

THE EFFECTS OF ACCULTURATION, AGE, AND YEARS IN THE UNITED STATES ON

RBANS PERFORMANCE IN RUSSIAN BILINGUALS

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CHAPTER I

INTRODUCTION

Overview

In the field of neuropsychology, the individual's cultural background and environment have been known to affect assessment results (Bialystok 1999, 2009). There is a paucity of research considering the effects of culture on neuropsychological measures for Russian bilinguals. This would seem to represent an oversight as, since the 1980s, the Russian bilingual population in the United States has increased by almost 400% (Ryan, 2013). The 2010 United States Census recently estimated the Russian bilingual population to be around 3.13 million, which is a little over one percent of the U.S. population (Norton, 2011). Russian is spoken in the home by 851,174 people over the age of four in the United States, which is almost four times greater than in 1980 when there were 173,226 Russian speakers in the United States. (Ryan, 2013). There are specific acculturation considerations when psychologists work with Russian bilinguals because of these particular geopolitical factors that contributed to their immigration to the United States. For example, Russians tend to be more collectivist, more open to bribes, and less focused on the individual than Western European or American counterparts (Jurcik et al., 2013). Russians living in the United States have reported less joy and more anger, guilt, and sadness when compared with Americans (Consedine et al., 2002). Findings from Ukraine suggest that prevalence rates of depression in women and alcoholism in men are substantially higher than in Western Europe (Bromet, et al., 2005). Lower life satisfaction in Russian immigrants has been linked to more negative emotions, with increased rates of alcoholism and depression (Jurcik et al., 2013). Cultural factors, such as time perception, attitude towards testing, values and meanings, modes of knowing, and patterns of abilities, have been

shown to impact performance on neuropsychological measures (Shuttleworth-Edwards, 2010; Walker et al., 2010; Agranovich & Puente, 2007; Ardila & Moreno, 2001). Cultural differences have also been shown to affect lateralization of language and spatial deficits, as well as nonverbal behavior and language (Agranovich et al., 2011; Fraine & McDade, 2009; Walker et al., 2010). Literacy level, language proficiency, quality of education, and degree of acculturation also affect neuropsychological test results (Saez et al., 2014; Ardila et al., 2010; Brucki & Nitrini, 2008). Due to this population increase and the unique cultural factors associated with Russian bilinguals, understanding how to provide culturally sensitive neuropsychological services to this population is increasingly important and serves as a significant rationale for this study.

Previous research has examined Russian bilingual performance on some neuropsychological tasks, such as task-switching, inhibition, naming, and verbal fluency (Bialystok, 2010; Bialystok et al., 2009; Agranovich & Puente, 2007). However, there does not appear to be published research on performance with this population on a brief neuropsychological battery, which is useful to screen for disorders, or when comprehensive testing is not practical, such as the *Repeatable Battery for the Assessment of Neuropsychological Status* (RBANS Update; Randolph, 2012). The RBANS is a brief neuropsychological battery measuring immediate and delayed memory, attention, language, and visuospatial skills. It can be used for the detection and characterization of dementia in the elderly, as a neuropsychological screener when lengthier assessments may not be appropriate or practical, for repeat evaluations when an alternate form is needed to control for practice effects, and it can also be useful for clinical trials (Randolph, 2012). Although there is a Russian-language adaptation of the original RBANS (Bluvshstein, 2004), there is a dearth of research on the performance of Russian bilingual

subjects on the English version of the RBANS. The Russian-language adaptation of the RBANS, developed by Bluvshstein (2004), compared the results of 95 native Russian-speaking immigrants living in America using the American normative sample reported in the RBANS. No significant differences were found between the Russian and American groups, with the exception of the Attention Index. Bluvshstein concluded that her Russian version of the RBANS has adequate psychometric qualities and clinical utility; however at present, no additional research on this version has been conducted (Bluvshstein, 2004). This is concerning because Jurcik et al. (2013) asserts that there are not many clinicians qualified to administer Russian-language versions of neuropsychological assessments, which would include the RBANS. This is also a concern given the lack of research regarding how Russian bilinguals perform on the English version so interpreting these results may lead to inaccurate conclusions and recommendations.

Brief batteries such as the RBANS provide valuable screening information and are not as time consuming as longer neuropsychological measures. This can be important in neuropsychological practice because individuals with neuropsychological impairment may be more prone to testing fatigue and deficits in arousal, and may not withstand a longer assessment battery. Given the previously mentioned cultural considerations associated with neuropsychological measures, the purpose of the study was to examine the effects of acculturation on Russian bilinguals' performance on the RBANS, when compared with monolingual controls. The study also contributes to the literature by providing further information about the performance of Russian bilinguals on the English version of the RBANS.

Bilingualism

Research on bilingualism has indicated that bilingual individuals perform better than their monolingual counterparts on certain cognitive tasks, such as divergent thinking (Landry, 1974;

Kharkhurin, 2007; 2008), creative and critical thinking ability (Ricciardelli 1992; Albert, Albert, & Radsma, 2002; Fleith, Renzulli, & Westberg, 2002), as well as inhibition and cognitive set-shifting tasks (Meuter & Allport, 1999; Prior & MacWhinney, 2010). However, bilinguals tend to be at a disadvantage compared to monolinguals on verbal tasks including receptive vocabulary (Portocarrero, Burright, & Donovanick, 2007; Bialystok, 2009), picture naming (Bialystok, et al., 2008), and the verbal comprehension measures of the *Wechsler Intelligence Scale for Children*, 3rd edition (WISC-III; Wechsler, 1991; Gasquione et al., 2010). Conversely, bilinguals tend to perform similarly to monolinguals on measures without as high a language requirement, such as the Matrix Reasoning test on the *Wechsler Adult Intelligence Scale*, 3rd edition (WAIS-III; Wechsler, 2008; Gasquione & Gonzales, 2012).

Some aspects of Russian culture seem to affect test performance. This effect can be observed via attitude towards timed tasks, where Americans tend to outperform Russian bilinguals who may not be as familiar with timed testing procedures (Agranovich & Puente, 2007; Agranovich et al., 2011). In Russian culture, speeded cognitive response is not as valued as accuracy on tasks, which may lead to the difference in time attitudes (Hayden et al., 2014). There have also been cultural differences documented on tasks with overlearned serial stimuli. In Russia, the alphabet is not recited or overlearned to the extent that it is in the United States, therefore Russians exhibited a slower response on tasks such as the Russian version of the *Trail Making Test B* (Hayden et al., 2014). In essence, it is reasonable to expect that Russian immigrants who have not lived in the United States very long may not be as integrated into American culture, and will exhibit different patterns on neuropsychological measures, such as those involving timed tasks or using serialized information. Additionally, those who are highly acculturated to American culture are expected to exhibit fewer cultural differences in this regard.

