PAPER NAME

2024 03 06 Artikel RAVLT di jurnal Acta Neuropsychologica.docx

WORD COUNT

8043 Words

CHARACTER COUNT

43251 Characters

PAGE COUNT

20 Pages

FILE SIZE

1.5MB

SUBMISSION DATE

Mar 19, 2024 10:55 AM GMT+7

REPORT DATE

Mar 19, 2024 10:56 AM GMT+7

10% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

- 9% Internet database
- 5% Publications database
- Crossref database
- Crossref Posted Content database
- 3% Submitted Works database

Excluded from Similarity Report

- Bibliographic material
- Quoted material
- Cited material
- Small Matches (Less then 10 words)
- Manually excluded sources
- Manually excluded text blocks

RESEARCH ARTICLE

ACTA Vol. 22, No. 1, 2024, 15-34
NEUROPSYCHOLOGICA

Received: 11.09.2023
Accepted: 10.02.2024

A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection

ADAPTATION OF REY AUDITORY VERBAL LEARNING TEST FOR INDONESIA: ITS VALIDITY AND RELIABILITY

Margaretha Sih Setija Utami[1] [A,C,D,E,G]
Augustina Sulastri[1][A,B,D,E,F,G]
Justinus Budi Santoso[2][C,D]
Angela Oktaviani Suryani[2][C,D]
Haryo Goeritno[1][C,D]
Lucia Trisni Widhianingtanti[1][B,C,D]
Gilles van Luijtelaar[3,4][C,D,E]

[1] Faculty of Psychology, Soegijapranata Catholic University, Indonesia,
[2] Faculty of Psychology, Atma Jaya Catholic University of Indonesia, Indonesia
[3] Donders Centre of Cognition, Radboud University, Nijmegen, the Netherlands
[4] Faculty of Psychology, Maranatha Christian University, Bandung, Indonesia

SUMMARY

Background: Rey's Auditory Verbal Learning Test (RAVLT) assesses different aspects of verbal memory and learning. This test is often used in clinical, educational, and selection contexts. We adapted the Geffen et al' version for Indonesia and here we present its psychometric properties. We tested the validity via its seven recall trials (A1 to A7), based on theoretical constructs (e.g. the presence and recency effect) via analyses of variance and factor analyses and the test's reliability via e.g. correlation analyses and Cronbach's alpha.

Material/ Methods: Two groups of healthy participants with varying ages (16-80) and education (from Elementary school to postgraduate alumni) included 492 persons for the validation, and 50 for the test-retest reliability part of the study with a 6–14-day interval. We tested the validity via its seven recall trials, based on theoretical constructs, and factor analyses. The test's reliability via Cronbach's alpha test, and test-retest

Results: The recall scores increased over trials A1 to A5. The expected position effect, primacy, and recency were found for A1 to A5. Factor analysis of Rey's Auditory Verbal Learning Test revealed three memory constructs. The word "ibu (mother)" caused an anomaly in the position effect of the 15 words. Both Cronbach's Alpha and the test-retest correlations increased from low A1 to satisfying A7. Carry-over results were found in the retest.

Conclusions: The Indonesian version of Rey's Auditory Verbal Learning Test is valid based on the position effect of the recall score and the three clusters covering different aspects of memorizing the items over the seven trials. The score of reliability is only moderate for the recall score, it might be due to the test-retest procedure.

Key words: validity, reliability, primacy, recency effect, verbal auditory learning, memory

INTRODUCTION

Assessment of memory of patients with neurological symptoms can be done either with a clinical examination (Cooper & Greene, 2005;Kipps & Hodges, 2005) or with objective standardized, well validated, and reliable neuropsychological tests (Schroeder et al., 2019). Standardized tests are often used and are needed in clinical practice to corroborate clinical assessment, support diagnosis, and guide interventions (Nielsen et al., 2018). Rey's Auditory Verbal Learning Test (RAVLT) is an often-used verbal learning and memory test (Groth-Marnat, 2003; Neblina, 2012; Cromer et al., 2013; Fard et al., 2016;de Paula et al., 2012). The first version of the RAVLT was developed by Andre Rey in French (1958). Taylor (1959) developed the first English version, followed by Lezak (1976). In the following years, various versions of the RAVLT were developed, including various English versions (Hawkins et al., 2004). Apart from the English versions, other versions exist around the world, e.g., a Greek, Spanish, Japanese and a Farsi version (Messinis et al., 2007; Neblina, 2012; Cromer et al., 2013; Fard et al., 2016). Some of these versions are merely translations of the English words, and there are differences between the versions regarding the number of syllables or phonemes, frequency of use in a language, or some of the words were adapted and replaced because of frequency of usage, or difficulties in pronunciation (Alviarez-Schulze et al., 2022; de Paula et al., 2012; Vlahou et al., 2013).

The test refers to the ability to acquire new verbal information, the improvement over trials, the storage of this newly acquired information first in short-term and subsequently in long-term memory and the ability to retrieve this stored information (Kessels & Hendriks, 2016; Henke, 2010; Baddeley, 2012). The RAVLT measures learning and memory by the acquisition and retention of a list of fifteen repeatedly presented words (Word list A). This list is presented five times and the client must recall the words after each presentation. Then another list of words (Word list B) is presented followed by a sixth recall trial and after about 20 minutes a final recall is measured. Next, in the recognition phase, participants are asked to mark the 30 words of word list A and B from a list of fifty words visually presented, including also twenty new words that were not previously presented.

The RAVLT is useful to differentiate between different types of memory deficits and as such, it is a viable tool to assess memory impairments in individuals at risk (Zeidman et al., 2008; Schoenberg et al., 2006). It is considered an important instrument to assess patients with psychoneurological complaints since the test is sensitive to memory impairments due to a wide variety of neurological causes, such as traumatic brain injury (Callahan & Johnstone, 1994), different types of dementia (Tierney et al., 2010), as well as psychiatric disorders such as depression and schizophrenia, post-traumatic stress, and anxiety disorders (Badcock et al., 2011; Gooren et al., 2013).

While previous findings support the utility of the RAVLT in clinical settings, its adaptation to the Indonesian language has now become imperative. As of the writing of this article, no specific test for auditory memory has been adapted for

Indonesia. Two previous studies have used the RAVLT in Indonesia prior to this study (Maharani, 2015; Widyastuti et al., 2016). However, these studies were part of another research that did not specifically aim to adapt the RAVLT. Therefore, to date, there is no study reporting the adapted and validated RAVLT in Bahasa Indonesia. Adaptation is important since cultural differences may have an impact on the meaning or familiarity of words and may affect the way test-takers memorize and respond to the words. And this is an obvious reason for the replacement of some words. The replacement and differences in word choice may have consequences for its psychometric properties. Therefore, a detailed description of the translation of the RAVLT to Indonesian language will help future comparison of measurements using the RAVLT in Indonesian samples with similar measurements from other languages or cultures. We report here the adaptation process including the translations for the Indonesian language. This includes a clear description of the translation process. The version of RAVLT we used was adapted from Geffen's version (1994) byHendriks et al. (2016). Next, we aimed to analyze the validity and reliability of the Indonesian version of the RAVLT.

Previous studies have investigated the validity of RAVLT with several other learning and memory tests. Moderate correlations were reported between the RAVLT and other similar measures, including subtests of the WMS-R (Pliskin et al., 2021; Wiens et al., 1994; Stallings et al., 1995; Johnstone et al., 2000). Besides that, factor analysis has shown that the variables of the RAVLT have high loadings on the same factor as similar variables from other verbal memory tests, including the subtests of WMS-R (Johnstone et al., 2000) and the California Verbal Learning Test (Wiens et al.,1994; Stallings et al., 1995).

