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ABSTRACT

A factor analysis study was conducted of the Wide Range Assessment of Memory and Learning (WRAML), a test developed from a test structure model of memory and learning. The battery is composed of nine subtests (three verbal, three visual, and three learning subsets). The sample consisted of 903 students aged 5 years through 8 years 11 months, and 1,460 students aged 9 years through 17 years 11 months. For the first sample, principal components analysis indicated a three-factor solution. A possible third factor was also indicated for the second sample. The factor analyses suggest a general confirmation of the model with a majority of subtests loading on the factors as predicted. However, several clear exceptions were found, indicating that the structural model was not completely confirmed. Further refinement of the subtests appears necessary. Test users are cautioned to be careful in generalizing beyond the present evidence for these subtests and indices. Two tables present the correlation matrices and principal components for the two samples. (SLD)

PSYCHOMETRIC PROPERTIES OF THE WIDE RANGE ASSESSMENT OF MEMORY AND LEARNING (WRAML)

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This paper, part of a Division 12 session on Assessing Memory in Children: A New Test Battery, provides notes and tables to accompany a presentation describing a factor analysis study of the Wide Range Assessment of Memory and Learning (WRAML).

Test Structure

The WRAML was developed from a test structure model of memory and learning. The test battery is comprised of 9 subtests: 3 verbal, 3 visual and 3 learning subsets. The test battery provides scores for the 9 individual subtests, indices for verbal memory, visual memory and learning together with a total general memory index.

Sample

The sample consisted of two groups (1) 903 students ages 5-0 through 8-11 and (2) 1460 students ages 9-0 through 17-11. The sample was drawn according to a national, stratified plan (see Administration Manual pp. 74-80) with the test battery administered by trained examiners. Data was collected between December 1988 and November 1989.

Methodology

Two separate analyses were made, one for each of the two samples described above. They are described separately as samples 1 and 2.

Sample 1

A principal components analysis of the data identified two eigen values above 1.0 and the third value at 0.929. A skree test indicated that a possible third factor might be assumed and consequently a three factor solution was conducted. Table 7.10 gives the correlation matrix and varimax solution for this sample.

Sample 2

A principal components analysis of the data identified 2 eigen values above 1.0 and the third at 0.765. A skree test provided a similar indication of a possible third factor. Table 7.11 gives the correlation matrix and varimax solution for this sample.

Results

Sample 1 (ages 5-0 through 7-11).

The structural model of the WRAML predicted that picture Memory, Design Memory and Finger Windows should load highest on a single visual factor and this was found to be so. However, Visual Learning, predicted to load on the learning index factor, loaded highest on the visual factor also and understandably so because this is a visual task albeit attributed by the model to be in the learning mode.

Story Memory ascribed to be a verbal task loaded higher on the learning factor with Verbal Learning and Sound Symbol than with Sentence Memory and Number/Letter as predicted by the test structure model.

Visual Learning, predicted to load highest with Verbal Learning and Sound Symbol, instead loaded highest with the visual index subtests.

Sample 2 (ages 9-0 through 17-11)

Picture Memory, Design Memory and Finger Windows loaded as predicted on the visual factor, but so did Visual Learning predicted to be Learning Index subtest.

Finger Windows loaded as high on the visual factor as on the verbal factor Story Memory, predicted as loading on the verbal factor, loaded on the learning factor and Visual Learning, predicted to load on the learning factor, did so moderately on that factor but more strongly on the visual factor.

To summarize, with Sample 1 the loadings generally occurred as predicted by the test structure but with two clear exceptions out of 9 for about 78% confirmation of loadings with the structural model.

Discussion

This factor analysis suggests a general confirmation of the model with a majority of the subtests loading on the factors i.e. indices as predicted, but with several clear exceptions. These exceptions indicate that the structural model was not completely confirmed. Perhaps the hypothesized indices weren't confirmed because the constitutent skills contained in the subtests are not pure themselves but require integrated abilities across modalities.

The implications for psychometricians are that further refining of the subtests is necessary before the model can be fully realized. The process of variable definition, operational definition and validation is, of course, a never ending process. Subtests need further scrutinizing to refine the skills taped by mental processes and items need to be developed or refined to accurately measure these processes.