Acculturation

Acculturation has been defined as the process of cultural and psychological change following the exposure to new cultures, specifically learning a second culture (Sam & Berry, 2010). At the group level, acculturation results in changes to culture, customs, and social institutions, including changes in foods, clothing, and language (Berry, 1990; 1997; 1998). At the individual level, acculturation affects daily behavior, psychological, and physical well-being (Rudmin, 2003; Berry, 2005). The most common factors that contribute to acculturation include language use and other cultural behaviors, values and attitudes, and ethnic or heritage identity (Schwartz et al., 2013). It is important to take culture into consideration when interpreting neuropsychological test performance (Mindt et al., 2008; Perez-Arce, 1999; Puente & Agranovich, 2003) as culture could impact test scores leading to an erroneous conclusion that a cultural variation represents an organic deficit. Consideration of culture is also important because the degree to which bilingual individuals are acculturated to mainstream American society has significant impact on their ability to function successfully in the classroom and in the workplace (Rhodes, 2010; Gopaul-McNicol & Armour-Thomas, 2002). Additionally, research has shown that cultural factors affect bilingual performance on neuropsychological measures including time perception, attitude towards testing, and language proficiency (Fasfous et al., 2013; Baird, Ford, & Podell, 2007; Puente et al., 2013). Differences in ethnicity have also contributed to significant group differences of measures of language (naming tasks), constructional ability, nonverbal processing speed, and executive skills tasks such as the Wisconsin Card Sorting Test (Rosselli & Ardila, 2003; Coffey, 2005; Boone et al., 2007).

Acculturation involves the social and psychological transitions that take place when there is continued interaction between two different cultures (Berry, 1997). The process of acculturation can lead to changes in attitudes, behaviors, values, and sense of cultural identity (Cuellar, Arnold, & Maldonado, 1995). There are two main approaches to acculturation research, the unidimensional and bi-dimensional theories (Berry, 1990; Liebkind, 2006; Rudmin, 2003). The unidimensional acculturation theory stipulates that the individual is on a single continuum ranging from immersion in the person's culture of origin to the immersion in the dominant or host culture (Berry, 1996; Rudmin, 2003). The bi-dimensional perspective argues that acculturation consists of two distinct, independent dimensions, adherence to the dominant culture and maintenance of the culture of origin (Berry, 1997; Cabassa, 2003; Ryder et al., 2000). The bi-dimensional approach is preferred by psychologists studying cultural phenomena, because it acknowledges that the individual can be multicultural, by being able to maintain ties to his or her native culture and being able to participate in the mainstream or dominant culture (Rudmin, 2003). Additionally, bi-dimensional models are more highly correlated with heritage and mainstream culture, as well as with personality, self-identity, and psychosocial adjustment, (Ryder, Alden, & Paulhus, 2000). Berry's (1990) bi-dimensional model of acculturation is one of the most used bi-dimensional acculturation models, which established that the retention of ethnic identity and behaviors is independent of the development of a new cultural identity. This theory has been used previously in acculturation and bilingual research (Culhane, 2004; Rosner, Gardner, & Hong, 2011; Rafieyan et al., 2014) as well as research with Russian immigrants (Birman & Trickett, 2001; Phinney et al., 2001; Birman, Trickett, & Vinokurov, 2002; Bourhis & Dayan, 2004; Jasinskaja-Lahti et al., 2006). In this model, two cultures may blend together, remain divergent, or become conflicted. There are four acculturation strategies, according to

Berry (1990; 1997): separation, marginalization, integration, and assimilation. Separation is valuing one's original culture and avoiding interaction with the new culture. Marginalization refers to rejecting both the original and new culture. Integration is valuing the original culture and interacting with the new culture at the same time, which is also known as biculturalism. This category is also associated with the most favorable psychological outcomes, especially among young immigrants (Schwartz et al., 2010). Integrated acculturation leads to better adaptation in the new culture than those who assimilate. Finally, assimilation is giving up the original culture in favor of the new culture completely (Baek Choi & Thomas, 2009). Studies have shown that individuals with better English language fluency had a more positive acculturation attitude, meaning they were not rejecting the new (American) culture, but working on integrating it with their original culture (Baek Choi & Thomas, 2009).

Kang (2006) also found that language competence among Asian Americans was a stronger predictor of adjustment than other domains of acculturation, including self-esteem, perceived stress level, adjustment to college, as well as familial relations. Saez et al. (2014) examined the relationship between sociocultural factors and nonverbal test performance in Spanish-speaking individuals with epilepsy. They found that sociocultural factors (i.e., acculturation and education) accounted for more variance in test performance than the neurological factors (i.e., epilepsy). Older Russian bilingual immigrants tend to acquire a new culture with difficulty and remain highly oriented towards their heritage culture (Klinger, 2007). Genkova and colleagues (2014) examined acculturation via the *Language, Identity, and Behavior Scale* (LIB; Birman & Trickett, 2001; 2002) to predict psychological, family, social, and medical care adjustment outcomes in a population of older Russian bilingual immigrants. The results

indicated that high American acculturation led to better outcomes in the social domain (Genkova et al., 2014; Birman, Trickett, & Buchanan, 2005).

The level of acculturation, either to the heritage culture or the new culture, can have mixed effects on psychological wellbeing. Russian immigrants who are not integrated into American culture reported higher rates of depression, alcoholism, and a lack of social support (Genkova et al., 2014; Jurcik, 2013). Russian bilingual immigrants experience acculturation stressors such as bicultural identity integration, intergenerational conflict, employment challenges, and language proficiency, all of which can affect assessment and accurate diagnosis and treatment (Jurcik, 2013). Acculturation level can also affect neuropsychological test performance, depending on how adjusted the individual is to their second culture, and needs to be considered in bilingual populations. Bilingual individuals who have lived in the United States longer, are more proficient in English, and have a higher level of education tend to perform similarly to monolinguals on neuropsychological tests (Boone et al., 2007). Bilinguals integrated into the mainstream culture were shown to have higher language proficiency (Berry et al., 2006). Therefore, bilinguals with a more integrated level of acculturation are expected to have better L2 proficiency and less language effects on neuropsychological assessments (Berry et al., 2006; Kang, 2006). In sum, the research suggests bilingual adults who are more integrated into their new culture will have greater language proficiency and outperform monolinguals on verbal immediate memory, verbal inhibition, and verbal switching tasks.

Memory

Immediate memory measures the initial encoding and learning of simple and complex verbal items, which can be assessed with tasks such as list learning and story repetition (Randolph, 2012). These verbal short-term memory tasks are in large part dependent on

language ability, where participants performing poorly on verbal recall tasks are likely to have some language deficits. Language proficiency is especially relevant in evaluating bilingual verbal memory abilities. A bilingual person's memory is dependent on the fluency of their second language (L2), the age that their L2 was acquired, and language proficiency of both languages (Swanson, 2010). Bilinguals that learn the L2 at an earlier age tend to have greater L2 proficiency, therefore would be expected to perform similarly to monolinguals on verbal memory measures (Bialystok & Feng, 2008; Flege, Yeni-Komshian, & Liu, 1999). High English language proficiency has been shown to have positive effects on semantic and episodic memory in bilingual individuals, especially children (Kormi-Nouri, Moniri, & Nilsson, 2003). Measures of verbal working memory are positive predictors of proficiency in a second language, and working memory capacity is strongly correlated with L1 and L2 abilities (Miyake and Friedman 1998, van den Noort, et al. 2006; Namazi & Thoradottir, 2010).