Altmann (2000) and Capitani et al. (1992) stated that when a set of items are presented for memorization, an association between an item and other items will occur due to the way the items are presented. Although the possibility to form associations between words based on their meaning is an important feature in remembering, the serial position of a word in the list is also relevant for the probability of remembering a word in a list (Capitani et al., 1992). There is abundant evidence for the tendency for subjects to recall rather better the early items (primacy effect) and the late items (recency effect) in a list of words than words from the middle of the list. The first five items tend to be easier to recall, perhaps due to a lack of or less interfering associations with previous words. The middle group of words might be the most difficult to remember, because humans tend to associate these with the words presented before and after them. The last group of words tend to be easier to recall because there is no or less association with words after them. Due to these effects, the first and last group of fifteen words should be easier to recall compared to the middle group of words and this primacy and recency effect were often replicated (Gavett & Horwitz, 2012; Martín et al., 2013; Morrison et al., 2018; Griffin et al., 2017; Lima et al., 2019). We used the presence of a primacy and recency effect as one of the ways to validate the for Indonesia adapted version of the RAVLT. The validity was also established via exploratory factor analysis (EFA) of the recall scores. EFA studies analyzing

A1 to A7 have identified three or four different clusters, an initial one comprising either 2 or 3 trials, a second one, and one or two clusters for trial 6 and 7 (post distraction and delayed recall) (Nordanskog et al., 2014; Geffen et al., 1994; de Paula et al., 2012). The reliability of the adapted RAVLT was determined by its internal consistency and by the test-retest method.

MATERIAL & METHODS

Participants

This study used two groups of participants. The first group consisted of 492 participants. Data gathered from these participants were used to test the chosen words and to establish the validity of trials A1, A2, A3, A4, A5, A6, A7 as valid learning and memory parameters and to calculate *Cronbach's Alpha Reliability coefficient.* Data gathered from the second group (N= 50) were used for the test-retest reliability. Participants in both groups were healthy adults living in urbanized areas in West, Central and East Java. Java island was chosen because it has the highest population (59%) of the total of 272 million Indonesian inhabitants (Badan-Pusat-Statistik, 2021).

All participants (the first and second group) gave their consent to get involved in the study. The second group of the participants agreed to be assessed twice. The second test was delivered in the interval of 7 to 15 days from the first test. The current research was conducted in accordance with the Declaration of Helsinki and the ethics committee of Soegijapranata University granted permission for this research project (University Ethical Clearance number: 001B/B.7.5/FP.KEP/IV/2018). Database design and transport and storage of sensitive personal information complies with Indonesian regulations as stated in ITE (Electronic Information and Transactions).

The range of years of education of the participants varied between 6 and 22 years (M = 13.99; SD = 2.80) and is grouped into five categories of education according to the natural division of the Indonesian education system, namely: (i) less than seven years (Elementary School), (ii) between 7-9 years (Junior High School), (iii) between 10-12 years (Senior High School or equivalent), (iv) between 13-16 years, undergraduate level (UG) or equivalent, and (v) above 17 years, postgraduate (PG).

Participants received financial compensation after completing a full series of neuropsychological tests. RAVLT is one of a series of neuropsychological tests given to each participant related to a larger project, namely the adaptation of a neuropsychological test battery of 10 subtests involving healthy people in Indonesia. All participants were not reported to have a history of psychiatric or neurological illness, head trauma, drug abuse, or other illness that could affect their test performance.

The entire process of data collection was carried out by research assistants. The research assistants were recruited based on specific criteria related to expertise in administering psychological tests. Before the data collection process

Table 1. Characteristics of the participants regarding level of Education, Age, and Sex

Variables	Category	Frequency (N=492)	%
Education	0-6	15	3.00
	7-9	33	6.70
	10-12	156	31 16
	13-16	267	54.30
	17-22	21	4.30
	Total	492	100.00
Age	16-19	63	12.80
	20-29	203	41.30
	30-39	73	14.80
	40-49	57	11.60
	50-59	66	13.40
	60-69	22	4.50
	70-highest	8	1.60
	Total	492	100.00
Sex	Female	295	60.00
	Male	197	40.00
	Total	492	100.00

was carried out, the research assistants received training on how to administer the entire neuropsychological test battery, and the data input process.

The RAVLT instructions were implemented in the official Indonesian language, Bahasa Indonesia. Before the test was administered, the assistant researcher explained the research procedure and informed the participants that the data would be used for scientific purposes.

A separate group of subjects were included in the data collection for the test-retest part of the study. Only the RAVLT test was administered. One week to 15 days later, the procedure repeated with the same version of the RAVLT.

Measurements

The RAVLT used in this study originated from (Geffen et al., 1994). There were two-word lists, A and B, each containing fifteen words. The tester read aloud the fifteen words from list A, see Table 2, at a rate of word per second. The participants were asked to recall as many words as possible, not necessarily in the same order. This was repeated five times (trial 1 to 5 with scores referred to A1 to A5) with the same words, in the same sequence and the same speed. Next, the tester read aloud the words from list B, see Table 3, the recall score of the participant refers to B1. The next stage, the participant was asked to reiterate the words from list A, (A6). After being given a pause of twenty minutes, filled with other tests, the participant was asked to recall once more the words from list A, which was then referred to as A7. Finally, the participant is then asked to read a list of fifty words (containing all words from list A and B, plus another twenty new words) and is asked to indicate whether the words were earlier presented, the number of correctly identified items is the recognition score.

Table 2. The Fifteen Words of the wordlists A and B

Word list A	A1	A2	A3	A4	A5	Word list B	B1	A6	A7
Pipa						Kursi			
Tembok						Satpam			
Jam						Kandang			
Gula						Sandal			
Murid						Kulkas			
Ibu						Gunung			
Bintang						Botol			
Foto						Sabun			
Tas						Awan			
Padi						Kapal			
Mulut						Domba			
Ayam						Bom			
Suara						Kertas			
Atap						Aula			
Danau						Udang			

Table 3. Recognition Sheet

Jam	Mata	Sabun	Kapal	Botol
Tante	Udang	Tembok	Kentang	Bangku
Tas	Bintang	Waktu	Ibu	Sandal
Sungai	Jas	Suara	Bebek	Bunyi
Satpam	Udara	Kursi	Padi	Kulkas
Mulut	Kandang	Bom	Kitab	Batu
Pistol	Gunung	Malam	Awan	Beras
Murid	Gula	Aula	Atap	Pipa
Gembok	Bangau	Ayam	Tugas	Bola
Kertas	Danau	Lomba	Foto	Domba

Statistical Analyses

The evaluation of the validity of the RAVLT was started by the analyses of the probability of the recall of each of the words. More specifically, we examined whether the probability of correct retrieved words was in agreement with what could be expected based on the theory regarding the presence of a primacy and recency effect. In order to do so, the probability of occurring of the first five words, the second five words (6^{th} to 10^{th}) and last five words were compared. We expected that a curve representing this would take the shape of the letter “U” curve, that is the five words at the beginning and the five words at the end of a list would have a larger probability to be remembered than words in the middle part (Rezvanfard et al., 2011). We tested this with repeated measures one-way ANOVA followed by post-hoc tests.

