Distinct Memory Profiles in Children with Learning Disabilities: A Neuropsychological Perspective

Beth Pollock & Joseph E. Casey
University of Windsor

Abstract

WRAML2 core and Verbal Working Memory subtest scores of 101 students diagnosed with Learning Disabilities were cluster analyzed to determine if reliable and meaningful subgroups would emerge. Five reliable subtype groupings were identified. Three of the five clusters were differentiated primarily by level of performance (Average, Low Average, and Borderline scores on the majority of subtests). The other two clusters were differentiated by pattern of performance (weak visuospatial short memory and weak auditory verbal working memory).

Rationale

•   Previous studies examining memory performance in children and adolescents with Learning Disabilities have had conflicting results.

•   Subtyping studies have proven useful in examining cognitive processes in heterogeneous groups such as individuals with learning disabilities.

•   To date, only one study published examining memory subtypes in the WRAML2 standardization sample and one study examining TOMAL performance in a sample of children and adolescents with dyslexia.

Hypotheses

Based on the results of previous research studies, it was hypothesized that:

• Reliable and meaningful memory profiles would emerge in a sample of children and adolescents with learning disabilities

• Variables that were not used to form the clusters were expected to vary across the clusters, such as prevalence of ADHD co-morbidity, delayed memory performance, intellectual functioning, and academic achievement, thus demonstrating their external validity.
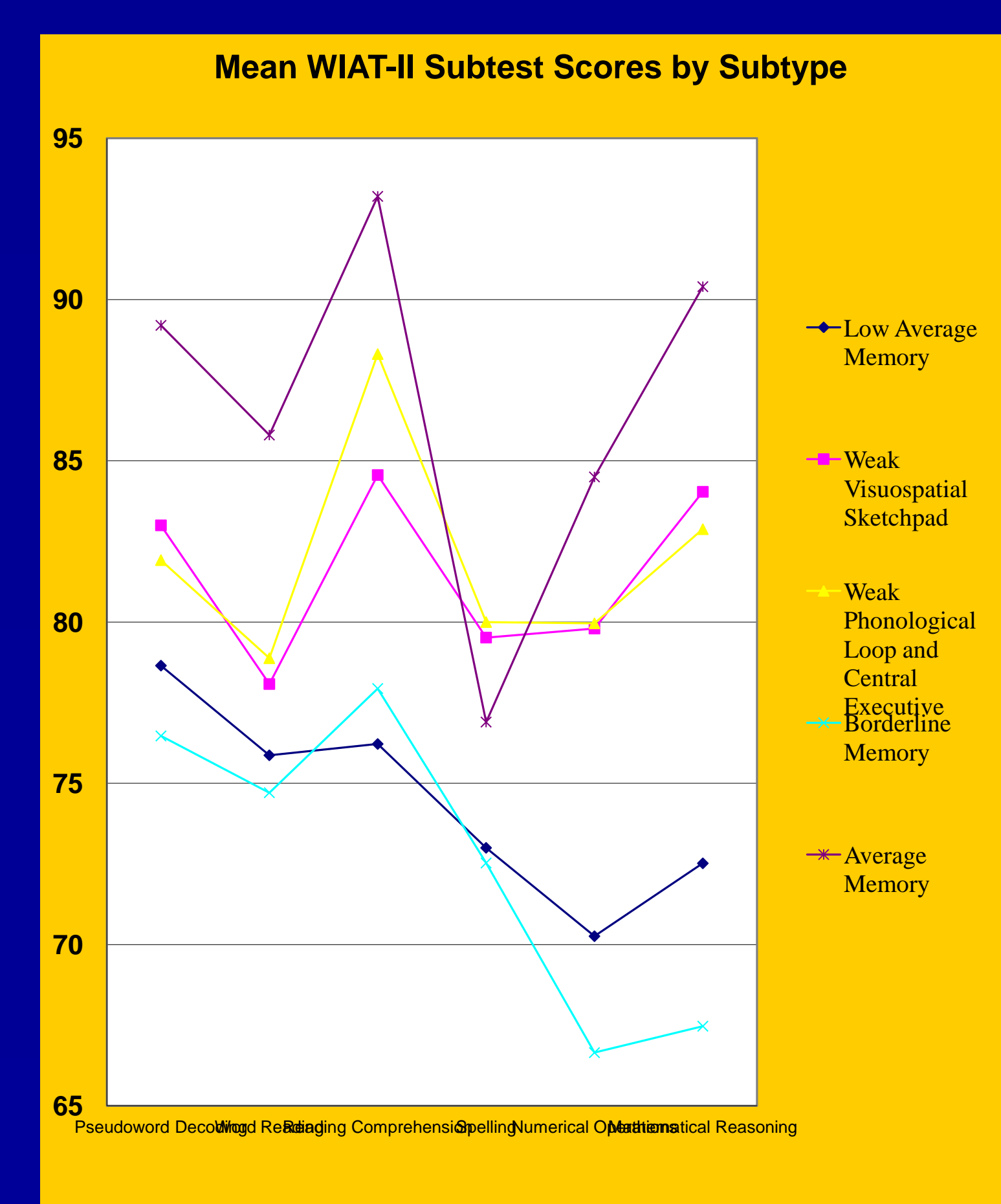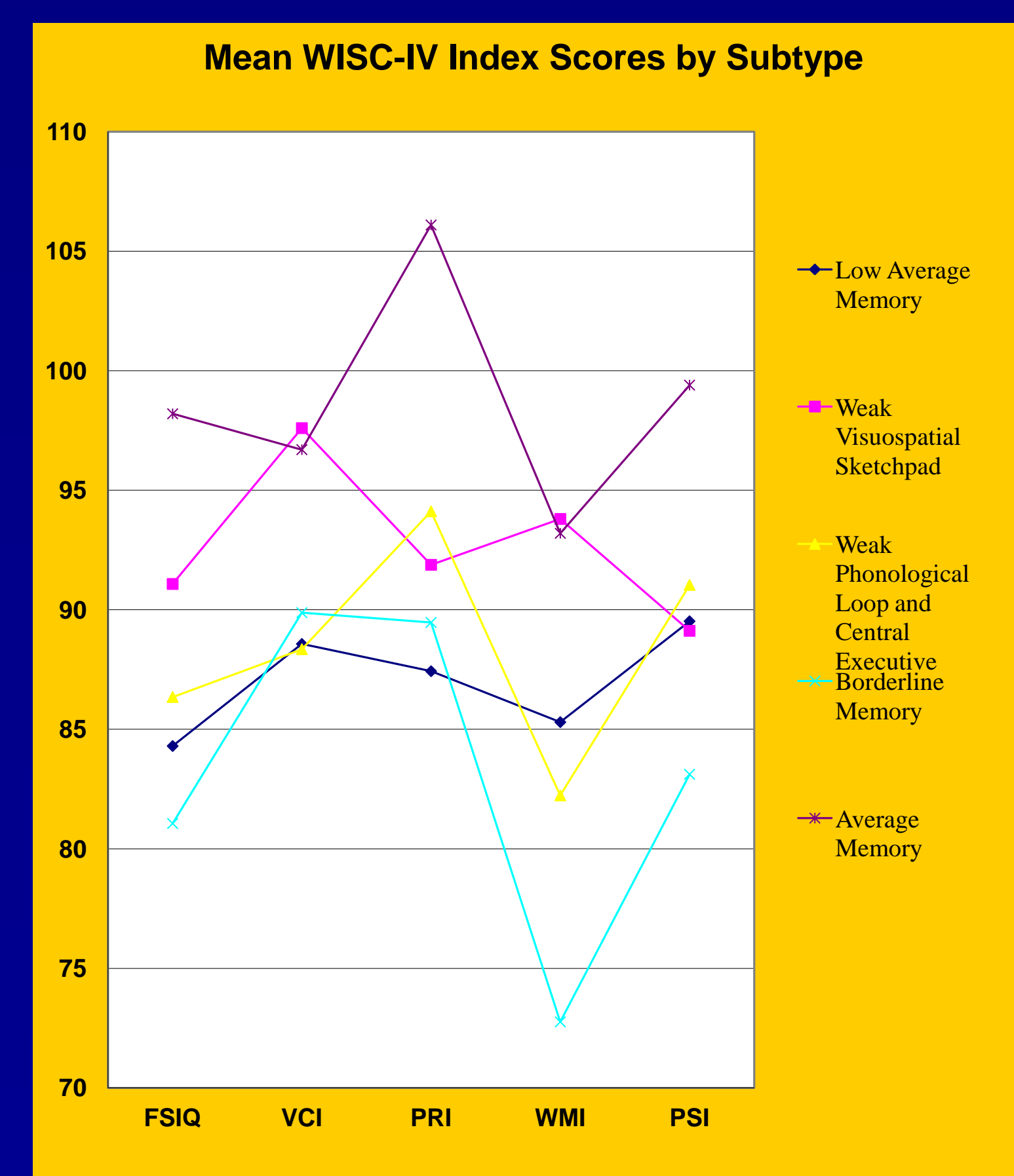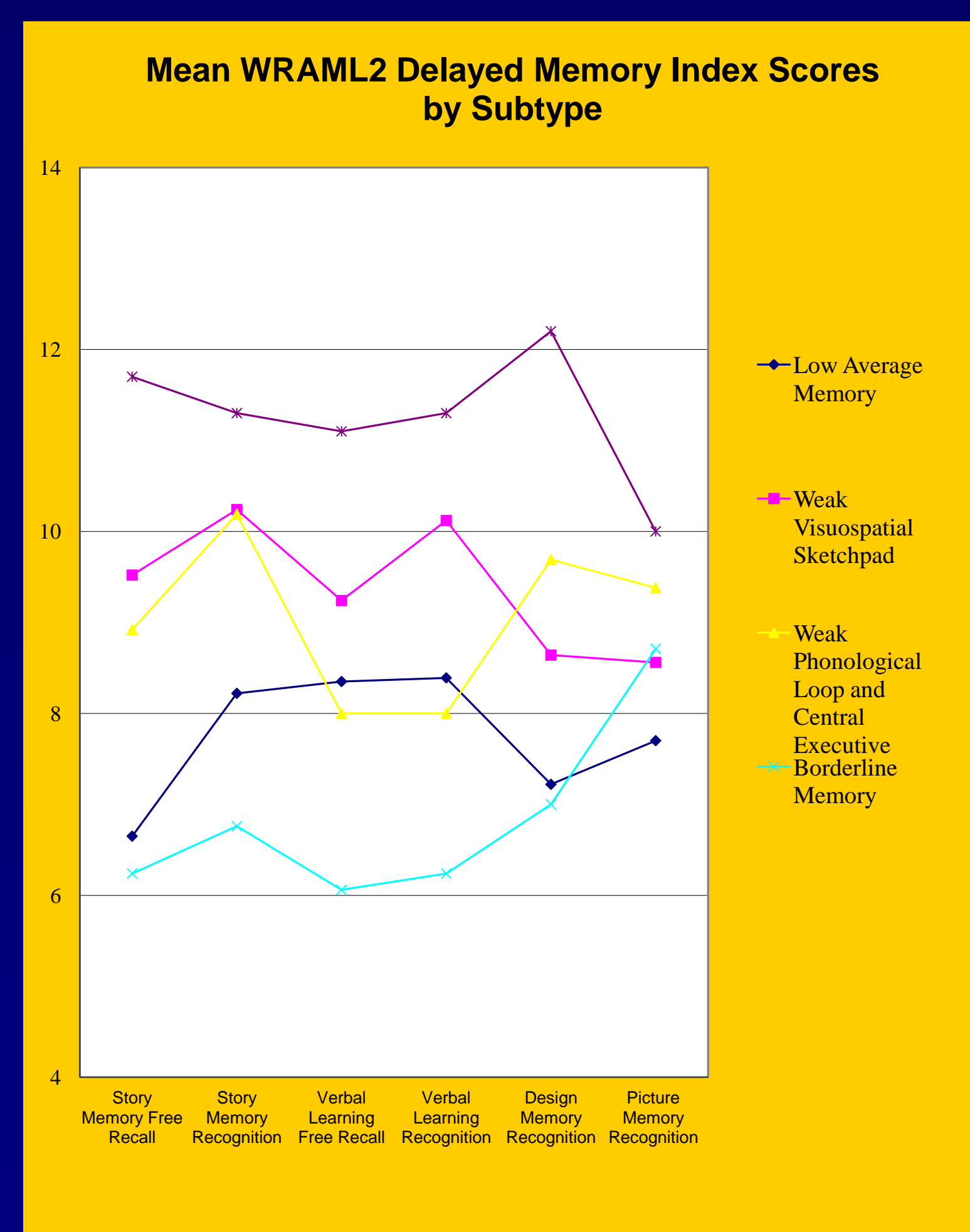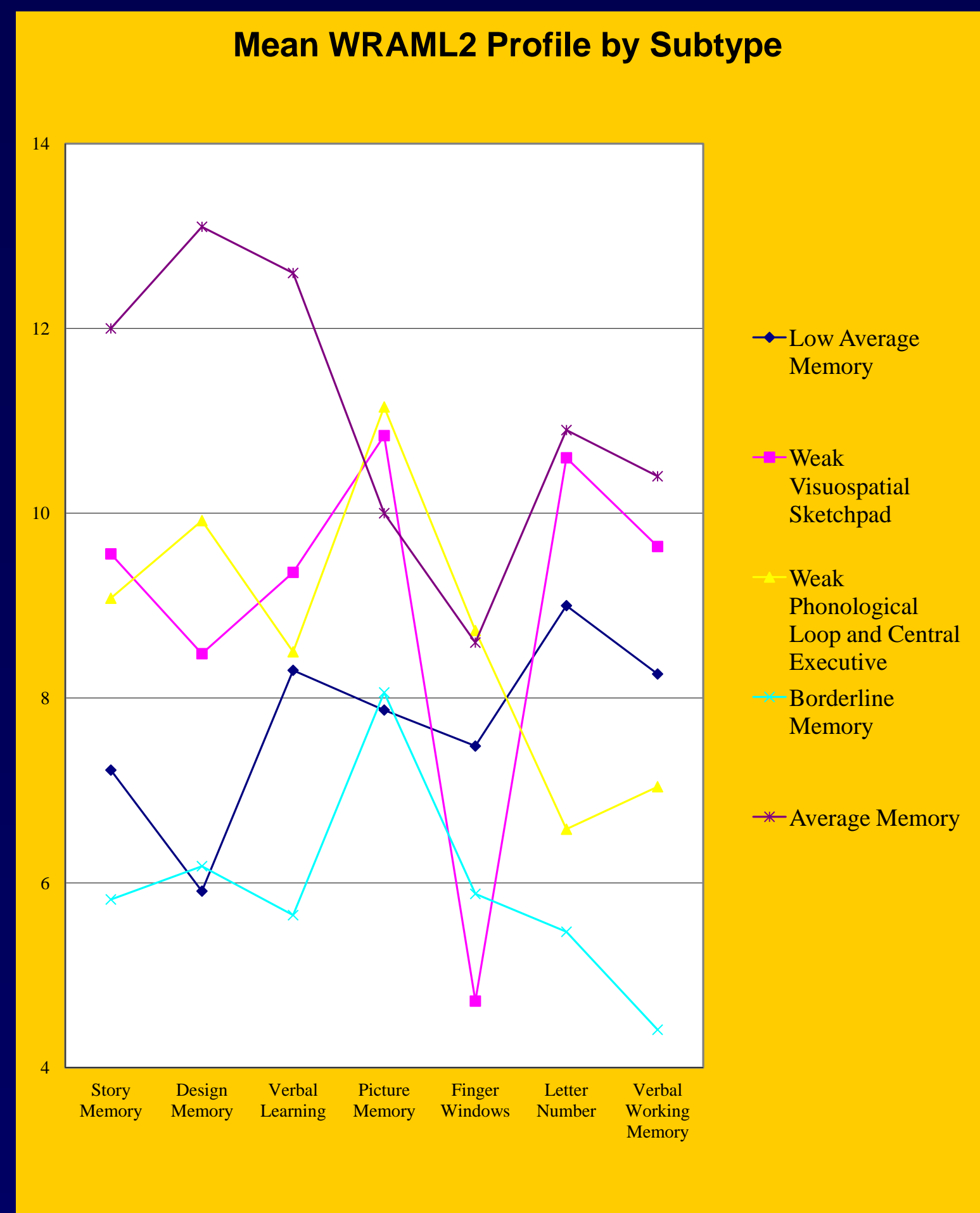
Method

