

Effect of Variables on Code-Switching Behavior for Bi-dialectal Chinese Speakers

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Abstract: Code-switching, the alternation between two or more languages or dialects in conversation, is a complex linguistic phenomenon influenced by various factors. This study examines how linguistic variables such as linguistic distance, cultural background, proficiency levels, negative relativity, and contextual triggers affect code-switching between local dialects and Mandarin Chinese. Through a quantitative analysis of data from bilingual speakers, the research found that linguistic distance did not significantly affect code-switching frequency, and cultural background showed no clear relationship to switching patterns. Proficiency levels were only vaguely related, indicating that higher proficiency might not consistently decrease code-switching occurrences. Notably, the cognitive control associated with frequent code-switching emerged as a significant factor impacting its frequency. Code-switching was common in short, fixed expressions like slang, proper nouns, interrogatives, and emotive interjections. Additionally, the interlocutor's code-switching often triggered a similar response from the other. These findings emphasize the role of contextual and cognitive factors in bi-dialectal communication, highlighting the adaptive nature of language use. The research contributes to understanding the nuanced dynamics of code-switching among bilingual speakers in China, which intends to offer insights into the influence of both social interaction and cognitive control on code-switching behavior.

Keywords: code-switching behavior, dialectometry, sociolinguistic variables, cognitive control, contextual trigger

1. Introduction

Code-switching, broadly speaking, refers to switching between two or multiple languages or dialects in spoken communication [1]. While much previous research has mainly focused on converting expressions between two or multiple vastly different languages, few have analyzed the interplay between dialects in a certain country.

1.1. Geographic Distribution Map of Chinese Dialects

The distribution map of linguistic groups in Figure 1 shows where 20 dialects are spoken in China. In our present research, we mainly focus on Mandarin and Southern dialects, which encompass 6

subtypes as marked by the red box line. Mandarin dialects are predominantly spoken in northern regions of China, extending from the east to the central and western areas. In contrast, Southern dialects are primarily found along the southeastern coast. Mandarin dialects are somewhat mutually intelligible with each other but not with Southern dialects. On the other hand, Southern dialects often lack mutual intelligibility with each other and with Mandarin dialects, with mutual intelligibility being significantly lower within the Southern branch than the Mandarin branch [2,3].



Figure 1: Approximate geographic locations of the 9 Chinese dialects (Mandarin and other 6 Southern dialect subtypes) targeted in the present study (Adapted from <https://www.loc.gov/item/90686002/>)

1.2. Classification of Code-Switching

In terms of classification, code-switching was categorized into three major types by many researchers, including Tenes et al. [4]. The three major types are compensatory, preferential, and pragmatic code-switching. Compensatory code-switching designates code-switching done out of necessity. In other words, when someone cannot express an idea or meaning in one language, they must use another. Preferential code-switching refers to unconscious code-switching usually because one language will feel more *natural* to the speaker. Finally, pragmatic code-switching is a rather conscious switching. Even when the speaker knows how to express something in one language, they will intentionally switch to another language because they believe the other language will be better for their particular expression or to create a special effect.

1.3. Systematic Review of Variables

Investigations of the relationship between code-switching and language proficiency should look beyond single-language contexts to consider code-switching behavior in contexts where code-switching is welcomed [5]. Thus, it is also a target variable possibly at play that resulted in the code-switching behavior. Fishman [6] states, "Obviously, since language can be used to express one's

identity, the identity imposed by one's group membership is a crucial factor in language choice." Using two languages instead of one group membership symbol demonstrates ethnic identity [7]. This viewpoint strongly suggests that while code-switching, an individual might be influenced by sociolinguistic factors. Cognitive study [8] has shed light on the assumption that code-switching in bilingual children might involve the same cognitive control mechanisms as code-switching in bilingual adults, which implies that the age of interviewers in our following qualitative research might not be an interference factor when it comes to assessment of cognitive control. Asymmetry is a major factor we must consider while conducting our following study, as previous research has indicated that code-switching from Dutch to Frisian demands more cognitive control than vice versa [8]. Moreover, the conversation context seems to significantly influence the interlocutor's decision to code-switch [9]. Studies carried out between the mid-1930s note that nouns are the most common code-switches through observation of bilingual children [10], which indeed very much ties into the possibility that certain words are better represented in one language or dialect than in another [9]. In the interview section of our research, we will elaborate on the procedure to corroborate these hypotheses.