Although there are obviously multiple factors to consider, bilingual adults have shown an advantage in memory tasks when compared to monolinguals (Wodniecka et al., 2010; Fernandes, et al., 2007). Bilingual adults tend to have a smaller lexicon, but are able to retrieve picture names more quickly if they knew the names both in their L1 and L2 (Gollan et al., 2005). Studies with infants have found that early experience with multiple language systems may show an advantage in memory generalization, and more balanced exposure to each language significantly predicts the ability to generalize (Brito & Barr, 2012). Bilinguals have been shown to perform better than monolinguals on tasks of episodic memory recall, letter fluency, and categorical fluency (Ljungberg et al., 2013; Francis & Strobach, 2013; Schroeder & Marian, 2012).

The need to manage several language systems in the brain has a great impact on language skills, which can negatively affect performance on immediate memory tasks for bilinguals (Kaushanskaya & Yoo, 2013; Emmorey, Petrich, & Gollan, 2013; Engel de Abreu, 2011; Bonifacci et al., 2011; Gutierrez-Clellen, Calderon, & Weismer 2004). Therefore, bilingual individuals may exhibit a disadvantage in immediate memory unless they are as proficient in the L2 as monolinguals (Higby, Kim, & Obler, 2013). Performance on working memory tasks may depend greatly on age of L2 acquisition, and whether lifelong experience speaking multiple languages leads to greater working memory ability when compared with monolinguals. Bilinguals who are more fluent and proficient in the L2 would be expected to outperform monolinguals on verbal short-term memory tasks, and less L2-proficient bilinguals are not likely to exhibit an advantage with immediate memory.

Attention

Attention is the ability to focus on a particular stimulus while ignoring irrelevant information (Lezak, 2012). It is an important part of executive control because it helps maintain the cognitive functions necessary for learning and encoding information into memory. In bilingual adults, positive effects on attention have been found for individuals who became bilingual at a young age (Yang, Yang, & Lust, 2011). Research indicates that bilinguals tend to have better inhibitory control for perceptual information when compared to monolinguals, and tend to perform faster on tasks of sustained attention (Bialystok, 1999; Bialystok & Martin, 2004; Hernandez et al., 2010). However, on cognitive control tasks, such as the *Stroop* and *Simon* tasks, bilinguals have exhibited variable performance (Simon & Small, 1969; Stroop, 1935). These tasks tap attention abilities because they require the subject to attend to the change in the stimulus to complete the task successfully. Some studies indicate bilinguals perform better

than monolinguals on *Stroop* tasks, if they are highly proficient in English, or their L2 (Suarez, et al., 2014; Kousaie & Phillips, 2012). In other studies, Spanish-English bilinguals performed worse on *Stroop* tasks, meaning they were slower on color-naming and the color-word condition (Coderre, Heuven, & Conklin, 2013; Rosselli, et al., 2002). Some research has indicated that bilingual children have an advantage in selective attention, task-switching, and inhibition, which could be due to constant need to inhibit the non-used language generalized to more effective inhibition in other situations as well (Hayrapetian et al., 2005; Bialystok et al., 2009). However, this claim has more recently been disputed with studies of monolingual and bilingual children that showed no difference in inhibition between the two groups (Dunabeitia et al., 2014).

Cross-cultural and bilingual studies have indicated that digit span and word length are not significantly different in bilinguals or monolinguals (Chincotta & Underwood, 1996; Lovatt, Avons, & Masterson, 2000). Ostrosky-Solis and Lozano (2006) found that digit span ability was affected by level of education and mastery of academic skills, such as learning to read and write at the appropriate age, as well as cultural variables such as language and quality of education (Razani et al., 2007). In a study of Russian and American adults' performance on neuropsychological tests, no group differences were found for attention tasks (digit span, category fluency, verbal/visual memory) and significant group differences for the *Color Trails Test* (CTT; D'Elia et al., 1996) were attributed to cultural differences in familiarity with timed testing procedures (Agranovich & Puente, 2007; Mitrushina et. al., 2005). These differences reflect the importance of cultural influences on test performance, and it is important to take acculturation into account when administering timed tasks to Russian bilingual individuals.

Bilingual performance on attention tasks, such as the *Stroop*, *Simon*, digit span, category fluency, and verbal/visual memory, appears to be influenced by their level of acculturation.

Performance on these tasks is also mediated by the bilinguals' proficiency in the L2, and in some cases the test performance is affected by the bilingual individual's cultural background (Agranovich et al., 2011; Agranovich & Puente, 2007; Bialystok & Feng, 2008). For example, Russian attitudes towards time and unfamiliarity with timed testing may have influenced their performance on timed attention tasks when compared to American monolinguals (Agranovich, et al., 2011). Acculturation and language proficiency is expected to affect bilingual performance on attention tasks, with bilinguals performing better if they are more integrated into the mainstream culture and are more proficient in the L2.

Language Proficiency

Language proficiency is the ability to understand and use a specific language (Shi & Zaki, 2014). Bilinguals with higher L2 proficiency tend to perform better on neuropsychological measures (Tse & Altarriba, 2014; Schmidtke, 2014). Recent research indicates differences in language proficiency between bilingual and monolingual individuals, with bilinguals exhibiting lower performance than monolingual on language tasks (Luo, Luk, & Bialystok, 2010; Bialystok, Craik, & Luk 2008). Bilingual individuals generally have a smaller vocabulary in each language when compared to monolinguals (Bialystok, 2009). Bilinguals also tend to have lower lexical retrieval, such as with picture naming tasks (Kaushanskaya & Marian, 2007; Bialystok & Feng, 2008).

On tasks of semantic and letter fluency, bilinguals produced fewer letters and words in all category types, with greater differences in semantic categories (Gollan, Montoya, & Werner, 2002). Bilingual college students also exhibited lower receptive and expressive vocabularies than their monolingual peers (Portocarrero, Burright, & Donovanick, 2007). Therefore, it could be hypothesized bilingual adults should exhibit similar or lower semantic and verbal fluency

abilities when compared to their monolingual counterparts. Luo, Luk, and Bialystok (2010) found that bilinguals with a higher vocabulary performed better than monolinguals and low-vocabulary monolinguals, which indicates that language proficiency will affect verbal fluency performance in bilinguals. The amount of time bilinguals have spent in the United States was a significant predictor of performance on verbal tasks such as the FAS task and the *Boston Naming Test* (Kaplan, Goodglass, & Weintraub, 1983). Bialystok et al., (2010) found that bilingual children performed significantly lower than monolingual children on a picture-naming task, indicating that bilingual children tend to know fewer words than their monolingual counterparts. Additionally, they found that much of the vocabulary difference involved words used in home life, where bilingual children are generally more exposed to their native language (L1).

Bialystok, Luk, and Kwan (2005) compared decoding and phonological awareness performance in bilingual and monolingual first graders, with bilinguals completing both tasks in two languages. The results indicated an advantage for children learning two alphabetic systems, such as students who were also bilingual in Hebrew and Spanish and showed greater progress in learning to read in English (Bialystok, Luk, & Kwan, 2005). Bilingual children may have more difficulty with grammar and syntax when writing sentences or paragraphs, but they can make progress in these abilities at a faster rate than monolingual children (Bialystok, 2013). For bilingual children and adults, the main component related to language abilities appears to be L2 proficiency, and length of time in the adopted country. Speaking the L2 more often and participating in their new culture has led to bilingual advantages such as faster progression in learning to read, spell, and write (Bialystok, 2013). Therefore, bilinguals who speak the L2 more often are likely to be more proficient in the L2, and expected to perform similarly to monolinguals on verbal measures. Additionally, bilinguals that are more acculturated into the

mainstream culture are likely to be more proficient in the L2 (Bialystok, Luk, & Kwan, 2005; Boone et al., 2007; Gollan et al., 2010).

