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Multicultural Neuropsychology: Performance of Mandarin-Speaking Children On Widely Used Assessment Instruments

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Abstract

In order to extend the multicultural horizons of neuropsychological assessment in the Chinese mainland, a battery of eight commonly used neurocognitive tests assessing motor speed, verbal and visual-spatial memory, language fluency, attention, and executive functioning were given to 224 Mandarin-speaking school children (107 boys and 117 girls) between the ages of 6 and 12 years. As main effects emerged from a 2 (gender) by 7 (age groups) multivariate analysis of variance (ps $< .01$), data were arranged by year level (all tests) and additionally by gender and year where the performance of boys and girls significantly differed. It is hoped these preliminary norms will have pragmatic psychodiagnostic utility for those involved in assessing the neuropsychological status of Mandarin-speaking children.

Multicultural Neuropsychology: Performance of Mandarin-Speaking Children On Easily Administered Assessment Instruments

As the psychology indigenization movement becomes prominent in Asia (Ho, Peng, Lai, & Chan, 2001; Kim & Park, 2007), some have called for locally developed, culturally specific assessment instrumentation (Chan, 1987; Chan, Shun, & Cheung, 2003, Sue & Chang, 2003). Others, however, such as Hsieh and Tori (2007) and Hedden et al. (2002) have cautioned against an unwanted monoculturalism in assessment theory and practice arguing that the ethnicity of test authors or where an assessment instrument was developed do not, per se, determine the utility of tests for diverse populations. From this perspective, an important aspect of multicultural neuropsychology involves the collection of local norms on assessment instruments having cultural invariant test performance potential.

Ubiquitous Human Functions

There are many neuropsychological functions found among all peoples (e.g., memory for objects and faces, recognizing incongruities, naming of flora and fauna, motoric speed, and connecting points) and the assessment of basic skills in cross-cultural settings has a long history. Hsieh and Tori (1993), for example, sought to understand the effects of Chinese language instruction on neurocognitive functions using samples monolingual and bilingual children and Shuttleworth-Edwards, Donnelly, Reid, and Radloff (2004) found that WAIS-III Digit Symbol subtest scores were relatively independent of cultural setting. Many assessment instruments have been developed with the explicit goal of use in diverse cultural settings such as Leiter International Performance Scale and Ravens Progressive Matrices (Athanasiou, 2000; Court, 1991).

Thus, for many research purposes, each culture and locale does not require individualized assessment instrumentation. From this perspective, multicultural assessment might be better served through the collection of local norms on tasks that are found in all societies and the present research was done with goal in mind. Such an approach does not, of course, preclude indigenous assessment instrumentation efforts. Both approaches may eventually have symbiotic effects and be indicative of a vibrant multicultural neuropsychology movement (Horton, 2008).

Rationale for the Instruments Used

Because the number of psychologists (and neuropsychologists in particular) relative to the Chinese population is quite small (Han & Zhang, 2007; Yang, 2004), local norms were collected on tests that could easily be administered by general practitioners, other professionals (e.g., teachers, public health workers, nurses), or paraprofessionals. Additionally, all instruments must have been successfully used cross-cultural studies. With these selection criteria in mind, the following tests were chosen: California Verbal Learning Test – Children's Version (Delis, Kramer, Kaplan, & Ober, 1994), Rey-Osterrieth Complex Figure Test (Meyers & Meyers, 1995), animal and food naming (Halperin, Healey, Zeitchik, Ludman, & Weinstein, 1989; McKenna & Parry, 1994), Color Traits Test (D'Elia, Satz, Lyons-Uchiyama, & White, 1996), Digit Span test from the Wechsler Intelligence Scale for Children – III (Wechsler, 1991),Digit Symbol Modalities Test (Smith, 1991), and the coin rotation task (Ghacibeh, Mirpuri, Drago, Jeong, Heilman, & Triggs, 2007). It is hoped that the provision of initial normative data on these tests will allow Chinese psychologists, educators, and health workers to have access to new and potentially very useful assessment instruments in their psychodiagnostic work.

