ORIGINAL ARTICLE

VALIDATION OF THE MALAY VERSION OF AUDITORY VERBAL LEARNING TEST (MVAVLT) AMONG SCHIZOPHRENIA PATIENTS IN HOSPITAL UNIVERSITI SAINS MALAYSIA (HUSM), MALAYSIA

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ABSTRACT

Objective: **Many studies have emphasized the significance of verbal memory for the functional outcome in schizophrenia. A preserved capability to encode and recall verbal information is essential for the long-term efficacy of psychoeducational programs and other psychological intervention to ensure the successful transfer of newly acquired skills or knowledge into everyday life. Aims of this study aimed to validate the MVALT among schizophrenia patients in HUSM.** ***Methods:*** **The subjects were 15 schizophrenia patients conveniently selected from the patients that attended follow up at the psychiatry clinic in HUSM or inpatients who have been admitted during the study period and 15 healthy control subjects as a comparison. Reliability and validity of the MVAVLT were analyzed.** ***Results:*** **The validation study showed that the Malay version Auditory Verbal Learning Test (MVAVLT) had a good validity (factor analysis 0.66 to 0.98) and test-retest reliability (pearson correlation ranged from 0.24 to 0.84) and has been shown to be sensitive in discriminating between normal and schizophrenia patients. In line with the previous research, the schizophrenia patients performed significantly worse than healthy control in all indexes measured in MVAVLT.** ***Conclusion:*** **The screening of deficits in verbal learning and memory among the schizophrenia patients is important, for early detection and treatment since it can be helpful for clinicians and psychologists in their counseling sessions. Subsequently, it helps patients to reduce such cognitive difficulties and their impact by using specific rehabilitation with the usage of newer antipsychotic agents.** ***ASEAN Journal of Psychiatry, Vol.10, No.1, Jan – June 2009: 54-74.***

Keywords: **Auditory Verbal Learning Test, Schizophrenia, validation**

Introduction

There is no local version that has been validated for local use at the moment. It is important to have a reliable and valid study instrument before conducting a study. In order to reduce cultural bias, the World Health Organization / University of California, Los Angeles (WHO / UCLA) version of the Auditory Verbal Learning Test [1] was developed and validated in English and had been widely used in English speaking countries in which they are socio-culturally different from us. All test items were selected from five categories (body parts, animals, tools, household objects and transportation vehicles) and presumably have universal familiarity. There are 15 items, three examples from each category. The administration format is the same as that described for the standard version. When both forms were given to individuals in Germany, correlations were in the moderate range (0.45 – 0.55). In addition, comparison among normal subjects in Thailand, Zaire, Germany and Italy suggested that the WHO / UCLA AVLT is freer of cultural influences than the traditional RAVLT. For those reasons, we preferred to validate the WHO / UCLA AVLT version for the use of our population.

The Rey Auditory Verbal Learning Test (RAVLT) [2] which was developed in the West may not be suitable for the local population because of language barrier and cultural difference. The lack of suitable instruments for detection of memory dysfunction is one of the reasons of under recognition. Therefore, there is a need for validation of this test and to look at how acceptable the test is to our Malaysia population especially among schizophrenia patient whom mostly have a very low academic achievement and have difficulty in understanding English words.

On top of that, our understanding about the importance of verbal and learning memory and its contribution to the functional outcome of schizophrenic patients is quite limited. Furthermore, despite a lot of advantages of this RAVLT [2], this test is rarely used in our clinical practice due to insufficient knowledge about it. This study gives a very clear idea for us to conduct further research in future.

This study aimed to determine the validity and examine the reliability of the Malay version of Auditory Verbal Learning Test (MVAVLT) for Malaysian population use and to determine the level of performance of the test among schizophrenia patients in HUSM.

Methods

Study sample

The subjects were 15 schizophrenia patients conveniently selected from the patients that attended follow-up at the psychiatry clinic in HUSM or inpatients who have been admitted in the ward during the study period (December 2007 till May 2008) and 15 healthy control subjects as a comparison. The schizophrenia patients should fulfill the diagnostic criteria based on DSM-IV and aged 18 to 60 years old. They should be cooperative and able to understand the Malay language. The patients were excluded from the study if they could not give a valid test performance or were untestable because of acute psychotic state or severe medical comorbidity,

those who score 5 (moderately severe) or more in the BPRS item, those with evidence of an organic central nervous system disorder (e.g. epilepsy, cerebrovascular accident, meningoencephalitis, brain tumour or traumatic brain injury); and those clinically mentally retarded.

The study protocol was approved by the Research & Ethics Committee, Universiti Sains Malaysia. A single researcher trained in psychiatric interview and examination, administered the test and interviewed all the subjects individually.