Participants
•   Ages: 9 – 16   FSIQ: 68 – 118   N = 101

Procedures
•   Scaled subtest scores were subjected to hierarchical (Ward's Method) and K-means iterative partitioning cluster analyses. Internal validity of the final cluster solution was established using multiple-method reliability techniques.

•   ADHD co-morbidity, WRAML2 delayed memory subtest scores, WISC-IV Index scores, and WIAT-II subtest scores were compared between the groups to determine the external validity of the derived memory subtypes, as   well as to assist with further description of the specific clusters.

Mean WRAML2 Profile by Subtype

Mean WRAML2 Delayed Memory Index Scores by Subtype

Mean WISC-IV Index Scores by Subtype

Mean WIAT-II Subtest Scores by Subtype

Results

•   Comparison of the results obtained using several two-stage cluster analyses strongly suggested the presence of five distinct memory subtypes.

•   The good agreement between all four clustering methods (intraclass correlations ranging from .626 to .837) was taken to suggest that the current five- cluster solution was reliable.

•   There were no differences in gender distribution, $\chi^2(4) = 1.347$, p = .853, or age distribution, $F(4, 96) = .669$, p =   .615, based on cluster membership.

•   The five subtypes were labeled:
   Cluster 1:   Low Average Memory (N = 23)
   Cluster 2:   Weak Visuospatial Sketchpad (N = 25)
   Cluster 3:   Weak Phonological Loop and Central Executive (N = 26)
   Cluster 4:   Borderline Memory (N = 17)
   Cluster 5:   Average Memory (N = 10)

•   While the Borderline, Low Average, and Average Memory subtypes were similar to those found in the WRAML2 standardization sample and the Weak Phonological Loop, and Central Executive subtype was similar to a subtype found a sample of children with dyslexia, this was the first study to identify a weak Visuospatial Sketchpad subtype.

•   The five subtypes exhibited distinct patterns of performance on measures of delayed memory, intellectual functioning and academic achievement and rates of co-morbid ADHD diagnosis, suggesting that the memory profiles are valid and potentially clinically meaningful.

Conclusions

•   Reliable patterns of WRAML2 subtest scores can be identified in children and adolescents with learning disabilities.

•   This study extends previous research by confirming that the heterogeneity of the Learning Disability population in fact also encompasses performance on a measure of memory and learning.

•   Despite research that has attempted to use memory assets and deficits for specific learning disability subtypes   (e.g., BPPD, NLD) to suggest strategies for intervention, the current findings failed to display memory profiles that were consistent with academic profiles typically used in multivariate studies.

•   Identification of Weak VSSP subtype reinforces need for the comprehensive assessment of memory processes.

•   Additional research is needed to validate the current findings using an independent sample.