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Correlation between Language Screening Test and Frenchay Aphasia Screening Test for Aphasia Screening in Ischemic Stroke

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Abstract
Aphasia is a communication disorder that occurs after brain damage. Delays in diagnosing aphasia can lead to depression, decrease quality of life, and raise hospital stays and costs. Ischemic stroke aphasia screening instruments have been widely developed but are still difficult to interpret. Nowadays, the Language Screening Test (LAST) is reportedly quick, easy to understand, straightforward, and suitable for use by nurses. However, the LAST subtests are different from the Frenchay Aphasia Screening Test (FAST), which has been used in the past to evaluate aphasia. This study aims to determine the relationship between LAST and FAST in ischemic stroke aphasic patients for aphasia screening. The study used an analytic observational method with a cross-sectional approach. The population in this study were stroke patients at Tugurejo Semarang Hospital who had their CT Scan checked. The sample was taken using a purposive sampling technique. Bivariate data analysis with Spearman Rank Correlation test. We obtained 50 samples 19 male patients and 31 female patients with the highest age range of 51-60 years as many as 26 patients. The highest Education and profession is primary school and housewife. Patients who experienced aphasia with LAST and FAST scored as many as 27 and 29 people, while the rest not have aphasia. The Spearman's Rank test obtained p-values of 0,000 and < 0,05 respectively. Meanwhile, the correlation coefficients of LAST and FAST on aphasia were 0,678 and 0,678 respectively. There is a positive correlation between the LAST and FAST in ischemic stroke aphasic patients for aphasia screening. Nurses can use the LAST instrument to collect data and establish nursing diagnoses of verbal communication disorders.

Keywords: Aphasia, Language Aphasia Screening Test, Frenchay Aphasia Screening Test, Ischemic Stroke.

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1. INTRODUCTION

Stroke is the number one cause of disability in the world (Pinzon, 2016; Wang et al., 2017). In Sri Lanka, The prevalence of stroke in 2015 was 104 per 1,000 population in 2017, it was 1,596 per 100,000 population (Chang, Gajasinghe, & Arambepola, 2015; Wang et al., 2017). There were 1,693 stroke patients in Japan, 52.5% of whom had aphasia (Pinzon, 2016). The prevalence of stroke in Indonesia has increased from 2013-2018 by 7.0% to 10.9% (Kemenkes RI, 2018). The prevalence of stroke in 2018, especially in the Special Region of Yogyakarta, was reported at 14.7%. Approximately 30% of stroke survivors experience aphasia during the ischemic stroke phase (Kemenkes RI, 2018; Pinzon, 2016).

Ischemic stroke aphasia is a language communication disorder that is found less than three months after a stroke (Bruun, 2007; Campbell & Marshall, 2013.; Iqbal, 2011). The cause of ischemic stroke aphasia is paralysis of the hypoglossal brain nerve in the front temporal lobe of the brain (Bruun, 2007; Pinzon, 2016). Stroke aphasia patients are unable to understand spoken language and have difficulty coordinating thoughts, feelings, and desires (Bruun, 2007; Lumbantobing, 2015). Patients with severe stroke aphasia are characterized by no longer spontaneous language, even though the patient can say several words repeatedly but is unable to understand the pronunciation (Bruun, 2007; Lumbantobing, 2015).

Assessment of aphasia to determine the prognosis of an ischemic stroke aphasia is related to the golden period (Bruun, 2007; Iqbal, 2011). Ischemic stroke aphasia patients have a golden period based on their management around 1-3 months after the attack (Campbell & Marshall, 2013.; Iqbal, 2011). Stroke patients who are found to have aphasia are easily anxious, stressed, and depressed (Morris et al., 2017; Shehata, 2018). The impact of ischemic stroke aphasia is felt in language skills, welfare, independence, social participation, quality of life, and length of stay (Bonilha et al., 2014; Corallo et al., 2017). Ischemic stroke patients with aphasia will experience an average length of stay of 1-2 weeks. The additional length of stay will increase the cost of treatment (Bonilha et al., 2014; Campbell & Marshall, 2013). Ischemic stroke aphasia must be assessed as early as possible, aphasia assessment is important as a preventive measure for the appearance of fast and repetitive speech styles (Campbell & Marshall, 2013). Early assessment of aphasia is an effort to find out the signs of language disorder symptoms that are known earlier so that treatment is timely, social participation increases, quality of life increases, and days of hospitalization decrease (Campbell & Marshall, 2013; Plowman, Hentz, & Ellis, 2012).