Language as a Neuropsychological Variable

The present study is one response to the call for an “anthropological neuropsychology” (Ardila, 2005). While increasing awareness regarding the importance of race and ethnicity in neuropsychology research is growing (e.g., Echemendia, 2004, Evans, Miller, Byrd, & Heaton, 2000; Ivnik, 2005), the influence of native language on neurocognitive performance has received much less attention. It is well established, however, that linguistic factors have considerable influence on nearly all processing and reactive functions (Boroditsky, 2001; Gentner & Goldin-Meadow; Hsieh & Tori, 1993; Niraula, Mishra, & Dasen, 2004; Shanahan, 2007). Thus, many feel that language, much like handedness, gender, age, and education, should be considered an important grouping factor in neuropsychology research and this would be particularly true for a linguistically diverse nation such as China (Hsieh & Tori, 2007). Future research on the influence of the various Sintic dialects on neuropsychological performance will, no doubt, provide new insights into the interactive nature of culture and brain-behavior relationships.

Overview of Research Goals and Objectives

. The basic goal of the present study is to contribute the emergence of multicultural neuropsychology by obtaining preliminarily normative data on seven easily administered neurocognitive texts among Mandarin-speaking boys and girls aged 6 through 12 years. It is hoped that findings may provide clinicians working with world’s largest native language population new diagnostic tools having utility in diverse situations (e.g., schools, public health centers, neurological and psychiatric clinics).

Method

Participants

A total of 224 school children who were living in northern region of China participated in the present study. The sample was collected from local communities and schools in three geographical areas: Beijing, Liaoning Province and Xinjiang Province. All participants were Mandarin-speaking between the ages 6 to 12 years. There were 107 boys and 117 girls with an average age of 9 years, 6 months. They came from grades ranging from kindergarten to 7^{th} grade, with the majority of children between first grade and 6^{th} grade. There were equivalent numbers of children in each grade level (on average, 30 per group) and equal numbers of boys and girls in each age group.

To guide subject selection, a child's average language and math grades of the past year were obtained from their teachers. Only those with average or above average academic performance in both mathematics and language skills were recruited. The student's average achievement scores were 91.28 in language and 91.86 in mathematics (out of a total score of 100). Exclusion criteria included those with medical conditions, mental retardation and special learning problems that were identified by the school teachers. A signed parental permission was also obtained prior to the administration of tests. Parental education and number of siblings were recorded. Consistent with current cultural norms of the People's Republic of China, the majority (n = 176, 78.6%) had no siblings and nearly all children identified as right-handed (n = 219, 97.8%). Each child was individually tested in his/her home or school.

Measures

The tests selected for this study consisted of measures of motor function, attention/concentration, memory and learning in both verbal and visual formats, executive functions (attention and concentration, processing speed and set switching), and non-verbal intellectual ability.

All test materials and instructions were translated into Mandarin by the first author and were reviewed by several graduate students for clarity and accuracy. As the verbal components of assessment were very straightforward no changes were deemed necessary prior to testing.

The battery consisted of the following tests that were administered in the order presented:

Coin Rotation Task (CR). Motor dexterity and speed are assessed by this fundamental task. Uses have included the evaluation of agility impairments and the degree of movement dysfunction (e.g., Gebhardt, Vanbellingen, Baronti, Kersten, & Bohlhalter, 2008). This easily administered procedure first involves having a subject hold a coin (e.g., a quarter) in the dominant hand and having the person to rotate the coin 180 degrees as rapidly as possible using the thumb, index, and middle fingers. Total complete rotations in 10 seconds minus total number of drops of are recorded. In the present study, three trials per hand were collected bilaterally and an average was then calculated (for the dominant and nondominant hands). The final score was the average score of the three trials per hand.

California Verbal Learning Test – Children's Version (CVLT-C). This is the child version of the adult California Verbal Learning Test (CVLT; Delis, Kramer et al. 1987). The CVLT-C is a verbal list-learning test that measures sustained auditory attention, immediate recall and delayed recall (Delis, Kramer et al., 1994). The procedure utilizes 3 separate word lists containing 15 nouns each. Each word grouping is organized around semantic categories that should be recognizable to school-aged children. The administration of the CVLT-C involves verbal presentation of word lists, and then recall and recognition of the constituent items at differing time intervals.