Construction of the MVAVLT

The RAVLT was translated into the Malay language using the translation and back translation method. The translation process was carried out by a senior lecturer and psychiatrist from Cyberjaya University College of Medical Sciences, Dr. Muhammad Najib Muhammad Alwi (MNMA) (2005, personal communication).

Among several variance of RAVLT, the WHO / UCLA version of the AVLT was chosen in this study because it is freer of cultural influences than the traditional RAVLT. A few words were omitted and replaced by new words which were more appropriate in the constructed Malay list. These changes were made because some of the words were deemed inappropriate following direct translation into the Malay language. . Retaining these words would provide "verbal clues" for subjects to remember them better. This may affect the validity of the test. The arrangement of the words were changed in order to avoid monotony and also to make sure the test was not dominated by words that begin with "k", such as happened in the direct translation of the items. However, all test items used or selected still adhered to the five categories recommended by the WHO / UCLA version of the RAVLT (body parts, animals, tools, household objects, and transportation vehicles) and presumably have universal familiarity. All the changes were based on patients' response and feedback following a simple pilot study using a direct translation of the original WHO / UCLA RAVLT.

The first stage of the construction of the MVAVLT translation was a forward translation into the Malay language. This consists of a single translation which included the new words conducted by N.A. in consultation with a linguist, who was blind to the study. It was then back translated into English by another linguist and medical personnel who worked on the translation independently. Translators reported any difficulties encountered. A group of experts then compared the back translation and forward translation and amendments were made according to the differences from the forward translation and back translation versions. From this, a consensus pre-final Malay version was produced.

Content validity

Content validity was measured by giving the questionnaire to three medical personnel who have experience in using the RAVLT which include two senior lecturers and psychiatrists from the Psychiatry Department and a psychologist and lecturer from Neuroscience Department of Universiti

Sains Malaysia. Both of them agreed with the content of the test.

Face validity

Face validity was measured by giving the test to six subjects who include healthy control subjects and schizophrenia patients who received treatment in Hospital Universiti Sains Malaysia. The hospital staffs served as healthy control subjects and screened for previous psychiatric and neurological disturbances. The test was reassessed and conclusion was made that the test appears to measure what it is supposed to measure and it seem like a reasonable way to gain the information the researches are attempting to obtain.