Visuospatial Abilities

Visuospatial and construction refer to a set of abilities to see an object or a picture as a set of parts and then to construct a replica of the original from these parts (Mervis, Robinson, & Pani, 1999). Bilinguals may perform complex visual-spatial tasks faster when compared to monolingual controls (McLeay, 2003). Bilingual children were more accurate than monolinguals on a spatial perspective-taking task, and were able to more accurately calculate the observer's point of view in all three positions (Greenberg, Bellena, & Bialystok, 2013). Other studies have found no difference in response time for non-linguistic tasks including mental rotation, pattern matching, and form completion, between bilingual and monolingual groups (Kohnert & Windsor, 2004; Windsor et al., 2008). Performance on visual detection tasks, which measured response times when bilingual and monolingual children saw a blue target dot on a screen, was found to be similar between bilingual and monolingual groups, with chronological age being a better predictor of response time on such tasks (Kohnert & Windsor, 2004). Similar performance on such tasks may suggest that visuospatial and construction tasks do not have a heavy cultural or linguistic load, and therefore are not as affected by level of acculturation or language proficiency. There are not many studies investigating bilingual performance on visuospatial tasks, which is another reason that looking at RBANS performance in a bilingual population may yield more information on bilingual abilities related to visuospatial and construction abilities.

Rationale of the Study

The goal of this study was to investigate the memory, visuospatial/construction, language, and attention skills in Russian bilingual individuals as compared to monolingual English-speakers. Recent research has indicated bilingual individuals may have an advantage in memory and executive functioning tasks, with individuals who learned a second language in childhood having the greatest advantages (Bialystok, Craik, & Luk, 2008; Bonifacci et al., 2011). An empirical investigation comparing Russian bilingual adults to monolingual American adults was conducted to provide information on differences in neuropsychological processes, specifically on a neuropsychological measure that has not been researched with the Russian bilingual population. The study also provided insight into the interpretation of the RBANS with the Russian bilingual population. In general, bilinguals have lower scores on verbal measures such as picture naming and verbal fluency, which are assessed on the RBANS. It is important to distinguish between neuropsychological deficits and lower scores due to lower English proficiency compared to monolinguals because this differentiation could impact accurate diagnosis and clinical intervention. An individual's level of acculturation may also affect neuropsychological test performance by impacting language proficiency and performance on verbal tests. Acculturation can also affect attitude towards timed tasks, where research has suggested that Russian bilingual immigrants may not be as accustomed to timed examinations as Americans are (Agranovich & Puente, 2007). By analyzing the impact of acculturation on RBANS performance, the results of the study provided recommendations when practitioners evaluate Russian bilinguals and other bilingual individuals. Finally, the study provided a foundation for further research with Russian bilinguals, other bilingual populations, and the effects of acculturation and bilingualism on other neuropsychological measures.

Significance of the Study

Given that the Russian bilingual population has almost quadrupled since the 1980 census (Ryan, 2013), a neuropsychological understanding of bilingualism in this population is necessary to offer the most effective services for this population. At this time, the research on Russian bilinguals' performance on neuropsychological tests is limited. Specifically, there is no current research comparing bilingual and monolingual performance on the RBANS, which is a valid and reliable measure of neuropsychological abilities (Randolph et al., 1998). For many neurological conditions such as traumatic brain injury, dementia, demyelinating conditions, as well as congenital conditions such as cerebral palsy, a brief neuropsychological battery, such as the RBANS, may be useful to assess functioning as it is not time-consuming when compared to larger neuropsychological batteries, and it provides information on performance on multiple domains. With a bilingual immigrant population such as Russian bilinguals, it is important to consider the cultural and linguistic effects on test scores when making treatment decisions. Having information on a non-clinical sample of bilingual Russian bilinguals can help establish normal levels of functioning for this population. With such information, it may be easier to identify true neuropsychological deficits in Russian bilinguals who are administered the RBANS. Previous research has evaluated bilingual performance on executive functioning measures and cognitive control tasks, such as the Stroop task, verbal fluency, and other inhibitory tasks. Acculturation is also an important factor to consider in interpreting neuropsychological results, as previous preliminary research suggests that culture impacts test performance (Agranovich & Puente, 2007; Agranovich et al., 2011; Razani et al., 2007; Baird, Ford, & Podell, 2007).

Assessing levels of acculturation within this population is also of interest because many Russian bilinguals, just as other bilingual immigrant groups, may still have difficulty integrating

into American culture (Birman, Trickett, & Vinokurov, 2002; Birman & Taylor-Ritzler, 2007). For that reason, much of this study focused on the effects of acculturation in neuropsychological domains. Since the RBANS was standardized on a monolingual American population, it may impact the performance when administered to Russian bilingual individuals (Randolph, 1998). Research has shown that language proficiency and acculturation affect test performance, so it will be important to take these factors into consideration when interpreting neuropsychological test results (Tse & Altarriba, 2014; Bialystok et al., 2009).

As the United States becomes more culturally diverse, this study brings attention to acculturation factors that may play an important role in the way we currently complete neuropsychological evaluations (Agranovich et al., 2011; Agranovich & Puente, 2007; Bialystok, 2009; Bialystok, 2013). While this study is focused on a sample of Russian bilinguals, the results may be generalized highlighting important considerations when working with immigrant populations. Therefore, acculturation may become a more important factor more consistently considered in the interpretation of psychological assessments. The results of the study may yield more information on how levels of acculturation can affect performance on neuropsychological assessments, and perhaps lead to further research on the topic with other cultural groups.

Research Questions

R1: What is the difference in RBANS scores for Russian bilinguals and monolinguals in the domains of Immediate Memory, Visuospatial/Constructional, Language, Attention, and Delayed Memory?

R2: How does acculturation affect RBANS scores for Russian bilinguals?

R3: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Index scores mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R3₁: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Immediate Memory (Bialystok et al., 2009; Mindt et al., 2008) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R3₂: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Visuospatial/Constructional scores (Kisser et al., 2009) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R3₃: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Language scores (Ivanova & Costa, 2008; Gollan et al., 2008) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R3₄: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Attention (Kaushanskaya, Blumenfeld, & Marian, 2011) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R3₅: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Delayed Memory scores (Bialystok et al., 2009; Mindt et al., 2008) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

CHAPTER II

REVIEW OF THE LITERATURE

The following review is organized into two sections that are relevant to the investigation of the effect of acculturation on Russian-American test performance on the *Repeatable Battery for the Assessment of Neuropsychological Status* (RBANS Update; Randolph, 2012). The first section discusses the population dynamics of Russian bilinguals and the particular cultural issues common to this population. It also contains an overview of acculturation theories, how acculturation styles affect an immigrant's transition from one culture to another, and how acculturation can affect test performance. The second section is an overview of the neuropsychological and cognitive abilities that will be assessed in this study along with a discussion of the neuroanatomical correlates. These abilities will be presented in a format outlining the RBANS Indices of Immediate and Delayed Memory, Attention, Language, and Visuospatial Abilities.

