

Validation of Memory Processing Classifications within the School Neuropsychological Conceptual Model using Exploratory Factor Analysis in a Mixed Clinical Group Sample

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These data were drawn from an archival sample of 956 mixed clinical case studies with imputed data conducted by students in the School Neuropsychology Post-Graduate Certification Program (2001 - 2010).

Test	Factors and Related Loadings																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Factor 1: Verbal Immediate Memory																	
WISC IV Integrated Letter Span Non-Rhyming	.785	.078	.022	.068	.186	-.061	-.056	-.018	.049	.021	.063	-.139	.011	.066	.055	.042	-.018
WISC IV Integrated Letter Span Rhyming	.760	-.002	.215	-.023	-.039	.064	-.043	.117	-.002	.029	-.161	-.019	-.149	.085	.208	.090	.062
WJ III Achievement Story Recall	.507	.294	-.106	-.032	-.017	.100	.062	-.015	.012	.078	.037	.042	.310	-.015	-.039	-.076	.185
TOMAL Memory for Stories Immediate	.407	.016	.164	.249	-.609	.158	.112	.149	-.131	-.063	-.090	-.056	.081	-.125	.031	.014	-.062
WISC IV Integrated Letter Number Sequence PA	.319	.042	.088	.122	.304	.034	.101	-.497	.165	-.194	.137	-.133	.312	-.046	.111	.002	.041
Factor 2: Semantic Working Memory																	
WJ COG Verbal Comprehension	.021	.847	.059	.018	-.025	.006	-.024	.008	.013	.027	-.019	.123	.073	-.081	.033	-.008	.095
WJ COG General Information	.078	.751	.132	-.032	.013	.166	-.016	.093	.064	.012	-.033	.156	.017	-.107	-.093	-.101	.110
WJ COG Auditory Working Memory	-.032	.604	-.080	.184	.052	-.105	.189	-.079	.133	.002	-.047	.025	-.011	.245	.017	.126	.046
WJ COG Numbers Reversed	.100	.586	-.110	.093	-.032	-.010	.023	.066	.114	-.134	-.021	-.073	.017	.298	.096	.207	-.150
WJ COG Memory for Words	.099	.549	.024	-.064	.093	-.078	.113	.053	.074	-.029	.080	-.067	.136	.079	.001	.176	-.204
Factor 3: Verbal List Learning																	
TOMAL Object Recall Immediate	.070	.051	.903	-.010	.012	-.011	.081	.035	-.013	.048	.005	-.039	.094	.122	.058	-.003	.004
TOMAL Word Selective Reminding	-.104	.025	.716	.220	-.107	-.046	.094	.186	-.043	-.100	.285	.092	-.135	-.129	.155	.008	-.172
TOMAL Word Selective Reminding Delayed	.330	-.036	.630	-.035	.102	.182	-.146	.017	-.043	.366	.156	-.011	.114	.020	.033	.078	-.016
Factor 4: Immediate Memory																	