First, participants were asked to repeat the list of 15 words over five immediate recall learning trials (List A). Second, they were asked to repeat a new 15-noun list free-recall (Interference List B). Next, the students were asked to perform short-delay recall and semantic-cued recall of List A. After 20 minutes delay, participants were again asked to perform a long-delay free-recall and a semantic-cued delay recall. Finally, a yes-no recognition memory trial was presented. Scores collected in the present study included the individual total scores for trials 1 and 5 of List A, the total score of List A (sum of trials 1-5), List B Free Recall, List A Short-Delay Free Recall and Cued Recall, List A Long-Delay Free Recall and Cued Recall and Long Delay Recognition Hits.

Rey-Osterrieth Complex Figure Test (RCFT). This test measures visuospatial constructional ability and visual-spatial memory (Meyers & Meyers, 1995). It has been used as an instrument to explore the emergence of spatial, motor and organizational abilities in both adults and children (Rosselli & Ardila, 2003). Participants were asked to copy the complex figure stimulus card. When completed, the child’s drawing was scored following Rey’s 18-item, 36-point scoring system (Hartman & Potter, 1998).

Animal Naming Test and Food Naming Test. Verbal fluency tests are used as a measure of executive functions and language; they can also be used to evaluate semantic memory. It is assumed these naming tasks require cognitive flexibility and linguistic skills. A developmental naming study of normal children aged 6 to 12 has been presented on American school children by Halperin et al (1989). In the present research, there were two one-minute trials, in which participants were asked to name animals and then food within allowed time period. Scoring is the number of animals and food recalled.

Color Trails Test. This is a non-alphabetical parallel form of Trails Making Test that can be used in cross-cultural population, as it is free from the influence of language ((D'elia et al. 1996). For children's version, subjects were asked to connect numbered, colored circles with continuous pencil strokes. There are two sections to Color Trails. Color Trails-1 asked subjects to connect lines on a page of scattered circles numbered from one to 15, with even-numbered circles colored yellow and odd-numbered ones colored pink. Color Trails-2 asked the subjects to alternate between the two colors and numbers. Scoring was the time in seconds spent in completing the test.

Digit Span Test of WISC-III (Wechsler Intelligence Scale for Children – Third Edition - Digit Span. The Digit Span subtest of the WISC-III measures attention, concentration, and short-term memory (Wechsler, 1991). Digit forward requires that subjects repeat orally presented number sequences of increasing length in the same order in which they are presented. Digit backward requires the subject to repeat digit sequences of increasing length in reversed order. Three scores were collected in the child study: raw score of total digit span, number of digit forward correctly repeated, and number of digit backward correctly repeated based on the administration manual of WISC-III.

Symbol Digit Modalities Test (SDMT). This test measures visual scanning, tracking, sustained attention and motoric speed (Smith, 1991). It also allows comparison between oral and written responses. It is similar to the Digit Symbol Subtest of the

Wechsler Intelligence Scale, but has more items (110) than Digit Symbol Test. Subjects are presented with a list of symbols that are paired with numbers (1 through 9). A total of 110 items are presented to participants using a standardized work sheet. Ninety seconds are allowed to complete each trial. Written administration was given first, subject was asked to write numbers in the blank spaces that is paired to the symbols above them. Oral administration was then followed, by asking the subjects to read the numbers that were paired to the symbols. Two scores were collected: the number of items (minus errors) completed within 90 seconds in both written and oral administrations.

Draw A Person Test (DAP). The Draw A Person Test has been used for over 79 years as a non-verbal estimate of the developmental stages of cognitive maturity and intellectual ability of children. Universal developmental markers can be seen in children's human drawings from all cultures; as a result, the human figure drawing is thought to be more culturally fair than other ability measures. In 1988, Naglieri revised the DAP by developing a 14 item, quantitative scoring system with updated norms and to reflect changes in styles of clothing, hair, etc. He compared matched pairs from his DAP standardization sample of White, Black and Hispanic students. He found no significant differences between standard scores for ages 5-14, suggesting minimal impact of cultural differences on scores.