Acculturation

Concepts of Acculturation

Level of acculturation is an important construct to consider in bilinguals, as it can affect performance on neuropsychological measures (Agranovich & Puente, 2007). In the literature, acculturation has been defined as a set of processes by which individuals and groups interact when they identify themselves as culturally distinct (Berry, 2005; Sam & Berry, 2010). In plural societies, such as in the United States, the issue of immigrants becomes how to acculturate (Berry, 1997). Plural societies refer to societies that are composed of different ethnic groups and cultural traditions. Teske and Nelson (1974) differentiated between acculturation and

assimilation as distinct dynamic processes, meaning that assimilation is not an end result of acculturation.

Acculturation was originally conceptualized as a unidimensional process (Gordon, 1964; Cuellar, Harris, & Jaso, 1980). In this model, individuals would have to give up aspects of their original culture as they acquired aspects of their new or mainstream culture. The individuals would eventually assimilate to their new society, thus losing their heritage and replacing it with that of the new society (Rivera, 2010). This model is based on the assumption that cultural variables such as values, attitudes, and self-construal are on a linear continuum, with the individual becoming acculturated in these domains from their heritage culture to the new or mainstream culture (Abe-Kim, Ozaki, & Goto, 2001). The unidimensional model has been criticized as being too restrictive by not allowing for different strategies of adjusting to a new culture, such as becoming bicultural (Ryder, Alden, & Paulhus, 2000). Another criticism of the unidimensional model is the assumption that acculturation only occurs for immigrants to the new society, and that it occurs in isolation of the mainstream society's influence (Berry, 1997; Cabassa, 2003).

Recent research suggests that bi-dimensional or multidimensional models of acculturation are more accurate representations of the acculturation process (Abe-Kim, Ozaki, & Goto, 2001; Rivera, 2000; Shin & Lach, 2014). In a bi-dimensional acculturation model, the individual retains their heritage culture while simultaneously appropriating aspects of the new society. Berry's (1997; 2001) bi-dimensional model is one of the most widely used among different cultural groups (Ben-Shalom & Horenczyk, 2003; Birman & Trickett, 2001; Dere, Ryder, & Kirmayer, 2010; Rivera, 2000; Sullivan et al., 2007). Berry (2001) identified acculturation attitudes of immigrants, which will affect how successfully immigrants will

acculturate, or what type of acculturation strategy would be employed based on psychological processes. Acculturation depends on the extent that immigrants seek involvement with the larger society, and to what extent they wish to maintain or give up their cultural attributes (Berry, 2001; Berry et al., 2006). There are four types of acculturation strategies, as outlined by Berry (1997): assimilation, separation, marginalization, and integration. Separation or segregation occurs when the dominant culture group enforces certain forms of acculturation and constrains the choices of the non-dominant or culturally different groups. If the individual chooses separation, they wish to maintain their heritage culture and avoid contact with the new society. In the context of the proposed study, the American culture is the dominant culture group that the Russian-American immigrant is adjusting to. Berry states that assimilation is a type of acculturation strategy, rather than its own distinct process, where the non-dominant groups completely accept the dominant culture in most aspects. In assimilation, the individuals seek to interact with and embrace the dominant society's culture and values while simultaneously rejecting the values and behaviors of their heritage culture. Marginalization can occur when people are forced to become assimilated and lose their individual cultural identification. Immigrants can become marginalized by their own culture, and may not be fully accepted by their adopted culture, which can lead to psychological distress. Additionally, individuals may adopt a marginalization strategy when they do not have a desire to maintain their heritage culture or interact with or adopt the values and beliefs of their new society's culture. When an individual chooses to integrate into their new society, they opt to maintain their heritage culture while interacting with and adopting aspects of the new society's culture, which Berry defined as biculturalism (Berry, 1997). The individual's adaptation of these strategies has implications for how the person adjusts to their new culture, as well as psychosocial and psychological effects. The integration strategy has been identified as

the most favorable acculturation approach because it is the most effective in achieving positive outcomes related to psychosocial adjustment and psychological well-being (Bemak, Chung, & Pedersen, 2003; Berry, 2003; Rivera, 2010).

Many acculturation measures still use a unidimensional framework, meaning that they measure the level of acculturation for the mainstream culture and make the assumption that the immigrant is therefore abandoning their heritage culture for their new one (Flannery, Riese, & Yu, 2001; Rudmin, 2003). However, bi-dimensional measures of acculturation have started becoming more common, examining both acculturation to the individual's heritage culture and their newly adopted culture (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Chung et al., 2004; Broesch & Hadley, 2012; Zea et al., 2003). Acculturation research is moving toward a bi-dimensional and multidimensional acculturation approach, with a greater need for these types of acculturation measures (Rivera, 2010).

There are many domains that affect the acculturative process, including the immigrant's values, attitudes, interpersonal relationships, language, and behaviors (Berry, 1997). Individuals within a particular cultural group may vary greatly in the extent to which they experience and adapt to cultural changes. To fully understand the acculturation process, prior immigration context must be considered (Sam & Berry, 2010; Cabassa, 2003). This involves the political, economic, and social contexts of the country of origin and reasons for immigration, as well as prior contact with the new society (Cabassa, 2003). Using proxy indicators of acculturation such as language use or length of residence in the United States has been shown to inaccurately explain levels of acculturation for immigrants, because acculturation is a more complex process (Cabassa, 2003; Rivera, 2010). How well the immigrant is able to settle into their new environment and individual factors should also be assessed when measuring levels of

acculturation. Previous research has found that language preference, whether English or L1 (first language), L2 (second language or acquired language) proficiency, cultural identity (heritage or new/mainstream culture), ethnic identity, cultural exposure (reading/writing/viewing in L1 or L2), years in the United States, generation, socio-economic status and years of education both in the United States and the country of origin, and have been shown to affect performance on cognitive and neuropsychological measures (Agranovich & Puente, 2007; Arentoft et al., 2012; Birman & Trickett, 2001; Carter-Pokras et al., 2008; Gollan et al., 2007; Lee et al., 2013; Padilla et al., 2011).

Generational effect refers to whether the bilingual individual is a first- or second-generation immigrant, and is an important factor in measuring acculturation. Recent immigrants (i.e., less than one year) have been shown to struggle with adapting to their new culture, whereas first and second generation immigrants behave similarly to members of the mainstream culture (Flaskerud, 2007; Rothe, Tzuang, & Pumariaga, 2010). Matera and colleagues (2011) investigated the role of first and second generation immigrants' desire for heritage cultural maintenance and intercultural contact, finding that generational status significantly predicted acculturation preferences, with first generation immigrants more likely to maintain their heritage culture. A study of Hmong immigrants found that cultural identity and family practices increased in adaptation to American culture with each generation (Der Vang, 2013). Additionally, Morrison and James (2009) found that first generation Portuguese immigrants were more likely to maintain their heritage culture, while their children preferred the mainstream (Canadian) culture. Therefore, generation is an important factor in understanding and contextualizing an individual's level of acculturation.