1.4. Purpose of the Present Study

To fill the void of dialectometric, this paper aims to look into how sociolinguistic variables affect dialect code-switching behavior among Chinese from the perspectives of linguistic distance, social background, proficiency level, and specific context that triggers the code-switching behavior. To delineate our points of view, the following sections will focus on our research procedure, the results and findings we retrieve from the following empirical experiments, and overall conclusions with insights into those variables' implications.

2. Methodology

2.1. Questionnaire

To collect quantitative data relating to the various aforementioned variables, this study resorted to using a questionnaire distributed via the Chinese social media platform *WeChat*. Participants of this questionnaire were predominantly tourists around the Beijing Yanqi Lake area, who the researchers reached out to personally. All participants spoke Mandarin along with another dialect of Chinese and consented to partake in the research. The questionnaire itself consisted of 22 questions designed to (1) collect basic information regarding the participants, (2) evaluate the participants' thoughts on the topic of code-switching, and (3) gather self-reported data on the variables of interest for this research. As many of the pertinent sociolinguistic variables in this study are qualitative, quantizing the categorical variables became a prime directive for this research. The researchers chose to quantify these categorical variables by applying *Likert Scales* to questions designed to gauge participants' opinions and attitudes. As an example, to measure the *extent of code-switching*, an unmistakable categorical variable, the questionnaire helped the researchers quantize this by asking participants to self-report how much they agreed to a given statement such as "When I cannot express an idea in my dialect/Mandarin, I will resort to using Mandarin/my dialect" on a scale of 0-3. Although this method of arbitrarily applying a scale to a categorical variable presented problems, it was the most reliable method for this study. The self-reported data was then aggregated to provide a more reliable and accurate perspective on the variables in question.

2.2. Interview

To corroborate our findings from the questionnaire, an interview was conducted as a follow-up case study, mainly focusing on the code-switching behavior between Mandarin and *Wuyu* (Wu dialect). In

this interview, we selected the *Xiaoshan* dialect under the rubric of *Wuyu*. The interview selection criteria included the participants (1) being both proficient in Mandarin and Xiaoshan dialect and (2) having a relatively basic set of communication skills. Participants were directly recruited from the clan that speaks the *Xiaoshan* dialect. Three volunteers recruited for our interview met the bar. Prior to their participation, all interviewees signed an informed consent form explaining their rights, including the right to withdraw from the study at any point without any negative consequences and agreeing the interview to be recorded throughout the whole process. It also emphasized the steps to maintain confidentiality, as the recording would be destroyed one month following the interview. Interviewees were assured of their voluntary involvement and basic rights to ask questions. However, it should be noted that the study's objective is not mentioned beforehand since we intend to test the extent of interviewees' cognitive control. Afterward, a 5-minute conversation flows casually at a moderate speech rate of approximately 170 words per minute. As the interview ends, the overall evaluation procedure comprises three steps: (1) The interviewees go through a self-evaluation by rating their own proficiency and cognitive control according to the questions (e.g., Do you think you have just expressed their thoughts deliberately in Mandarin / *Xiaoshan* dialect? Please rate it from 1-5). The self-evaluation feedback is based on a 5-point Likert scale (1="low," 2="relatively low," 3="moderate," 4="relatively high," 5="high"); (2) According to the transcript of the recording, interviewers calculate both the number of code-switching instances and frequency by identifying and marking each instance where the interlocutors alternate between dialects. In this case, we divide the total number of code-switching instances by the duration of the conversation; (3) The interviewers identify the context and analyze the type of each code-switching instance.