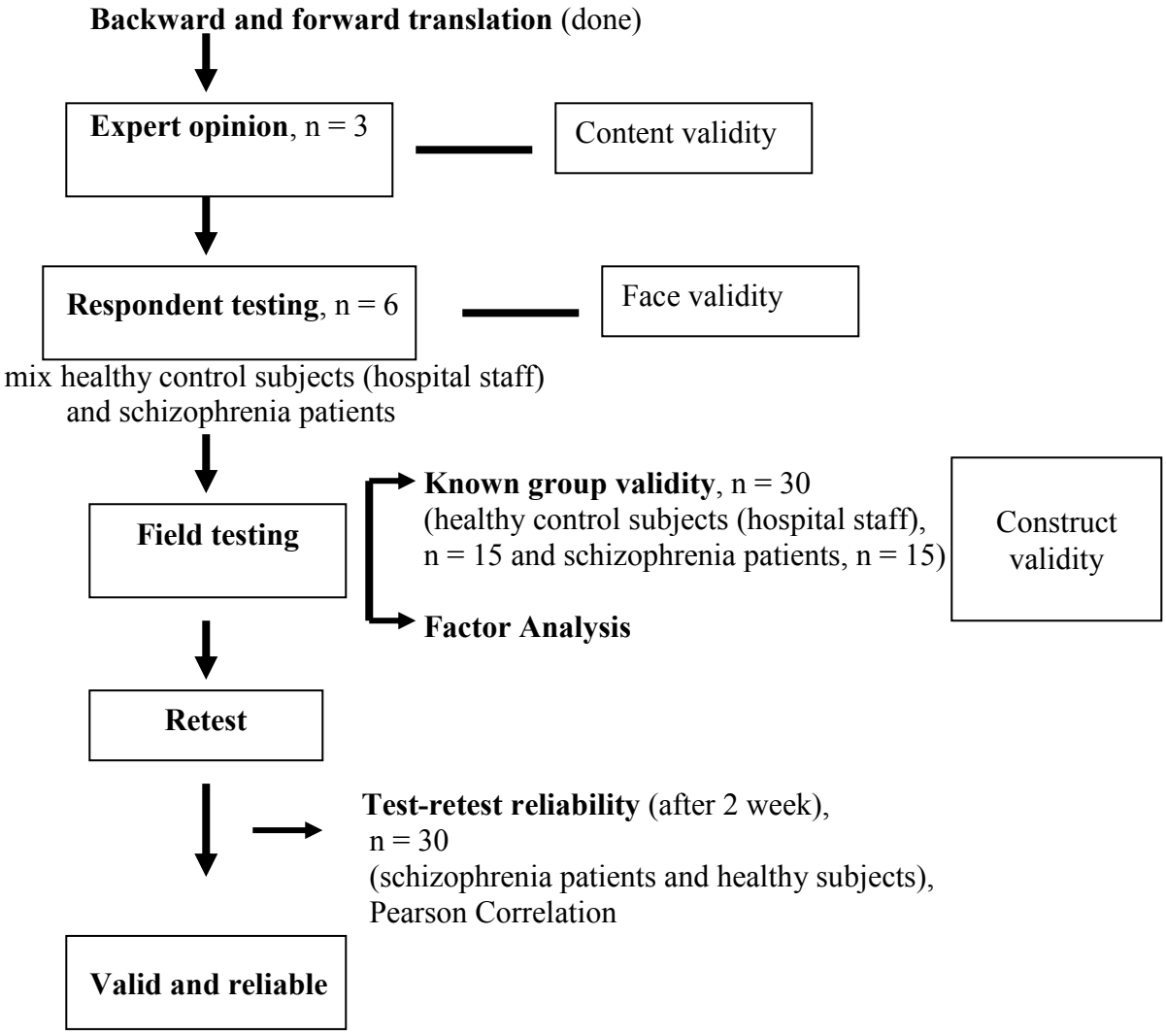
Construct validity

Construct validity was measured by using factor analysis and known group validity. Data were subjected to principal component factor analysis with varimax rotation using a single factor, as suggested by the previous factor analytic studies. Known group validity was analyzed using independent t-test to assess the ability of the test to discriminate between normal and schizophrenia patients.

Test-retest reliability

Test-retest reliability was conducted on 30 subjects including 15 schizophrenia patients conveniently selected from the patients that attended follow up in psychiatry clinic in Hospital Universiti Sains Malaysia or inpatient who have been admitted in the ward during the study period and 15 healthy control subjects. The reason why the healthy control subjects were involved in this phase was because the researcher wanted to get some idea regarding the level of performance of the test in the normal participants and to know whether the test was able to discriminate both of the groups involved. The test was administered by the same interviewer who was trained by the expert and was re-administered again after two weeks interval. The test-retest reliability was determined by using pearson correlation and factor analysis.

Flow chart of pilot study on validation of Malay Version Auditory Verbal Learning Test (MVAVLT).



Data Analysis

The results were analyzed using SPSS version 12.0.1. The scores in the MVAVLT was taken as dependent variables. The sociodemographic variables (such as age, gender, ethnicity, marital status, educational and occupational level) and patients clinical variables (such as number of hospitalization, duration of illness, types of antipsychotics, comorbid medical illness, substance use, concurrent medications, medication compliance, BPRS and Malay version CDRS score) were taken as independent variables. Statistical analysis started with descriptive statistics which included frequency, percentage, mean, standard deviation and range accordingly for sociodemographic characteristics, clinical presentation and MVAVLT scores for each domain level. Factor analysis was determined and test-retest reliability was evaluated using pearson correlation.

Results

Subject characteristics

Table 1 : Sociodemographic and clinical characteristics of pilot study of MVAVLT.

Demographic and clinical variables (N = 30)	Characteristics	n (%)	Mean (SD)
Age (years)			38.2 (9.52)
	<30	6 (20.0)	
	30 – 40	9 (30.0)	
	41 – 60	15 (50.0)	
Gender			
	Male	14 (46.7)	
	Female	16 (53.3)	
Race			
	Malay	30 (100.0)	
	Chinese	0	
	Others	0	
Marital status			
	Single	10 (33.3)	
	Married	19 (63.3)	
	Divorced	1 (3.3)	
Occupation			
	Unemployed	12 (40.0)	
	Self employed	2 (6.7)	
	Government servant	16 (53.3)	
	Private sector	0	
Education level			
	Primary school	1 (3.3)	
	Secondary school	20 (66.7)	
	College / university	9 (30.0)	
Concurrent medical illness			
	With medical illness	4 (13.3)	
	Without medical illness	26 (86.7)	
History of substance abuse			
	Yes	4 (13.3)	
	No	26 (86.7)	
Concurrent medication			
	Yes	4 (13.3)	
	No	26 (86.7)	