In the present study, one human figure drawing was administered with pencil and 81/2 X 11" paper to each child. Drawings were scored and evaluated using the Naglieri's 14-item quantitative scoring system to derive an estimate of intellectual ability. Means and standard deviations were calculated for female and male students at one-year increments.

Procedure

Under the supervision of the first author, four native Mandarin-speaking graduate students from the Psychology Department of Peking University in Beijing, China, undertook data collection. Administration of tests followed standardized procedures except where otherwise noted. Participants were offered small souvenirs for completing the psychometric tasks. To ensure proper test administration and scoring, the graduate students participated in a training workshop before conducting the field work. Ongoing supervision was provided throughout data collection.

The total testing administration ranged between 40 minutes to one hour. Scoring of individual tests followed the standard procedure of each individual testing manual. Inter-scorer reliability of Rey Complex Figure Test was insured by having three research assistants all score twenty copy test forms for scoring consistency. Any discrepancies were discussed to increase the consistency of scoring among the graduate student administrators.

Statistical Analyses

Initial analyses were conducted to ensure that the assumptions for parametric univariate and multivariate statistical analyses were met (Lix & Keselman, 2004; Wilkinson, 1999). A 2x7 (Gender x Age) MANOVA was conducted to detect main effects and interaction effects in the test variables. Follow up tests were then applied, as appropriate to determine the specific nature of the mean differences in the test variables. The obtained scores were divided by gender and age demographics to provide scores that would be useful for preliminary normative purposes.

Results

Preliminary Analyses

The data set was examined for outliers (variations from the mean of more than three standard deviations) and two were discovered that were determined to be errors in data entry. The distributions for all continuous variables save one (CVLT recognition score) were found to be reasonably normal. The CVLT recognition score had high negative skew; therefore, a $\log_{10}$ transformation was used to improve normality (Rasmussen, 1989).

Age by Gender Multivariate Analysis of Variance on All Dependent Variables

Significant main effects for gender, $\Lambda = .833$, $F(20,190) = 1.904$, $p = .014$, and age, $\Lambda = .168$, $F(120,1105.55) = 3.336$, $p < .001$, were obtained, with a non-significant interaction term, $\Lambda = .525$, $F(120,1105.55) = 1.085$, $p = .260$.

However, it was determined that not all of the variables had gender differences. Follow-up ANOVAs revealed that differences between boys and girls were obtained on a majority of the scores in the CVLT (excluding Recognition score) with female participants consistently scoring higher than their male peers, *ps* < .025. Only 2 other neuropsychological variables differed across gender, the Written subtest of the SDMT, $F(1,209) = 4.710$, $p = .031$, and the Draw-A-Person total score, $F(1,209) = 6.961$, $p = .009$. In both cases, girls again scored higher than boys. Tables summarizing test data will provide average scores either separating values by gender or collapsing across the sexes as determined by the above analyses.

Additional ANOVAs to characterize age differences revealed significant findings for every test variable, *ps* < .003. Multiple comparisons of every age with each other (e.g. 6 vs. 7, 6 vs. 8, 6 vs. 9, etc) revealed inconsistent patterns of age differences (e.g., ages 6 and 7 were equivalent on some variables but not for others). Due to this inconsistency in age differences, tables summarizing neuropsychological test data provide readers with normative data organized by age (year).

Gender and Age Tables

Boys. Test data summarizing boy's performance by age is provided in Table 1. Note that the variables summarized in this table were those that differed across gender.

Girls. Test data summarizing girl's performance by age is provided in Table 2. Again, this table summarizes performance on those variables where there was a gender difference.

Combined gender groups. Table 3 provides descriptive statistics for test variables where gender differences were not statistically significant.