TOMAL Digits Backward	-.064	.075	-.110	.728	.031	-.020	.214	-.053	.089	-.161	.280	-.014	-.112	-.231	-.064	-.130	-.112
TOMAL Letters Backward	-.189	.102	.097	.726	.067	-.093	.083	.059	-.171	.126	-.169	-.250	.202	-.028	.038	-.035	-.032
TOMAL Abstract Visual Memory Immediate	.468	.019	.076	.686	-.130	.030	-.029	.007	.148	.085	-.082	.037	-.148	.108	-.053	.090	.118
TOMAL Facial Memory Immediate	.345	-.022	.502	.519	-.166	-.174	.053	-.010	.056	-.080	-.016	.086	-.133	.173	.035	.089	.030
TOMAL Paired Recall	.093	-.024	.130	.502	-.029	.112	.036	-.244	-.175	-.121	.332	.309	.263	.105	.030	.314	.043
TOMAL Memory for Location Immediate	.333	-.006	.351	.378	-.254	.171	-.118	.120	.136	.206	.157	.110	-.309	.214	-.120	.103	.046
Factor 5: Recall of Information																	
WISC IV Arithmetic	.121	.010	-.079	.060	.712	.119	.191	-.008	-.054	.022	-.155	.075	.169	.039	.099	-.008	-.068
WRAML 2 Design Memory Recognition	.104	-.020	.065	.114	.644	-.009	.182	-.155	.137	-.257	.259	.001	-.169	.059	-.052	.152	.056
WISC IV Digit Span	.074	.141	.133	-.218	.557	-.342	-.072	-.156	.041	-.093	.002	-.221	.156	-.116	.041	-.160	.000
WISC IV Information	.300	-.072	.040	-.220	.341	.186	.000	.169	-.229	.251	-.128	.263	.101	.144	.278	.164	.032
Factor 6: Recognition Memory																	
WISC IV Integrated Visual Digit Span	.152	.027	-.004	-.112	.176	.806	.194	-.158	.111	.026	.086	-.065	.076	-.015	.085	-.061	-.008
TOMAL Memory for Stories Delayed	-.233	.060	.159	.129	-.305	.727	.085	-.098	.008	.226	.097	.012	.012	-.050	-.007	-.046	.078
WISC IV Integrated Information Multiple Choice	.032	-.090	-.182	-.360	-.191	.618	-.025	.356	-.165	.214	-.193	.120	-.070	-.039	-.042	.084	-.008
WISC IV Integrated Spatial Span Forward	.412	.019	-.110	.087	.104	.520	-.214	.055	-.062	-.077	.119	.202	-.048	.235	.262	.030	.042
WISC IV Integrated Arithmetic PA	.289	-.090	.218	-.036	.321	.362	.278	.132	-.148	-.145	-.419	-.011	-.185	-.008	-.256	.102	-.121
Factor 7: Visual Memory for Abstract Designs																	
NEPSY II Memory for Designs Delayed	-.176	.116	.036	.027	.119	.171	.869	-.021	-.030	-.015	-.040	-.035	.088	-.033	.046	.031	-.004
NEPSY II Memory for Designs	.048	.060	.092	.159	.014	.011	.819	-.056	.132	-.039	.060	.159	.056	.041	-.046	.084	.043
NEPSY II Word List Interference Recall Total	.167	.109	-.133	-.008	.353	-.012	.511	-.047	-.001	.134	.393	.119	.081	.180	.058	-.109	.036