Demographic and clinical variables (N = 15)	Characteristics	n (%)	Mean (SD)
a)Psychiatric status and history			
Illness duration (years)			6.7 (5.00)
	< 2	3 (20.0)	
	2 – < 5	5 (33.3)	
	5 - < 10	1 (6.7)	
	≥ 10	6 (40.0)	
Types of antipsychotic			
	Typical	8 (26.6)	
	Atypical	6 (20.0)	
	Clozapine	0	
	Both	1 (3.3)	
Number of hospitalization			
	< 2	2 (6.7)	
	2 - < 6	8 (26.7)	
	≥ 6	5 (16.7)	
Use of anticholinergic medication			
	Yes	7 (46.7)	
	No	8 (53.3)	
Followup			
	Regular	5 (16.7)	
	Defaulter	10 (33.3)	
Drug compliance			
	Yes	5 (16.7)	
	No	10 (33.3)	
b)Clinical presentation			
BPRS score			29.7 (4.75)
	< 30	9 (60.0)	
	≥ 30 – 50	6 (40.0)	
CDRS score			1.9 (2.63)
	0 – 6 (no depression)	14 (93.3)	
	≥ 7 (depression)	1 (6.7)	

Content validity

The Malay version AVLT was concluded to have good content validity as reported by 3 medical personnel who include two senior lecturers and psychiatrists from the Psychiatry Department and a psychologist and lecturer from Neuroscience Department of Universiti Sains Malaysia, who have experience in using this test. All of them agreed that the content of the test covers all relevant aspects about auditory verbal learning memory in schizophrenia patients.

Face validity

The Malay version AVLT was also concluded as having good face validity and appropriate in assessing the intended purpose. All the six respondents had no difficulty to understand the word lists and could answer the test administered to them.

Construct validity

a) Factor analysis

A large number of factor analytic studies provide evidence of concurrent and criterion validity for the RAVLT. Ideally, the standard measurement tools use as comparison include three Wechsler Adult Intelligence Scale, Revised (WAIS-R) Verbal subtests (Information, Vocabulary, and Similarities), three WAIS-R Performance subtests (Picture Arrangement, Block Design, and Digit Symbol), subtests of the Wechsler Memory Scale (WMS), and three RAVLT scores (Ryan et al., 1984). The three measures from the RAVLT included Trial I-V Total, Trial VI, and recognition memory. Data were obtained from this study, and were subjected to principal component factor analysis with varimax rotation using a single factor, as suggested by the previous factor analytic studies. All MVAVLT indexes in this study loaded on the first factor with loadings of 0.66 to 0.98. The results of single factor, factor analysis of MVAVLT for 7 indexes are shown in table 2.

Table 2 : Factor Analysis of Malay Version Auditory Verbal Learning Test (MVAVLT).

MVAVLT trials	Factor Loading
A1	**0.834**
A5	**0.944**
Total A1 – A5	**0.975**
B1	0.664
A6	**0.913**
A7	**0.941**
Recognition	**0.818**

Extraction Method: Principal Component Analysis.
a 1 components extracted.
% of variance 76.678

(b) Known group validity

In addition to this factor analysis, the MAVLT has been shown to be sensitive to discriminate well between normal and schizophrenia patients using independent t-test. The results of the analysis are shown in table 3.

Table 3 : Malay Version Auditory Verbal Learning Test (MVAVLT) scores in normal healthy staffs and schizophrenia patients.

MVAVLT trials	Normal healthy staffs (n = 15) Mean (SD)	Schizophrenia patients (n = 15) Mean (SD)	Mean differences (95% CI)	P value
A1	8.5 (2.20)	5.9 (2.09)	2.5 (0.93, 4.14)	**0.003**
A5	12.2 (1.78)	8.2 (3.05)	4.0 (2.13, 5.87)	**< 0.001**
Total A1-A5	53.2 (7.72)	34.5 (12.09)	18.7 (11.08, 26.26)	**< 0.001**
B1	5.0 (1.60)	3.3 (1.53)	1.7 (0.56, 2.91)	**0.005**
A6	11.0 (2.51)	7.1 (3.20)	3.9 (1.79, 6.08)	**0.001**
A7 (delayed recall)	11.1 (2.49)	6.7 (2.74)	4.4 (2.44, 6.36)	**< 0.001**
Recognition	14.3 (0.88)	11.5 (2.92)	2.7 (1.12, 4.35)	**0.002**

** Independent samples test is significant at the 0.05 level (2-tailed).

This study found that each of these MVAVLT scores discriminated between these two groups better. As shown in table 4.3, the mean score of MVAVLT among normal healthy staff were 8.5 words and 12.2 words respectively for Trial A1 and A5. These results were consistent with the previous normative data where most young adults (ages 20-39) recall six or seven words on Trial A1 and achieve 12 or 13 words by the fifth trial (Trial A5). The change in number of words recalled from Trial A1 to A5 show the capability of learning among this group of individuals. The mean score of MVAVLT among schizophrenia patients were much lower. The minimal words recalled shows that schizophrenia patients have little or no learning ability.