Discussion

This research sought to extend the multicultural perspective of neuropsychology by collecting preliminary norms for Mandarin-speaking children on easily administered and internationally used neurocognitive tests. Hopefully, this effort will contribute to an emerging psychometric infrastructure available for Chinese social scientists, educators, and mental health practitioners. Given the wholesome educational and health characteristics of the samples, the obtained test data can serve as normality markers. If significant deviations from these values are found, the possibility of serious biopsychosocial problems should be considered (e.g., sequelae of disease, disability, or injury). Finally, other researchers may want to extend the normative database for these (and related) instruments taking into consideration class, linguistic (e.g., various Chinese dialects), and cultural factors.

An Etic Multicultural Assessment Approach

Thought regarding the nature of multicultural neuropsychological assessment may be stimulated by the approach used in this study (i.e., collection of local norms on widely used instruments). In the postmodern age, some have conjectured that each culture and nation is so particular as to require an individualized (or indigenous) assessment technology (Hoshman & Polkinghorne, 1992; Kim, Park, & Park, 2000). Others, however, have feared that this view may actually result in unwanted monoculturalism (Hsieh & Tori, 2007; Tori & Bilmes, 2002). For example, care must be taken to avoid judgmental characterizations of the ethnicity or locale of test originators such as Cheung, Leong, and Ben-Porath's (2003, p. 245) declaration that "… the ethnocentrism of Western psychology poses a barrier to the broadening of scientific knowledge and the practice of the profession."

In contrast to the above position, it can be argued that the cross-cultural utility of psychometric instruments is a more accurate legitimacy metric than place of origin matters. In this regard, the tests selected for used in the present study met the conditions given by Sue and Chang (2003) for valid cross-cultural assessment (i.e., culturally appropriate items, reliable scoring, accurate translations, and uniformity of constructs across groups). It was felt that one aspect of multicultural neuropsychological testing involves the collection of local norms on instruments assessing functions found in all cultures (e.g., motor speed and control, memory, attention, and speech production).

Of course, such an approach does not eschew the more emic (i.e., indigenous) approaches to psychodiagnostic assessment. Given that the universalist v. contextualist debate has had considerable heuristic value (e.g., Kim, 2000), it seem likely that each perspective will continue make unique contributions to multicultural neuropsychological measurement. Also, it should not be forgotten that, from a pragmatic stance, ultimate decisions about the relative importance of methodological approaches rest on empirical findings rather than philosophical tenets (Trierweiler & Stricker, 1998, chap. 3). Thus, psychometric research from both positions should continue and be critically evaluated in terms of scientific criteria.

Age and Gender Differences

While differences between each of the age groups were not always significant, as is commonly done with other normed tests, it was decided to group data into separate year intervals. Hopefully, this manner of presentation will make the data arrays easy to use and it also seemed likely that as additional normative data become available (with larger sample sizes) more consistent year by year age differences will emerge. In the present battery, age differences were most distinct on instruments that assessed motor speed and memory (i.e., Color Traits and Symbol Digit Modalities Test) along with measures of verbal fluency (animal and food naming). However, for no instrument were the post hoc tests contrasting the year groupings all significant. Developmental, educational, and social-cultural factors, no doubt, all contributed to this finding.

Normative data are not typically separated by gender for the instruments used in the present study (particularly for children under the age of eight). We also found, for the most part, that gender differences were not significant on the majority of test scores obtained by the normal children sampled. The exceptions were parts of the California Verbal Learning, Symbol Digit Modalities, and Draw-A-Person tests. With respect to verbal learning, others have also reported gender differences in children (e.g., Cutting, Koth, Mahone, & Denckla, 2003; Donders & Hoffman, 2002; Goodman, Delis, & Mattson, 1999) and norms for the Symbol Digit Modalities Test are divided by gender. While the projective drawings of boys and girls often qualitatively differ (Gardner, 1982; Malchiodi, 1998), no significant differences the sexes have heretofore been found using the Naglieri scoring system (Hagood, 2003). The significant gender differences obtained on this measure in the present study should stimulate further investigations of this issue in Asian populations.