3. Results

3.1. Questionnaire

The questionnaire received a total of 95 responses. These 95 responses fell into 12 of the major dialects of China, ranging from *Guangfu Yueyu* (Cantonese) to *Jinyu* (the spoken dialect in Shanxi province). However, the data was highly lopsided, with a large share of respondents (43.16%) reporting that their dialect was *Wuyu* (a dialect group spoken in Jiangsu, Shanghai, and Zhejiang). Meanwhile, participants who reported they spoke Hakka and Hokkien only represented 1.05% of the total participants. This meant that the variation for these specific dialects was significant. That is not to say the data for these dialects were unusable, but rather that they were less representative of actuality. The researchers hypothesize that this disparity is due to Beijing's location in China's North. In contrast, most of these underrepresented dialects were from Southern China, and most of the researcher's personal contacts resided in places that spoke *Wuyu*. No significant gender gap was found in the data, as the percentage of participants identifying as female and male were 44.21% and 54.74%, respectively, with 1.05% identifying as "other." Ensuring that the male-to-female ratio was largely 1:1 made sure our research was representative of real life, where the sex ratio is essentially the same. The age of the participants were also relatively evenly spaced out, with the median age being between 31-40. The only age groups that were not represented were those above 70. This was hypothesized because the elderly were much less likely to agree to participate in an online questionnaire. Moreover, older generations are generally worse at *Putonghua* or Standard Mandarin Chinese and thus unfit to participate in this research. Overall, the demographics do not show any significant problems with the data other than the data being somewhat lopsided in terms of the dialects represented.

Since the questionnaire aimed to gauge a variety of variables, the results from the questionnaire for each pertinent variable will be displayed below with analysis.

3.1.1. Effect of Dialectal Distance on Extent of Code-Switching

Dialectal distance, as the name suggests, is a *measure* of how far apart two dialects are. In this research, the main focus was on vocabulary and phonetic distance. In other words, how easy was it for speakers of one dialect to understand and articulate utterances in another dialect? This variable was quantified using a metric presented by Tang & van Heuven's [2] research on predicting the mutual intelligibility of Chinese dialects. In their experiment, they asked participants to listen to a sentence spoken in another dialect and try to write down the last two words of the sentence. This was a good proxy for mutual intelligibility because the participants could use the context of the entire sentence to "predict" the last two characters instead of only relying on their hearing. They scored the participants on a scale of 100, with 100, meaning they understood all of the utterances of the other dialect. They did this for dialects from 15 cities representing dialects across China. Moreover, the dialects from these cities largely coincided with the dialect groups of this research, so the measure of mutual intelligibility found by Tang and Heuven was used. Since they conducted their research for all 15 dialects and the interactions between each, they have $15 \times 15 = 225$ sets of data. Since this research only focused on the linguistic distance between dialects and *Putonghua*, this study only used 28 sets of data. The scores were then averaged for each dialect-*Putonghua* pair to control for disparities in listening and speaking. For example, listeners from Guangzhou (representative of Cantonese) scored a 90 when listening to Beijingers (representative of *Putonghua*). However, listeners from Beijing only scored a 3 when listening to Guangzhou speakers of Cantonese. The scores would then average 46.5 for the *Putonghua-Cantonese* pair to ensure the dialectal distance was not one-sided. The original hypothesis for this set of variables was that when the dialectal distance was larger, the extent of code-switching would be lower. This was intuitive because when a larger dialectal distance would mean the two dialects are further apart, code-switching would become harder as it would represent a larger cognitive switch. The result from the questionnaire is displayed in Figure 2.