As for Trial A6, the mean score of MVAVLT among normal healthy staff was 11.0 words with a different of 1.2 words from Trial A5 whereas the scores were significantly lower among the schizophrenia patients. This finding was consistent with the previous normative data, where in general, approximately 1.5 words are lost from Trial A5 to Trial

A6 following the interference trial list (Trial B1).

There were little loss of words occurs between Trial A6 and A7 among normal healthy staff and this was consistent with the previous normative data. As for recognition trial, usually no more than one error shows up and this was similar with our finding which the mean score for normal healthy staff was 14.3 words as compared to schizophrenia patients. This may elicit evidence that the schizophrenia patients cannot keep track of what they have learned or make order out of it. Further, recognition scores below 13 are relatively rare among intact persons under age 59 [2], and scores under 12 are infrequent among 55 to 69 year olds [3].

Test-retest reliability

The test-retest reliability of the MVAVLT was measured at two weeks interval by using pearson correlation. Test-retest correlations ranged from 0.24 to 0.84. Data from this study suggest good reliability for Trials A5, A1-A5 Total, B1, A6 and A7 (delayed recall), with correlations ranging from 0.69 to 0.84. Test-retest reliability was lower for Trials A1 and recognition. A correlation for these trials was 0.23 and 0.24 respectively. The results of test-retest reliability of MVAVLT are shown in table 4.

Table 4 : Test-retest reliability (Pearson correlation) of Malay Version Auditory Verbal Learning Test (MVAVLT).

MVAVLT trials	Pearson Correlation	P value
	Repeat trials (2 weeks interval) (N = 30)	
A1	0.234	0.214
A5	0.716	**< 0.001**
Total A1-A5	0.725	**< 0.001**
B1		
A6	0.686	**< 0.001**
A7 (delayed recall)	0.777	**< 0.001**
Recognition	0.841	**< 0.001**
	0.240	0.201

Correlation is significant at the 0.01 level (2-tailed).

Discussion

Although a range of cognitive and information-processing deficits have been consistently observed in schizophrenia, a meta-analysis of neuropsychological studies found that the largest effect sizes for cognitive dysfunction in schizophrenia are for verbal learning and memory [4]. Interest in verbal memory dysfunction has increased in recent years. In addition, verbal memory deficits have been linked to difficulties with self-generated organizational strategies in which patients fail to use semantic information to facilitate verbal encoding and retrieval [5].

In the era of giving the best standard of care in schizophrenia patients particularly the cognitive intervention, the problem of valid instrument to be used in different cultures is still an issue. The WHO / UCLA AVLT group has put a lot of effort to produce an instrument to assess Auditory Verbal Learning Test (AVLT) cross culturally. However, different culture values and languages become the barrier of using the same instrument. Therefore, it is vital to have a validated translated test into languages that can be understood by most of the people in each country and the validation process must follow a standard procedure. The MVAVLT is shown to have good face validity and content validity. The MVAVLT indexes is loaded strongly on the first factor (0.66 - 0.98) as measured by using principle component with varimax rotation and number of factor set at one.

Factor analytic studies indicate that the RAVLT loads primarily with other verbal memory tests (for example, those found on the Wechsler Memory Scale) [6]. The RAVLT, however may measure a construct that is not singularly verbal in nature. Factor analyses of variable sets that include the RAVLT indicate that memory variables load together regardless of whether they are verbal or nonverbal measures [7]. Further, the learning measures of the AVLT (V, VI, recognition) correlate significantly (mostly in the 0.50 to 0.65 range) with other learning measures [8].

A large number of factor analytic studies provide evidence of concurrent and criterion validity for the RAVLT. Smith et al., 1992 performed a factor analysis of general intelligence and memory measures of a non clinical elderly sample (N = 338) [7]. From the Wechsler Adult Intelligence Scale, Revised (WAIS-R), they selected the Information, Vocabulary, Arithmetic, Block Design and Object Assembly subtests. Mental Control and several memory scores (Figural Memory, Digit Span, Visual Span and immediate and 30 minute delayed scores for Paired Associates, Logical Memory, Visual Association and Visual Reproduction) were taken from the Wechsler Memory Scale, Revised (WMS-R); Trial I-V Total and delayed recall were taken from the RAVLT; and similar scores were taken from the Visual Spatial Learning Test (VSLT). They found that the RAVLT measures had very strong loadings (0.77 for Trial I-V Total and 0.84 for delayed recall) on the memory factor. Figural Memory did not have a strong primary loading on any factor, but the other WMS-R memory scores had loadings of 0.57 to 0.80 on this general memory factor.

