

The Colorado College

**The Effects of Linguistic and Cultural Code-Switching on Cognition: Decision Making and
Response Times**

A thesis presented in fulfillment of the requirements of the departments for the degree of
Bachelor of Arts in Neuroanthropology, Departments of Psychology and Anthropology,
Colorado College.

Martrice L. Ellis

May 2021

Committee in charge:

Professor Lori Driscoll

Professor Krista Fish

Director Aaron Stoller

Abstract

Previous studies have shown that multiculturalism and multilingualism may both enhance and decrease the cognitive performance of certain ethnic groups. Due to a lack of research on the positive effects of multiculturalism on Black ethnic groups, the present study attempts to replicate previous findings by examining how different types of code-switching positively affect the decision making and average response times of Black individuals living in North America. The amount of time a person lives in North America does not predict the amount of general code-switching a person does. Additionally, there was no relationship found between code-switching and cognitive performance. Even so, the data provides more context about code-switching experiences and theoretical trends that may be used to create a standardized scale for future studies.

The Effects of Linguistic and Cultural Code-Switching on Cognition: Decision Making and Response Times

Deciphering the neuronal processes of humans has been an interest of researchers for many years. A large body of research has been conducted evaluating the effects of culturally constructed barriers on the mental health of African American's, specifically. It has been shown that African Americans are 10% more likely to experience serious mental health issues and are more likely to experience socioeconomic barriers than other racial groups (NAMI, 2020). Also, not accounting for the stigma of refusing mental health treatment in the African American community, Black people and African Americans are 20 times more likely to report having significant psychological distress than White people. Additionally, Black people are more likely to experience violent crime, co-varying with their likeness to experience higher rates of Post-Traumatic Stress Disorder (PTSD), and Schizophrenia (MHA, 2020). Therefore, in addition to racial trauma, there is potentially an intersection of the covariance of multiple risk factors and conditions. The results of these studies aid in supporting the speculative voices of millions of Black people and bring awareness to a vital cultural and biological issue.

There has been a plethora of studies looking into how systemic oppression negatively impacts Black people. In contrast, previous studies have examined the positive relationship between multiculturalism, multilingualism, and cognition for other racial/ethnic groups (Lavric et al., 2019; Woumans et al., 2015). Although these studies have shown positive effects of multilingualism and multiculturalism on cognition, many of these studies do not include Black individuals. The purpose of the present study is to consider other aspects of the experience of Black residents of America by examining the relationship between code switching--

multiculturalism and multilingualism-- and cognition. The present study will observe how the degree of acculturation and multilingualism affect decision making, and response times.

Code-Switching

There are three main definitions of code-switching. The first definition solely uses a linguistic perspective. In linguistics, code-switching is seen as the alternation of multiple languages in one environment (Dictionary.com, 2020). An individual may use both Spanish and English in the same academic setting. The second definition combines a sociological and linguistic perspective. In sociolinguistics, code-switching is defined as speaking in one dialect, register, accent, or language over another, in relation to the social context and identity of the individual (Dictionary.com, 2020). English may be used exclusively in an academic setting while predominately Spanish is spoken at home. The last definition exclusively uses a sociological perspective. In sociology, code-switching is defined as the switching of any behavior, appearance, etc. to match different social environments and norms (Dictionary.com, 2020). Professional clothing would be worn at work and casual clothing would be worn at home. In the present study, code-switching will be defined by combining the second and third definition. Therefore, code switching is as any change in an individual's presentation of oneself, whether physically, mentally, linguistically, etc. to acclimate to various perceived conditions and environments.

There are various terms that code-switching is synonymous to. One of the earliest terms used to describe code-switching is double consciousness. Double consciousness was popularly used by W.E.B. Dubois, a sociological Black activist (NAACP, 2021). Much of W.E.B. Dubois' work focuses on dissecting the Black experience. In "The Strivings of Negro People," Dubois

(1897) describes double consciousness as a battle between two identities: a Black identity based in African roots and an American identity based in the White culture of America. DuBois claims that Black people continuously switch between these two identities. One continuously strives to integrate both their Black and American identities, while effectively eliminating the negative connotations of each identity. An important aspect of double consciousness is that these two identities are provided and created from the perspectives of others, rather than the Black individual (DuBois, 1897). Therefore, double consciousness is a learned activity, increasing as one integrates from solely Black culture to partially North American culture. As support for this theory, a study revealed that when asked to write a speech application for both a mainstream graduation ceremony and an African American graduation ceremony, there were significant differences in the central themes discussed in the speeches. There were significantly more speeches for the mainstream graduation ceremony that were centered about independent values, and there were significantly more speeches for the African American graduation ceremony that were centered on interdependent values (Brannon et al., 2015). The Black participants that wrote about the mainstream American graduation ceremony included text that centered themselves in relation to everyone else. The Black participants then code-switched to write about a Black graduation ceremony, and they focused more on the community rather than themselves.

In another study, Whaley (2016) sought to find if African Americans identified more with double consciousness, Africentricism, multiculturalism, or only human. He found African Americans identified more with being multicultural. The participants that identified as Black, were shown to have the least amount of identity conflict. One inconsistency that could have caused these results is the researcher's definitions of the variables. Whaley (2016) defined

double consciousness as identifying as American, Africentricism as Black, and multicultural as both Black and American. According to DuBois's (1897) definition of double consciousness, having both a Black and American identity, is synonymous to how Whaley (2016) defines multiculturalism, not double consciousness. Additionally, Merriam-Webster Dictionary (2020) defines being multicultural as "of, relating to, reflecting, or adapted to diverse cultures." This definition would qualify double consciousness as being a form of multiculturalism. So, while it appears Whaley's results contradict the analysis of Dubois, research suggests double consciousness is synonymous with multiculturalism. Therefore, due to the learned code-switching of the Black Diaspora, Black people are more likely to qualify as multicultural. But in the present study, Black people will be asked to self-report their experiences to evaluate their degree of multiculturalism.