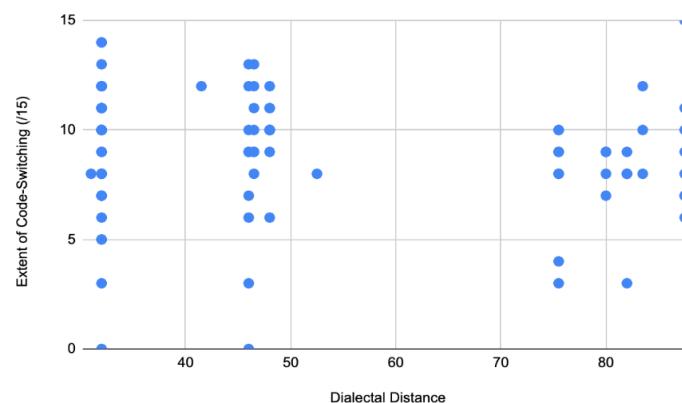


Figure 2: Extent of code-switching graphed against dialect distance

On the x-axis, the dialectal distance was displayed, with smaller values corresponding to a smaller linguistic distance. On the y-axis, an aggregate of the extent of code-switching, which was scaled out of 15, is displayed, with larger values meaning there is a larger extent of self-reported code-switching. The results from the graph suggest that there is no apparent correlation between dialectal distance and the extent of code-switching. The grouping of points on the graph is more due to the fact that dialectal distances could only take on certain values. In other words, no Chinese dialects had a dialectal distance of 60 from *Putonghua*. Figure 3 is a histogram of dialectal distances represented and it largely confirms this hypothesis. For each dialect, there seems to be a large amount of disparity in people's extent of code-switching. Thus, it was safely concluded that dialectal distances did not impact the extent of code-switching between Chinese dialects.

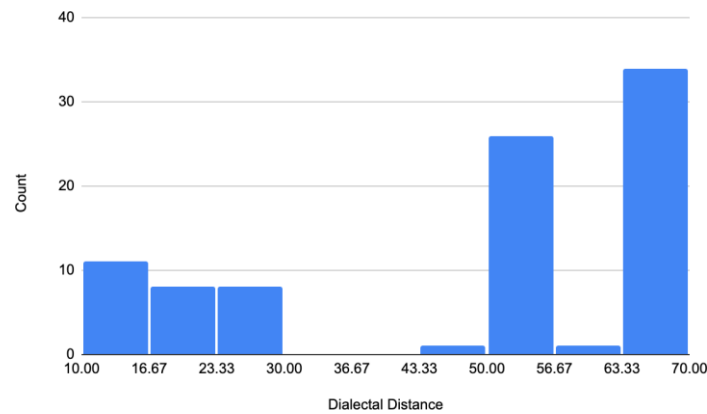


Figure 3: Histogram of dialectal distances represented

3.1.2. Effect of Cultural Background on Extent of Code-Switching

On the x-axis, the dialectal distance was displayed, with smaller values corresponding to a smaller linguistic distance. On the y-axis, an aggregate of the extent of code-switching, which was scaled out of 15, is displayed, with larger values meaning there is a larger extent of self-reported code-switching. The results from the graph suggest that there is no apparent correlation between dialectal distance and the extent of code-switching. The grouping of points on the graph is more since dialectal distances could only take on certain values. In other words, no Chinese dialects had a dialectal distance of 60 from *Putonghua*. Figure 3 is a histogram of dialectal distances represented and it largely confirms this hypothesis. For each dialect, there seems to be a large amount of disparity in people's extent of code-switching. Thus, it was safely concluded that dialectal distances did not impact the extent of code-switching between Chinese dialects.