The *Boston Diagnostic Aphasia Examination* (BDAE), The *Minnesota Test for Differential Diagnosis of Aphasia* (MTTDDA), and The *Functional Communication Profile* (FCP) are tools for assessing aphasia. This tools takes between 30 minutes and 3 hours to assess aphasia (Erdodi & Roth, 2017; Prins & Maas, 2002). This measurement is difficult to perform in patients who cannot tolerate long periods (Prins & Maas, 2002). The questions used in the "understanding" sub-test produce answers in the form of "yes and no" so that patients can answer them only by nodding their heads which can lead to bias (Erdodi & Roth, 2017). Assessment tools such as the Mobile Aphasia Screening Test (MAST), Sheffield Screening Test (SST), and Screeling are stroke aphasia assessment tools with an attack onset of 1-127 days, which takes 3-15 minutes (El Hachioui et al., 2017). This assessment tool does not have sub-tests that require "yes or no" answers. This tool is only specifically carried out by therapists or specialist doctors, while other health workers cannot use it (El Hachioui et al., 2017; Erdodi & Roth, 2017).

Assessment of ischemic stroke aphasia can be carried out with special assessment tools by non-specialists such as general practitioners, junior medical staff, and nursing staff (Enderby, Wood, Wade, & Hewer, 1986; Flamand-Roze et al., 2011; Thommessen, Thoresen, Bautz-holter, Bautz-holter, & Laake, 2017). Nurses need to assess ischemic stroke aphasia

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disorders because they often find these cases during treatment (Enderby et al., 1986; Poslawsky, Schuurmans, Lindeman, & Hafsteinsdóttir, 2010; Thommessen et al., 2017). Nurses often find signs and symptoms of stroke aphasia patients in the form of an inability to speak, slurred speech, and difficulty expressing words so that communication is disrupted (Al-Khawaja, Wade, & Collin, 1996; Poslawsky et al., 2010). The nurse collects subjective and objective data and then establishes a nursing diagnosis of verbal communication disorders (PPNI, 2016). Nurses can intervene by providing support for treatment programs and making treatment decisions (Berthier, 2005; PPNI, 2018).

Measuring tools that support the potential of nurses in the assessment of post-stroke aphasia patients have been seen , with the result that the Frenchay Aphasia screening Test (FAST) is a simple, fast assessment tool that can be done by nurses in 10 minutes nurses (Poslawsky et al., 2010). A simple and fast assessment tool is needed by nurses to collect subjective and objective data on ischemic stroke aphasia (Enderby et al., 1986; Thommessen et al., 2017). Assessment tools such as the Minnetosa Test For Differential Diagnosis of aphasia (MTTDA) and Functional Communication Profile (FCP), and the Sheffield Screening Test (SST) have been tested for correlation with FAST to assess stroke aphasia and the results show a positive relationship with the three tools (Al-Khawaja et al., 1996; Enderby & Crow, 1996).

FAST is simple, easy to understand, fast, and has good specificity sensitivity (Enderby & Crow, 1996; Enderby et al., 1986; Neill, Cheadle, & Wyatt, n.d.; O'neill, Cheadle, Wyatt, McGuffog, & Fullerton, 1990). FAST is in the form of a scenic image stimulus using instructions and hint cards without "yes and no" questions (Enderby & Crow, 1996; Enderby et al., 1986). FAST is an assessment tool that is widely used in post-ischemic stroke by non-specialists such as nurses (Enderby & Crow, 1996; Enderby et al., 1986; Neill et al., n.d.; O'neill et al., 1990). FAST has assessment criteria, namely understanding commands, expressions, reading, and writing abilities (El Hachioui et al., 2017; Enderby et al., 1986). This tool cannot be used with illiterate and deaf patients. Patients with ischemic stroke who are hemiplegic, on the "writing" test can use the hand that is not hemiplegic (Enderby & Crow, 1996; Salter, Jutai, Foley, Hellings, & Teasell, 2006).