Stress related to immigration and adapting to a new culture is another factor related to acculturation. Acculturation can affect immigrants' stress levels, depending on how the individuals participate in the culture of their new place of residence. Acculturative stress has been defined as a combination of environmental, familial, and demographic effects, associated with adjusting to a foreign country and a different culture (Bemak, Chung, & Pedersen, 2003). This type of stress occurs when the individual is faced with changing their identity, values, behaviors, cognitions, attitudes, and affect (Berry, 1997; Liebkind, 1996; Miranda & Matheny, 2000). Pawliuk and colleagues (1996) examined acculturative stress symptoms, including depression, anxiety, and psychosomatic symptoms, in 48 children of immigrant parents living in Canada. They measured acculturation styles related to immigration by using the *Bicultural Involvement Questionnaire* (Szapocznik et al., 1980). They found that acculturation style did not affect psychological functioning; however, children of assimilated parents rated higher on social competence than children of parents in the integrative and marginalized groups. Parents in the integrative group were more likely to adopt the cultural norms of the mainstream culture while maintaining their culture of origin. Parents in the marginalized group were more likely to reject both their culture of origin and the mainstream Canadian culture. Individuals who completely assimilated to the American culture and did not retain aspects of their heritage culture tended to have children who felt more psychosocial competence in the American culture than children of immigrants who were not as assimilated. Furthermore, children of assimilated parents were reported to have fewer internalizing problems. However, assimilated children were reported to have more externalizing problems than integrated children. The authors suggested that parents of assimilated children might view assimilation as rebelliousness, which leads to higher ratings

of externalizing behavior by the parents. Therefore, parental acculturation styles can affect social competence and behaviors in children of immigrants.

The types of acculturation strategies that immigrants employ are also associated with their perceptions of competence. Birman (1998) investigated whether different acculturation styles predicted perceived competence in life spheres. This study was conducted with 123 Latino immigrant adolescents in the United States, who were assessed on perceived life competence and acculturation style. Acculturation to American culture predicted positive self-perceptions of competence with American peers, while acculturation to Hispanic culture predicted positive self-perceptions of competence with Latino peers. According to Birman, immigrants that identify more with the American culture may feel more competent in their academic or professional fields than immigrants who are less acculturated to American culture. Conversely, immigrants that participate much more in their native culture feel more competent and positive around their cultural peers. Therefore, immigrants who are more acculturated to the American culture may feel more confident in their academic abilities and more competent in their L2 speaking abilities, which may yield performance similar to monolinguals on a neuropsychological battery normed in the United States.

An international study looking at acculturation of immigrant youth (13-18 years old) investigated how immigrant youth deal with the process of acculturation and how well they are able to adapt (Berry et al., 2006). The study used data from immigrants and natural citizens in Western European countries, Canada, and Australia, and adolescents were asked to fill out a structured questionnaire assessing acculturation and adaptation variables, such as acculturation attitudes (integration, assimilation, separation, and marginalization), cultural identity, acculturation behaviors, family values, perceived discrimination, psychological adaptation, and

sociocultural adaptation. The authors found that those with an integration profile had the best psychological and sociocultural adaptation outcomes. They concluded that immigrant youths should be encouraged to retain their own heritage and cultural identity, while simultaneously participating in the larger national society (Berry et al., 2006; Verkuyten, 2005). In order for immigrants to maintain their ethnic identity, there has to be some support for ethnic maintenance, and it depends on the strength of pressure for assimilation in the receiving society (Phinney et al., 2001).

Acculturation has been shown to affect neuropsychological domains, such as naming, verbal fluency, attention, and visuospatial abilities (Pedraza & Mungas, 2008). Lowered performance in African-Americans relative to Caucasian individuals has been observed for the RBANS (Patton et al., 2003), as well as with Chinese individuals (Lim et al., 2010). Lowered performance in African-Americans was also documented for naming tests (Whitfield et al., 2000), and level of acculturation significantly impacted Latino scores on naming tasks (Gollan et al., 2007). Japanese-Americans who were familiar with their pictorial writing style (Kanji) outperformed monolingual Americans on visuospatial and construction tasks (Sakamoto & Spiers, 2014). Factors such as education, level of acculturation to the U.S. culture for Latinos accounted for a greater portion of the variance in neuropsychological measures of attention, verbal fluency, visuospatial skills, and processing speed (Arentoft et al., 2012; Saez et al., 2014). Language proficiency in English and cultural familiarity with testing format led to better performance in bilingual Middle Eastern participants (Razani et al., 2007). In these studies, higher levels of U.S. acculturation and greater English language proficiency yielded higher scores for bilingual and bicultural individuals, indicating that acculturation is an important factor in test performance for this population. The main acculturation factors influencing

neuropsychological test scores appear to be level of education, L2 proficiency and familiarity, the age of acquisition of the L2, exposure to reading and writing in the L2, and level of cultural identity (either heritage culture or American culture) (Boone et al., 2007). Given this information, it can be assumed that Russian-American bilinguals with higher education, greater English proficiency, and greater American cultural competence are likely to perform similarly to the monolingual norms on comparable neuropsychological measures.

Acculturation and Bilingualism

Acculturation attitudes also affect second language (L2) acquisition. Learning a second language involves the mastering of grammatical and linguistic rules as well as understanding the cultural aspects of the language (Culhane, 2004; Kang, 2006). Schumann's model of second language acquisition predicts that learners will acquire the target language to the degree they acculturate to the target language group (Schumann, 1986). In adults, learning a second language can be improved by acculturating to the culture of their L2. Rafieyan et al. (2014) examined the acculturation attitudes of 70 Iranian undergraduate students studying English, following a semester of studying abroad in the United States. The results indicated the students tended to adapt integration and assimilation strategies, while still maintaining their original culture, because they were only studying abroad for a short time. The authors conclude that immersion strategies such as a study-abroad semester appear to be the most optimal for L2 acquisition. Jiang et al (2009) investigated the relationship between L2 learning and acculturation in 49 Chinese international students in graduate programs at an American university. The participants were still closely tied to their native culture, food, socialization with other Chinese students, and speaking Chinese whenever English was not required. The authors found that the degree of immersion in American society was positively associated with L2

speaking proficiency, despite the fact that the participants were still deeply immersed in Chinese culture. These studies suggest that language immersion coupled with integrative acculturation strategies may be employed to help adults learn a second language. This is especially true if the adults are in the country where the L2 is spoken natively. Therefore, it would be expected that Russian bilinguals with greater L2 proficiency would be more integrated into American culture. The age of bilingual participants is also an important factor in considering the level of American acculturation. Younger bilinguals tend to acculturate to their new culture more readily (Abreu et al., 2013; Berry et al., 2006; Titzmann & Jugert, 2015). Birdsong (2014) found that younger adult bilinguals tend to perform better on naming tasks in their L2 than their older counterparts, and that the younger a child is when they acquire a second language (L2), the more proficient they will be in their L2. Greater L2 proficiency has been shown to positively affect acculturation to the bilingual individual's adoptive culture (Berry et al., 2006; Boone et al., 2007; Culhane, 2004).