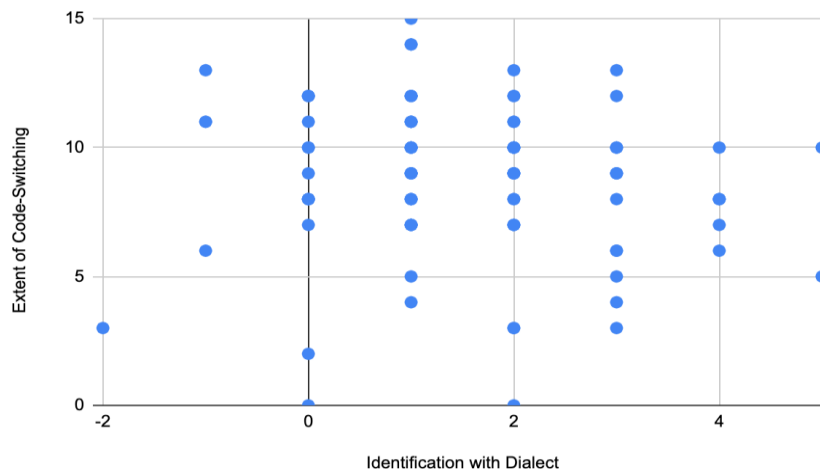


Figure 4: Extent of code-switching graphed against identification with dialect

Again, there does not seem to be an inherent correlation between people's identification with their dialect and the extent of code-switching. However, this data provides many valuable insights. Firstly, we can see that most people identified with their dialects and viewed their dialects favorably. However, most people are still grouped near the middle, meaning the majority of people viewed their dialect and *Putonghua* similarly, with no clear favorite. In other words, in today's China, where *Putonghua* is unarguably the lingua franca, people still value their dialects. Moreover, the shape of the distribution representing a sort of a bell curve suggests that the more equally people viewed their

dialect and *Putonghua*, the more likely they are to code-switch between the two, which is also intuitive. However, it is important to note that this trend has clear outliers.

3.1.3. Effect of Dialectal Proficiency on Extent of Code-Switching

Another pertinent variable considered in this research was proficiency in speaking the dialect. Dialectal proficiency was measured in two ways. The first metric was to solely use self-reported proficiency from the participants through a straightforward question. Another more comprehensive method combined many questions, including their self-professed proficiency as well as other benchmarks such as their consciousness and interspersing rate. The interspersing was done both for *putonghua* interspersing, in which an utterance started with their dialect will feature words or phrases in *putonghua*, and dialect interspersing, in which an utterance started with *putonghua* features words or phrases in a dialect. Overall, it was found that people generally used *Putonghua* code-switching more in their daily lives. This is an exciting insight as it leads to many interesting conclusions. For one, this may indicate that people are generally worse at their dialects, thus needing to use *Putonghua* to compensate. Alternatively, this can suggest that people use their dialects more, and thus, they naturally have more settings to use *putonghua* interspersing. The initial hypothesis was that individuals with lower proficiency would code-switch to a more considerable extent. In other words, the researchers aimed to show that people who code-switching usually did so for compensatory reasons. The following figure presents the findings from the questionnaire.

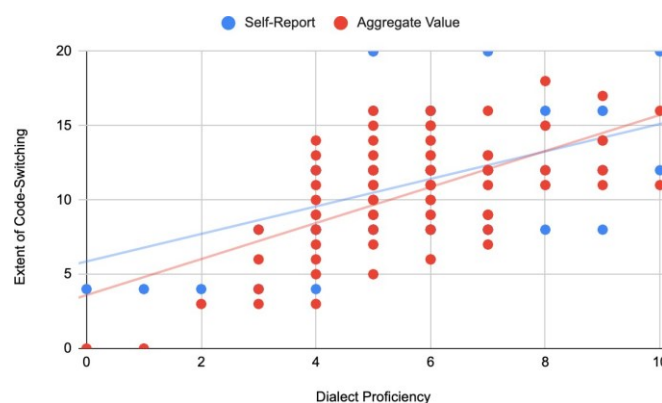


Figure 5: Extent of code-switching graphed against dialect proficiency

This figure reveals many interesting findings. There was a linear positive correlation between dialect proficiency and the extent of code-switching for both the aggregate and self-reported values. Overall, the more proficient someone was with their dialect, the more they code-switched. The best-fit line had an R-square value of 0.59, corresponding to a moderate level of correlation. The fact that higher proficiency levels in the dialect corresponded to a greater extent of code-switching reveals that contrary to the initial hypothesis, code-switching among Chinese speakers of the two dialects was largely due to preferential and pragmatic reasons, as opposed to compensatory reasons. Earlier results studying code-switching between two languages found a much weaker positive correlation between proficiency and code-switching [11]. The researchers hypothesize that the nature of the research can explain this discrepancy between prior and current research. As this study focused on code-switching behaviors between dialects of Chinese instead of different languages altogether, fewer people needed to carry out compensatory code-switching, represented by the participants who had low proficiency but high extents of code-switching. None of the participants who scored less than 4/15 on their dialect proficiency had high extents of code-switching. Another less critical finding was that people's self-