The Language Screening Test (LAST) is an alternative measurement tool for assessing ischemic stroke aphasia (El Hachioui et al., 2017; Flamand-Roze et al., 2011). The required measurement tools can assess aphasia in detail, are easy to use, fast, and do not involve writing sub-tests (El Hachioui et al., 2017). LAST is a measurement tool developed for health workers to assess stroke aphasia (Flamand-Roze et al., 2011). Measuring tools that existed before were very time-consuming and still had a very high risk of bias because they involved writing sub-tests and were difficult for nurses to interpret. Brief, low-bias, and easy-to-interpret assessments are needed (Flamand-Roze et al., 2011). LAST is the only tool that is the fastest at assessing aphasia, which only takes 2-3 minutes. LAST consists only of two-sided images facing the patient and examiner (Flamand-Roze et al., 2011; Flowers, Flamand-roze, Denier, & Roze, 2015; Vanbellingen et al., 2016).

LAST is offered because it is simple, easy to interpret, fast, and can be used by nurses. This study aims to establish a correlation between LAST and FAST for aphasia screening in ischemic stroke patients.

2. RESEARCH METHOD

Ethical approval for this study was obtained from the Health Research Ethics Committee, Nursing Department Faculty of Medicine at Diponegoro University (71/EC/KEPK/D/Kep/XI/2019).

A quantitative study using a cross-sectional research design, We choose the research design because to see the relationship between LAST and FAST in ischemic stroke aphasic patients for aphasia screening. The sampling technique is a non-probability type of purposive sampling. The criteria for participants were those who were declared ischemic stroke through the results of a CT scan, had an ischemic stroke for the first time and had passed the acute phase after 3 days of treatment, cognitive assessment using MMSE $\geq$ 24, had no visual impairment or hearing loss, and good or composmentis (GCS 14-15) (Azuar et al., 2013; Enderby & Crow, 1996; Enderby et al., 1986; Flamand-Roze et al., 2011). A total of 53 participants were asked to be involved in this study, but 2 respondents experienced a decrease in consciousness and 1 person refused to be studied. Finally, we select 50 respondents to be included in this study. The stroke unit at Tugurejo Hospital, Semarang was chosen as the research location for 6 weeks. The FAST and LAST instruments were used to assess ischemic stroke aphasia. Aspects of the FAST assessment include image comprehension, the patient's verbal expression, reading ability and writing ability. The score range is between 0-30 and it is said that there is aphasia if the score is less than 24 and there is no aphasia if the score is $\geq$24 (Amila, Sitorus, & Herawati, 2015; Enderby et al., 1986; Salter et al., 2006). LAST instruments include naming, repetition, spontaneous speech, picture comprehension, and verbal instructions. The total score obtained is between 0-15. The total rating of the entire LAST test is 15, it is said that there is aphasia if the value is <14 and there is no aphasia if the value is $\geq$14 (Flamand-Roze et al., 2011; Flowers et al., 2015; Vanbellingen et al., 2016).