The number of years a bilingual individual has lived in their adoptive country also has significant effects on level of acculturation to their new culture. In general, the longer a bilingual individual resides in their adopted or host country, the more likely they are to acculturate to their new culture (Berry 1997; Berry et al., 2006). Kuo and Roysircar (2004) found that adolescent Chinese immigrants living in Canada were more likely to acculturate faster to Canadian culture if they had lived in Canada longer, were younger when they emigrated to Canada, and came from a more affluent background. Thus, socioeconomic status in conjunction with age and the amount of years an individual has lived in their adopted country are all factors affecting level of acculturation. Lopez and Bui (2014) found that the longer a bilingual student stayed in the

United States, the greater their English language proficiency and acculturation to their host country.

Acculturation is an important factor in psychological adjustment to a new country with a new, often unfamiliar language and cultural structure (Modal, 2012). Acculturation styles can also affect behavior and plays an important role in L2 acquisition. Research shows that cultural adjustment can lead to greater proficiency in the L2. Learning the language of the dominant culture is predictive of positive outcomes in social, economic, and psychological domains (Culhane, 2004). Psychosocial support for immigrants is also a major factor affecting acculturation. Immigrants who receive support from their cultural group in their new country, for example Russian immigrants receiving help from the Russian-American community in the United States, tend to have better psychological outcomes, experience less acculturative stress, and have a higher chance of successfully integrating into American culture (Rhodes et al., 2013; Stewart et al., 2008). For refugee groups, such as Russian Jewish immigrants from the former Soviet Union, immigration to the United States can lead to acceptance of their experience with discrimination and other adversities witness in their country of origin (Bemak, Chung, & Pedersen, 2003). Refugees may also have more psychological distress, such as depression, post-traumatic stress disorder, anxiety, and paranoid ideation. These pre and post-migration experiences are important factors to consider in all immigrant populations.

Russian Immigrant Considerations

Russian immigrants first arrived in the United States in two waves prior to the Second World War, first in the late 19th century, and then in the 1920s, just as the Soviet Union was coming into existence (Sakwa, 2011). Following the post-World War II era, Russian immigration was very restricted due to the Cold War tension between the United States and the

Soviet Union. In the late 1980s following more open border policies in both nations, Russian citizens were permitted to emigrate out of the USSR (Russell & Batalova, 2012). The 1980s saw great political and economic reforms in the Soviet Union, such as perestroika (rebuilding) and glasnost (openness). At this point, Soviet citizens were able to start immigrating to the United States for greater economic opportunities outside the Soviet Union (Jurcik et al., 2013). Soviets seeking political asylum and religious freedom were also emigrating and many Russian Jewish individuals in particular moved to the United States and Israel (Rosner, Gardner, and Hong, 2011). Russian immigration to the United States greatly increased in the 1990s, following the end of the Cold War and the dissolution of the Soviet Union in 1991 (Hoffman et al., 2006).

Russian-American immigrants are likely to have a different set of perceptions than other immigrants to the United States, due to their unique cultural context. Carnaghan (2007) conducted over 60 intensive interviews with Russian citizens living in Russia, between 1998 and 2003, to investigate Russian thinking regarding political institutions and their views on the political changes that have happened in Russia since the dissolution of the Soviet Union. She found that the Russians she interviewed had a “limited perception” of how democratic institutions function. The results also indicated a strong predilection for laws and keeping order in society over the democratic processes. Given Russia’s tumultuous political history, it may be harder for some Russian immigrants to adapt to the democratic culture and political process, which can lead to distrust and alienation in recent immigrants to the United States. Given these results, it is certainly possible that the age of arrival to the United States will contribute to higher levels of acculturation. Therefore, immigrants who move to the United States at an earlier age may feel less alienated and be more trustful of the democratic system, leading to higher levels of acculturation.

According to the 2010 Census, more than 4.8 million European immigrants resided in the United States, representing 12% of all immigrants (U.S. Census Bureau, 2012). About 44% of European immigrants were from Eastern Europe. As of 2011, there were an estimated 398,086 immigrants from Russia residing in the United States. There were 342,153 Ukrainian immigrants, comprising 0.8% of the population (Motel & Patten, 2013). According to the 2010 U.S. census, there were 905,843 people over the age of 5 years that spoke Russian. According to the 2013 American Community Survey, approximately 55,261 Russian immigrants and 59,018 Ukrainian immigrants residing in the Midwestern region of the United States (U.S. Census Bureau, 2013). These populations were identified because immigrants from these countries are all Russian-speaking, and may also be fluent in Ukrainian (Riasanovsky & Steinberg, 2010). The majority of Russian and Ukrainian immigrants reside in the Northeast United States, specifically New York and New Jersey, followed by the Western United States, specifically California, and then the South of the United States (U.S. Census Bureau, 2013).

Immigration can be a very stressful process, and can result in psychological side-effects for the individual (Brown, Cohen, & Mezuk, 2014; Kisselev, Brown, & Brown, 2010; Yakushko, 2010; Levitt, Lane, & Levitt, 2005). Many immigrants, including Russian immigrants, move to the United States for a wider range of opportunities and in some cases religious freedom (Birman & Trickett, 2001; West, 2011). However, uprooting themselves, and, in many cases, their family members, can cause psychological distress and put undue pressure on the family unit. Elias and Lemish (2011) found that asynchronous second language development among Russian immigrant family members can lead to stress in the family unit. Asynchronous second language development can occur when children of immigrants become more fluent in the L2 than their parents, and as a result, become more accepting of American cultural standards. This leads to

stress in the family because the parents feel that their children are rejecting their heritage language and culture. The authors found that more liberal parenting styles, i.e, those that were the most pluralistic and tolerant to the culture of the new country, helped reduce familial tensions between immigrant children and parents.

Acculturation research in Russian immigrant populations has tended to look at L2 language proficiency, number of years spent in the United States, level of education, occupation, country of origin, ethnicity, cultural identity of the immigrant (either Russian or the new culture), and the level of participation in Russian versus mainstream culture activities, such as watching TV, playing sports, and joining clubs. Safdar, Calvez, and Lewis (2012) assessed acculturation in Russian-Canadian immigrants, finding that resilience, self-perceived cultural competence (with regards to the Canadian culture), and perception of social support were the greatest predictors of acculturation for this population. Liebkind and Jasinskaja-Lahti (2000) found that the strongest predictors of acculturation in adolescent Russian immigrants residing in Finland were the level of ethnic identity, level of education, Finnish language proficiency, and experiences of family support in the community. Subsequent research with this population indicated that socio-economic status, comprised of level of education, occupation, and income, was another important predictor of acculturation for adult Russian immigrants residing in either Finland or Israel (Jasinskaja-Lahti, Horenczyk, & Kinunen, 2011). Birman and colleagues (2014) assessed Russian-American immigrants' self-reported English language proficiency and the extent to which they participate in behaviors associated with American culture (e.g., language use, media, music, entertainment, food) combined with occupation, income, and education levels, indicating that greater American acculturation was associated with higher English proficiency, higher education levels, and therefore higher socioeconomic status. There is still a

general paucity of research regarding acculturation factors for Russian-American immigrants. Much of the current research with Russian immigrants is done in Israel, where there is a large Russian population. However, with an estimated Russian-speaking immigrant population of 800,000-900,000 residing in the United States, it is important to research the factors related to acculturation in this population.