reported proficiency was not entirely in line with the aggregate score we came up with but was relatively close, as can be seen from the similar trend found for both values.

3.2. Interview

In the interview that simulated the situational code-switching scenario, three interviewees responded to all of our questions without much pause throughout the 5-minute interview. The qualitative outcomes for each related variable will be elaborated on in the following sections.

3.2.1. Inverse Relationship between Cognitive Control and Code-Switching Frequency

As shown in Table 1 below, the data from the participant profiles roughly indicate an inverse relationship between cognitive control and code-switching frequency from a qualitative perspective on the whole.

Table 1: The overall outcome of the interview

Participants	Cognitive control	Code-switching frequency (times/min)	Proficiency
Interviewee 1	5	0.0	5
Interviewee 2	3	1.0	4
Interviewee 3	4	0.6	4

All participants seemed to remain on “high alert” during the interview. Participant 1, who exhibited high cognitive control, did not engage in any code-switching throughout the entire interview. It contrasted with Participant 2, who had moderate cognitive control and a code-switching frequency of 1 switch per minute. Participant 3, with relatively high cognitive control, showed a lower code-switching frequency of 0.6 switches per minute. The outcomes imply that individuals with higher cognitive control tend to code-switch less frequently. This could be due to their enhanced ability to focus on a single language, effectively suppressing the competing language and reducing the need to switch between them. Therefore, cognitive control appears to be a significant factor in managing bilingual language use, with higher levels of control associated with reduced code-switching frequency, which testifies to our initial finding from the quantitative study.

3.2.2. Effect of Context that Triggers Code-Switching Behavior

Code-switching was observed a total of 9 times within the conversation, categorized into majorly four types: (1) fixed expressions, (2) interjections, (3) interrogative, and (4) nouns. The following excerpts from the transcript of our interview illustrate three distinct scenarios of code-switching between the *Xiaoshan* dialect (in italic font) and Mandarin, each instance revealing the underlying motivations and contextual factors that prompt these switches.

Table 2: Excerpts from the transcript of the interview

Code-switches	Occurrence number	Content (English & Pinyin version)
Fixed expression	2	(1) Every time you say that, I think you are <i>lying through the teeth</i> .
		(2) <i>That's dope!</i> I mean it.
Interjection	2	(1) <i>Aha!</i> I didn't know that. You should have told me earlier.
		(2) <i>Good job!</i> You've grown up.

Table 2: (continued).

Interrogative	2	(1) <i>How</i> did I know that? I am not a mind reader. (2) <i>Where</i> on earth did they go?
Noun	3	(1) <i>The sun</i> is scorching these days. (2) <i>Zǎi</i> , long time no contact! I hope you are doing good. (3) We climbed <i>the Great Wall</i> this week in Beijing with Professor.

The code-switching in the first script involves a fixed expression, where the interviewee code-switched to the slang phrase in the *Xiaoshan* dialect. The dialectal expression scenario (1) roughly means the slang “*lying through your teeth*” in English. The unexpected code-switching to the *Xiaoshan* dialect captures a culturally specific way of accusing someone of dishonesty through this slang phrase.

The second excerpt demonstrates code-switching triggered by emotional expressions, or what we call interjections. For instance, the interviewee’s reaction, a spontaneous interjection “*Aha!*” in the *Xiaoshan* dialect, suggests an emotional response that makes the *Xiaoshan* dialect more accessible in conveying raw emotion, which is also in line with our former finding of the inverse relationship between cognitive control and code-switching frequency as the cognitive control is relatively low in emotive expressions. The use of the *Xiaoshan* dialect intuitively here allows the speaker to express disbelief with an immediacy that might be a little more remote in Mandarin.