LAST has been translated into Indonesian through a back translation process and expert testing. Based on input from two experts, there were several changes to the LAST observation sheet, namely the picture of a telephone was replaced with a picture of a cell phone, the picture of a cigarette and smoking pipe was changed in accordance with general social culture in Indonesia, the command to point to the ceiling was changed to point to the roof, and the picture of cheese was changed. with objects familiar to Indonesians such as hats, tomatoes or balls, and with clearer verbal instructions using one hand or two hands. The intermediate agreement test obtained a value of 98.67% with a Cohen's kappa value of 0.97, which means there is high agreement. The validity of the LAST instrument tested using Spearman obtained a validity value of 0.678, which means this instrument is valid. The LAST instrument was also tested for reliability with the Cohens Kappa test, obtaining a value of 0.97, which means this instrument is reliable. LASTLY, compared to other tools, it has the advantage of having a sensitivity value of 98% and a specificity of 100%, The Mississippi Aphasia Screening Test (MAST*) has a sensitivity value of 89% and a specificity value of 80%, and the Mobile Aphasia Screening Test (MAST) has a sensitivity value of 90% and specificity 73% with the time difference between the three distances ranging from 2-10 minutes. These results show that LAST is the instrument with the highest sensitivity and specificity value in detecting aphasia stroke and is fast in its assessment in a short time.

Informed Consent to be signed as a form of participation in the research. The researcher examines the patient by give a picture card and verbal instructions. Participants follow the instructions while the examiner makes an assessment based on the results of the observations. The patient will be given two instruments with the FAST instrument first and then the LAST instrument. The lag time between FAST and LAST checks is approximately 1 minute. Researchers involve the family to accompany the patient. The results of LAST and FAST measurements are not known to respondents, their responses to the results are ignored.

The statistical method used is analytical observational. Spearman analysis was used to see the correlation between LAST and FAST for aphasia screening in ischemic stroke patients because the LAST and FAST results are categorical data, namely aphasia, and no aphasia. The significance test can be seen from the p-value if < 0.05 then there is a relationship with the

correlation (see Pearson correlation) otherwise, if the p-value is ≥ 0.05 then there is no relationship between the two variables (Sujarweni, 2014). The strength and direction of the correlation will have meaning if the relationship between these variables is significant. It is said that there is a significant relationship if the calculated significance value is less than 0.05. Meanwhile, if the significance value is greater than 0.05, the relationship between these variables can be said to be insignificant or meaningless (Sujarweni, 2014). The Spearman Correlation Coefficient value is 0.80-1.000 which is said to be very strong, the value of 0.60-0.799 is said to be strong, the value of 0.40-0.599 is said to be quite strong, the value of 0.20-0.399 is said to be low and the value of 0.00-0.199 is said to be very low with a confidence level of 95%.

3. RESULTS AND DISCUSSION

Table 1. Characteristics based on age, gender, occupation, and education

Respondent Characteristics	N	%	Mean	SD
Age				
40-50 Years	13	26,0		
51-60 Years	26	52,0	55,40	6,366
61-70 Years	11	22,0		
Gender				
Male	19	38,0		
Famale	31	62,0		
Education				
Primary School	20	40,0		
Junior High School	12	24,0		
Senior High School	17	34,0		
PT	1	2,0		
Profession				
Farmer	6	12,0		
Trader	6	12,0		
Government Employees	1	2,0		
Housewife	22	44,0		
Entrepreneur	15	30,0		

Table 1 that most of the respondents were aged 51-60 years (52.0%) with a mean is 55,40 and a standard deviation of 6,366, the most gender was female 31 people (62.0%), the elementary school educated 20 people (40.0%) and the most jobs were housewives 22 (44,0%).

Table 2. Categorical LAST Score

Aphasia	Frequency	Percentage
Not Aphasia	23	46,0
Aphasia	27	54,0
Total	50	100,0

Table 2, it can be concluded that ischemic stroke patients who were declared aphasia by the LAST instrument were 27 people (54%) and 23 people (46%) who were declared not aphasia.

Table 3. Categorical FAST Score

Aphasia	Frequency	Percentage
Not Aphasia	21	42,0
Aphasia	29	58,0
Total	50	100,0

Table 3, it can be interpreted that ischemic stroke patients who were declared aphasia by FAST were 29 people (58%) and 21 people (42%) who were declared not to have aphasia.