Subsequently, we implemented an Exploratory Factor Analysis (EFA) to identify the structure of dimensions of the seven recall trials. The structure of a psychological construct known as a system involves dimension(s), factor(s), or latent variable(s) from a set of inter-correlated data (Watkins, 2018) to help researchers to formulate the constructs that underlie the observed scores. Geffen et al. (1994) classified the first three trials (A1-A3) as “acquisition trials,” whereas the second group, namely trials four (A4) and five (A5), specifically as “later acquisition trials,” while trial six (A6) as “post distractor trial,” and trial seven (A7) as “delayed trial.”

In the last step, we test the instrument's reliability by implementing the internal consistency method, namely Cronbach's Alpha and by the test-retest reliability. Internal consistency would provide evidence of whether there are consistent responses across trials since repetition was involved in the learning process. Test-retest reliability delivered an indicator of the stability of a test over time. The basic assumption of test-retest reliability is that the constructs measured by a test do not change over time. The interval between testing should be enough to prevent the memory of the first testing from affecting the test takers' scores in the second testing (Bolarinwa, 2015).

RESULTS

The translation and adaptation for Indonesians

We translated and adapted the words in the RAVLT written by (Geffen et al., 1994) (see Table 4) based on the following considerations, namely direct translation from English, its meaning (rather than the number of syllables/ pronunciations/phonemes of the words), and the familiarity of the terms for Indonesians. The selected words from the latest consideration came from the same group or type of words in the English version. For example, "wheat" in the original version was adapted as "padi" in Bahasa Indonesia, which means "rice" in English, because Indonesians are more familiar with rice than wheat as daily meals. None of the words had more than two syllables and were easily pronounceable for Bahasa speaking persons.

Table 4. The Translation Version of Geffen et al. (1994) to the Indonesian version

No.	Words of group A			Words of Group B		
	Geffen et al (1994)	Bahasa Indonesia	Back-translation	Geffen et al. (1994)	Bahasa Indonesia	Back-translation
1.	Pipe	Pipa	Pipe	Bench	Kursi	Chair
2.	Wall	Tembok	Wall	Officer	Satpam	Security guard
3.	Alarm	Jam	Clock	Cage	Kandang	Cage
4.	Sugar	Gula	Sugar	Sock	Sandal	Slipper
5.	Student	Murid	Student	Fridge	Kulkas	Fridge
6.	Mother	Ibu	Mother	Cliff	Gunung	Mountain
7.	Star	Bintang	Star	Bottle	Botol	Bottle
8.	Painting	Photo	Photo	Soap	Sabun	Soap
9.	Bag	Tas	Bag	Sky	Awan	Clouds
10.	Wheat	Padi	Rice	Ship	Kapal	Ship
11.	Mouth	Mulut	Mouth	Goat	Domba	Sheep
12.	Chicken	Ayam	Chicken	Bullet	Bom	Bomb
13.	Sound	Suara	Sound	Paper	Kertas	Paper
14.	Door	Atap	Roof	Chapel	Aula	Hall
15.	Stream	Danau	Lake	Crab	Udang	Shrimp

Table 5. The Proportion Per Word and Trial for Giving the Right Answer

No.	Word	Trial A1		Trial A2		Trial A3		Trial A4		Trial A5		Trial A6		Trial A7	
		Pro-portion	SD	Pro-portion	SD	Pro-portion	SD	Pro-portion	SD	Pro-portion	SD	Pro-portion	SD	Pro-portion	SD
1.	Pipa	.84	.366	.83	.377	.89	.310	.92	.270	.93	.257	.90	.302	.88	.320
2	Tembok	.77	.422	.85	.354	.88	.320	.89	.318	.91	.280	.90	.294	.89	.308
3	Jam	.55	.497	.73	.444	.78	.416	.83	.380	.85	.360	.77	.424	.78	.414
4	Gula	.33	.469	.56	.497	.67	.470	.72	.448	.78	.413	.73	.442	.70	.458
5	Murid	.39	.488	.64	.479	.74	.438	.78	.417	.80	.401	.78	.416	.77	.422
6	Ibu	.58	.495	.77	.421	.80	.400	.83	.373	.87	.334	.88	.328	.88	.323
7	Bintang	.21	.407	.42	.494	.60	.490	.68	.467	.74	.441	.68	.468	.69	.463
8	Photo	.11	.318	.27	.442	.47	.500	.61	.489	.67	.472	.59	.493	.57	.496
9	Tas	.25	.433	.45	.498	.60	.490	.75	.436	.77	.422	.66	.473	.69	.464
10	Padi	.35	.477	.49	.500	.60	.491	.62	.486	.69	.463	.59	.492	.54	.499
11	Mulut	.33	.472	.52	.500	.58	.495	.64	.480	.71	.453	.55	.498	.56	.497
12	Ayam	.42	.494	.60	.490	.67	.472	.70	.461	.77	.422	.66	.473	.66	.475
13	Suara	.41	.493	.66	.473	.79	.410	.83	.377	.87	.332	.71	.455	.65	.478
14	Atap	.47	.500	.64	.482	.71	.454	.76	.425	.80	.397	.65	.478	.65	.479
15	Danau	.66	.473	.81	.392	.89	.315	.93	.257	.94	.232	.82	.387	.80	.401

Validity examination

The word position effect

We compared the probabilities of correct responses of the three word groups via a repeated measures one-way ANOVA for each of the trials (see Table 5 for the Proportion and the Standard Deviations of each word), for all descriptive and inferential statistics regarding group effects (first, second and third group of five words) see Table 6 and 7. The comparison testing showed a significant difference among the three groups of words, and the post-hoc analysis showed that the second group (the 6th to 10th words) always had the lowest mean and was statistically different from the means of the first and third group. This finding was consistently present across the first five trials (A1 – A5) (see Tables 6 and 7).

The statistical analyses showed that the partial eta squared in each test was more than 0.14, which means that the effect of the order of word group has a substantial impact (see Cohen in Lakens, 2013 on the meaning of the magnitude of effect size).

Trials A6 and A7 were clearly different from A1 to A5: there were no significant differences anymore between middle and recency word groups and only the primacy effect remained present during trial A6 and A7. This result was like Martín et al.'s (2013) and Griffin et al.'s (2017) on long-term memory. Figure 1 shows that the first group of word groups, representing the primacy effect, increased

Table 6. Comparing Three Groups of Words (Primacy, Middle, and Recency) from Trial A1 to Trial A7

Trials	Primacy Group (The 1st- 5th Words)		Middle Group (The 6th-10th Words)		Recency Group (The 11th -15th Words)		Wilks' Lambda F
	Mean	SD	Mean	SD	Mean	SD	
1	2.88	1.209	1.50	1.052	2.30	1.230	212.079**
2	3.62	1.175	2.40	1.246	3.23	1.221	180.452*
3	3.97	1.023	3.08	1.325	3.63	1.146	102.214*
4	4 13	1.016	3.48	1.251	3.86	1 116	55.614*
5	4.27	0.982	3.73	1.201	4 10	0.980	42.842*
6	4.08	1.049	3.40	1.302	3.39	1.330	97.316*
7	4.03	1.050	3.37	1.302	3.32	1.410	97.311*

Table 7. Wilks Lambda and Partial Eta Squared of Primacy, Middle, and Recency Word Groups of Trial 1-7

