



The Woodcock-Muñoz Foundation

Research Brief

Children with Mild Mental Retardation: Characteristics of Performance on Measures of CHC Broad Cognitive Abilities

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Introduction

The purpose of this study is to examine the group and individual cognitive profiles of a sample of children with mild MR and a matched sample of children with Average intelligence using the Cattell-Horn-Carroll (CHC) factor clusters of the Woodcock-Johnson III Tests of Cognitive Abilities (WJ III COG; Woodcock, McGrew, & Mather, 2001).

Method

Participants

Children with **mild MR** were selected using the following criteria: (a) a diagnosis of MR within the past 5 years, (b) a Full Scale IQ scores between 50 and 70 on the WISC-III or Stanford-Binet IV, (c) adaptive behavior skill deficits on the Vineland Adaptive Behavior Scales, Interview Edition, and (d) intellectual and adaptive behavior deficits that could not be attributed to a medical condition. There were 16 children who met these criteria. An equal number of children with **Average** general intelligence (i.e., GIA-Ext between 90 and 110) were selected from the WJ III norming sample to match those in the mild MR group on age, gender, ethnicity, and SES.

- Average age 11.4 (range 9 – 17 years)
- 88% Black, 12% White
- SES (based on father's education level): 37.5% did not complete high school; 50% graduated from high school; 12.5% attended some college

Measures

The seven CHC factor clusters from the WJ III were used as dependent variables in the profile analysis:

- **Comprehension-Knowledge (Gc)**: Comprehensiveness of acquired knowledge, ability to verbally communicate knowledge, and ability to reason by drawing upon previous experiences
- **Long-Term Retrieval (Glr)**: Ability to encode, store, and retrieve information for later use
- **Visual-Spatial Thinking (Gv)**: Ability to perceive, analyze, and synthesize visually presented information and patterns; ability to store and recall visual information
- **Auditory Processing (Ga)**: Ability to analyze, discriminate, and integrate auditory stimuli
- **Fluid Reasoning (Gf)**: Ability to reason abstractly, form concepts, and solve problems using unfamiliar information
- **Processing Speed (Gs)**: Ability to rapidly and efficiently perform simple tasks
- **Short-Term Memory (Gsm)**: Ability to hold information in immediate awareness and then use it within a few seconds

Research Questions

To evaluate the cognitive profiles of the two groups, a repeated measures analysis of variance was computed using a general linear model procedure to determine

- if the MR group scored significantly lower than the Average group on the CHC factor clusters as a set (i.e., levels test)
- if the pattern of highs and lows on the CHC factor clusters was similar across groups (i.e., parallelism test)
- if the combined groups' scores were notably higher or lower on any of the CHC factor clusters (i.e., flatness test).

Results

Group Profile Analysis

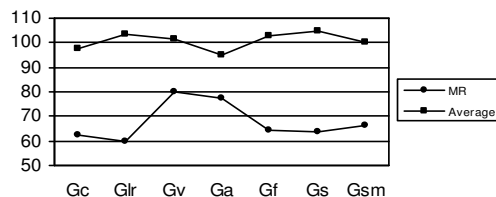
- The MR group scored significantly lower than the Average group on the CHC factor clusters as a set, $F(1,30) = 157.22, p < .001$.

CHC Factor Cluster Means, Standard Deviations, and Ranges for the MR and Average Groups

Factor	MR Group (n = 16)			Average Group (n = 16)		
	Mean	SD	Range	Mean	SD	Range
Gc	62.38	11.40	39-82	97.81	9.54	80-113
Glr	59.69	12.99	38-79	103.56	11.39	90-131
Gv	79.81	13.31	51-97	101.56	7.40	89-118
Ga	77.69	11.64	58-91	94.81	8.53	81-112
Gf	64.25	10.10	52-82	102.94	8.33	88-123
Gs	63.63	15.08	37-95	104.56	9.81	90-125
Gsm	66.06	15.51	36-86	100.00	9.75	82-117

- The MR and Average groups exhibited different pattern of strengths and weaknesses on the CHC factor clusters, $F(6, 25) = 12.16, p < .001$.

