and above (80th percentile), by modality strength and by subtests indicated that the higher performing CLU group scored significantly higher than the lower performing CLU group in each one of the subtests of the verbal portion of the WAIS by modality area. This result is reported in Table 5. Specifically then, both audio and visual capabilities, whether in the area of information, comprehension, arithmetic, similarities, digit span, or vocabulary, are significantly stronger in the higher performing group than in the lower performing group. This finding again suggests the importance of a general intelligence factor in accounting for academic achievement.

Table 6 reports the t-tests within each group of students with CLU exam scores at or below 70 and those with exam scores at or above 83 by modality strength and by subtest. It is interesting to note from this table that in the lower performing group, audio comprehension, visual arithmetic, and audio vocabulary far surpassed the corresponding reciprocal skill areas. Whereas for the higher performing CLU group only visual arithmetic and audio vocabulary surpassed their reciprocals. One can suggest that the balance in the modality strength for the comprehension

subtest for the upper level group allows them dual channels for learning--a fact not existing to the same degree in the poor performing group. Since comprehension has the highest single correlation with CLU exam performance, the lack of good visual comprehension skills is a deterrent to successful performance on the CLU examinations.

A more surprising finding is reported in Table 7. In this case the absplute discrepencies that exist between the audio and visual modalities by subtests were accumulated for each individual. Directionality was ignored and only the raw differences between the audio and visual subtests were summarized for each individual. The t-test value of 1.70 is significant ($p < .05$ level for a one-tailed test). In this case the t-test indicates that individuals who are performing poorly on the CLU exams have a greater tendency to have wider discrepencies in their audio versus visual capability than individuals who are performing at the higher performing group. Learning disabilities may then exist in those subjects with wider discrepencies in modality strength. The fact that these individuals also perform more poorly on the subtests in general in comparison to the more successful CLU peers suggests that intelligence obviously is an important factor. The reason is the conventional chicken and egg controversy because one does not know whether the lack of modality capability led to the poor performance or if the poor performance inhibit the utilization of the audio and visual channels.

Summary and Conclusions

The need to look at adults with learning problems goes without saying. This was a preliminary attempt to investigate the possibility that the Wechsler Adult Intelligence Scale could provide a vechicle

whereby differences in audio and visual capabilities on the part of adults could be identified and linked to applied criterion of CLU examination performance. Preliminary results indicate that indeed this is so. Further work must go on to separate out the importance of the intellectual factors from the modality capabilities of the individual and to isolate the importance of these modality capabilities in not only examination performance but also in the wide areas of ongoing daily activities, such as those commonly found in business and industry.

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Table 1

Estimate WAIS Subtest Reliabilities Using the

Spearman Brown Prophecy Formula

WAIS Subtest	Original rtt	New Number of Item	Estimate rtt
Information	.91	12	.83
Comprehension	.77	7	.62
Arithmetic	.81	7	.68
Similarities	.85	6	.73
Digit Span	.66	No Change	.66
Vocabulary	.95	20	.90
Total	.96	---	.90

Table 2

Means and Standard Deviation of the Six Subtests of the WAIS by Modality Audio and Visual

	Audio		Visual	
Subtest	$\bar{X}$	SD	$\bar{X}$	SD
Information	11.14	1.74	11.14	1.85
Comprehension	12.21	1.20	11.56	2.07
Arithmetic	7.26	1.36	8.18	1.29
Similarities	9.17	1.97	9.88	1.91
Digit Span	11.61	2.31	11.77	2.64
Vocabulary	31.81	4.44	27.82	5.16

Note. N = 112

Table 3

t Test Results Between Audjo and Visual Modalities by Subtest

Subtest	t			
Information	.00	Audio = Visual	N.S.	-
Comprehension	2.88	Audio > Visual	p < .01	df 111
Arithmetic	5.19	Visual > Audio	p < .0001	df 111
Similarities	2.74	Visual > Audio	p < .01	df 111
Digit Span	.48	Visual = Audio	N.S.	df 111
Vocabulary	6.19	Audio > Visual	p < .0001	df 111

Table 4

Pearson Product Moment of Coefficient of Correlation of Audio and Visual Modalities by WAIS Subtest and with CLU Exam Performance

Audio Information with CLU	.2423**
Visual Information with CLU	.2442***
Audio Information with Visual Information	.2945***
Audio Comprehension with CLU	.2562***
Visual Comprehension with CLU	.3389***
Audio/Visual Comprehension	.2040*
Audio Arithmetic with CLU	.2717***
Visual Arithmetic with CLU	.2503***
Audio/Visual Arithmetic	.2515***
Audio Similarities with CLU	.2385**
Visual Similarities with CLU	.1420 N.S.
Audio/Visual Similarities	.1431 N.S.
Audio Digit Span with CLU	.1907*
Visual Digit Span with CLU	.2804***
Audio/Visual Digit Span	.6300***
Audio Vocabulary with CLU	.3414***
Visual Vocabulary with CLU	.3207***
Audio/Visual Vocabulary	.6100***

*r = .1857 p < .05 df 110
**r = .2196 p < .02 df 110
***r = .2425 p < .01 df 110

Table 5

t Test by Modality and by WAIS Subtest

Between Students with CLU Exam Scores ≤ 70 and ≥ 83

Audio Information	t = 2.25	p < .05	df 110
Visual Information	t = 2.16	p < .05	df 110
Audio Comprehension	t = 2.90	p < .01	df 110
Visual Comprehension	t = 2.56	p < .05	df 110
Audio Arithmetic	t = 3.29	p < .01	df 110
Visual Arithmetic	t = 3.48	p < .01	df 110
Audio Similarities	t = 2.18	p < .05	df 110
Visual Similarities	t = 3.72	p < .01	df 110
Audio Digit Span	t = 2.63	p < .05	df 110
Visual Digit Span	t = 4.01	p < .01	df 110
Audio Vocabulary	t = 3.79	p < .01	df 110
Visual Vocabulary	t = 2.39	p < .05	df 110

Table 6

t Test Results Between Students with CLU Exam Scores

$\leq$ 70 and $\geq$ 83, by Subtest by Modality

		t	p	
Audio/Visual Information	$\leq$ 70	< 1	N.S.	
Audio/Visual Information	$\geq$ 83	< 1	N.S.	
Audio/Visual Comprehension	$\leq$ 70	t = 2.50	p < .05	df 110
Audio/Visual Comprehension	$\geq$ 83	< 1	N.S.	
Audio/Visual Arithmetic	$\leq$ 70	t = 2.35	p < .05	df 110
Audio/Visual Airthmetic	$\geq$ 83	t = 3.00	p < .01	df 110
Audio/Visual Similarities	$\leq$ 70	< 1	N.S.	
Audio/Visual Similarities	$\geq$ 83	< 1	N.S.	
Audio/Visual Digit Span	$\leq$ 70	< 1	N.S.	
Audio/Visual Digit Span	$\geq$ 83	< 1	N.S.	
Audio/Visual Vocabulary	$\leq$ 70	t = 2.50	p < .05	df 110
Audio/Visual Vocabulary	$\geq$ 83	t = 3.01	p < .01	df 110

Table 7

"T" Test of Difference Between Absolute Discrepancy Scores for Students with CLU Scores at 70 or Below (N = 24) and 83 or Above (N = 21)

$t = 1.70$ ($p < .05$, 1 tail test, df 43)