A factor analysis of scores made by 146 normal volunteers for Trials I,V,B,VI,VII, recognition and a temporal order measure produced three basic factors : retrieval, storage and acquisition (short-term memory) [9]. The first factor included performance on temporal order and trials VII, B and V; the second factor included only the recognition score; and trials I and B entered into the third factor.

In this study, the test-retest reliability of the MVAVLT was measured at two weeks interval by using Pearson correlation. Test-retest correlations ranged from 0.24 to 0.84. Data from this study suggest good reliability for Trials A5, A1-A5 Total, B1, A6 and A7 (delayed recall), with correlations ranging from 0.69 to 0.84. Test-retest reliability was lower for Trials A1 and recognition. A correlation for these trials was 0.23 and 0.24 respectively.

Several studies provide test-retest data for the individual trial scores of the RAVLT. Geffen et al., 1994 [10] have presented test-retest data in a study aimed at demonstrating the equivalence of a parallel form they developed. Subjects were volunteers from non clinical settings. The test-retest interval ranged from 6 to 14 days. Half of the subjects received the original form of the test first, and the other half received the new parallel form first. Test-retest correlations ranged from 0.12 to 0.85 which was not much difference from our study. Data from this study suggest good reliability for Trials IV,V, VI, delayed recall and recognition for List A words, with correlations ranging from 0.20 to 0.85 (median r = 0.60). Test-retest reliability was lower for Trials I, II, III and B. Correlations for these trials ranged from 0.12 to 0.53 (median r = 0.44). The Geffen et al., 1994 data suggest that scores for later learning trials are more stable than those for earlier trials and our study also support the finding [10]. Low recognition memory reliability in our study as compared to the other trials scores is probably related to the relatively low variability which resulted in restricted range of the score.

The RAVLT has high test-retest reliability. Using alternate forms with a retest interval of one month, correlations ranged from 0.61 to 0.86 for trials I-V and from 0.51 to 0.72 for delayed recall and recognition [11]. Test-retest reliability correlation coefficients after one year ranged from 0.38 (for trial B) to 0.70 (for trial V) [12].

The MVAVLT also was able to discriminate between healthy control participants and schizophrenia patients. Schizophrenia patients performed significantly worse than healthy controls in all indexes measured in MVAVLT. The pattern of the impaired performance in the MVAVLT is suggestive of a primary memory dysfunction because if the memory impairment is due to the secondary consequence of deficits in word generation (verbal fluency), deficits in free recall but not recognition would have been expected.

In line with previous research, the schizophrenia patients performed significantly worse than healthy control in all indexes measured in MVAVLT. A study by Mungas (1983) found diminished RAVLT performance in schizophrenia [13]. A recent meta-analysis of memory studies in schizophrenia found moderate effects on

recognition performance and large effects on recall performance [14]. Further exploration of recognition memory has suggested that patients with schizophrenia might rely more on familiarity rather than recollection of the event.

In general, the relative severity of memory deficits in schizophrenia depends on the specific conditions under which information is learned and the way in which retrieval is tested. For instance, during encoding, it seems that patients typically do not use semantic encoding strategies to facilitate encoding and retrieval [15]. This might reflect an underlying failure in the self generation of organizational strategies [5,16].

Our finding was consistent with a previous study done by Hill et al., 2004 [17]. They found that schizophrenia participants performed significantly worse than healthy individuals on measures of verbal learning, short and long term memory, and immediate attention. They also found that the deficits in recall were related to reduce use of organizational strategies to facilitate verbal encoding and retrieval. From their study, they concluded that deficits in consistency of learning over several trials, as well as a strong relationship between semantic organizational strategies and reduced learning capacity, implicate prefrontal dysfunction as a contributor to verbal memory deficits in schizophrenia.

There were a few limitations in this study. First, the sample size was small and the samples were conveniently selected from outpatient and inpatient schizophrenia patients from psychiatric unit at a selected hospital, which was HUSM. Therefore, the generalizability is limited because schizophrenia patients that did not turn for our follow up during the study period or patients that sought treatment in Hospital Raja Perempuan Zainab II (HRPZ II) were not included in this study. The patients receiving treatment from this hospital may differ in their socio-economic status and illness chronicity from those receiving treatment from the state government hospital. Recruiting only those patients or the accompanying relative who gave consent, thus excluding patients with more serious condition. However, this cannot be overcome as this test should only be administered to individuals who are capable of cooperating with the test procedures.