Cognitive Profiles of the MR and Average Groups



- When averaged over both groups, the CHC factor clusters deviated significantly from flatness, $F(6, 25) = 6.80, p < .001$, indicating that the MR and Average groups, when combined, were markedly higher or lower on one or more of the CHC factor clusters.

In order to determine possible strengths or weaknesses within each group, a priori contrasts were performed to compare each CHC factor cluster to the mean of all others combined. Within the Average group, a significant relative weakness was found on the Ga cluster, $F(1, 15) = 9.99, p = .006$. The MR group demonstrated relative strengths on the Gv and Ga cluster, $F(1, 15) = 46.16, p = .018$ and $F(1, 15) = 14.82, p = .002$, respectively, and relative weaknesses on the Gc and Glr clusters, $F(1, 15) = 4.83, p = .044$ and $F(1, 15) = 28.98, p < .001$, respectively.

Individual CHC Factor Cluster Profiles for the MR Group

Case No.	Gc	Glr	Gv	Ga	Gf	Gs	Gsm
1	L	L	A	A	L	A	LA
2	VL	EL ^W	LA ^S	L	VL	VL	L
3	L	L	A	LA	LA	L	L
4	VL	VL	L	LA ^S	VL	EL ^W	VL
5	EL ^W	EL ^W	VL	VL	VL	VL	VL
6	VL	VL	L	LA	L	EL ^W	LA
7	VL ^W	VL	LA ^S	L	VL	L	LA
8	VL ^S	EL	VL	LA ^S	VL	EL ^W	EL ^W
9	LA	L	LA	LA	L	VL	L
10	VL ^W	VL	LA	A ^S	VL	L	L
11	L	VL	A ^S	VL	VL ^W	L	VL ^W
12	VL	VL	LA	LA ^S	L	VL	VL
13	VL	EL	L	VL	VL	L	VL
14	VL	L	A ^S	VL	L	VL	VL
15	VL	EL	VL	VL ^S	VL	EL	EL
16	VL	VL	LA ^S	A ^S	VL ^W	VL	L

Individual Cognitive Profiles Within the MR Group

Across the cases, 6 of the 16 children with MR (37.5%) obtained at least one CHC factor cluster within the Average range (i.e., standard score [SS] ≥ 90). Moreover, 11 of those in the MR group (68.8%) obtained at least one CHC factor cluster that was within one standard deviation of the population mean (i.e., $SS \geq 85$), and all but three children obtained at least one CHC factor cluster that was not in the MR or Low range (i.e., $SS \geq 80$).

An index of intra-individual cluster scatter was computed for individual cases in the MR group. A factor cluster score that deviated by 1 standard deviation or more (i.e., ± 15) from the individual's average was considered significant. Approximately 75% ($n = 12$) displayed a significant strength, a significant weakness, or both on at least one CHC factor cluster. Consistent relative strengths were noted on the Gv and Ga clusters, and consistent relative weaknesses were noted on the Glr, Gf, Gs, and Gsm clusters.

Discussion

Children with MR are often presumed to be deficient in all cognitive abilities. In fact, some may presume that a child who meets diagnostic criteria for MR (i.e., low IQ and low adaptive functioning) but who displays either (a) a normatively Average or Low Average score on some measure of specific cognitive abilities or (b) significant profile scatter should not be classified as having the disorder. In light of these presumptions, this study sought to investigate the specific cognitive abilities of children with MR using well-validated measures of specific cognitive abilities.

Results revealed that individual children with MR demonstrated a rather wide range of performance across the CHC broad cognitive abilities. When individual cognitive profiles were examined within this group, over one third exhibited one or more broad cognitive abilities that fell within the Average range, and all but three children exhibited at least one broad cognitive ability that was not within the Low range. These results suggest that low general intelligence does not necessarily imply a general impairment across all cognitive abilities and that impaired abilities are not necessarily consistent across children with MR. Thus, children with MR may have very different profiles of strengths and weaknesses across specific cognitive ability measures.

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