In another study, the relationship between double consciousness, psychological distress, and coping behaviors was explored (Walker, 2018). The data shows that 25% of the Black participants reported having serious psychological distress. Also, for the participants that showed double consciousness, 71.4% reported having unhealthy coping behaviors for managing double consciousness and 57.1% showed healthy coping behaviors for double consciousness. It is important to note that there is a bit of overlap between the percentages, as there was a false positive rate of 35% (Walker, 2018). These results suggest that double consciousness may be correlated with a cognitive overload and consequently, cognitive defects. The negative effects of stress on cognitive functions, such as long-term memory, are widely known (Gagnon & Wagner, 2016). But some researchers suggest acute stress may have positive effects on cognition, depending on the type of stressor and amount of motivation present. Typically, a small amount of stress in conjunction with motivation optimizes a person's performance by activating the

hypothalamic-pituitary-adrenocortical (HPA) axis (Schwabe et al., 2013). But, too much stress may cause the HPA axis to decrease its functionality, causing a decrease in cognitive regulation (Bear et al., 2020). In support, Shields et al. (2016) demonstrated that higher levels of stress hormones, cortisol and dehydroepiandrosterone, are correlated with an enhancement of decision making. So, theoretically, double consciousness has the potential to modify cognitive performance depending on how well a person's body regulates stress.

Code switching is very similar to double conscious. Cross et al. (1998) defined code-switching as “the turning off or switch- ing on of one's proclivity to present oneself in a "Black" way.” Cross et al. (1998) states that a Black person briefly removes themselves from their black identity to an identity that matches more with the ideology and expectations of another person or place. Code-switching is not meant as a threat to others or a source of harm. Code-switching happens in response to an external demand to change one's behavior to match another context and provide comfort to others (DuBois, 1897). Switching cultural identities is a way for Black people to fulfil their survival needs, such as food security and financial stability (Cross et al., 1998). Some examples of places that code-switching occurs are school, work environments, neighborhoods, and stores (Cross et al.1998). Likewise, Students attending a predominantly White institution (PWI) viewed code switching more as a performance than an actual part of their identity. Most participants exclaimed code-switching was something they did naturally in response to the environment. They also thought of their individualism as more important than their Blackness (Payne et al., 2014). Therefore, the students had a central identity and code-switched between different personas depending on the cultural context. But this persona was not a reflection of their conscious identity, although the naturalness of this activity suggests unconscious internalization. Keeley (2018) argues a different perspective. In a review, Keeley

(2018) makes the argument that multilinguals and multiculturalists may experience a change in perception, morality, emotions, and behavior when a cultural or linguistic switch occurs. Keely (2018) believes multicultural and multilingual individuals have multiple frames they transition between that are a part of their identity. The differences in these theories may point to different levels of acculturation and inhibition of expression.

Multiculturalism

Some studies have found a link between biculturalism and frame-switching/ code-switching. Luna et al. (2008) revealed that frame-switching occurred more in bicultural bilinguals, than bilinguals that are not bicultural. The researcher defined biculturalism as a person who has internalized two cultures as a part of the self and fluently speaks the languages of both cultures. A bilingual is defined as someone who fluently speaks two languages but has not internalized the cultures of both languages (Luna et al., 2008). Therefore, a person can be monocultural and bilingual. In one of Luna et al.'s (2008) studies, female participants fluent in both English and Spanish viewed the same ads differently. Women that viewed the ads in Spanish saw women as more self-sufficient and extroverted than women that viewed the ads in English. Additionally, the women that saw English ads described women as having qualities that aligned more with the traditional stereotypes of women in American culture (Luna et al., 2008). This study provides support for Keely (2018) and shows that code-switching can change the perspectives of an individual. In another study, Kreitler et al. (2016) found that Mexican Americans primed with American icons reported less external factors that contributed to their emotions, and lower levels of positive emotions than the individuals primed with Mexican icons. Therefore, there is support for the theory that code-switching can affect the way people process information and make decisions.

Multilingualism

People of the African Diaspora have developed their own language and dialect in addition to Standard English. There are multiple names for this language such as Black English, bad English, Ebonics, and the more formal name African American Vernacular English (AAVE). AAVE is defined as slang, often adapted into popular culture. Some of the qualities of AAVE include deleting the final consonant sound, the pronunciation of vowel sounds with –ah, and the pronunciation of –th as –t (Rickford, 2020).

While there has not been much research studying AAVE, there has been a multitude of studies looking at the effects of multilingualism. Ordin et al. (2020) conducted two experiments assessing the link between metacognition processing and bilingualism. In the first study, Ordin et al. (2020) created two artificial languages from overlap of consonants and vowels of the two languages of the participants: Spanish and Basque. The participants had to pick which words of the artificial language appeared in an audio recording. There was not any difference between the performance of monolinguals and bilinguals. But bilinguals were better at accessing how correct their answers were, although there was not any confidence bias. In the second study, the researchers did not know how many times each word was spoken and replicated the results. Additionally, overall, the monolinguals were slightly more confident in their decisions than bilinguals. The researchers believe the findings are a result of the bilinguals having more practice in noticing errors than monolinguals. (Ordin et al., 2020). In contrast, another study noticed differences in cognitive processes when switching languages. In this study, preparing for a language switch caused the same brain activation as preparing for a task switch. But, when cued, the language switch was less taxing on the brain (Lavric et al., 2019). This indicates that the mechanism to switch to another language may have been more developed. Multilinguals have

more experience alternating between different modes of communication than monolinguals. So through practice, the neuronal pathways become reinforced and the brain becomes more efficient at understanding linguistic differences.

Other researchers have investigated how bilingualism affects cognitive control. Woumans et al. (2015) researched the connection between bilingualism (French and Dutch) and verbal/non-verbal cognitive control. The researchers found that monolinguals experienced a higher frequency of selective attention on the Simon task, a conflict resolution test, than the bilingual groups. So, multilingualism appeared to negatively impact one's ability to focus on one object at a time. Woumans et al. (2015) also found that balanced bilinguals and the interpreters were the most efficient on tasks measuring alertness, orientation, and executive control. Secer (2016) also revealed a cognitive advantage in bilinguals. Participants took a test that measured sustained attention and cognitive control. While the study did not yield any differences in attention between the Turkish monolinguals and Turkish-English bilinguals, there were differences in cognitive control. The bilinguals had shorter reaction times on the cognitive control test than monolinguals (Secer, 2016). Another study also found bilinguals may be better at making connections between words and other contexts, even if they were not exposed to the material beforehand (Francis et al., 2019). So, the amount of integration of multiple languages may play a role in one's ability to control goal-oriented behavior and decipher language.