	Wilks' Lambda Value		Partial Eta Squared	Mean Differences (Primacy & Middle Word Groups)	Mean Differences (Primacy & Recency Word Groups)	Mean Differences (Middle & Recency Word Groups)
Trial 1	.536		.464	1.384*	0.581*	-0.803*
Trial 2	.576		.424	1.222*	0.388*	-0.833*
Trial 3	.706		.294	0.892*	0.339*	-0.553*
Trial 4	.815		185	0.648*	0.274*	-0.374*
Trial 5	.851		149	0.539*	0 169*	-0.370*
Trial 6	.716		.284	0.685*	0.691*	0.006
Trial 7	.716		.284	0.663*	0.713*	0.051

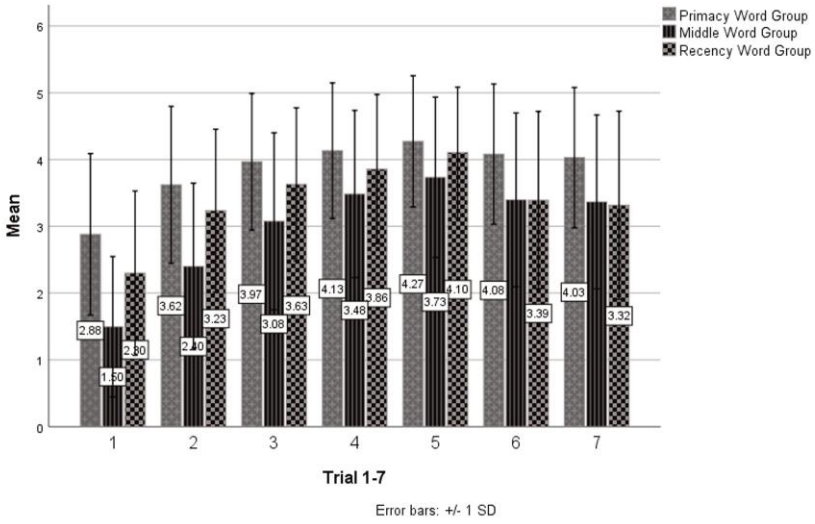

Figure 1. Mean score of each word groups across the seven trials

from A1 to A5 and decreased only slightly at A6 and A7. Similar increasing scores were seen for the middle and last group for trial A1 to A5, representing learning over trials. The decrease at A6 and A7 is larger for the middle and recency group compared to the primacy group. In fact, the recency advantage, clearly present at A1 to A5 completely disappeared at A6 and A7. Put into other words, the typical U-shape present during trial A1 to A5 is no longer there at A6 and A7.

We also compared the probabilities for each of the fifteen words of list A. It was found that the sixth word “Ibu” (mother) had a higher probability compared to its neighboring words. This is illustrated for the scores of trials A1, A5, and A7 in Figure 2.

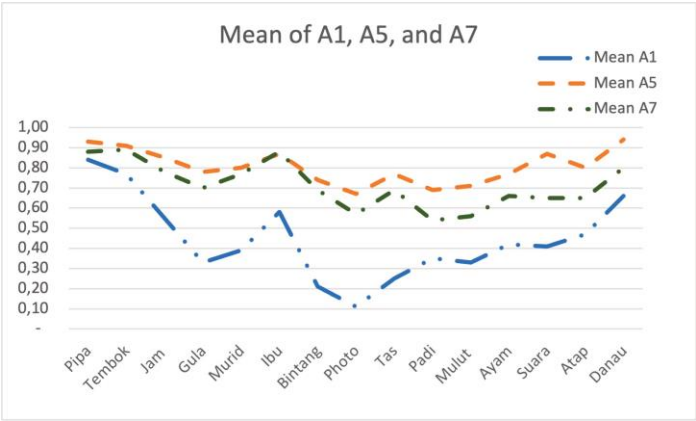

Figure 2. Probabilities of occurring of each of the fifteen-word trial A1, A5, and A7. Notice also the high probability of the word ïbu”

The structure of the trials group

EFA was used to identify whether and how the seven recall trials would form dimensions or constructs, based on covariance. We performed EFA analysis using JASP version 14 (University of Amsterdam, 2021). The results showed that the data are adequate for the EFA test (Overall KMO = 0.90; Bartlett's Test of sphericity 2(21) = 2718.78; $p < 0.001$; cumulative total variance explained = 75%) (Watkins, 2018). A rotation with the Oblimin method discovered three factors. Factor 1 consists of A1 ($\lambda = 0.71$) and A2 ($\lambda = 0.78$). These trials could be considered the acquisition trials of the newly presented words. Factor 2 consists of A3 ($\lambda = 0.48$), A4 ($\lambda = 0.84$), and A5 ($\lambda = 0.56$); the words are already familiar, the learning curve is less steep, and this factor was interpreted as retention. Factor 3 consists of A6 ($\lambda = 0.90$) and A7 ($\lambda = 0.87$) and was labeled as a recall factor.

Reliability

The internal reliability

The Cronbach's alpha and coefficient of corrected correlations between items and total score are presented in Table 8 (the critical value of significant correlation was 0.088 (df = 490; alpha = 0.05). Even though the coefficient correlations were relatively low in the first two trials (A1 and A2), the coefficients gradually increased in the subsequent trials. The small and insignificant coefficients on the first trial can be attributed to the overall low memorization of the words, leading to inconsistent recall of the various items.

The ICC coefficients increased as the test progressed to later trials. It means a consistent response to the problems asked by RAVLT ascended through repetition. We assumed this finding confirmed the Hebb repetition effect in the memory/learning process (see Oberauer & Meyer, 2009; Oberauer et al., 2015). The repetition helped participants connect the words (in such a way), so they could more easily recall them, the number of correct answers increased and memorizing the word list developed gradually to a rather consistent response pattern.

Test-Retest Reliability

The retest was conducted one week to ten daysafter the first test. We examined the correlation between the scores in the first and second tests. A comparison between the mean scores of the two measurements was also applied (Table 9).

Table 8. The internal consistency coefficients of items in each trial

No.	Trial	Alpha Cronbach	Coefficient of Corrected Item-Total Correlation
1	A1	0.358	0.024-0.214
2	A2	0.539	0 079-0 291
3	A3	0.577	0 150-0.294
4	A4	0.625	0 118-0.310
5	A5	0.620	0 129-0.345
6	A6	0.722	0 179-0.407
7.	A7	0.733	0.197-0.428

Table 9. The correlations and the differences of test (A1 to A7) – retest (RA1 to RA7) of RAVLT

Trials	Mean	SD	r (N=50, df: 49)	t (df: 49)
A1	6.90	1.581	0.467**	10.678**
RA1	10.46	2.636		
A2	9.66	2 182	0.630**	9.327**
RA2	12 12	2 154		
A3	11.02	2.272	0.552**	4.803**
RA3	12.48	2.270		
A4	11.68	2.254	0.556**	4.416**
RA4	13.00	2.231		
A5	12 10	2.690	0.470**	3.972**
RA5	13.48	1.898		
A6	11.20	2.949	0.761**	6.509**
RA6	12.96	2.267		
A7	11 14	2.900	0.776**	6.779**
RA7	12.90	2.401		

Note: ** *sig at p < 0.01*

The results, as presented inTable 9, showed that the test-retest reliability coefficients are significant but also that significant differences were observed between the scores of the first and second testing of each trial. Significant differences between the trials might be affected by the short interval between the test and retest and that the subjects still remembered some items from the first assessment.

