
Difference in Language Switching Cost in Language Switching between Dominant and Weak Languages in Early Adult Javanese-Indonesian Bilinguals

Ratih Manggarsari, Margaretha

Universitas Airlangga, Indonesia

Email: ratihmanggarsari@gmail.com, margaretha@psikologi.unair.ac.id

ABSTRACT

This replication experiment study examines the asymmetric cost of language code switching in bilingual Javanese-Indonesian and tests the suitability of the cost pattern with the inertial task set hypothesis. Participants consisted of 72 students (49 women, 23 men; aged 20–23 years) who were native Indonesian speakers with Javanese as a second language (L2) or vice versa. The experiment was carried out using a Microsoft Excel-based program to pronounce numbers in both languages. The response records were analyzed to measure the reaction time (in seconds) of the correct responses. Reaction times for incorrect answers were excluded from the analysis. The average reaction time was analyzed using ANOVA and paired sample t-tests with SPSS version 22. The results showed that there was no significant difference in code transfer costs in the transition from L1 to L2 and vice versa, either in the group with the dominant Indonesian language (L1→L2: $M = 0.62$ s, $SD = 0.12$; L2→L1: $M = 0.62$ s, $SD = 0.11$; $t = 0.24$, $p = 0.98$) or Javanese (L1→L2: $M = 0.59$ s, $SD = 0.11$; L2→L1: $M = 0.59$ s, $SD = 0.11$; $t = 1.05$, $p = 0.3$). However, a significant difference was found between mentions with code transfer ($M = 0.61$ s, $SD = 0.11$) and without code switching ($M = 0.57$ s, $SD = 0.1$; $t = 3.88$, $p = 0.00$). These findings do not support the task set inertia hypothesis and indicate balanced bilingual characteristics in the study subjects.

Keywords: bilingual, language switching, language switching fee

INTRODUCTION

Humans use language to communicate with others. Language is a human ability that allows us to exchange meaningful messages through discourse and text, which are structured according to the rules and conventions of a particular language that we impose together with others (Jackson & Stockwell, 2023). From the explanation of the term, it is clear that every human being needs to know at least one language. But what about people who can speak more than one language? Romaine (2021, in Bialystok, 2022) states that there are about 6700 languages in the world, while there are only about 200 countries. This provides a huge space for linguistic diversity within one place. In the last 20 years, there has been a drastic increase in the number of studies on bilingualism (Anjani, 2021). One of the main reasons is that more researchers recognize bilingualism (the presence of two or more languages) as much more common than previously thought, and even as the norm in society (Dewaele, Housen, & Wei, 2021). Bilingualism (or multilingualism), using more than one language interchangeably, is a reality of life in Indonesia. Why is that? Historically, Indonesian as the national language was only established on October 28, 1928. One reason for its creation was to serve as a communication language that allows people from different regions to understand each other (Language Development and Development Agency, t.yrn). This is because until then, Indonesians still spoke the regional languages of their respective tribes or places of origin (Bathia & Ritchie, 2021).

Uniquely, Indonesians still maintain the use of their respective regional languages, even though there is now a “*unifying language*” officially used in various contexts as the state language, the language of instruction in education, national transportation means, and others (Central Statistics Agency, 2024). The Language Center noted that there are at least 746 regional languages in Indonesia, and 420 of them have been clearly mapped in terms of the number of speakers, dialect varieties, and usage in daily life (Launch of the Indonesian Language Map, 2022). In Indonesia, the island of Java is one of the most populous islands. On Java, there are various tribes and regions with diverse cultural attributes, and therefore many different languages. In East Java province, the recorded regional languages used include Javanese, Tengger Language, Madura Language, Javanese Osing, and Kangean Language (Paryono, 2020). According to the Indonesian population census in 2010, Javanese is quite dominant in East Java, and its inhabitants still use it in various circumstances, including conversations within the home environment (Central Statistics Agency, 2020). From this explanation, individuals living in East Java are exposed simultaneously to two languages: Javanese, the regional language, and Indonesian, the official state language. Individuals who use two languages interchangeably can be referred to as bilingual individuals (Weinreich, 2021). For clarity, the author will use the term bilingual for individuals who speak two languages (Bialystok & Craik, 2010; Gross 2010a, 2010b; Harris, 2021).

Bilingualism as a field of study is complex. Researchers examine it through various dimensions, such as age, social status, memory organization, and fluency (De Groot, 2023). A debated dimension among linguists is fluency. Some experts argue that a person is bilingual if they have second language fluency equivalent to native speakers, such as Bloomfield (2023). However, others like Haugen (1953) and Diebold (1961) avoid such absolute definitions. Ultimately, bilingual individuals are people who use two languages interchangeably (Weinreich, 2021).