With the knowledge that Black people living in America have two main cultures they engage in, Black culture and American culture, and fluency in two main languages, Standard English and AAVE, many Black residents of North America would classify as multiculturals and multilingual. But, through self-reporting, the present study will determine if the degree of code-

switching affects how well the participants perform on the cognitive tasks. In the present study, the researcher predicts the following:

1. The number of years that an individual resides in North America will increase the total amount individual code-switches (CBCS). Additionally, the number of years will also affect the amount of cultural (CCS) and linguistic code-switching (LCS).
2. The more a person code-switches on all three levels, the shorter their reaction time to stimuli will be. There will be no difference in the effects of the types of code-switching on their reaction time to stimuli.
3. As the amount of code-switching increases, the amount of correct answers (CA) on the cognitive test will increase. But, there will be stronger positive correlation between the amount of code-switching and how well an individual can decipher between conflicting stimuli (incongruent trials).
4. As the amount of code-switching increases, the average reaction time to respond to the cognitive trials will decrease. There will be a larger significant negative correlation between code switching and the reaction times for the trials with conflicting stimuli.

Methods

Participants

1,459 participants were recruited for the study through Amazon MTurk to complete a Qualtrics survey. Out of 1,459 people, only 35 participants were used for analysis (Male = 11 Female = 24 Transgender = 0 Non-Binary = 0 Black Only = 31 Biracial = 2 Multiracial = 2). Exclusion criteria included if the participant did not identify as fully or partially “Black,” did not currently reside in North America, did not complete all the experiment, completed the experiment in under

5 minutes, did not complete the cognitive tasks and cultural tasks, and had more than one inconsistent answer. For example, individuals that identified as only speaking English, but answered multiple questions for speaking a secondary language were excluded from the study.

Materials

Cultural Code Switching (CCS). The CCS scale was devised by the researcher to evaluate various dimensions of cultural code switching the participants engage in. The scale included a set of 15 questions that used a similar point system and a larger number of points indicated more cultural code switching. Nine of the questions used a 1- 5 point Likert scale (1- Strongly disagree, 2-disagree, 3-Neutral, 4-Agree, 5-Strongly agree). An example of a question asked was “Cultural expectations of the environment I am involved in determine how frequently I change my behavior and appearance.” For any questions that indicated how much the participant did not culturally code-switch, the 1-5 point Likert Scale was reversed (1-Strongly agree, 2-Agree, 3-Neutral, 4-Disagree, 5-Strongly disagree). An example of a question that indicated a decrease in cultural code switching was “I view North American culture as the same as the culture of my race/ethnicity.” The remaining six questions asked about the participants’ race, ethnicity, and region of residence. A point was added to the CCS score for each race and ethnicity of each person. For example, if a participant identified as bi-racial, 1 additional point would be added to their CSS score for their second race. Participants received one score for all their combined points that indicated cultural code-switching (CCS).

Linguistic Code-Switching Scale (LCS). The LCS Scale was a revised version of the Code-Switching questionnaire by Byers-Heinlien (2012) to evaluate the use of the primary and secondary languages of the participants. Three of the questions followed a 0-5 Likert scale (0- Not applicable, 1-Strongly agree, 2-Agree, 3-Neutral, 4-Disagree, 5-Strongly disagree). An

example of one of these questions included “It is likely that I will switch between languages during the course of an average day.” Five of the questions are on a multi-point scale, allotting a point for each context that causes a participant to linguistically code-switch. For example, participants were asked “In what situations do you use your primary language?” The remaining questions used a point scale for each language the participants use. So, the participant received a point for each additional language they speak besides English, as English is the standard spoken language in North America. A total linguistic code-switching (LCS) score was given for each participant that was used for the analysis.

Combined Code-switching. To analyze the two major components of code switching together, the cultural code switching (CCS) and linguistic code-switching (LCS) scores were combined to form a combined code-switching (CBCS) score for analysis. A additional point was added if the person was not originally from North America.

Cognition Test. A flanker Task was used to access the participants’ ability to correctly respond to stimuli. The participants were presented with (30) randomly designed trials. For each trial, there were four symbols. Four of the symbols were constant in the symbol type and direction. The middle, 5th, symbol changed for each trial. The middle symbol either matched the symbol type and direction (congruent) , match the symbol type but not direction (incongruent), or not match the symbol type or direction (neutral) of the other four symbols.

Figure 1

Example of Incongruent and Congruent Flanker Trial.

A.

< < > < <

<
>

B.

> > > > >

<
>

Note. **(A)** An incongruent flanker trial with conflicting stimuli. **(B)** A congruent flanker trial with non-conflicting stimuli.

Participants received a score for the total number of trials they correctly answered. Participants also received separate scores for the amount of incongruent trials and congruent trials they correctly answered and their respective average reaction time (RT). The participants completed 30 trials with a max time of 1.5 seconds to answer each trial. Due to the limitations of the coding features of Qualtrics, the flanker trials were not randomized. But, the 30 trials were designed using two computer randomized sequences.

Procedure

Participants were first asked to report a series of demographic questions, such as their race(s), country of residence, and gender via a Qualtrics survey. If the participants indicated they were fully or partially Black, and a resident of North America, they were prompted to complete the next portion of the survey. Individuals that successfully continued to the next portion of the survey were asked to complete the cognitive tasks. Participants were instructed to complete the practice trials and complete the study in an area without distractions. During the cognition task, each person was shown 30 Flanker trials, 1.5 seconds max to choose an answer choice for each trial. If they did not answer the trials, the trials were marked as incorrect and continued to the next trial. After completing the cognition tasks, they were asked to answer 25 additional randomized questions about their cultural background.