The comparison test revealed a significant difference between the first and second assessments; the participant's scores were substantially higher in the second trial. This finding drove us to inspect this further. We computed the deviation between means of the subsequent trials across the two assessment sessions. The mean deviation between A1 and A2 in the first assessment was coded as D1, whereas in the second assessment was RD1. Next, the mean deviation between A2 and A3 was coded as D2 in the initial measurement and RD2 in the second measurement. We continued calculating the mean deviation until the last pair, A6 and A7 coded as D6 and RD6, respectively (Table 10).

The t-test (Table 10) showed that two out of six revealed significant differences between the mean deviations, that were between D1-RD1 and D2-RD2. No significant differences were observed between the mean scores from trial three onward in the first and second assessments. Interestingly, the changes between trials six and seven in the first and second testing were precisely the same. These latter findings supported the reliability of the Indonesian version of RAVLT over time.

Table 10. The differences of the change of every successive trial between test and retest

No	Pairs	Mean $_{deviation}$	SD $_{deviation}$	*t-values*	P
1	D1-RD1	1 10	2.60	2.99	0.00
2	D2-RD2	1.00	2.69	2.62	0.01
3	D3-RD3	0 14	2.24	0.44	0.66
4	D4-RD4	-0.06	2.86	-0.15	0.88
5	D5-RD5	-0.38	2.30	-1 17	0.25
6	D6-RD6	0.00	1.74	0.00	1.00

DISCUSSION

The process of adapting a verbal test instrument for Indonesia faces the difficulty that choosing literal translation of English words, the test may become more easily of more difficult, considering that the word frequency might be different for different cultures or societies, and that also words with cultural sensitivity are more likely to be recalled than foreign words, or the possibility that words can be associated more or less easy. The difficulty of recalling a word is also affected by the number of syllables, and the easiness or difficulty in pronunciation of the words in the original versus an adapted version (Geffen et al., 1994). The translation and back translation, a common procedure in adapting tests, was done by experts with understanding of the RAVLT and consensus was reached regarding the adaptation of the word lists, as presented in Table 5. Our first priority in the adaptation process was to look for words that have the same meaning or to use words from Geffen's word list A and B. The second priority is to try to keep the number of syllables the same, if not, try to make sure that the number of syllables is not much different. The third priority is pronunciation. For example: pipe (pīp) was adapted into Indonesian to be Pipa (pipa), alarm (əˈlärm) to clock (kläk). In total, four words were replaced in word list A, and nine words in word list B.

Validity and the word position effects

Word position effects

The first validity test regarding whether the recall probability of the words agrees with the position effects in each trial is in accordance with the Memory in Chains theory in the form of Primacy-Recency effects (Altmann, 2000). According to Altmann (2000), the sequence of words that we hear and express back in the form of memory, is a major factor in determining the probability of a proper recall. Words become related with each other through their sequence in which they are presented. The linkage of words to others preceding and following words causes the middle words the noisiest because they have two positions of interfering or disturbing words, namely the words before and the words after them, and this makes the middle words more difficult to remember than the first and last words. The first words are easier to remember than the middle words because there are no preceding disturbing words and next there is more time for rehearsals. The last words are easier than the middle words because they are not followed by interfering or disturbing words, the only distractors are the earlier words in the list. This causes the U-shaped curve for memorizing a word list.

The comparison of the mean value of the first, second and third group of five words in trial A1 to A5 showed indeed the U-shaped curve, in accordance with Altmann (2000). The results also showed that the words in the recency group became more difficult to recall after the presentation of wordlist B, Trial A6. The presentation of a new word list B interferes with the encoding or recall of list A, but much more for the words of the last group than for the words of the first

group, since only the recency advantage disappeared. It can be speculated that the first few words were already encoded, the later words not or less well. The recency advantage did not return at the delayed recall, as witnessed by similar averages of scores for the middle and recency word groups. Interestingly, such results were like the findings of Martín et al. (2013) and Griffin et al. (2017).

In addition to following the primacy-recency effect, the words in the Indonesian version of group A of RAVLT also experienced "The Von Restorff effect" which is the effect of a special stimulus that makes it easier for participants to remember the word than other words (Lima et al., 2019). From the data as presented in Table 6 and in Figure 2 and focus on the probability of remembering each of the fifteen words of word list A in trial A1, A5, and A7, the word "ibu" (mother) is an anomaly. Even though it is at position number 6, it is easier for the participants to remember than words at position 5 and 7 and this was always the case, that is in all seven trials. Considering the obtained probability for the recall of the word Ibu, and given the probabilities of the recall of the other words, we propose that the position of the word Ibu should be changed and should move to position 1, 2 or 3, or should exchange position with the word "Gula" or move to position 14 or 15. In all proposed position shifts it is likely that the primacy and recency effect would remain present or become bigger.

Trial clustering test

The second validity test in this study is to test the extent to which the grouping of the trials is appropriate and according to what has been described for other versions of the RAVLT. The results of the exploratory factor analysis part of our study indicated that the seven trials can be best grouped into three groups. Group 1 consisted of trials A1 and A2; Group 2 trial A3, A4, and A5; and Group 3 trial A6 and A7. Similar results were reported by Nordanskog et al. (2014), they stated that the seven trials of the RAVLT can be grouped into three groups, namely: Immediate recall, retention, and delayed recall. The results of our EFA are also only slightly different from those of Geffen et al. (1994). They stated that the seven trials clustered into four groups, namely 1) A1, A2, A3 as the acquisition trials, 2) A4, and A5 as the later acquisition trials, 3) A6 as the post distractor trial, and 4) A7 as the delayed trial. The results of our present study are also rather similar to those of de Paula et al. (2012). The results of their factor analysis of trial 1-7 RAVLT showed that trial A1-A4 grouped into one factor which they called the learning factor, trial A5 was named the transition factor, while A6-A7 grouped into one group which they called the retrieving factor. In all, all three factor analyses papers acknowledge that trial A1 to A5 should not be considered as unity and that the A7 alone or with A6 should be considered as (delayed) recall test.

From the results above, the Indonesian version of RAVLT is sensitive for the primacy and recency effect and that the scores of trials A1 to A7 largely agree with what has been internationally reported. The differences between the different papers regarding how the different trials can be grouped might be due to differences in the population of the participants.

In all, considering the presence of primacy effect in all trials, the recency effect in trial 1 to 5, and its disappearance at trial A6 and A7, the presence of three different constructs, and the presence of the Von Restorff effect, all in agreement with outcomes of previously validated internationally used versions of the RAVLT, we cannot but conclude that the Indonesian version of RAVLT should be considered as a valid test for verbal episodic memory.

The reliability of the adapted version of the RAVLT

The reliability test in this study was carried out in two ways, namely through its internal consistency using the Cronbach-Alpha and through test-retest reliability, the latter measures whether the results of the participants' answers are consistent after some time has passed.

The Cronbach-Alpha coefficient increased from one trial to the next. At the time of the first trial (A1), the reliability coefficient was 0.358, then it increased with each trial repetition. The highest reliability coefficient in the seventh trial (A7), it became 0.733. Likewise, the corrected item-total correlation coefficient also increased from A1 to the highest at A7. This is different from the research of de Sousa Magalhães et al. (2012) which showed that the Cronbach alpha coefficients A1 to A7 tended to be stable between 0.78-0.79 during the test, and 0.81-0.82 during the retest. Based on Cronbach Alpha reliability test, it can be concluded that the delayed recall of the Indonesian version of RAVLT is reliable because it is above 0.7 (Leech & Onwuegbuzie, 2010) the lower scores of the other trials only witness that the different trials measure different constructs, and this agrees with the outcomes of the exploratory factor analysis part of our study.