Table 4. Cross tabulation of LAST and FAST

Categorical LAST Skor	Categorical FAST Skor		Total
	Not Aphasia	Aphasia	
Not Aphasia	18	5	23
Aphasia	3	24	27
Total	21	29	50

Table 4, it can be concluded that 18 ischemic stroke patients were declared to have no aphasia by FAST and LAST, while those who were declared to have aphasia by FAST and LAST were 24 people. Furthermore, 5 people were stated to have aphasia by FAST, but by LAST it was stated that there was no aphasia and vice versa. 3 people were declared not to have aphasia by FAST but by LAST they were declared to have aphasia.

Table 5. Spearman Correlation

Variable	Spearman's rho	FAST Skor	LAST Skor
Categorical FAST Skor	Correlation Coefficient	1,000	,678[**]
	Sig. (2-tailed)	-	,000
	N	50	50
Categorical LAST Skor	Correlation Coefficient	,678[**]	1,000
	Sig. (2-tailed)	,000	-
	N	50	50

Table 5 shows that there is a relationship between LAST and FAST with a significance value of 0.000 <0.05 and a correlation coefficient of r value of 0.678 which means there is a strong correlation. The correlation coefficient number in the results above is positive so that the relationship between the two variables is unidirectional (type of unidirectional relationship), thus it can be interpreted that the higher the LAST indicates that there is aphasia in patients with ischemic stroke aphasia, the higher the FAST states that there is ischemic stroke aphasia.

Assessment of aphasia in ischemic stroke patients using an assessment instrument is important because it contributes to language and intelligence problems, language and short-term memory, cognitive abilities, and rehabilitation (Kertesz, 2015). The benefit of assessing aphasia is to find out earlier language disorders experienced by ischemic stroke sufferers. An instrument is said to be good if it can measure what it should measure (validity), produce the same value on repeated examinations (reliability), has the same value in each of its components (linear), has simple instructions, and can predict future outcomes or events (Azwar, 2012).

The Frenchay Aphasia Screening Test (FAST) was first developed by Enderby in France to assess aphasia. FAST has also been harmonized and adapted in English and has become the gold standard used by therapists in assessing stroke aphasia. FAST has been used to assess aphasia by Amila in Indonesia to assess the functional communication abilities of motor aphasia patients after being given alternative communication. The instrument validity test was

carried out on 13 respondents at Tasik Malaya Hospital with the results of the interrater test obtained with the Kappa coefficient showing the number 1,000 with p <0.05 (Amila, 2012).

The results of the assessment of 50 patients diagnosed with non-hemorrhagic stroke were observed and found that 54-58% had aphasia which was confirmed using these two instruments. The total value of LAST as seen from its relationship with FAST in ischemic stroke aphasic patients for aphasia screening was analyzed using the Pearson test to see the relationship between the two assessments in ischemic stroke aphasic patients for aphasia screening. In addition, the correlation test between LAST and FAST has also been tested using the Spearman test which is seen from ordinal data to see the relationship between the two variables.

The results of previous studies examining the correlation between 3 instruments, namely FAST, MTTDDA (Minnetosa Test for Differential Diagnosis of Aphasia), and FCP (Functional Communication Profile) with a sample size of 25 post-stroke patients (3-6 weeks) with an average age of 67 show a positive correlation of the three measuring instruments with a significance value of the three measuring instruments is p <0.001 (Neill et al., n.d.). The results of another study looking at the relationship between FAST and SST (Sheffield Screening Test) to assess stroke aphasia with a sample of 50 stroke patients over six months found that there was a positive correlation between FAST and SST with a p<0.00 (Al-Khawaja et al., 1996). The results of research examining FAST as a simple tool for non-specialists have been tested for correlation with the Functional Communication Profile (FCP) in 50 post-stroke patients with an r-value of 0.87 (P<0.001) (Enderby et al., 1986).