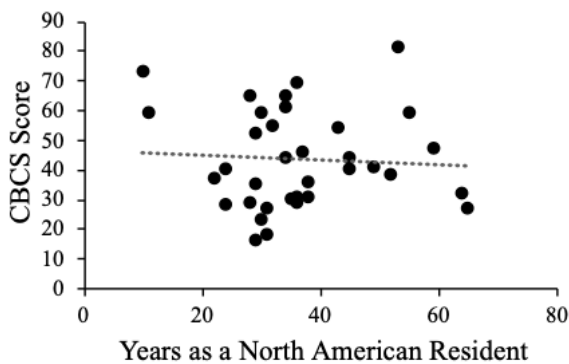
Results

Three simple linear regressions were performed to reveal if the amount of time a person lived in North America predicted the amount of combined code switching, the amount of cultural code-switching, and the amount of linguistic code-switching. The analysis did not reveal a significant relationship between the years the participants have lived in North America ($M = 36.46$, $SD = 12.89$), and the total amount of code-switching present ($M = 43.46$, $SD = 16.36$) $\beta = -0.065$, $R^2 = 0.004$, 0.709 (Figure 2a). Similarly, there was not a significant relationship between the amount of time a person lived in North America and the amount of cultural code-switching ($M = 31.63$, $SD = 6.30$) $\beta = -0.051$, $R^2 = 0.003$, $P = 0.769$, or linguistic code-switching ($M = 11.77$, $SD = 12.48$) $\beta = -0.050$, $R^2 = 0.003$ $P = 0.774$ (Figure 2b & Figure 2C).

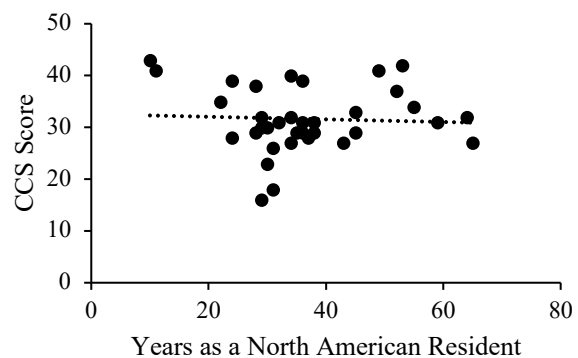
Figure 2

The Effect of Resident Years on Code-Switching

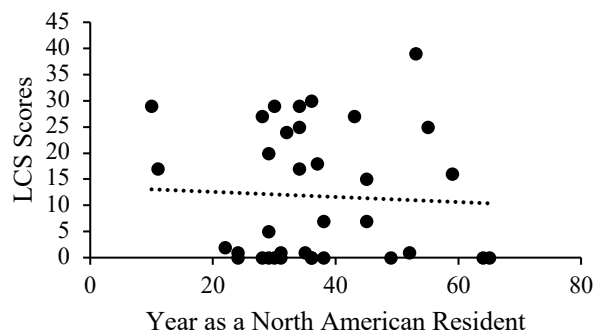
A.



B.



C.



Note. (A) Shows the relationship between the amount of years a participant lives in North America and their combined code-switching score (CBCS) (B) Shows the relationship between the amount of years a participant lives in North America and their cultural code-switching score (CCS) (C) Shows the relationship between the amount of years a participant lives in North America and their linguistic code-switching score (LCS).

A multiple regression was conducted to see if the amount of cultural and linguistic code-switching predicted the average RT of all the flanker trials. There was not a significant relationship between the amount of cultural code-switching ($M = 31.63$, $SD = 6.30$) $\beta = -0.053$, $P = 0.786$, and linguistic code-switching ($M = 11.77$, $SD = 12.48$) $\beta = -0.174$, $P = 0.373$ and the reaction time on the flanker trials ($M = 0.883$ $SD = 0.239$) $R^2 = 0.041$. Due to multicollinearity, the relationships between the total amount of code-switching and cognitive performance were tested by simple linear regressions. There was no significant relationship between the total amount of code-switching ($M = 43.46$, $SD = 16.36$) and the average RT ($M = 0.883$ $SD = 0.239$) for all of the flanker trials $\beta = -0.198$, $P = 0.127$, $R^2 = 0.039$.

Table 1

Effect of Code-Switching on Flanker Trials Average Reaction Time (All)

Variable	β	95% CI
Combined Code Switching (CBCS)	-0.198 {.002}	{-0.008, 0.002}
Linguistic Code Switching (LCS)	-0.174 {.004}	{-0.011, 0.004}
Cultural Code Switching (CCS)	-0.053 {0.007}	{-0.017, 0.013}
R^{2**}	0.039	
R^{2***}	0.041	
N	35	

Note. The coefficients of Standard Error are in parenthesis in the β column.

* R^2 for the effect of CBCS on RT (All)

** R^2 for the effect of LCS and CCS on RT (All)

*** $P < 0.05$

A multiple regression evaluating the relationship between code-switching, and linguistic code-switching, and the average RT of the incongruent flanker trials did not reveal significant results. The amount cultural code-switching ($M = 31.63$, $SD = 6.30$) $\beta = -0.061$, $P = 0.759$, and linguistic code-switching ($M = 11.77$, $SD = 12.48$) $\beta = -0.109$, $P = 0.582$ did not predict the reaction time of the incongruent trials ($M = 0.974$ $SD = 0.280$), $R^2 = 0.021$. The total amount of code-switching ($M = 43.46$, $SD = 16.36$) also did not predict the average RT of the incongruent flanker trials $\beta = -0.142$, $P = 0.208$, $R^2 = 0.020$.

Table 2

Effect of Code-switching on Flanker Trials Reaction Time (Incongruent)

Variable	β	95% CI
Combined Code Switching (CBCS)	-0.142 {.003}	{-0.008, 0.004}
Linguistic Code Switching (LCS)	-0.109 {.004}	{-0.011, 0.006}
Cultural Code Switching (CCS)	-0.061 {0.009}	{-0.02, 0.015}
R^{2**}	0.020	
R^{2***}	0.021	
N	35	

Note. The coefficients of Standard Error are in parenthesis in the β column.