One interesting aspect of bilingual language use is that bilingual individuals can switch between two languages in which they are fluent. Bilinguals who are fluent can generally choose their language well and keep the two languages separate (Meuter & Allport, 2020). This suggests that bilinguals have a control system regulating language output and input to avoid interference during conversation (De Groot, 2021).

This control system refers to a brain mechanism involved in processing language production, both in storage and production (e.g., oral speech). De Groot (2021) explained that controlling language in the brain requires organizing each linguistic knowledge (lexical items) into language systems. For example, lexical items are like books containing knowledge in different languages, and language systems are bookshelves. The brain sorts and stores each book on the correct shelf, effectively distinguishing units belonging to one linguistic subsystem from another.

Meuter and Allport (2020) describe that in choosing which language to use, bilinguals undergo *language switching*. This cognitive process involves inhibition, a function of executive control in the prefrontal cortex (Goldstein & Naglieri, 2024). Inhibition suppresses distractions

so individuals can focus on relevant information and suppress habitual impulses to respond adaptively to environmental stimuli (Dillon & Pizzagalli, 2024). Bilinguals inhibit one language system not in use, allowing the other language system to be expressed. For example, a Javanese-Indonesian bilingual saying "I want to eat" in Indonesian inhibits the Javanese system to produce the words in Indonesian (Kementerian Pendidikan dan Kebudayaan Republik Indonesia, 2013).

However, Meuter and Allport (2021) note that language switching has a *cost*—a behavioral impact manifesting as increased reaction time. When bilinguals switch languages, they respond more slowly to stimuli compared to using a single language without switching. Further, non-balanced bilinguals with differing fluency show different response times when switching from dominant to weak language versus vice versa.

Research by Meuter and Allport (2020) has limitations. One major drawback is their sample: 16 volunteers (11 women, 5 men) aged 23–44, which spans early and late adulthood stages (Santrock, 2020). Their subjects spoke English as either dominant or weak language, but the second language varied (French, German, Italian, etc.), restricted only to European languages. This study aims to improve consistency by focusing on more uniform subjects.

Bilinguals can control speech production well when environment demands only one language (Meuter & Allport, 2024). Yet, regulating oral production when switching languages leads to longer reaction times due to cognitive processing (Meuter & Allport, 2021).

A review by Kroll et al. (2020) concludes that inhibition plays a role in language selection, especially in speaking. Inhibition is a subcomponent of executive function, which encompasses goal-oriented prefrontal cortex control (Best, Miller & Jones, 2009 in Nagileri, 2024). Lezak (2023, in Nagileri, 2024) describes executive function as cognition that governs *how* and *whether* a person performs actions. Definitions of subcategories like inhibition vary; Goldman-Rakic et al. (2021, in Nagileri, 2022) define inhibition as resistance to automatic tendencies. This explains inhibition's role in suppressing the non-target language during language selection. Kroll and colleagues (2023) found that both languages are activated during speech production in bilinguals, with strong evidence of competition between languages. Inhibition counters the unwanted language tendencies.

Recent fMRI studies by Weissberger et al. (2020) show bilinguals efficiently inhibit unused language systems, managing distractions especially in contexts requiring use of only one language.

Because of the inhibition process, bilinguals' response times to stimuli sometimes increase (Meuter & Allport, 2023). Their experiments found inconsistent response times when switching between languages, explained by unbalanced bilingualism (De Groot, 2021). Meuter and Allport (2026) call the dominant language L1 and the weaker language L2. They found switching from L1 to L2 is faster than from L2 to L1. This is because inhibition effects are stronger on L1 due to its dominance.

Meuter and Allport (2023) explain the *task set inertia hypothesis*: inhibition from a prior task affects subsequent tasks. When switching from L1 (dominant) to L2, much effort inhibits

L1. Since L1 is habitual, the brain strongly favors it. Returning to L1 after using L2 is slower because inhibition of L1 remains. This paradox appears in other task switch studies (Macleod, 2025).

They argue that bilingual fluency similarity affects response time discrepancies—the closer fluency levels in L1 and L2, the smaller the response time gap.

To answer the research problem, the study sets the following limits: *bilingualism* defined per the Great Dictionary of Indonesian as mastery of two languages; here, following Weinreich (2023), bilingual individuals use two languages alternately. Subjects use Indonesian and Javanese (unspecified regional dialects). *Language selection* involves cognitive processes controlling language (De Groot, 2021), with strong evidence of competition during oral production (Kroll, Bobb, Misra, & Guo, 2024). The brain allows only the intended language while retaining the unwanted one. *Language switching costs* refer to the time taken for oral production to transition between languages (De Groot, 2025), measured in seconds or milliseconds. *Early adulthood* refers to ages 18 to 25, a phase of transition and exploration between adolescence and adulthood (Santrock, 2021).