The implications for clinicians are that any test interpretations of these subtests and indices be made carefully and in recognition of the lack of pure indices as yet not fully realized. Test users should be cautioned to be careful in generalizing beyond the evidence possessed for these subtests and indices.

Further studies are being conducted. I am randomly splitting the sample to see if the data from these subtests will replicate the model and confirm each other. I am also investigating gender differences. Item analysis has indicated that certain items may have influenced the results and further refinement of items will add to our knowledge of these item which can eventually bring the model and the data together.

REFERENCES

Sheslow, D. & Adams, W. (1990). Administration manual: Wide range assessment of memory and learning. Wilmington, DE: Jastak.

Table 7.10

Correlation Matrix of WRAML Subtests (8 & Younger)*

	PICTURE MEMORY	DESIGN MEMORY	VERBAL LEARNING	STORY MEMORY	FINGER WINDOWS	SOUND SYMBOL	SENTENCE MEMORY	VISUAL LEARNING	NUM/LTR
PICTURE MEMORY	1.000								
DESIGN MEMORY	0.304	1.000							
VERBAL LEARNING	0.212	0.289	1.000						
STORY MEMORY	0.250	0.316	0.362	1.000					
FINGER WINDOWS	0.160	0.251	0.223	0.207	1.000				
SOUND SYMBOL	0.160	0.184	0.279	0.232	0.111	1.000			
SENTENCE MEMORY	0.163	0.267	0.285	0.398	0.297	0.265	1.000		
VISUAL LEARNING	0.190	0.312	0.254	0.201	0.275	0.242	0.230	1.000	
NUM/LTR	0.105	0.198	0.185	0.201	0.226	0.172	0.591	0.204	1.000

* ALL SIGNIFICANTLY CORRELATED AT THE .002 LEVEL (N = 903)

Principal Components with Varimax Rotation of WRAML Subtests (8 & younger)

	VISUAL	VERBAL	LEARNING
Picture Memory	0.569*	-0.148	0.320
Design Memory	0.669*	0.078	0.259
Verbal Learning	0.311	0.111	0.615*
Story Memory	0.285	0.222*	0.585
Finger Windows	0.655*	0.382	-0.160
Sound Symbol	-0.004	0.125	0.749*
Sentence Memory	0.159	0.800*	0.320
Visual Learning	0.605	0.158	0.157*
Number/Letter	0.082	0.859*	0.113

* SELECTED SUBTESTS FOR RESPECTIVE INDEXES

Table 7.11

Correlation Matrix of WRAML Subtests (9 & Older)*

	PICTURE MEMORY	DESIGN MEMORY	VERBAL LEARNING	STORY MEMORY	FINGER WINDOWS	SOUND SYMBOL	SENTENCE MEMORY	VISUAL LEARNING	NUM/LTR
PICTURE MEMORY	1.000								
DESIGN MEMORY	0.390	1.000							
VERBAL LEARNING	0.233	0.306	1.000						
STORY MEMORY	0.315	0.304	0.353	1.000					
FINGER WINDOWS	0.211	0.247	0.248	0.244	1.000				
SOUND SYMBOL	0.254	0.283	0.330	0.374	0.247	1.000			
SENTENCE MEMORY	0.181	0.223	0.302	0.435	0.300	0.352	1.000		
VISUAL LEARNING	0.294	0.418	0.310	0.329	0.272	0.378	0.234	1.000	
NUM/LTR	0.143	0.156	0.202	0.234	0.280	0.306	0.605	0.198	1.000

* ALL SIGNIFICANTLY CORRELATED AT THE .001 LEVEL (N = 1460)

Principal Components with Varimax Rotation of WRAML Subtests (9 & Older)

	VISUAL	VERBAL	LEARNING
Picture Memory	0.674*	0.012	0.221
Design Memory	0.720*	0.023	0.277
Verbal Learning	0.239	0.091	0.648*
Story Memory	0.216	0.196*	0.695
Finger Windows	0.584*	0.585	-0.145
Sound Symbol	0.214	0.240	0.638*
Sentence Memory	0.017	0.749*	0.441
Visual Learning	0.583	0.076	0.401
Number/Letter	0.005	0.837*	0.215

* SELECTED SUBTESTS FOR RESPECTIVE INDEXES