* R^2 for the effect of CBCS on RT (INC)

** R^2 for the effect of LCS and CCS on RT (INC)

*** $P < 0.05$

A multiple regression analyzed the relationship between cultural code-switching, and linguistic code-switching, and the number of correct answers of flanker trials. The regression revealed no relationship between the amount cultural code-switching ($M = 31.63$, $SD = 6.30$) $\beta = -0.247$, $P = 0.203$, and linguistic code-switching ($M = 11.77$, $SD = 12.48$) $\beta = 0.269$, $P = 0.203$ and the number of correct answers of flanker trials ($M = 25.543$, $SD = 4.368$), $R^2 = 0.074$. A simple linear regression of the total amount of code-switching and the total number of correct trials was performed. There was no relationship between the total amount of code-switching $M = 43.46$, $SD = 16.36$) and the number of correct answers on the flanker trials $\beta = 0.069$, $P = 0.693$, $R^2 = 0.005$

Table 3

Effect of Code-switching on Flanker Trials Correct Answers (All)

Variable	β	95% CI
Combined Code Switching (CBCS)	0.069 {.046}	{-0.076, 0.113}
Linguistic Code Switching (LCS)	0.269 {.066}	{-0.041, 0.230}
Cultural Code Switching (CCS)	-0.247 {0.132}	{-0.439, 0.097}
R^{2**}	0.005	
R^{2***}	0.074	
N	35	

Note. The coefficients of Standard Error are in parenthesis in the β column.

* R^2 for the effect of CBCS on CA (All)

** R^2 for the effect of LCS and CCS on CA (All)

*** $P < 0.05$

A multiple regression was performed to evaluate if cultural code-switching and linguistic code-switching predicted the amount of correct incongruent trials. The data does not indicate a

significant relationship between the amount cultural code-switching ($M = 31.63$, $SD = 6.30$) $\beta = -0.184$, $P = 0.352$, linguistic code-switching ($M = 11.77$, $SD = 12.48$) $\beta = 0.120$, $P = 0.541$ predicted the amount of correct incongruent trials ($M = 9.714$ $SD = 2.359$) $R^2 = 0.029$. A simple linear regression between the total amount of code-switching and the number of correct incongruent trials did not indicate the total amount of code-switching $M = 43.46$, $SD = 16.36$) as a predictor of the number of correct answers on the incongruent flanker trials $\beta = -0.023$, $P = 0.895$, $R^2 = 0.001$.

Table 4

Effect of Code-switching on Flanker Trials Correct Answers (Incongruent)

Variable	β	95% CI
Combined Code Switching (CBCS)	-0.023 {.025}	{-0.054, 0.048}
Linguistic Code Switching (LCS)	0.120 {0.037}	{-0.052, 0.098}
Cultural Code Switching (CCS)	-0.184 {0.073}	{-0.217, 0.080}
R^{2**}	0.001	
R^{2***}	0.029	
N	35	

Note. The coefficients of Standard Error are in parenthesis in the β column.

* R^2 for the effect of CBCS on CA (INC)

** R^2 for the effect of LCS and CCS on CA (INC)

*** $P < 0.05$

Discussion

The results of the present study were inconsistent with the hypothesized. There was not strong direct relationship between the degree to which an individual code-switches and the number of years they have lived in North America. The amount of time a person lives in North

America also had no effect on how much they linguistically and culturally code-switched, separately. These findings contradict the anthropological notion that the environment a person is in plays a role in their cultural expression. The more a person is exposed to an environment, they are expected to become more accustomed to that particular environment (Peoples & Bailey, 1999). Therefore, it is surprising that the degree of acculturation to North American culture from exposure over time does not play a larger role in how much an individual code-switches between different frames of expression.

A possible explanation for result is that there were natural group separations in the code-switching data, particularly for linguistic code-switching. It was observed that a number of participants identified as monolingual. Therefore, their linguistic code-switching score would be zero. By measuring code-switching on a continuous scale, all of the participants were put in one large group. This created a separation in the data into groups that could have skewed the regression analyses. The scores of the multilinguals were more variant, in contrast to the monolinguals. Consequently, the code-switching scores of the two lingual participant subgroups may have counteracted against each other. It is possible that there are separate relationships between the effect of residence years on monolinguals, versus the effect of residence years on multilinguals. The regression analysis does not evaluate those sub relationships separately, potentially resulting in an inaccurate statistically result. Additionally, some parts of the regression graph for the linguistic code-switching contradicted the regression line. In conjunction with a small sample size, these justified deviations could have largely impacted the results. Consequently, the sub group deviations could have impacted all of the regression models, resulting in no correlation between the types of code-switching and cognitive performance. Therefore, it is hypothesized that a relationship between difference frames of

thought and executive performance is dependent on certain factors, such as acculturation and the use of multiple languages.

Limitations

There were a number of limitations that could have impacted the reliability and validity of the study. One major limitation of the study was its distribution method. Originally, the study was designed to be conducted in a laboratory. Due to the covid-19 pandemic, the study was adapted to an online format via Qualtrics. Although Qualtrics is widely used in research, the platform has a limited amount of features. When disabling the “back” button, the “next” button would also be disabled. Additionally, if the randomization feature was activated for a set of questions, the tracker that timed the reaction time for each question was included in the randomization. So, Qualtrics would include two flanker trials on one page without a time tracker, and only a time tracker on blank page. Many of these issues can be resolved with coding. But, there is a possibility that the added coding features may malfunction during usage. For instance, the researcher added a formula into the software to only disable the “back” button to restrict participants from changing their responses. A malfunction may re-add the “back” button, disable the “next” button, or disabled both buttons.

Qualtrics does not report on coding errors, as the platform does not provide for external functions added via coding. But, users commonly using coding and Qualtrics has created a guide to reduce errors (Qualtrics, 2021). The online survey was thoroughly tested before distribution. Even so, it is not possible to verify the survey functionality during distribution to the public.

Location was a large limitation of the study because there are general regional assumptions that can provide additional context about the linguistic and cultural environments of the participants. For this reason, the study was restricted Black North American residents. But,

the verification of location solely depended on each device's internet protocol (IP) address. Recently in the digital world, virtual private networks (VPN) have become increasingly popular for their ability to falsely identify a device's location. VPNs are fairly accessible to the general population and there have been reported cases of VPNs being used on Amazon Mturk. A recent study conducted on the platform found that less than 5% of the participants were likely using VPNs to access regional dependent surveys (Loepp & Kelly, 2020). Therefore, it is highly unlikely that any of the participants were not Black residents of North America. Nevertheless, only a few falsely identified participants could drastically impact the quality of the data. Therefore, the researcher highly recommends a revised replication of the study in a controlled environment to reduce many of the limitations.