The research questions are: Is there a difference in *language switching cost* during transitions between L1 and L2 in naming tasks for early adult Javanese-Indonesian bilinguals? Does the pattern follow the *task set inertia hypothesis*, where switching from L1 to L2 is faster than the reverse?

This study aims to examine differences in *language switching costs* between dominant and weak languages in naming activities among early adult Javanese-Indonesian bilinguals pursuing undergraduate education at a public university in Surabaya. It also aims to verify if the pattern aligns with the *task set inertia hypothesis*. The research is expected to contribute theoretically to psycholinguistics and bilingual processing—especially in Indonesia’s unique bilingual context—and practically to educators, speech therapists, and language policy makers by enhancing understanding of cognitive language control for better educational and intervention strategies.

METHOD

The type of research is an important step in designing a study, as it influences the research method used. This study employed an experimental method, involving experiments to test hypotheses (Nasution, 2021). The researcher used this approach to examine the pattern of *language switching costs* in language selection, requiring strict control over variables to test the hypothesis. A computer program was used as the data collection tool.

The experimental design was a pre-experiment, as there was no control group and samples were obtained through non-probability sampling. Specifically, this study followed a One Shot Case Study design (Yusuf, 2021). The stimulus was presented randomly, with approximately one thousand trials. All subjects received the same treatment, although they belonged to two groups: those with Javanese as L1 and those with Indonesian as L1.

Variables refer to phenomena that vary in form, quality, or quantity (Bungin, 2021). This study focused on one variable: language switching cost. According to De Groot (2023), language switching cost is a key dependent variable in language switching research. It refers to the time taken by subjects to respond to stimuli, measured in milliseconds. The researcher aimed to determine whether the pattern of language switching costs aligned with the *task set inertia* theory.

Sampling used a non-probability purposive technique to select subjects with specific characteristics relevant to the research objectives (Nasution, 2021). Screening was conducted via a form, selecting individuals fluent in Javanese and Indonesian who did not speak other languages (to avoid multilingualism) and who used these two languages in all life domains.

Data analysis included descriptive statistics to characterize the data, normality testing with Kolmogorov-Smirnov, and homogeneity testing with Levene's Test for parametric assumptions. A paired-sample t-test was applied to compare switching costs between L1-to-L2 and L2-to-L1 transitions. Additionally, independent sample t-tests and one-way ANOVA were conducted to examine differences based on demographic and linguistic participant characteristics. All analyses were performed using SPSS version 22 with a significance level of $\alpha = 0.05$.

RESULTS AND DISCUSSION

Descriptive statistical analysis

Descriptive analysis is carried out so that the researcher can get an overview of the research data. This analysis provides insights into mean, standard deviation, skewness, and kurtosis (Pallant, 2021). Mean is the average; it is obtained from summing the total value of the data and dividing it by the amount of data. The standard deviation is obtained from measuring the average distance between the value and the average. Skewness is a measure of degrees that indicates when the distribution of data is symmetrical or squint. Kurtosis is a measure that indicates a steep decline in the distribution of data.

Table 1. Descriptive Analysis of Average Reaction and Error Time

Variable	M(SD)	Min	Max	Skewness (SE)	Kurtosis (SE)
Mtotal	,59 (.11)	,36	,82	,07 (.28)	-,16 (.55)
MP	,61 (.13)	,31	,87	-,02 (.28)	-,05 (.55)
MTP	,57 (.12)	,34	,78	,17 (.28)	-,08 (.55)
Mindo	,58 (.12)	,36	,86	,24 (.28)	-,06 (.55)
Mjawa	,6 (.13)	,29	,81	-,10 (.28)	-,07 (.55)
MerP	12,08 (1,68)	0	91	3,031 (.28)	13,25 (.55)
MerTP	16,47 (2,15)	0	32	3,86 (.28)	21,98 (.55)

Information:

N = 72. M= Mean, SD= Standard Deviation, SE= Standard Error, MTotal= Mean of all data, MP= Mean of Language Switching, MTP= Mean without Switching, MIndo= Indonesian Mean, MJawa= Javanese Mean, MErP= Mean Error Switch, MErTP= Mean Error Without Switching The data is presented in seconds. A high value indicates slower results.

Table 1 provides an overview of the average of several data, namely: the reaction time of the subject in general, the reaction time when switching languages, the reaction time when not changing languages, the reaction time in the pronunciation of Indonesian, the reaction time of the pronunciation in Javanese, and the number of mistakes made by the subjects, both during the language switch and without the switch. It is suspected that the average of the total data from 72 subjects of this study is 0.595 seconds.