Utility of Data

How might the data collected be useful to practitioners and educators? As reviewed by Strauss, Sherman, and Spreen (2006), the tests used in this research have been employed in a host of clinical investigations evaluating the sequelae of brain pathology due to injury, disease, and drug toxicity; they have also been used to diagnose learning problems, developmental delays, and psychiatric disorders (e.g., autism, depression, and anxiety). Human figure drawings have long been used as measures of personality and cognitive functioning in diverse settings (Koppitz, 1968; Machover, 1949; Qing-Xiong, Jin, & Xiao-Mei, 2005; Rae & Hyland, 2001) and they are almost always an integral component of psychodiagnostic batteries for children.

Yet another characteristic of the present tests contributing to their utility is very straightforward administration. Also, most of the instruments can be given in a short time and complicated materials that are found in traditional neuropsychological assessment tests (e.g., Halstead-Reitan or the Luria Nebraska neuropsychological batteries) are not necessary. Thus, teachers, public health officials, and various paraprofessionals could easily be trained in test administration making widespread use of the instruments possible. If this were the case, it is possible that routine neurocognitive screening of children could become feasible.

Limitations

As with all empirical research, limitations regarding the presented data should be considered. First, random and larger samples are desirable and this is something that should occur in the near future. In a country as large and diverse as China, it is possible that performance on tests could vary as function of language and ethnicity. Thus, it would be a wise course of action to develop norms based on these factors (e.g., perhaps, native Cantonese and Mandarin speakers might differ in fauna and flora naming). Finally, assessment of children with identified neurological or psychiatric problems would have been informative.

Conclusion

Initial normative data for typical (i.e., lacking any known neurological or psychiatric problems), Mandarin-speaking children aged 7 through 12 years on seven widely used neuropsychological tests are presented. For statistical reasons and ease of use, test data were arranged by age for all instruments and by age and gender on tests where the performance of boys and girls differed. It is hoped that these data will be of assistance to those charged with the psychodiagnostic assessment of children from this population and for use in educational and public health settings.

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Author Notes

Table 1

Neuropsychological Test Data for Boys by Age

	Age Groups													
	6 (*n* = 12)		7 (*n* = 9)		8 (*n* = 17)		9 (*n* = 23)		10 (*n* = 17)		11 (*n* = 16)		12 (*n* = 13)	
Indices	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CVLT-C														
List A														
Trial 1	5.08	1.38	5.22	2.11	5.65	2.03	6.13	1.87	5.94	1.25	6.31	1.14	6.62	1.80
Trial 5	9.92	3.29	9.56	3.13	11.18	1.67	11.22	2.91	11.47	1.81	11.88	1.54	12.23	1.88
Total recall	40.00	10.50	40.00	11.79	45.06	9.20	46.91	11.25	45.76	7.90	49.38	4.15	52.00	7.68
Short-delay														
Free recall	8.25	2.86	8.67	2.50	9.53	2.27	10.26	2.91	9.59	2.37	10.31	1.40	11.15	2.73
Cued Recall	7.58	3.65	8.11	3.48	9.65	2.12	9.96	3.18	9.53	2.50	10.38	1.54	11.38	2.33
Long-delay														
Free recall	8.75	3.44	8.89	2.57	10.12	2.00	10.39	2.59	9.82	2.40	10.50	1.46	11.15	2.34
Cued Recall	8.17	3.41	8.56	4.13	10.24	1.68	10.39	3.43	10.12	2.29	11.25	1.53	11.69	2.29
List B														
Total recalled	5.00	2.34	4.22	2.05	5.47	1.59	5.48	2.06	4.82	1.74	5.75	1.57	6.38	1.66
SDMT - Written Score	16.25	5.93	25.11	8.96	29.88	4.85	37.04	6.58	36.82	7.32	41.31	7.25	45.38	7.33
DAP - Total Score	24.75	9.99	32.00	8.69	36.88	8.13	38.04	8.09	42.00	8.37	43.94	5.94	41.00	5.42

Note. CVLT-C = California Verbal Learning Test - Children's Version, SDMT = Symbol Digit Modality Test, DAP = Draw-a-Person Test.