The lack of a standardized environment could have influenced the results of the study. In Hammond's model of Cognitive Continuum Theory (CCT) there are two types of stressors: endogenous (internal) and exogenous (external). An endogenous stressor occurs within the assigned task, such as a switch in rules or a pattern change. In contrast, an exogenous stressor occurs outside of the task, such as a loud noise or background music (Bourne & Yaroush, 2003). The key difference between the stressors is that an endogenous stressor causes a person to switch their cognitive state to complete the task. So, the individual is allowing code-switching to occur. In comparison, when affected by an external stressor, a person is actively trying to not switch cognitive states so they may complete the task (Bourne & Yaroush, 2003). In other words, the person is inhibiting code-switching from occurring. Hammond's theory indirectly suggests that endogenous stressors require less energy for a person to change frames of thought within a task, than the energy required to suppress the mind from switching to the frame of thought of

exogenous stressors. There is neurological support for the claim that stress can impact cognitive performance.

The ventrolateral prefrontal cortex is activated during both inhibition and cognitive flexibility. But, when demonstrating cognitive flexibility, the left posterior superior parietal cortex and the bilateral extra striate cortex are activated more. Conversely, more brain regions are recruited when demonstrating inhibition, such as the right superior parietal cortex, premotor cortex, and frontopolar cortex (Sylvester et al., 2003). These findings are relevant because this means that it is less taxing on an individual's brain if they allow their mind to code switch to a different frame of thought freely, versus inhibiting their brain switching to another frame of thought. Consequently, short term and long-term stressors could have impacted each person performance. Future studies would have to consider stress in the code-switching scale to accurately assess how code-switching affects development.

Based on the descriptions of code-switching, cultural and linguistic code-switching can be viewed as either an endogenous or exogenous stressor. Code-switching between various cultural frames would be endogenous if the individual switches to the cultural frames of a particular environment while freely maintaining their other cultural frames. An example of this would be a Black individual speaking a secondary language without having to disregard their blackness. Conversely, code-switching could be an exogenous stressor if the individual is actively suppressing a cultural frame to allow another cultural frame to be expressed. An example of this would be a Black individual changing the texture of their hair to adhere to European standards, while suppressing any indication of blackness. The basal ganglia may play a role in this difference. Cameron et al. (2009) found a difference in the activation of the basal ganglia when participants were deciding between two competing options. The basal ganglia was

activated more when an individual actively planned to switch from a more automatic response to a less automatic response (Cameron et al., 2009). So, it is possible that the basal ganglia is activated differently, depending on how acculturated an individual is with different identities. The present study did not control for these factors. Due to the higher possibility of cognitive overload occurring when exogenous stressors are present, it is vital to determine the long-term and short-term influences of these stressors on one's ability to code-switch and perform.

The way in which Black people view the intentions and consequences of code-switching could potentially impact executive functioning long term and short term. Some believe that when Black people code-switch, it requires them to engage in a battle of what it means to be Black and American, increasing the possibility of cognitive overload (Dubois, 1897; Keely, 2018). For individuals that align more with Payne et al. (2014), they have a stable identity that is not under constant attack. So, code-switching is viewed as a natural part of the environment, not their sense of self. Therefore, there is not identity battle. These core ideologies could be the key to understanding why there is conflicting data for the effects of multiculturalism and multilingualism. While these relationships may appear miniscule, if significant, it would have implications on emotional control, financial decisions, relationship building, impulsivity, health concerns, etc. In summary, the present study prompts theories on how brain development, caused by societal factors, can influence the future development of cultural practices. Thus, it is important to further explore the trends presented in the study to support or reject their relevance.

Conclusion

While the present study does not yield any significant results, the data allows for researchers to use an unconventional anthropological perspective to inform future studies. For example, the present study provides information about how to more accurately measure code-

switching experiences. This study revealed that code-switching is more inclusive of people that are not multicultural than previously assumed. Post analysis, it was discovered that there were a number of participants that indicated they code-switched, although they were not multicultural or multilingual. So, there may be additional factors involved in code-switching, such as syntax structure, regional diversity, and socioeconomic status within North America. As a result, the code-switching scales should be modified to reflect additional factors to receive a more accurate representation of the data. One revision for future studies includes adapting the scale to fit more categorical data by editing some of the questions to include more yes/no answers. This change would allow the data to be analyzed in a similar categorical fashion used in previous studies, rather than utilizing ranges. For example, the participant pool would need to be subdivided into groups such as, people that are not multicultural or multilingual, people that are multilingual only, people that are multicultural only, and people that are both multilingual and multicultural. Then each of these four groups would have to split into people that code-switch and people that do not code-switch. Therefore, there would be eight independent variable groups, rather than one large pool of all the participants, and four dependent variable groups (average reaction time for all of the flanker tasks, average reaction time for the incongruent flanker trials, the amount of correct answers for all of the flanker trials, and the amount of correct answers for the incongruent trials. Splitting the data into categories would allow for both the comparison of means between the different participant groups, and an analysis of how well the code-switching scores for each participant group predict their reaction times and amount of correct answers, This would also significantly reduce the chance of a natural separation of data from occurring within each group and having a negative impact of the results. This revised study would be monumental because it

would confirm if there is a relationship between code-switching and cognitive efficiency and if the relationship is conditional.

In conclusion, the present study yielded mostly inconclusive results due to a minuscule sample size and unsuited scales of measurement for the three different types of code-switching (combined, cultural, and linguistic). The amount of time a person spends was found to positively increase the total amount a person code-switches, but code-switching was not found to impact cognitive performance. In contrast, the present study provided additional insight code-switching experiences that can aid in creating a standardized measurement scale. A replication study comparing subgroups of participants, rather than a continuous scale, is recommended for future analysis.