The third excerpt illustrates code-switching with interrogatives, where the interviewee suddenly code-switches from Mandarin to the *Xiaoshan* dialect in questions such as “*How* did I know that?” and “*Where* on earth did they go?” These whole questions are embedded in a predominantly non-English conversation, yet the unexpected switch of interrogative words in the *Xiaoshan* dialect is observed to allow the interviewees to emphasize the uncertainty and curiosity inherent in these questions. The code-switching here may be, as we perceive, motivated by the specific connotations that the *Xiaoshan* dialect interrogatives carry, which might not be as habitually communicated if rendered in Mandarin for interlocutors.

In the fourth excerpt, code-switching occurs using a noun or noun phrase, where the interviewee addressed someone as the noun “*zǎi*” (an intimate way of addressing one’s son or daughter in *Xiaoshan* dialect) within a predominantly Mandarin sentence in (2). This intimate address, as the interviewee adds that it makes the conversation more lively, reflects a personal and perhaps culturally embedded way of showing affection or familiarity. The switch to the *Xiaoshan* dialect here might, as speculated, reflect a pattern where certain terms of endearment address are more commonly or naturally used in the less predominant language (*Xiaoshan* dialect in our case).

Given all these examples, we might have observed how code-switching is not random but contextually driven by the need to convey specific meanings, emotions, or social identity that one dialect might encapsulate better than the other in a given moment, which corresponds with the model of situational switching understood as the change of code directly influenced by the context [12].

4. Discussion

Despite our efforts to conduct the research thoroughly, drawbacks are ineluctably in the study. There are three overall limitations in the present research. Initially, the questionnaires were not distributed to target subjects in an utterly random way since the primary source of participants was limited to the clan that spoke *Wuyu*, inevitably leading to a disproportionate number of *Wuyu* speakers. Secondly,

due to some limitations, only 3 interviewers were recruited for the interview. Thus, future studies are advised to include a larger sample size to enhance the generalizability of their findings.

In addition, more research on further classification of dialectal distance can be done in future studies. Moreover, our interview only investigated the context where people tend to code-switch between the *Xiaoshan* dialect and Mandarin Chinese in daily conversation. Future studies should investigate other case studies to examine whether our findings about the context can still be applied to other dialectal conversions. On top of that, a notable limitation of this study is the subjective nature of the research data, as some of our results are based on self-assessment. Influenced by personal perspectives and biases, participants could have provided answers they believe are more acceptable than their genuine opinions. This subjectivity may affect the accuracy of the results on a large scale and suggests a need for further research to use a combination of methods to validate these findings.

5. Conclusion

The findings from this research led to numerous conclusions of value. Firstly, it was found that there is no inherent relationship between dialectal distance and the extent of code-switching. Secondly, the relationship between a speaker's identification with their dialect and their extent of code-switching showed no apparent linear relationship. However, people who identified with both their dialect and *Putonghua* to a similar degree showed larger extents of code-switching. Thirdly, it was found that dialect proficiency and the extent of code-switching had a moderately strong positive linear correlation. This finding sheds light on the reason for people's code-switching behavior between Chinese dialects. Namely, code-switching was usually done for preferential and pragmatic reasons instead of compensatory reasons. Although these results did not align with our initial hypothesis, they all made sense and were explained intuitively in this study. Fourthly, the conclusion can be reached that people tend to code-switch in the context of nouns, emotive expressions, and some fixed expressions in the target dialect. Ultimately, the results of this interview confirm the former conclusions about cognitive control and contextual triggers and prove that when one person code-switches, the other interlocutor often subconsciously follows suit.

Acknowledgments

Yiyao Franklin Wang and Yutao Lai contributed equally to this work and should be considered co-first authors.

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