Previous studies investigating the reliability of the RAVLT also employed the test-retest design (e.g. Geffen et al., 1994; Carstairs et al., 2012; Hale et al., 2019; Munjir et al., 2015; Rezvanfard et al., 2011), although the time-lag between the test and retest varied from one study to another. Carstairs et al. 's took the longest time-lag, that was one year, whilst Hale et al., Munjir et al. and Resvanfard et al. used a one-month period between the test and retest. Our study took the same interval as Geffen et al., that is 6-14 days. The highest correlation in all these studies, including ours, irrespective of the used interval, was at the "Delayed-Recall", that is the recall of List-A after 20-minutes delay, except in the Geffen et al.'s study. This indicates that the most reliable indicator of memory is the delayed recall, its score is the result of learning and relearning and correct retrieval. The lowest test-retest correlation was found by us for the recall scores at trial A1; this is also in line with the Carstairs et al. and Geffen et al. The gradual increase of the reliability coefficient across the seven trials, as could be seen in Table 10, was earlier reported by Geffen et al. as well. The low test-retest correlation for A1 might also be since in the assessment, the fifteen words were new, and only less than half of the words were remembered. This finding indicates the well-known Thorndike's readiness effect in learning, that is when one is exposed to a new set of stimuli then he or she will only recall less than half of the presented materials. In the retest, the same word lists were used again, the sub-

jects might have remembered some items and the score is therefore higher. The newness of the words is less and therefore a different underlying construct could have been measured in the retest. A higher score on the retest trial 1 has also consequences for the learning aspect of the retest, as is commonly expressed as learning over trials. The results in Table 11 reflect the trial-to-trial change during the test and retest and they illustrate that the A1-A2 and A2-A3 differences are significantly larger in test compared to the retest. This illustrates that learning over trials is larger in the test session compared to the retest session. The differences between test and retest trial to trial changes were no longer present in any of the other trial to trial changes.

Munjir et al. (2015) analyzed the repetition effect, that is they compared the scores between two memory assessments with the same version of the Malay Auditory Verbal Learning Test (MAVLT) as we did, but they used a one-month interval. Their results showed that the scores were higher in the second assessment for the first, second, and third trial, no significant differences were observed on the following trials. We showed a better performance in all trials, we had more subjects (fifty vs thirty) and a shorter interval (one month vs 7-10 days) compared to Munjir et al. and this might have caused us to find more statistically significant differences. Rezvanfard et al. (2011) tested the reliability of the Persian version of the RAVLT with a one-month test-retest interval and these authors showed a difference in the results between the test and retest scores for all seven trials. The results of the research above show that the interval between the test and the retest affects the stability of the test-retest correlation scores. The shorter the time interval, the more there is an interfering “carry over effect” that causes an increase in the memory scores of the retest. The presence of a carry-over effect or practice effect can be prevented by using alternate forms of the RAVLT, as was shown by Munjir et al. (2015) for the MAVLT. This practice effect is clinically relevant in cases where participants need to be repeatedly tested.

CONCLUSIONS

The adaptation of the RAVLT test is documented, as well that indications of its reliability and validity are now obtained. The reliability test shows that the internal consistency of the instrument increases with the later trials of the test as a delayed memory test. In addition, there are positive and significant correlations between test and retest scores, which even and also increase towards the later trials. Both results show that a consistent trait is captured in the latter trials of the adapted RAVLT.

The validation part of the study was theoretically guided: the recall of the words in the various trials is in accordance with the Memory in Chains theory predicting that primacy and recency effects will occur. A Von Restorff effect for the word “ibu”, was found, while the factor analyses found showed that the adapted version of RAVLT also agrees with the theoretical view that three different aspects of memory are assessed: immediate memory, retention, and delayed

recall. All three findings contribute to the validity of the adapted version as a verbal memory test. It is proposed that the word “Ibu” should change its position, for example change position with the word “gula”. The usage of the for Indonesian adapted RAVLT awaits definite normative scores, which need to be corrected for age and education, as is nowadays necessary. Now only preliminary normative data for Javanese adults of the adapted version are available (Wahyuningrum et al., 2021).

Funding

This work was supported the Directorate of Higher Education General of Indonesia with number 010/LL6/SP2H.1/AMD/Penelitian/2020

REFERENCES

Altmann, E. M. (2000). Memory in Chains: Modeling Primacy and Recency Effects in Memory for Order. *Proceedings of the Twenty Second Annual Meeting of the Cognitive Science Society*, 31–36. http://hfac.gmu.edu/people/altmann/nairne-rpm.txt

Alviarez-Schulze, V., Cattaneo, G., Pachón-García, C., Solana-Sánchez, J., Tormos, J. M., Pascual-Leone, A., & Bartrés-Faz, D. (2022). Validation and Normative Data of the Spanish Version of the Rey Auditory Verbal Learning Test and Associated Long-Term Forgetting Measures in Middle-Aged Adults. *Frontiers in Aging Neuroscience*, *14*. https://doi.org/10.3389/fnagi.2022. 809019

Badan-Pusat-Statistik. (2021). *Statistik Indonesia 2021*.

Badcock, J. C., Dragović, M., Dawson, L., & Jones, R. (2011). Normative data for rey’s auditory verbal learning test in individuals with schizophrenia. *Archives of Clinical Neuropsychology*, *26*(3), 205–213. https://doi.org/10.1093/arclin/acr005

Baddeley, A. (2012). Working memory: Theories, models, and controversies. *Annual Review of Psychology*, *63*, 1–29. https://doi.org/10.1146/annurev-psych-120710-100422

Bolarinwa, O. (2015). Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. *Nigerian Postgraduate Medical Journal*, *22*(4), 195. https://doi.org/10.4103/1117-1936.173959

Callahan, C. D., & Johnstone, B. (1994). The Clinical Utility of the Rey Auditory-Verbal Learning Test in Medical Rehabilitation. In *Journal of Clinical Psychology in Medical Settings* (Vol. 1, Issue 3).

Capitani, E., della Sala, S., Logie, R. H., & Spinnler, H. (1992). Recency, Primacy, and Memory: Reappraising and Standardising the Serial Position Curve. *Cortex*, *28*(3), 315–342. https://doi.org/10.1016/S0010-9452(13)80143-8

Carstairs, J. R., Shores, E. A., & Myors, B. (2012). Australian Norms and Retest Data for the Rey Auditory and Verbal Learning Test. *Australian Psychologist*, *47*(4), 191–197. https://doi.org/10.1111/j.1742-9544.2012.00086.x

Cooper, S., & Greene, J. D. W. (2005). The clinical assessment of the patent with early dementia. In *Neurology in Practice* (Vol. 76, Issue SUPPL. 5). https://doi.org/10.1136/jnnp.2005.081133

Cromer, J., Krishna, V., Nguyen, A., & Acquadro, C. (2013). Cross-cultural adaptation of a research version of the Rey Auditory Verbal Learning Test (RAVLT) into Japanese. In *ISPOR 18th Annual International Meeting* (pp. 1–1). www.mapigroup.com

de Paula, J. J., Pacheco, L., Melo, C., Nicolato, R., Nunes De Moraes, E., Bicalho, M. A., Hamdan, A. C., & Fernandes Malloy-Diniz, L. (2012). Reliability and construct validity of the Rey-Auditory Verbal Learning Test in Brazilian elders Fidedignidade e validade de construto do Teste de Aprendizagem Auditivo-Verbal de Rey em idosos brasileiros. *Rev Psiq Clin*, *39*(1), 19–23.

de Sousa Magalhães, S., Malloy-Diniz, L. F., & Hamdan, A. C. (2012). Validity convergent and reliability test-retest of the Rey Auditory Verbal Learning Test. *Clinical Neuropsychiatry: Journal of Treatment Evaluation, 9*(3), 129–137.