References

- Bailey, G. A., & Peoples, J. G. (1999). *Introduction to cultural anthropology*. Belmont, CA: West/Wadsworth.
- Bear, M. F., Connors, B. W., & Paradiso, M. A. (2020). *Neuroscience: Exploring the brain*. Burlington: Jones & Bartlett Learning.
- Black & African American Communities and Mental Health. (2020). Retrieved June 22, 2020, from <https://www.mhanational.org/issues/black-african-american-communities-and-mental-health>
- Black/African American. (2020). Retrieved June 22, 2020, from <https://www.nami.org/Your-Journey/Identity-and-Cultural-Dimensions/Black-African-American>
- Brannon, T. N., Markus, H. R., & Taylor, V. J. (2015). “Two souls, two thoughts,” two self-schemas: Double consciousness can have positive academic consequences for African Americans. *Journal of Personality and Social Psychology*, *108*(4), 586-609.
doi:10.1037/a0038992
- Bourne, L. E., Jr., & Yaroush, R. A. (2003). Stress and Cognition: A Cognitive Psychological Perspective. *University of Colorado*.
- Byers-Heinlein, K. (2012). Parental language mixing: Its measurement and the relation of mixed input to young bilingual children's vocabulary size. *Bilingualism: Language and Cognition*, *16*(1), 32-48. doi:10.1017/s1366728912000120
- Cameron, I. G., Coe, B. C., Watanabe, M., Stroman, P. W., & Munoz, D. P. (2009). Role of the basal ganglia in switching a planned response. *European Journal of Neuroscience*, *29*(12), 2413-2425. doi:10.1111/j.1460-9568.2009.06776.x

Code-switching. (2020). Retrieved June 22, 2020, from

<https://www.dictionary.com/browse/code-switching>

Cross, W. E., Jr., & Strauss, L. (1998). The everyday functions of african american identity. in J.

K. Swim & C. Stangor (Authors), *Prejudice: The target's perspective*(pp. 267-279). San Diego, CA: Academic Press.

Du Bois, W. (1897). *Strivings of the negro people*. Charlottesville, VA: University of Virginia Library.

Francis, W. S., Strobach, E. N., Penalver, R. M., Martínez, M., Gurrola, B. V., & Soltero, A.

(2019). Word–context associations in episodic memory are learned at the conceptual level: Word frequency, bilingual proficiency, and bilingual status effects on source memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 45(10), 1852-1871. doi:10.1037/xlm0000678

Gagnon, S. A., & Wagner, A. D. (2016). Acute stress and episodic memory retrieval:

Neurobiological mechanisms and behavioral consequences. *Annals of the New York Academy of Sciences*, 1369(1), 55-75. doi:10.1111/nyas.12996

Keely, T. D. (2018). The potential effects of language switching on self-concept, values and

personality expression - Examining the Evidence. *Kyushu Sangyo University, Keieigaku Ronsu (Business Review)*, 28(3), 59-77.

Kreitler, C. M., & Dyson, K. S. (2016). Cultural Frame Switching and Emotion Among Mexican

Americans. *Journal of Latinos and Education*, 15(2), 91-96.

doi:10.1080/15348431.2015.1066251

- Lavric, A., Clapp, A., East, A., Elchlepp, H., & Monsell, S. (2019). Is preparing for a language switch like preparing for a task switch? *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *45*(7), 1224-1233. doi:10.1037/xlm0000636
- Loepp, E., & Kelly, J. T. (2020). Distinction without a difference? An assessment of mturk worker types. *Research & Politics*, *7*(1), 205316801990118. doi:10.1177/2053168019901185
- Luna, D., Ringberg, T., & Peracchio, L. A. (2008). One Individual, Two Identities: Frame Switching among Biculturals. *Journal of Consumer Research*, *35*(2), 279-293. doi:10.1086/586914
- Multicultural. (2020). Retrieved June 22, 2020, from <https://www.merriam-webster.com/dictionary/multicultural>
- NAACP history: W.E.B. DUBOIS. (2018, July 13). Retrieved May 08, 2021, from <https://www.naacp.org/naacp-history-w-e-b-dubois/>
- Ordin, M., Polyanskaya, L., & Soto, D. (2020). Metacognitive processing in language learning tasks is affected by bilingualism. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *46*(3), 529-538. doi:10.1037/xlm0000739
- Payne, Y. A., & Suddler, C. (2014). Cope, Conform, or Resist? Functions of a Black American Identity at a Predominantly White University. *Equity & Excellence in Education*, *47*(3), 385-403. doi:10.1080/10665684.2014.933756
- Qualtrics Code TasK. (2021, May 04). Retrieved May 08, 2021, from <https://www.qualtrics.com/support/survey-platform/actions-module/code-task/>
- Rickford, J. R. (2020). What is Ebonics (African American English)? Retrieved June 22, 2020, from <https://www.linguisticsociety.org/content/what-ebonics-african-american-english>

Seçer, I. (2016). Skills of Cognitive Flexibility in Monolingual and Bilingual Younger Adults.

The Journal of General Psychology, 143(3), 172-184.

doi:10.1080/00221309.2016.1200530

Shields, G. S., Lam, J. C., Trainor, B. C., & Yonelinas, A. P. (2016). Exposure to acute stress enhances decision-making competence: Evidence for the role of dhea.

Psychoneuroendocrinology, 67, 51-60. doi:10.1016/j.psyneuen.2016.01.031

Sylvester, C. C., Wager, T. D., Lacey, S. C., Hernandez, L., Nichols, T. E., Smith, E. E., & Jonides, J. (2003). Switching attention and resolving interference: Fmri measures of executive functions. *Neuropsychologia*, 41(3), 357-370. doi:10.1016/s0028-

3932(02)00167-7

Walker, S. M. (2018). Empirical Study of the Application of Double-Consciousness Among African-American Men. *Journal of African American Studies*, 22(2-3), 205-217.

doi:10.1007/s12111-018-9404-x

Whaley, A. L. (2016). Identity Conflict in African Americans during Late Adolescence and Young Adulthood: Double Consciousness, Multicultural, and Africentric Perspectives.

Africology: The Journal of Pan African Studies, 9(7).