Normality Test

This study aims to examine the difference between the reaction time of the transition from the dominant language to the learnh language and vice versa. To do this, the statistical processes that need to be carried out at SPSS are ANOVA and T-test. Both processes can only be carried out when several assumptions tests are met (Pallant, 2021). One of the tests of these assumptions is that the data used has a normal data distribution. Therefore, the researcher conducted a normality test with the following results:

Table 2. Normality Test Average Reaction Time and Error

Variable	Kolmogorov-Smirnov
	<i>P</i>
MTOT	.20
MP	.20
MTP	.20
MIND	.20
MJA	.20
MERP	.00
MERTP	.00
Information:	
N = 72. MTOT= Mean of all data, MP= Mean of Language Switching, MTP= Mean Without Transition, MIND= Mean of Indonesian, MJA= Mean of Javanese, MERP= Mean of Error of Transition, MERTP= Mean Error Without Transition, p= significance, Normality is significant on $p > 0,05$.	

Based on Table 2, we can see that most of the research data is a normal data distribution, with two exceptions. The distribution of error data made by the subject, both at the time of language switching and not is classified as abnormal. When referring to the Table. 4.3 (which presents descriptive data) The researcher can conclude that the data is too skewed to the right (positive) with skewness above 3. This means that many research subjects repeatedly perform saaahs during the experiment, especially when there is a language switch.

Homogeneity Test

As mentioned earlier, before researchers can test data using ANOVA and T-Test, researchers need to perform a series of assumption tests. In addition to normality, another assumption test that must be carried out is the homogeneity test, using the equality of variances test by Levene (Pallant, 2021). The distribution of the data used must be homogeneous. In this

homogeneity test, the researcher will test variables based on demographic characteristics and language characteristics. The results of the homogeneity test are as follows:

Table 3. Homogeneity Analysis of Average Reaction Time and Error based on Demographic Characteristics

	<i>P</i>						
	MTotall	MP	MTP	MIndo	MJawa	MErP	MErTP
Gender	,63	,63	,37	,81	,94	,04	,12
Age	,65	,74	,87	,90	,53	,33	,30
Place of Birth	,21	,99	,95	,29	,2	,90	,94
Move	,45	,51	,92	,72	,10	,05	,10
Moving Frequency	,56	,07	,43	,80	,10	,20	,43
Place of Living	,56	,07	,43	,80	,10	,20	,43

Information:

N = 72. MTotall= Mean of all data, MP= Mean of Language Transition, MTP= Mean without transition, MIndo= Indonesian Mean, MJawa= Javanese mean, MErP= Mean of transition error, MErTP= Mean of Error without transition. Homogeneous when $p > 0,05$.

Table 4. Analysis of Average Homogeneity, Reaction Time and Error based on Language Characteristics

	<i>p</i>						
	MTotall	MP	MTP	MIndo	MJawa	MErP	MErTP
Dominant Language	,18	,75	,10	,80	,07	,16	,40
First Language	,38	,77	,25	,78	,09	,17	,03
Consistency	,32	,64	,38	,50	,31	,35	,50
Learnt Language	,23	,59	,82	,29	,60	,07	,47

Information:

N = 72. MTotall= Mean of all data, MP= Mean of Language Transition, MTP= Mean without transition, MIndo= Indonesian Mean, MJawa= Javanese mean, MErP= Mean of transition error, MErTP= Mean of Error without transition. Homogeneous when $p > 0,05$.

From the data obtained from Tables 3 and 4, it is known that the data used in this study are homogeneous, both from the demographic characteristics, and from the language

characteristics of each subject. However, in carrying out this homogeneity test, there is one demographic characteristic that cannot be used to conduct a homogeneity test, namely ethnicity. This is because the variation is only found in one character, namely "Javanese" while there is only one subject in the other two tribes. However, the results presented in the table show that the data in this study are homogeneous. Thus, researchers can use ANOVA and T-test as data processing methods to test research hypotheses.

Differential Test

Hypothesis Test

The following is a paired sample T-test analysis that aims to test the research hypothesis, namely the difference in the cost of language switching in the transition from the dominant language to the weak language and vice versa, in bilingual Indonesian Javanese individuals. The paired sample t-test is used because the data is obtained from the same group of subjects (Pallant, 2021).

Table 5. Differential Test Language Switching Cost Move from L1 to L1 L2

		L1 to L2	L2 to L1
Dom Indo	Mean	,62	,62
	SD	,12	,11
	t	-0,2	
	p	,98	
Dom Jawa	Mean	,59	,59
	SD	,11	,11
	t	1,05	
	p	,3	
Keterangan:			
N = 72. Signifikan apabila p < 0,05.			