Fard, E. K., Keelor, J. L., Bagheban, A. A., & Keith, R. W. (2016). Comparison of the Rey Auditory Verbal Learning Test (RAVLT) and digit test among typically achieving and gifted students. *Iranian Journal of Child Neurology*, *10*(2), 26-37.

Gavett, B. E., & Horwitz, J. E. (2012). Immediate list recall as a measure of short-term episodic memory: Insights from the serial position effect and item response theory. In *Archives of Clinical Neuropsychology* (Vol. 27, Issue 2, pp. 125–135). Oxford University Press. https://doi.org/10.1093/arclin/acr104

Geffen, G. M., Butterworth, P., & Geffen, L. B. (1994). Test-Retest Reliability of a New Form of the Auditory Verbal Learning Test (AVLT). *Archives of Clinical Neuropsychology*, *9*(4), 303–316.

Gooren, T., Schlattmann, P., & Neu, P. (2013). A comparison of cognitive functioning in acute schizophrenia and depression. *Acta Neuropsychiatrica*, *25*(6), 334–341. https://doi.org/10.1017/neu.2013.21

Griffin, J. W., John, S. E., Adams, J. W., Bussell, C. A., Saurman, J. L., & Gavett, B. E. (2017). The effects of age on the learning and forgetting of primacy, middle, and recency components of a multi-trial word list. *Journal of Clinical and Experimental Neuropsychology*, *39*(9), 900–912. https://doi.org/10.1080/13803395.2017.1278746

Groth-Marnat, G. (2003). *Handbook of Psychological Assessment* (4th ed.). John Wiley & Sons, Inc.

Hale, C., Last, B. S., Meier, I. B., Yeung, L. K., Budge, M., Sloan, R. P., Small, S. A., & Brickman, A. M. (2019). The ModRey: An Episodic Memory Test for Nonclinical and Preclinical Populations. *Assessment*, *26*(6), 1154–1161. https://doi.org/10.1177/1073191117723113

Hawkins, K. A., Dean, D., & Pearlson, G. D. (2004). Alternative forms of the Rey Auditory Verbal Learning Test: A review. In *Behavioural Neurology* (Vol. 15). IOS Press.

Hendriks, M., van Luijtelaar, G., Halim, M., & Sulastri, A. (2016). *Development of The Indonesian Neuropsychological Test Battery*. A Joint Research Proposal of Raboud University of Nijmegen, the Netherlands, Atma Jaya Indonesian Catholic University, Jakarta, Indonesia, and Soegijapranata Catholic University, Semarang, Indonesia

Henke, K. (2010). A model for memory Systems based on processing modes rather than consciousness. *Nature Reviews | Neuroscience*. *11*. 523-531

Johnstone, B., Vieth, A. Z., Johnson, J. C., & Shaw, J. A. (2000). Recall as a Function of Single versus Multiple Trials: Implication of Rehabilitation. *Rehabilitation Psychology*, *45*(1), 3–19. https://doi.org/10.1037/0090-5550.45.I.3

Kessels, R. P. C., & Hendriks, M. P. H. (2016). Neuropsychological Assessment. In *Encyclopedia of Mental Health: Second Edition* (pp. 197–201). Elsevier Inc. https://doi.org/10.1016/B978-0-12-397045-9.00136-1

Kipps, C. M., & Hodges, J. R. (2005). Cognitive assessment for clinicians. In *Neurology in Practice* (Vol. 76, Issue 1). https://doi.org/10.1136/jnnp.2004.059758

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Frontiers in Psychology*, *4*(NOV). https://doi.org/10.3389/fpsyg.2013.00863

Leech, N. L., & Onwuegbuzie, A. J. (2010). Guidelines for Conducting and Reporting Mixed Research in the Field of Counseling and Beyond. *Journal of Counseling & Development*, *88*(1), 61–69. https://doi.org/10.1002/j.1556-6678.2010.tb00151.x

Lima, G., Teldeschi, A., Oliveira, N., Bernardes, C., Drummond, C., Assunção, N., Bortolini, T., & Mattos, P. (2019). The von restorff effect in the brazilian version of the rey auditory verbal learning test in an elderly population. *Dementia e Neuropsychologia*, *13*(1), 89–96. https://doi.org/10.1590/1980-57642018dn13-010010

Maharani, V. (2015). Perbandingan Fungsi Kognitif pada Anak-Anak dengan Gangguan Gizi dan Anak dengan Gizi Normal.*Thesis.* Jakarta; Fakultas Kedokteran Universitas Indonesia

Martín, M. E., Sasson, Y., Crivelli, L., Roldán Gerschovich, E., Campos, J. A., Calcagno, M. L., Leiguarda, R., Sabe, L., Allegri, R. F., & Cognitivo Leve;, D. (2013). Relevance of the serial position effect in the differential diagnosis of mild cognitive impairment, Alzheimer-type dementia, and normal ageing PALABRAS CLAVE. *Neurologia*, *28*(4), 219–225. www.elsevier.es/neurologia

Messinis, L., Tsakona, I., Malefaki, S., & Papathanasopoulos, P. (2007). Normative data and discriminant validity of Rey's Verbal Learning Test for the Greek adult population. *Archives of Clinical Neuropsychology*, *22*(6), 739–752. https://doi.org/10.1016/j.acn.2007.06.002

Morrison, R. L., Pei, H., Novak, G., Kaufer, D. I., Welsh-Bohmer, K. A., Ruhmel, S., & Narayan, V. A. (2018). A computerized, self-administered test of verbal episodic memory in elderly patients with mild cognitive impairment and healthy participants: A randomized, crossover, validation study. *Alzheimer's and Dementia: Diagnosis, Assessment and Disease Monitoring*, *10*, 647–656. https://doi.org/10.1016/j.dadm.2018.08.010

Munjir, N., Othman, Z., Zakaria, R., Shafin, N., Hussain, N. A., Desa, A. M., & Ahmad, A. H. (2015). Equivalence and practice effect of alternate forms for malay version of auditory verbal learning test (MAVLT). *EXCLI Journal*, *14*, 801–808. https://doi.org/10.17179/excli2015-280

Neblina, C. (2012). *Construct and Criterion Validity of the Rey Auditory Verbal Construct Learning Test-Spanish Version in Adults with Traumatic Brain Injury* [University of Nevada]. https://digitalscholarship.unlv.edu/thesesdissertations/1686

Nielsen, T. R., Segers, K., Vanderaspoilden, V., Bekkhus-Wetterberg, P., Minthon, L., Pissiota, A., Bjørkløf, G. H., Beinhoff, U., Tsolaki, M., Gkioka, M., & Waldemar, G. (2018). Performance of middle-aged and elderly European minority and majority populations on a Cross-Cultural Neuropsychological Test Battery (CNTB). *Clinical Neuropsychologist*, *32*(8), 1411–1430. https://doi.org/10.1080/13854046.2018.1430256

Nordanskog, P., Larsson, M. R., Larsson, E. M., & Johanson, A. (2014). Hippocampal volume in relation to clinical and cognitive outcome after electroconvulsive therapy in depression. *Acta Psychiatrica Scandinavica*, *129*(4), 303–311. https://doi.org/10.1111/acps.12150