In construct validity testing, in 50 patients with aphasia, FAST had a strong correlation with the Barthel Index (r = 0.59) and was very good in the comprehension subtest with the Sheffield Screening Test for Acquired Language Disorder (SST) (r = 0.74). The expression subtest correlates (r=0.92). The validity of FAST on the Functional Communication Profile (FCP) and the Minnesota Test to differentiate aphasia diagnoses, FAST has a very good correlation between the two instruments (r = 0.73 and r = 0.91) (Al-Khawaja et al., 1996; El Hachioui et al., 2017; Enderby & Crow, 1996).

The Language Screening Test (LAST) instrument was first developed by Flamand Roze in France for detecting aphasia in stroke patients. LAST which was developed by Flamand Roze was then harmonized and adapted to English (Flowers et al., 2015). The LAST instrument itself has been adopted from the English version of LAST which has been harmonized and a language interpretation test and expert test have been carried out on a neurologist taking into account the culture in Indonesia. The results of the Cohen's Kappa coefficient test between experts and researchers were carried out to measure the closeness of the two variables in the contingency table which were measured in the same category or to find out the level of agreement of the 2 judges in assessing ischemic stroke aphasia. The score test has been carried out and the results of the interrater of agreement test obtained a value of 98.67% with a Cohens kappa value of 0.97 which means it has a high agreement.

The results of this study were based on the Spearman statistical test to see the correlation between LAST and FAST in ischemic stroke patients for aphasia screening. It was found that the two instruments had a relationship with a significance value of 0.000 <0.05 and correlation coefficient of r value of 0.678, which means that it is a strong correlation. The correlation coefficient on these results is positive so the relationship between the two variables is unidirectional. A cohort study compared LAST with the Token Test of 101 (33-91 years) patients 11 days after stroke, 57% of whom were men. The measuring instrument was assessed based on the equivalence analysis of the two versions of LAST. Internal validation using internal consistency analysis and external validation using a short version of the Token test. The result is that the two equivalent LAST versions show a correlation coefficient of 0.91

(confidence interval 0.81-0.96). Furthermore, internal validation is accepted as evidenced by the Cronbach α value of 0.74. A significant correlation was found in the external validation indicated by the value of r = 0.74, p <0.0001 (Vanbellingen et al., 2016). LAST has retained the linguistic properties of the original version such as word frequency, number of words and sentence length, number of syllables, and consonant clusters in translation, as it has an impact on language performance (Ivanova & Hallowell, 2013).

The results of the assessment of 50 patients diagnosed with non-hemorrhagic stroke were observed and found that 54-58% had aphasia, which was confirmed using this instrument. We looked at the correlation of LAST and FAST in ischemic stroke aphasic patients to aphasia screening in ischemic stroke patients. LAST and FAST are generally considered simple, easy, and fast to use to assess aphasia in ischemic stroke patients. The LAST instrument consists of 5 sub-tests namely naming pictures, repeating words and sentences, speaking spontaneously, understanding, and following verbal commands where each component has a different value, namely 1-5 for naming pictures, 1-2 for repeating words and sentences, and 1 for speaking spontaneously, 1-4 for understanding pictures, and 1-3 for verbal commands. This instrument has several drawbacks, including not being able to assess when the patient has decreased consciousness, visual and hearing impairments (Flamand-Roze et al., 2011; Flowers et al., 2015; Vanbellingen et al., 2016; Yang et al., 2018). Whereas FAST has 4 sub-tests for aphasia screening which include image comprehension, pronunciation, reading, and writing (Enderby & Crow, 1986).

4.   CONCLUSION

LAST and FAST have a strong relationship with aphasia screening in ischemic stroke patients. The Spearman's Rank test obtained p-values of 0,000 and < 0,05 respectively. Meanwhile, the correlation coefficients of LAST and FAST on aphasia were 0,678 and 0,678 respectively. There is a relationship between the LAST and FAST in ischemic stroke aphasic patients for aphasia screening with a positive correlation. Nurses can use the LAST instrument to collect data and establish nursing diagnoses of verbal communication disorders. Finally, we realize that research regarding the LAST correlation tests in aphasic patients with ischemic stroke for aphasia screening is still very limited with a limited number of respondents.

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