From the results obtained from the table above, it is concluded that there is no significant difference between the two switches. This means that the working hypothesis of this study is rejected and the null hypothesis is accepted. More clearly indicated by a p-value higher than 0.05. In addition, the value of t indicates a magnitude that is quite close to 0 (further supporting the accepted null hypothesis). However, the researchers explored further the existing data from the experiments that had been conducted.

Table 6. Switching and Non-Switching Reaction Time Difference Test

	Switching	Without Switching
Mean	,61	,57
SD	,11	,10
t	3,88	
p	,00	
Information:		
N = 72. Significant if p < 0,05.		

First, the researchers wanted to see if bilingual individuals took longer to perform oral propositions when they were required to make language switches. The results presented showed that the average time it took for an individual to make a verbal mention when he was not required to switch languages was less (he could react quickly) than when he needed to switch. In addition, the difference is significant, characterized by a p value of 0.000, as well as a t value that is far from 0. This result is indeed expected. Individuals who need more time to do the language selection process are logical. This is also in line with findings from reference studies (Meuter & Allport, 2021), which presented data that their experimental subjects took less time to perform verbal production on stimuli without displacement, both in dominant and weak languages.

Table 7. Test of Difference in Reaction Time for Pronunciation in Indonesian and Javanese

	Indonesian	Javanese
Mean	,58	,60
SD	,10	,11
t	1,24	
p	,21	

Keterangan: $N = 72$. Signifikan apabila $p < 0,05$.

From the data presented above, it appears that although the subjects of this study showed logical and predictable results in the previous difference test (between switching and without switching), this study subject showed unusual results when the researcher conducted a difference test that compared the reaction time in Javanese and Indonesian. In Table 4.9, the significance of the difference is 0.217, which means that it is insignificant. The subjects of this study have more or less the same speed in producing spoken words in both languages. In addition to using a test that is different from the t -test, the researcher also uses a one-track ANOVA to study mean differences based on the characteristics of the subject, both demographic characteristics, and those related to language. The results of the analysis are as follows:

Table 8. Total Mean Difference Test, Transition, No Transition, Indonesian Mention, Javanese Mentions Based on Gender and Age

		Gender			Age				
Variable		L	P	Total	20	21	22	23	Total
MTOT	M	,62	,58	,59	,59	,59	,60	,60	,59
	SD	,10	,10	,10	,09	,12	,10	,10	,10
	p	,20			,99				
MP	M	,58	,63	,61	,61	,60	,63	,62	,61
	SD	,12	,11	,11	,12	,12	,09	,11	,11
	p	,07			,77				

		Gender			Age				
Variable		L	P	Total	20	21	22	23	Total
MTP	M	,55	,59	,58	,58	,57	,59	,56	,58
	SD	,09	,11	,10	,11	,11	,09	,10	,10
	<i>p</i>		,16				,83		
MJA	M	,62	,59	,60	,60	,60	,60	,61	,60
	SD	,10	,11	,11	0,12	,12	,10	,12	,11
	<i>p</i>		,22				1,00		
MIND	M	,61	,58	,59	,58	,58	,60	,60	,59
	SD	,11	,10	,10	,09	,12	,12	,10	,10
	<i>p</i>		,25				,92		

Note: N=72. MTOT= Mean of all data, MP= Mean with Language Switching, MTP= Mean without Language Switching, MIND= Mean Indonesian Language, MJA= Mean Javanese Language. Significant if $p < 0.05$.

Tabel 9. Uji Beda Mean Total, Peralihan, Tanpa Peralihan, Penyebutan Indonesia, Penyebutan Jawa Berdasarkan Bahasa Dominan, Bahasa Pertama, dan Konsistensi Bahasa

		DOM			FIRST			CONS		
Variable		IN	JA	Total	IN	JA	Total	KONS	TKONS	Total
MTOT	M	,60	,58	,59	,61	,58	,59	,58	,61	,59
	SD	,09	,11	,10	,09	,11	,10	,09	,11	,10
	<i>p</i>		,35			,23			,23	
MP	M	,64	,57	,61	,63	,59	,61	,61	,61	,61
	SD	,11	,11	,11	,11	,11	,11	,12	,10	,11
	<i>p</i>		,01			,19			,89	
MTP	M	,60	,54	,58	,59	,56	,58	,58	,57	,58
	SD	,11	,08	,10	,11	,09	,10	,11	,09	,10
	<i>p</i>		,02			,26			,59	
MJA	M	,61	,59	,60	,62	,57	,60	,60	,60	,60
	SD	,11	,11	,11	,10	,11	,11	,11	,12	,11
	<i>p</i>		,42			,04			,86	
MIND	M	,60	,57	,59	,59	,59	,59	,57	,62	,59
	SD	,09	,12	,10	,09	,12	,10	,09	,11	,10
	<i>p</i>		,35			,91			,03	

Note: N=72. MTOT= Mean of all data, MP= Mean with Language Switching, MTP= Mean without Language Switching, MIND= Mean Indonesian Language, MJA= Mean Javanese Language, Significant if $p < 0.05$.