Test	Factors and Related Loadings																
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Factor 8: Verbal Memory (high contextual cues)																	
WRAML 2 Story Memory Delayed Recall	.128	.027	.044	-.011	-.206	.051	-.121	.701	-.025	.185	-.109	.105	-.012	.067	.061	.221	.136
WRAML 2 Symbolic Working Memory	-.009	.013	.204	.007	-.034	-.096	-.004	.682	.089	-.008	.273	-.238	.148	.049	.124	-.056	.000
WRAML 2 Story Memory	.121	.193	.046	.014	.075	-.060	.037	.645	.127	-.277	.022	.000	.170	-.124	-.013	.039	.290
Factor 9: Verbal-Visual Associative Memory (with familiar content)																	
NEPSY II Memory for Names Delayed	.058	.045	-.129	.043	-.055	-.037	.033	-.021	.738	.101	.108	-.038	.029	.173	.169	.182	.090
NEPSY II Memory for Names	.090	.230	-.055	-.083	-.087	.030	.227	.075	.676	-.097	.088	-.071	-.127	.188	-.004	-.026	.030
NEPSY II Narrative Memory Free Recall	-.125	.093	.154	.012	.237	.005	-.135	.082	.614	.102	-.082	.457	-.103	-.095	-.094	.013	-.089
Factor 10: Semantic Memory with Recognition																	
WJ III Achievement Academic Knowledge	.099	.032	.021	.094	-.034	.221	.080	.345	.064	.685	-.068	-.297	-.014	-.105	-.113	-.028	-.081
NEPSY II Narrative Memory Recognition	-.270	.104	.372	-.031	.207	-.176	.313	-.069	-.128	.434	-.135	-.067	.384	.149	.097	.022	.070
Factor 11: Motor Sequential Recall																	
TOMAL Manual Imitation	-.031	-.069	.264	.043	.013	.133	.064	.073	.071	-.052	.823	.061	-.042	-.013	-.092	.001	-.007
Factor 12: Story Recall and Recognition																	
NEPSY II Narrative Memory Free & Cued Recall	-.097	.170	.007	-.062	-.009	.040	.168	-.042	-.020	.006	.079	.858	.063	.033	-.018	-.040	-.025
Factor 13: Verbal Immediate Memory (moderate contextual cues)																	
WRAML 2 Sentence Memory	-.024	.110	.025	-.013	.060	.018	.117	.130	-.082	-.128	-.002	.063	.737	.036	-.018	.136	-.053
Factor 14: Visual Memory for Faces																	
NEPSY II Memory for Faces	.058	.109	.079	-.025	.023	.006	.034	.067	.145	-.020	-.041	.061	.015	.813	-.075	-.122	.048
NEPSY II Memory for Faces Delayed	.285	.125	.158	-.024	.235	.002	.061	-.236	.264	.053	.171	-.098	.067	.479	-.055	.113	.130
Factor 15: Verbal Working Memory																	
WISC IV Digit Span Backward	.136	.028	.086	-.084	.013	.012	.051	.068	.015	-.125	-.010	.028	.012	-.074	.792	.087	.003
WISC IV Integrated Spatial Span Backward	.049	.031	.191	.155	.142	.228	-.160	.017	.401	.043	-.092	-.267	-.106	-.035	.546	-.032	-.034
WISC IV Letter Number Sequence	.253	.092	.154	.063	.303	.020	.178	-.010	.221	-.075	-.104	-.009	.191	-.036	.310	-.255	.107
Factor 16: Verbal-Visual Associative Memory (with unfamiliar content)																	
WJ COG Visual Auditory Learning Delayed	.152	.096	.060	.018	.049	-.021	.065	.141	.226	.098	-.093	.030	.240	-.099	-.002	.728	-.051
WJ COG Visual Auditory Learning	-.037	.453	.026	.002	-.037	-.019	.055	.036	-.002	-.033	.058	-.081	-.068	-.023	.136	.618	.154
Factor 17: Visual Memory																	
WRAML 2 Picture Memory	.095	-.075	-.069	-.075	-.003	.040	.016	.198	.071	.049	.048	.007	.009	.039	.004	.023	.713
WJ COG Picture Recognition	-.085	.365	-.102	.096	.017	.012	.146	-.072	-.158	-.080	-.119	-.015	-.193	.147	.108	.011	.508
WRAML 2 Design Memory	.319	.071	.131	.009	.071	-.089	-.014	.170	.204	-.303	.266	-.104	-.004	-.078	-.218	-.044	.423
WRAML 2 Picture Memory Recognition	.082	.038	.080	.293	-.072	.031	-.167	-.005	.392	-.102	-.273	-.074	.259	.054	-.008	.171	.411
WRAML 2 Verbal Working Memory	-.044	.087	-.084	.053	.117	-.078	.070	.093	-.063	-.785	-.023	-.162	.173	-.015	.097	-.061	-.006
Percentage of the variance explained by factor	6.2%	5.7%	5.4%	5.3%	5.1%	4.7%	4.6%	4.4%	4.4%	4.1%	3.7%	3.3%	3.2%	3.0%	2.9%	2.9%	2.8%
Cumulative percentage of variance explained by factor	6.2%	11.9%	17.2%	22.5%	27.6%	32.4%	37.0%	41.4%	45.8%	49.8%	53.5%	56.8%	60.0%	62.9%	65.8%	68.7%	71.5%

- Implications:**
- Seventeen factors were generated from a cross-battery sample of memory measures. These 17 factors explained 71.5% of the total variance.
 - Some of the factors closely align with the School Neuropsychological Conceptual Model (see handout), yet some tests designed to measure the same construct do not relate to each other or are specific to the tests from which they came.
 - Practitioners are urged to conduct a demand analysis of individual test performance when interpreting memory test results.
 - Further research is needed to better describe how memory functions are being assessed across the various batteries of tests.