The interval of test-retest from the previous studies were not standardized which ranging from 2 hours to 1 month. The duration of 1 to 2 weeks is actually being used in most of the studies internationally. Furthermore, most of the patients especially those who were treated as out patient had difficulty to come to clinic just for doing the retest as compared if they have appointment with the doctor or to get treatment. Therefore, only those who stay nearby and very cooperative were offered to do the retest. In addition to this, the practice effects when readministering the test could also significantly influence our findings.

Finally, the fact that the same interviewer rated all the patients could also introduce systematic bias. This can be minimize if the individuals administering the RAVLT be trained and qualified in the administration of the test.

It is recommended that Malay Version Auditory Verbal Learning Test (MVAVLT) be used in other study of verbal learning and memory in Malaysia as it is easy to administer and a valid instrument. However, it is better if the test could be validated in larger and more diverse samples in Malaysia with inter-rater agreement.

Conclusion

The MVAVLT is one of the neuropsychological assessment instrument which is used to measure a person's ability to encode, consolidate, store or retrieve verbal information and has been found to be a sensitive test of verbal learning and memory. It is brief, easily administered test that uses a fixed order word list and can be used any time whenever a measure of verbal learning and memory is needed, such as in routine neuropsychological evaluations or in psychological evaluations where cognitive functions are screened for impairment. This study shows that MVAVLT is a valid instrument that can be used in our population. It is also freer of cultural influences than the traditional RAVLT.

In line with the previous researches, the schizophrenia patients performed significantly worse than healthy control in all indexes measured by MVAVLT.

Acknowledgements

This study was conducted with Short-term Intensification of Research in Priority Areas Grant from Universiti Sains Malaysia.

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Received: 28 January 2009 Accepted: 6 February 2009

Appendix 1 : WHO / UCLA version of the Auditory Verbal Learning Test.

List A	List B	Recognition items	
Arm	Boot	Mirror	Lips
Cat	Monkey	HAMMER	Tree
Axe	Bowl	KNIFE	ARM
Bed	Cow	Candle	Nose
Plane	Finger	Motorcycle	Sun
Ear	Dress	AXE	Truck
Dog	Spider	CLOCK	EYE
Hammer	Cup	CHAIR	Fish
Chair	Bee	PLANE	EAR
Car	Foot	Turtle	BIKE
Eye	Hat	HORSE	Snake
Horse	Butterfly	Leg	Stool
Knife	Kettle	DOG	Bus
Clock	Mouse	Table	BED
Bike	Hand	CAT	CAR

Appendix 2 : Table comparing words from the original RAVLT (WHO / UCLA version) and the changes made to the MVAVLT.

WHO/UCLA version	Direct translation	N.A version
List A	**List A**	**List A**
Arm	Lengan	Kapak
Cat	Kucing	Harimau
Axe	Kapak	Siku
Bed	Katil	Katil
Plane	Kapal terbang	Telinga
Ear	Telinga	Kapal
Dog	Anjing	Anjing
Hammer	Tukul	Tukul
Chair	Kerusi	Kerusi
Car	Kereta	Ayam
Eye	Mata	Mata
Horse	Kuda	Kereta
Knife	Pisau	Pisau
Clock	Jam	Jam
Bike	Basikal	Basikal

WHO/UCLA version	Direct translation	N.A version
List B	**List B**	**List B**
Boot	Kasut Boot	Mangkuk
Monkey	Monyet	Monyet
Bowl	Mangkuk	Kasut
Cow	Lembu	Lembu
Finger	Jari	Jari
Dress	Baju	Baju
Spider	Labah-labah	Semut
Cup	Cawan	Cawan
Bee	Lebah	Tebuan
Foot	Kaki	Itik
Hat	Topi	Topi
Butterfly	Rama-rama	Kaki
Kettle	Cerek	Cerek
Mouse	Tikus	Tikus
Hand	Tangan	Tangan

WHO/UCLA version	Direct translation	N.A version
Recognition	**Recognition**	**Recognition**
Mirror	Cermin	Cermin
HAMMER	Tukul	Tukul
KNIFE	Pisau	Pisau
Candle	Lilin	Lilin
Motorcycle	Motosikal	Beca
AXE	Kapak	Kapak
CLOCK	Jam	Jam
CHAIR	Kerusi	Bulan
PLANE	Kapal terbang	Kapal
Turtle	Penyu	Penyu
HORSE	Kuda	Ayam
Leg	Kaki	Kaki
DOG	Anjing	Anjing
Table	Meja	Meja
CAT	Kucing	Harimau
Lips	Bibir	Bibir

Truck	kereta trak	Lori
EYE	Mata	Mata
Fish	Ikan	Telinga
EAR	Telinga	Basikal
BIKE	Basikal	Ular
Snake	Ular	Bangku
Stool	Bangku	Bas
Bus	Bas	Katil
BED	Katil	Kereta
CAR	Kereta	Tangan