Table 10. Total Mean Difference Test, Transition, No Transition, Indonesian Mention, Javanese Mentioning Based on Number of Languages Studied

		Number of Languages Learned							
Variable		2	3	4	5	6	7	8	Total
MTOT	M	,58	,60	,56	,68	,68	,56	,65	,59
	SD	,02	,10	,11	,06	,08			,10
	<i>p</i>					,10			
MP	M	,65	,60	,62	,66	,60	,62	,53	,61
	SD	,15	,12	,12	,07	,06			,11
	<i>p</i>					,91			
MTP	M	,61	,56	,59	,66	,51	,58	,58	,58
	SD	,13	,10	,11	,11	,06			,10
	<i>p</i>					,39			
MJA	M	,62	,59	,56	,71	,71	,53	,65	,60
	SD	,02	,10	,12	,07	,09			,11
	<i>p</i>					,04			
MIND	M	,54	,60	,55	,65	,65	,58	,64	,59
	SD	,06	,11	,10	,07	,10			,10
	<i>p</i>					,27			
Note: N=72. MTOT= Mean of all data, MP= Mean with Language Switching, MTP= Mean without Language Switching, MIND= Mean Indonesian Language, MJA= Mean Javanese Language. Significant if p < 0.05.									

From the presentation of tables 8, 9, and 10, it is known that most of the difference tests do not show significant differences. However, there are some exceptions, namely in the results of pronunciation in Indonesian seen from the consistency of the first language and the dominant language. Subjects with consistent language showed significantly faster results ($p = 0.03$). Another result that was seen was that individuals with the dominant Javanese language showed significantly faster reaction times compared to the dominant Indonesian subjects in mentions with transitions, without transitions, and in Javanese.

The difference test based on the number of languages that have been learned did not show significant differences, except for the mention in Javanese. The researchers also did not see a pattern indicating that learning more languages could hinder or make it easier for individuals to make spoken pronunciation and language switching quickly.

Discussion

From the presentation of the results of the research in the previous section, it is known that the working hypothesis of this research is not accepted. This means that there is no difference/incongruence when the subject of this study switches the language from the

dominant language to the weak language and vice versa. In addition, the working hypothesis that the cost pattern of language switching will follow the task set inertial theory is also not proven.

In a reference study conducted by Meuter and Allport (2021), it was stated that one of the factors that can affect the cost of language switching when bilingual speakers switch languages is the level of fluency. More precisely, if the subject's level of fluency in the dominant language far exceeds the fluency of the weak language, the difference in reaction time will be even greater. On the other hand, if the level of fluency of the two languages is similar, then the difference in reaction time between the two will be small. Individuals who have the same level of fluency in the two languages they use are called balanced bilingual.

When the researcher conducts the experiment, there is an assumption that the phenomenon will occur. Finding balanced bilingual individuals in a population is a possibility. However, the findings of this study show that as a group, the subjects of this study showed balanced bilingual characteristics. More precisely, as a group, the subjects of this study had a reaction time that did not differ significantly. From the previous presentation, it can be seen that language fluency is a factor that affects the pattern of language switching costs in bilingual individuals.

This finding is even more interesting because balanced bilingual individuals are difficult to find/determine. This is explained by Hugo Beardsmore (1986, p. 9) in his book, *Bilingualism: Basic Principles*. He explained that balanced bilingualism, or it can also be called equilingualism, occurs when the mastery of two languages is roughly equal, and this ability is also equivalent to monoglot speakers of the two languages.

In his book, Beardsmore cites the explanation from Fishman and colleagues (2022, in Beardsmore, 2023) that bilinguals are rarely equally fluent in two languages. He said that it is rare for a speaker to be equally fluent in all topics in two languages at once. What's more, Dornik (2020, in Beardsmore, 2021) explains that a person can be seen to have balanced bilingualism on the surface, but an evaluation of impressionistic abilities in two languages, and stress, fatigue, emotional disturbances will bring out hidden imbalances.

The data shows that the data distribution for the number of errors made during the experiment is abnormal, with a squint to the right. This shows that most of the study subjects make a large number of mistakes. The data can be evidence that although the subjects showed more or less the same reaction time, they were not bilingual equivalents, because they made many pronunciation errors.

The researchers consider that Indonesian society, and the subjects of this study in particular (mostly women, from East Java and highly educated), have special characteristics that affect their reaction time. In acquiring the language they speak, these bilinguals can be influenced by the environment in which they live and develop. This is in line with Bronfenbrenner's theory of ecological systems.