Woumans, E., Ceuleers, E., Linden, L. V., Szmalec, A., & Duyck, W. (2015). Verbal and nonverbal cognitive control in bilinguals and interpreters. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 41(5), 1579-1586.

doi:10.1037/xlm0000107

Appendix***Appendix A. Demographic Questions***

1. What is your age? (sliding scale from 0-100)
2. What country/region do you currently live in?
 - North America
 - Central America
 - South America
 - Europe
 - Africa
 - Asia
 - Australia
 - Caribbean Islands
 - Pacific Islands
 - Not listed
1. What gender do you identify as?
 - Male
 - Female
 - Transgender Female
 - Transgender Male
 - Non-binary
 - Not listed (please type)
 - Prefer not to say
1. What is the highest degree or level of education you have completed?
 - Some High School or lower
 - High School
 - Associate's degree or 2 completed college years
 - Bachelor's degree

_ Master's degree or 1 completed post graduate year

_ Ph. D., JD, MD, or other terminal degree

_ Trade/Vocational/Technical School

_ Not listed (please type)

_ Prefer not to say

1. How many years have you lived in that country/region? (free response answer)

Appendix B. Flanker Trials

1. >><>>

2. ++<++

3. <<<<<

4. ++>++

5. >>>>>

6. >><>>

7. <<><<

8. <<<<<

9. >>>>>

10. ++>++

11. >>>>>

12. >><>>

13. <<<<<

14. <<><<

15. ++<++

16. <<<<<

17. <<<<<

18. ++>++

19. >><>>

20. >><>>

21. >>>>>

22. ++>++

23. ++<++

24. <<><<

25. <<><<

26. >><>>

27. <<><<

28. <<><<

29. >>>>>

30. <<<<<

Appendix C. Cultural Code-Switching Questions

1. What race do you identify as?

 American Indian or Alaska Native Asian Black Hispanic and/or Latinx Native Hawaiian or Pacific Islander White Biracial Multiracial Not listed

1. Please specify all the races you identify as (check all that apply)

*only applies if they pick biracial or multiracial

White

Black

American Indian or Alaska Native

Asian

Native Hawaiian or Pacific Islander

Not listed

1. Were you born in your country of residence?

yes

no

1. Please specify all of the ethnicities within the “Black” race that you identify with

(check all that apply)

I do not identify as Black

African

African American

Afro Canadian

Afro Caribbean

Afro Latin American

Not listed

1. During the course of an average day, in my interactions with others, it is likely that I will switch between my cultural identities.

Strongly agree

Agree

Neutral

Disagree

Strongly disagree

1. I identify with North American culture
 - Strongly agree
 - Agree
 - Neutral
 - Disagree
 - Strongly disagree

1. I view North American culture as the same as the culture of my race/ethnicity?
 - Strongly agree
 - Agree
 - Neutral
 - Disagree
 - Strongly disagree

1. I view North American culture as separate from the culture of my race/ethnicity?
 - Strongly agree
 - Agree
 - Neutral
 - Disagree
 - Strongly disagree

1. I code-switch between the culture of my race/ethnicity and North American culture?
 - Strongly agree
 - Agree
 - Neutral
 - Disagree
 - Strongly disagree

1. I frequently code-switch between the culture of my race/ethnicity and North American culture?
 - Strongly agree

- Agree
- Neutral
- Disagree
- Strongly disagree

1. I change my appearance (clothing, hair, etc.) depending on the type of environment I am in

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

1. I change my behavior depending on the type of environment I am in

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

1. Cultural expectations of the environment I am in determine if I change my behavior and appearance.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

1. Cultural expectations of the environment I am in determine how frequently I change my behavior and appearance.

- Strongly agree

- Agree
- Neutral
- Disagree
- Strongly disagree

Appendix D. Linguistic Code-Switching Questions

1. What is the language you speak and use the most (primary language)?

- English
- Spanish
- French
- Chinese
- Tagalog
- Vietnamese
- German
- Arabic
- Korean
- Italian
- Vernacular Black English (Ebonics)
- American Sign Language

Not listed
1. Please specify any other languages (secondary) you speak.

(to any degree)

- Arabic
- Chinese
- English
- French
- German

- Italian
 - Korean
 - Sign Language (including American, Chinese, Spanish, etc.)
 - Spanish
 - Tagalog
 - Vernacular Black English (Ebonics)
 - Vietnamese
 - Not listed
1. In what situations do you use your primary language? (select all that apply)
- One on one situations
 - At home
 - With friends
 - In a professional environment
 - When out for entertainment
 - Not listed
1. In what situations do you use your additional (secondary) languages? (select all that apply)
- One on one situations
 - At home
 - With friends
 - In a professional environment
 - When out for entertainment
 - Not listed
1. How much do you speak your primary and secondary languages?
- I speak my primary language more than my secondary language (s)
 - I speak my secondary language (s) more than my primary language (s)
 - I equally use my primary language and my secondary language (s)

- I only speak one language primarily or rarely speak my secondary language (s)
1. It is likely that I will switch between languages during the course of an average day
- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree
- Not applicable
1. I often mix my primary and secondary (s) languages
- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree
- Not applicable
1. The way in which I use my primary and secondary languages depends on the setting I am in
- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree
- Not applicable
1. Please specify any of the following situations that may cause you to change the degree to which you use your primary language. (select all that apply)
- When I am speaking to someone outside of my culture

- _ When speaking to relatives of different ages
- _ When speaking to people, generally, of different ages
- _ When speaking to relatives and friends, generally
- _ When in a professional environment
- _ When out for entertainment with people of the same culture as I
- _ When out for entertainment with people of a different culture than I
- _ Not listed
- _ The situation I am in does not determine how much I use my primary language

1. Please specify any of the following situations that may cause you to change the degree to which you use your secondary language(s). (select all that apply)

- _ When I am speaking to someone outside of my culture
- _ When speaking to relatives of different ages
- _ When speaking to people, generally, of different ages
- _ When speaking to relatives and friends, generally
- _ When in a professional environment
- _ When out for entertainment with people of the same culture as I
- _ When out for entertainment with people of a different culture than I
- _ The situation I am in does not determine how much I use my secondary language