Appendix 3 : Malay Version of Auditory Verbal Learning test (MVAVLT)

Malay Version of WHO Auditory Verbal Learning Test ©

Helaian Markah

Nama: _____

Tarikh: _____

Pemeriksa: _____

Cubaan Mengingat						*Cubaan Mengingat*				
Senarai A	A1	A2	A3	A4	A5	Senarai B	B1	A6	A7	Senarai A
Kapak						mangkuk				Kapak
Harimau						Monyet				Harimau
Siku						Kasut				Siku
Katil						Lembu				Katil
Telinga						Jari				Telinga
Kapal						Baju				Kapal
Anjing						Semut				Anjing
Tukul						Cawan				Tukul
Kerusi						Tebuan				Kerusi
Ayam						Itik				Ayam
Mata						Topi				Mata
Kereta						Kaki				Kereta
Pisau						Cerek				Pisau

Jam Basikal						Tikus Tangan				Jam Basikal
Jumlah										
Tambahan										

Senarai Mengenali

	Ya	Tdk		Ya	Tdk
Cermin			Bibir		
TUKUL			Pokok		
PISAU			SIKU		
Lilin			Hidung		
Beca			KERUSI		
KAPAK			Lori		
JAM			MATA		
Bulan			Ikan		
KAPAL			TELINGA		
Penyu			BASIKAL		
AYAM			Ular		
Kaki			Bangku		
ANJING			Bas		
Meja			KATIL		
HARIMAU			KERETA		

Jumlah	**Tepat Senarai (Hit)**	**Tepat Bukan (CR)**	**Tidak Kenal (Mis)**	**Tiada Dikenal (FP)**

Hit = Tepat seperti dalam senarai

CR = Tepat dikenali sebagai bukan dalam senarai

Mis = Tidak dikenali walaupun dalam senarai
FP = Dikenali walaupun tiada dalam senarai (false positive)
Arahan:

1) Untuk cubaan A1:

"Saya akan membacakan senarai beberapa perkataan. Sila dengar baik-baik kerana sebaik sahaja saya tamat membacakannya, anda dikehendaki menyebut kembali sebanyak mungkin perkataan yang boleh anda ingati. Anda tidak perlu menyebut perkataan-perkataan itu mengikut turutan. Cuma cuba mengingati sebanyak yang mungkin. Jika anda sudah bersedia, saya akan mulakan sekarang..."

Setiap perkataan hendaklah disebut dengan selang kira-kira satu saat di antara satu sama lain.

2) Untuk cubaan A2 – A5:

"Sekarang saya akan membaca semula perkataan –perkataan tadi. Sekali lagi, sebaik sahaja saya tamat, anda dikehendaki menyebut semula perkataan-perkataan itu sebanyak yang mungkin. Tidak mustahak perkataan mana yang disebut dahulu. Baik, saya akan mulakan sekarang..."

3) Selepas cubaan A5, pemeriksa akan membacakan senarai B:

"Sekarang, saya akan membacakan satu lagi senarai beberapa perkataan. Sila dengar baik-baik kerana sebaik sahaja saya tamat membacakannya, anda juga dikehendaki menyebut kembali sebanyak mungkin perkataan yang boleh anda ingati. Anda tidak perlu menyebut perkataan-perkataan itu mengikut turutan. Cuma cuba mengingati sebanyak yang mungkin. Jika anda sudah bersedia, saya akan mulakan sekarang..."

4) Sebaik sahaja tamat cubaan di atas, pemeriksa akan menyuruh pesakit mengulangi semula sebanyak yang mungkin, perkataan-perkataan daripada senarai pertama (Senarai A) tanpa mengulangi kepada pesakit perkataan-perkataan itu (seperti A1 – A5):

"Sekarang sebutkan kepada saya semua perkataan yang anda ingati daripada senarai pertama tadi"

5) Selepas 20 minit yang dipenuhi dengan aktiviti lain, minta pesakit sekali lagi mengulangi semua perkataan daripada Senarai A:

"Sebentar tadi, saya sudah membacakan perkataan daripada suatu senarai beberapa kali dan meminta anda mengulanginya beberapa kali. Sekarang beritahu saya perkataan-perkataan itu."

6) Akhir sekali lakukan ujian Senarai Mengenali dengan membacakan perkataan-perkataan tersebut dan minta pesakit menyatakan "ya" atau "tidak" sama ada perkataan itu terdapat dalam Senarai A.

Keseluruhan Ujian ini sepatutnya mengambil masa kira-kira ½ jam (termasuk selang 20 minit).

Ref: Satz, Chervinsky and D'Elia (1990)