In this case, the researcher examines the things that lie in the macro system and chronosystem in the subject's life, namely state policy and the history of the Indonesian State

related to the language used by the people. Historically, Indonesian, which is the official language of the state, is not the first language of the Indonesian people. Before 1950, most people used their respective regional languages to communicate. Until 1950-1980 the government aggressively promoted the use of the Indonesian language, one of which was through education.

Nowadays, people use Indonesian widely, especially in urban areas. This was followed by a decline in Javanese speakers. An interesting thing stated by Poejosoedarmo (2021, in Cohn & Ravindranath, 2022) is that many people are not proficient in using the levels in Javanese. Until now, if you want to talk to an older person or politely, people use Indonesian

In short, even though Javanese is a social language that is used in a familiar atmosphere or used in a household, Indonesian people can no longer use the level of politeness/krama. The researcher concluded that this can affect the research subjects to be able to transfer languages between Java and Indonesia; they use Javanese with friends and family at home, but in the official and public spheres, they switch to Indonesian because they cannot use Javanese Krama and (in academic cases) are required to use the national language. The cost of language transfer in the subjects of this study can be caused by the subject's life which makes them very accustomed to changing languages or even using two languages in the same area of life.

In addition to an explanation from the sociological side of the subject, the researcher found the results of a study that can explain why this study shows insignificant differences in the transfer of L1 to L2 and vice versa. A study by Calabria and colleagues explained the difference in the results of switching research between proficient and low-proficient bilingual subjects. This study cites research conducted by Meuter and Allport (2021) complete with the results obtained as well as the task set inertia hypothesis and agrees with the findings. However, Calabria and colleagues further explained that the subject of Meuter and Allport (2021) was an incompetent subject, because there was a difference in fluency between the two languages, with L2 having a (more) lower level of fluency.

Calabria and his friends explained that there was a type of bilingual who was proficient in the languages he knew, they called him proficient bilingual. When studied, the proficient bilingual group did not show incongruence/asymmetry in their language switching costs, regardless of the difficulty level of the languages in the task set. More precisely, when ordered to make a switch between the two languages he or she mastered, this group showed an equivalent language switching cost at the L1 to L2 switch and vice versa.

Calabria and his colleagues suspect that this happens because bilingual people are proficient in using different language control mechanisms than non-bilingual people in language transfer activities. In their study, they also used two types of tasks switching tests, lingual and non-lingual, to study the relationship between the language control process and executive control (using executive functions). If the results of the two tests are not related, then they will prove that the language control process in proficient bilinguals is not under the influence of executive functions. In other words, if proven, then the task set inertia hypothesis does not apply to skilled bilingualists.

They suspect that when an individual's fluency in his L2 reaches a certain level, the bilingual individual does not even need to use inhibition to hold his L1. Their suspicion is that bilinguals use mechanisms that inhibit the occurrence of lexical competition in the brain. However, from the results of their research, the data obtained are not strong enough to confirm whether the control process of proficient bilingual language is separate from executive control. Unfortunately, the results of Calabria and his colleagues' research cannot be immediately used to explain the results of this study. The biggest reason is that in this study there is no measurement method that measures task switching that only measures executive functions.

To dig deeper, the researchers looked at the study population broadly and examined the differences in the average perceived from their backgrounds, i.e. demographic characteristics, as well as their language characteristics. In the sex-based difference test, there was no significant improvement in the average reaction time, although female subjects were slightly faster

These results seem to support a theory that women have superior verbal performance than men. This was raised by a meta-analysis study conducted by Janet Hyde and Marcia Linn in 1988. They collected 165 studies, with a total of 1,418,899 subjects to analyze and summarize. They found a weighted mean effect size (d) of +0.11, slightly higher in women. According to them, the difference was so small and close to zero that their zero hypothesis was accepted, that there was no significant difference between the verbal abilities of women and men. However, most of the subjects of the study are from the United States, and the study is already more than 20 years old, so the findings are likely irrelevant.

Based on age, the average results showed no significant difference. This is because the age range of the research subjects is in the same stage of development, namely early adulthood, which is 18-25 years old. Researchers think demographic characteristics may have a role in causing the same reaction time patterns in Indonesian and Javanese. Given that most of the research subjects are students, in the early adult age range, they come from East Java, and the majority are women.

In addition to these factors, things that are thought to cause significant differences do not show prominent results, either from the dominant language factor, the first language, or the consistency of the language. However, individuals who have the same dominant language as their first language, have a slightly faster average time. Another thing that can be seen is that individuals who have Javanese as their dominant language have a relatively faster reaction time than those who have the dominant language of Indonesian.