Table 2

Neuropsychological Test Data for Girls by Age

	Age Groups													
	6 (*n* = 19)		7 (*n* = 19)		8 (*n* = 15)		9 (*n* = 18)		10 (*n* = 13)		11 (*n* = 15)		12 (*n* = 17)	
Indices	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CVLT-C														
List A														
Trial 1	4.79	1.99	6.47	1.71	6.93	2.05	6.44	1.46	6.62	1.33	8.00	1.69	7.47	1.87
Trial 5	10.16	2.12	11.16	2.29	12.07	2.02	12.61	1.85	12.15	1.77	12.67	2.38	12.53	1.91
Total recall	38.42	9.11	45.95	9.56	51.00	6.01	51.89	5.92	52.46	7.09	55.07	10.57	52.41	6.46
Short-delay														
Free recall	8.68	2.71	9.74	2.64	10.60	1.88	11.39	2.45	11.38	2.99	11.87	3.83	11.71	2.28
Cued Recall	7.89	2.00	8.84	2.24	10.93	2.25	11.28	2.14	11.31	2.32	11.67	2.94	11.18	2.21
Long-delay														
Free recall	8.47	2.93	10.16	2.59	11.53	2.23	11.72	2.42	11.31	2.78	12.53	2.88	11.53	2.15
Cued Recall	8.21	2.18	9.47	3.01	11.47	2.13	11.89	2.40	11.92	2.63	12.27	2.84	11.82	2.32
List B														
Total recalled	4.58	1.92	5.21	1.93	6.27	2.28	6.17	2.07	5.77	1.69	6.80	1.66	6.47	1.74
SDMT - Written Score	18.00	5.52	26.32	4.76	31.00	7.62	35.05	10.46	41.46	8.77	43.87	7.69	51.82	9.59
DAP - Total Score	35.16	5.15	37.00	9.25	40.33	10.20	43.32	7.15	41.08	9.21	45.93	6.04	37.71	12.74

Note. CVLT-C = California Verbal Learning Test - Children's Version, SDMT = Symbol Digit Modality Test, DAP = Draw-a-Person Test.

Table 3

Neuropsychological Test Data for Both Genders by Age

	Age Groups													
	6 (*n* = 31)		7 (*n* = 28)		8 (*n* = 32)		9 (*n* = 42)		10 (*n* = 30)		11 (*n* = 31)		12 (*n* = 30)	
Indices	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
CVLT-C														
Recognition Score	12.55	2.79	14.00	1.66	14.34	1.21	14.15	1.24	14.07	1.23	13.90	2.10	14.53	0.82
Rey Complex Figure Test														
Raw Score	21.98	5.78	21.80	6.42	23.36	6.36	25.65	3.11	27.43	4.41	28.44	3.63	28.58	2.95
Animal Naming	11.94	3.76	13.04	4.21	12.50	2.95	14.60	3.68	15.77	4.01	16.65	4.32	17.57	4.54
Food Naming	10.16	3.72	10.00	3.67	10.63	3.55	11.71	3.84	13.10	3.56	13.74	4.12	15.97	4.77
Color Trails														
Test 1	71.68	37.15	46.07	23.00	40.13	14.51	36.07	9.93	30.63	9.37	29.45	14.36	25.77	9.99
Test 2	128.61	60.20	81.68	27.05	72.47	16.52	62.64	16.86	52.53	9.70	55.45	17.85	44.73	12.07
Digit Span (WISC-III)														
Forward	11.29	2.16	11.61	2.15	11.91	2.41	12.90	1.88	12.93	1.93	13.42	1.96	13.60	2.16
Backward	4.13	1.61	4.46	1.57	4.75	2.14	5.60	1.96	6.17	2.57	6.45	2.75	6.77	3.01
Total Score	15.42	2.81	16.07	2.93	16.69	3.91	18.50	2.94	18.77	2.82	19.87	3.91	20.37	4.46
Symbol Digit Modality Test														
Verbal	23.00	6.85	31.61	7.90	34.97	7.55	40.21	10.52	44.87	11.19	48.42	9.35	54.07	12.71

Note: CVLT-C = California Verbal Learning Test - Children's Version