Oberauer, K., Jones, T., & Lewandowsky, S. (2015). The Hebb repetition effect in simple and complex memory span. *Memory and Cognition*, *43*(6), 852–865. https://doi.org/10.3758/s13421-015-0512-8

Oberauer, K., & Meyer, N. (2009). The contributions of encoding, retention, and recall to the Hebb effect. *Memory*, *17*(7), 774–781. https://doi.org/10.1080/09658210903107861

Pliskin, J. I., DeDios Stern, S., Resch, Z. J., Saladino, K. F., Ovsiew, G. P., Carter, D. A., & Soble, J. R. (2021). Comparing the Psychometric Properties of Eight Embedded Performance Validity Tests in the Rey Auditory Verbal Learning Test, Wechsler Memory Scale Logical Memory, and Brief Visuospatial Memory Test–Revised Recognition Trials for Detecting Invalid Neuropsychological Test Performance. *Assessment*, *28*(8), 1871–1881. https://doi.org/10.1177/1073191120929093

Rezvanfard, M., Ekhtiari, H., Noroozian, M., Rezvanifar, A., Nilipour, R., & Javan, G. K. (2011). The Rey Auditory Verbal Learning Test: Alternate Forms Equivalency and Reliability for th Iranian Adult Population (Persian Version). *Article in Archives of Iranian Medicine*, *14*(2). https://www.researchgate.net/publication/50248727

Schoenberg, M. R., Dawson, K. A., Duff, K., Patton, D., Scott, J. G., & Adams, R. L. (2006). Test performance and classification statistics for the Rey Auditory Verbal Learning Test in selected clinical samples. *Archives of Clinical Neuropsychology*, *21*(7), 693–703. https://doi.org/10.1016/j.acn.2006.06.010

Schroeder, R. W., Martin, P. K., & Walling, A. (2019). Neuropsychological Evaluations in Adults. *American Family Physician*, *99*(2). https://pubmed.ncbi.nlm.nih.gov/30633479/

Stallings, G., Boake, C., & Sherer, M. (1995). Comparison of the California Verbal Learning Test and the Rey Auditory Verbal Learning Test in Head-Injured Patients. *Journal of Clinical and Experimental Neuropsychology*, *17*(5), 706–712. https://doi.org/10.1080/01688639508405160

Tierney, M. C., Moineddin, R., & McDowell, I. (2010). Prediction of all-cause dementia using neuropsychological tests within 10 and 5 years of diagnosis in a community-based sample. *Journal of Alzheimer's Disease*, *22*(4), 1231–1240. https://doi.org/10.3233/JAD-2010-100516

Vlahou, C. H., Kosmidis, M. H., Dardagani, A., Tsotsi, S., Giannakou, M., Giazkoulidou, A., Zervoudakis, E., & Pontikakis, N. (2013). Development of the Greek verbal learning test: Reliability, construct validity, and normative standards. *Archives of Clinical Neuropsychology*, *28*(1), 52–64. https://doi.org/10.1093/arclin/acs099

Wahyuningrum, S. E., van Luijtelaar, G., & Sulastri, A. (2021). An online platform and a dynamic database for neuropsychological assessment in Indonesia. *Applied Neuropsychology:Adult*. https://doi.org/10.1080/23279095.2021.1943397

Watkins, M. W. (2018). Exploratory Factor Analysis: A Guide to Best Practice. *Journal of Black Psychology*, *44*(3), 219–246. https://doi.org/10.1177/0095798418771807

Widyastuti, K., Susilawathi, N. M., Utama, I. M. S., & Laksmidewi, A. P. (2016). Perbedaan Angka Limfosit CD4 Pada Penderita HIV dengan Gangguan Memori Verbal dan Tanpa Gangguan Memori Verbal di RSUP Sanglah Denpasar. In *Proposal Penelitian Skema Hibah Dosen Muda* Denpasar: Fakultas Kedokteran Universitas Udayana

Wiens, A. N., Tindall, A. G., & Crossen, J. R. (1994). California verbal learning test: A normative data study. *Clinical Neuropsychologist*, *8*(1), 75–90. https://doi.org/10.1080/13854049408401545

Zeidman, Y., Schweiger, A., Korczyn, A. D., Vachapov, V., Verhovsky, R., Halperin, I., Neufeld, M. Y., & Andelman, F. (2008). Rey Auditory Verbal Learning Test as a tool for diagnosis of Mild cognitive impairment. *Acta Neuropsychologica*, *6*(2). https://www.researchgate.net/publication/288561243

Corresponding author:
Margaretha Sih Setija Utami
Psychology Faculty
Soegijapranata Catholic University
Jl. PawiyatanLuhur IV/no.1, Bendan Dhuwur, Semarang, Indonesia
Phone: +6285727037075
e-mail: cicih@unika.ac.id

10% Overall Similarity

Top sources found in the following databases:

- 9% Internet database
- Crossref database
- 3% Submitted Works database
- 5% Publications database
- Crossref Posted Content database

TOP SOURCES

The sources with the highest number of matches within the submission. Overlapping sources will not be displayed.

1	**discovery.researcher.life** Internet	4%
2	**Shinta Estri Wahyuningrum, Gilles van Luijtelaar, Augustina Sulastri. "A...** Crossref	1%
3	**cvrcollegehyderabad on 2024-03-07** Submitted works	1%
4	**repository.unika.ac.id** Internet	<1%
5	**epdf.tips** Internet	<1%
6	**University of Melbourne on 2013-03-28** Submitted works	<1%
7	**Sergio Della Sala, Robert H. Logie, Cristina Trivelli, Roberto Cubelli, Clel...** Crossref	<1%
8	**Victoria University on 2014-05-17** Submitted works	<1%

9	Heni Gerda Pesau, Aria Saloka Immanuel, Augustina Sulastri, Gilles va... Crossref	<1%
10	Lin, Theresa. "Sleep Disordered Breathing and Cognition Among Young... Publication	<1%
11	Martinez, Maria Elizabeth. "Construct validation of the semantic and se... Publication	<1%
12	link.springer.com Internet	<1%
13	richtmann.org Internet	<1%
14	California Southern University on 2024-01-04 Submitted works	<1%
15	University of Newcastle on 2020-11-08 Submitted works	<1%
16	pjps.pk Internet	<1%
17	City University of Hong Kong on 2023-03-31 Submitted works	<1%
18	University of Bristol on 2022-10-12 Submitted works	<1%
19	eprints.bournemouth.ac.uk Internet	<1%
20	frontiersin.org Internet	<1%

21	researchgate.net Internet	<1%

Excluded from Similarity Report

- Bibliographic material
- Cited material
- Manually excluded sources
- Quoted material
- Small Matches (Less then 10 words)
- Manually excluded text blocks

EXCLUDED SOURCES

Margaretha Sih Setija Utami, Augustina Sulastri, Justinus Santoso, Angela Sur... 72%

Crossref

EXCLUDED TEXT BLOCKS

2023Accepted

Barbara Gawda, Małgorzata Chojak, Adrian Korniluk. "SNSS USE IN GENERATION Z, EMOTIONAL STIMULI P...

ADAPTATION OF REY AUDITORYVERBAL LEARNING TEST FORINDONESIA

repository.unika.ac.id

A,C,D,E,G]Augustina

repository.unika.ac.id

2 Faculty of Psychology, Atma Jaya Catholic University of Indonesia, Indonesia3

link.springer.com