CONCLUSION

The study of early adult bilingual Javanese-Indonesian individuals, mostly female students aged 20–23 from East Java, found no significant difference in language switching costs, and the observed switching cost pattern did not support the *task set inertia* hypothesis; thus, the working hypotheses (Ha1 and Ha2) were rejected. This outcome is likely due to the participants' comparable fluency in both languages, enabling them to perform verbal retrieval

in roughly the same time regardless of switching. Participants pronounced numbers significantly faster when not required to switch languages, and those whose dominant language matched their first language reacted more quickly than those with differing dominant and first languages. Future research should explore how varying levels of language dominance and balanced bilingualism influence switching costs, possibly with a more diverse sample and including neurological measures to better understand cognitive mechanisms underlying language control.

REFERENCES

- Anjani, I. (2021, Agustus 31). Mata Pelajaran Bahasa Asing Di SMK Perlu Diberi Ruang Dalam Kurikulum. Dipetik November 8, 2017, dari Web Direktorat Pembinaan SMK Direktorat Pendidikan Dasar dan Menengah Kementerian Pendidikan dan Kebudayaan: <https://psmk.kemdikbud.go.id/konten/1860/mata-pelajaran-bahasa-asing-di-smk-perlu-diberi-ruang-dalam-kurikulum>
- Badan Pusat Statistik. (2012). Penduduk Indonesia: Hasil Sensus Penduduk 2010. Jakarta: Badan Pusat Statistik Indonesia.
- Bathia, T. K., & Ritchie, C. W. (2021). Handbook of Bilingual. Oxford: Blackwell Publishing.
- Bialystok, E. (2010). Bilingualism. WIREs Cogn Sci, 1, 559-572.
- Bialystok, E., & Craik, F. I. (2010). Cognitive and Linguistic Processing in the Bilingual Mind, 19(1). Current direction in psychological science,, 19-23.
- Calabria, M., Hernández, M., Branzi, F. M., & Costa, A. (2012). Qualitative Differences Between Bilingual Language Control and Executive Control: Evidence from Task-switching. Frontiers in Psychology, 2 (399), 1-10.
- Cohn, A. C., & Ravindranath, M. (2022). Local Languages In Indonesia: Language Maintenance or Language Shift? . Linguistik Indonesia, 131-148.
- De Groot, A. (2011). Language and Cognition in Bilinguals and Multilinguals: An Introduction. East Sussex: Psychology Press.
- Dillon, D. G., & Pizzagalli, D. A. (2021). Inhibition of Action, Thought, and Emotion: A Selective Neurobiological Review. Applied and Preventive Psychology, 12(3), 99-114.
- Goldstein, S., & Naglieri, J. A. (2022). Handbook of Executive Functioning. New York: Springer International Publishing.
- Gross, R. (2010). Psychology: the Science of Mind and Behaviour Book One. Yogyakarta: Pustaka Pelajar.
- Gross, R. (2010). Psychology: the Science of Mind and Behaviour Book Two. Yogyakarta: Pustaka Pelajar.
- Harris, L. C. (2021). Language and Cognition. Encyclopedia of Cognitive Science.
- Jackson, H., & Stockwell, P. (2011). An Introduction to the Nature and Functions of Language. New York: Continuum International Publishing Group.
- Kementerian Pendidikan dan Kebudayaan Republik Indonesia. (2013). Jendela Interaksi Kurikulum: Download Peraturan dan Kebijakan. Dipetik November 8, 2017, dari Website

- Kurikulum oleh Kementerian Pendidikan dan Kebudayaan Republik Indonesia: <http://kurikulum.kemdikbud.go.id/downloads>
- Meuter, R. F., & Allport, A. (2021). Bilingual Language Switching in Naming: Asymmetrical Costs of Language Selection. *Journal of Memory and Language*, 40(1), 25-40.
- Nasution, S. (2021). *Metode Research (Penelitian Ilmiah)*. Jakarta: PT. Bumi Aksara.
- Pallant, J. (2021). *SPSS Survival Manual*, 3rd. Berkshire: McGraw Hill.
- Paryono, Y. (2021, Oktober 19). Dialek-dialek Bahasa Jawa di Jawa Timur. (R. Manggarsari, Pewawancara)
- Santrock, J. (2011). *Life-span Development*, Thirteen Edition. New York: McGraw-Hill.
- Weissberger, G. H., Gollan, T. H., Bondi, M. W., Clark, L. L., & Weirenga, C. E. (2015). Language and task switching in the bilingual brain: Bilinguals are staying, not switching, experts. *Neuropsychologia*, 66, 193-203.
- Yusuf, M. (2021). *Metode Penelitian Kuantitatif, Kualitatif & Penelitian Gabungan*. Jakarta: Kencana.



© 2025 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY SA) license (<https://creativecommons.org/licenses/by-sa/4.0/>).