Generational effects are also an important factor to consider in Russian immigrant acculturation research. Adolescents who are first generation immigrants to the United States are faced with a unique set of acculturation issues. Birman, Trickett, and Vinokurov (2002) investigated the acculturation and adaptation of Soviet Jewish refugee adolescents. The study used the *Language, Identity and Behavioral Acculturation Scale* (LIB; Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002) to assess the subjects' levels of acculturation in the domains of language, identity, and behavior both for Russian (heritage) culture and American culture. The results indicated that acculturation to American culture in the language, identity, and behavior domains predicted better grades and perceived support from American peers. Russian acculturation predicted better relationships with parents and Russian peers. Both Russian and American acculturation was related to reduced loneliness and increased support from parents. The results also indicated that more adolescents had higher levels of American acculturation, illustrating a generational effect for the Russian-American population as well.

Remennick (2004) investigated the language acquisition and social integration of Soviet immigrants who moved to Israel during the second wave of Russian immigration in the 1990s. The results indicated that younger Russian-Israeli immigrants were more likely to be bilingual in Russian and Hebrew, which led to a greater likelihood that they would participate in Israeli culture, outside of their Russian cultural background. Meanwhile, older Soviet immigrants were

more likely to maintain their Russian cultural ties and be less likely to learn the L2 (Hebrew). The conclusions indicated that becoming more proficient in the native language of the second culture (L2) leads to a reshaping of the individual's identity and increases their likelihood of being a greater participant in that culture. Additionally, language acquisition appears to be fundamental to cultural integration, which is beneficial for a person's psychological well-being. However, Hubenthal (2004) found that Russian-American immigrants in their 60s and 70s were motivated to learn English in order to integrate into American society more easily and to be able to function autonomously as they did in the Soviet Union. In this case, older Russian immigrants viewed language proficiency as a method for functioning with autonomy and confidence in their new culture. Successful functional communication can also lead to greater self-efficacy, self-esteem, and better psychosocial adjustment for Russian immigrants. These divergent results may be due in part to Russians having a more insular community in Israel, and many Russian immigrants living in close-knit communities where learning Hebrew is not required to function autonomously in their new society (Remennick, 2004). Russian bilinguals are less likely to be in such a self-contained community and have a greater impetus to learn the L2 in order to maintain autonomy.

Greater adjustment to American culture has benefits for younger immigrants as well. Birman, Trickett, and Buchanan (2005) found that Russian adolescents who identified more with American culture had higher overall school achievement and fewer school absences, greater school involvement, and more social support from American peers in school. For younger Russian immigrants, attending mainstream schools tends to accelerate the rates of integration into American culture, especially if the students are receiving support from their parents in pursuing American activities and speaking more English at home (Jones, Trickett, & Birman,

2012). Russian-American immigrants who have attended high school and college in the United States would therefore be expected to have higher levels of American acculturation.

Acculturation Considerations in Russian-Jewish Immigrants

Russian-speaking Jews are a large part of the Russian immigrants to the United States, many of who left their former Soviet Union as refugees seeking religious or political asylum (Kliger, 2011). This immigrant group encounters some different challenges when compared to non-Jewish Russian immigrants. Russian Jews have the challenge of acculturating into American Jewish culture, American culture as a whole, and maintain their identities as Russian Jews in the United States (Rosner, Gardner, & Hong, 2011). Persky and Birman (2005) examined Russian, American, and Jewish ethnic identities, and investigated which cultural identity was most predictive in psychological acculturation. The authors differentiated between the multiple identities of Jews from the former Soviet Union living in the United States and found that many of them identify “American” as their national identity and “Russian” as their ethnic identity. The study utilized the *LIB Acculturation Scale* (Birman & Trickett, 2001) to assess participation and acculturation in language, identity, and behaviors for Russian, American, and Jewish cultures. To gauge psychological adjustment, subjects were administered rating scales regarding alienation, life satisfaction, and symptom distress (for symptoms of depression, somatic distress, and anxiety). The results of this study indicated Jewish identity was the most salient, meaning that Soviet Jewish immigrants most identified with a Jewish culture and identity. Immigrants with refugee status may have more psychological trauma from their country of origin, in the form of discrimination, deprivation of food or shelter, physical injury or torture, or witnessing of torture and killing. Therefore, refugees may be more susceptible to psychological problems such as guilt, despair, depression, post-traumatic stress disorder, anger,

and hostility (Bemak, Chung, & Pedersen, 2003). For example, Russian Jewish immigrants living in Israel were found to be more prone to paranoid ideation and anxiety than Ethiopian immigrants (Remmenick, 2002). Additionally, Gutkovich and colleagues (1999) found that Russian Jewish immigrants were more likely to express distress in psychosomatic terms, leading to higher rates of depression in this population. Refugees may also become more aware of their ethnic or racial identity after resettling in a new country. For Russian Jews, anti-Semitism was a very common experience in the former Soviet Union in all aspects of daily life (Day & Cohen, 2000). Immigration can help these refugees come to terms with their experiences and connect more to their ethnicity. Russian Jewish immigrants were able to normalize anti-Semitic experiences in the former Soviet Union after relocating to Israel (Rapoport, Lomsky-Feder, & Heider, 2002). This study will recruit from agencies that service Jewish immigrants and Russian Jewish individuals will likely comprise part of the sample population. Therefore, it is important to be aware of the acculturation issues surrounding this specific cultural group.

Acculturation plays an important role in how well immigrants adjust to life in the United States. Immigrant acculturation strategies may affect the individual's L2 proficiency and cultural adjustment. These various acculturation factors affect multiple neuropsychological domains, including memory, attention, language ability, visuospatial processing, and construction (Arentoft et al., 2012; Bialystok et al., 2009; Boone et al., 2007; Patton et al., 2003; Pedraza & Mungas, 2008; Saez et al., 2014; Sakamoto et al., 2014; Whitfield et al., 2000). When examining these domains in bilingual immigrants, it is important to consider how cultural and linguistic factors affect their performance to accurately inform diagnosis and treatment.

Memory

Memory is the process in which information is encoded, stored, and retrieved. Difficulty with memory is one of the primary complaints of patients with acquired neurological conditions and can interfere with a variety of functional activities. Problems with memory could easily interfere with acculturation as the immigrant may struggle with recalling recently learned information important for transitioning to a new culture. Encoding allows information perceived from the world to reach our senses and become part of long-term memory storage (Lezak, et al., 2012). According to the information processing theory, there are three stages of formation and retrieval of memory (Nyikos & Oxford, 1993). Encoding is the first stage of memory, where the brain receives and processes incoming information. The second stage of memory is the storage of information, which creates a permanent record, and is stored in long-term memory. Retrieval is the final stage, where the individual is able to recall the stored information in response to a particular cue. There are different types of memory, including sensory memory, short-term memory, working memory, and long-term memory. The subjects in this study will be assessed on immediate memory and delayed memory recall, therefore this literature review will discuss these constructs at length.

Immediate Memory

Immediate memory is the first stage of short-term memory (STM), and temporarily holds information retained from the registration process. STM can be equated with simple immediate span of attention (Baddeley, 2003). It serves as a limited capacity store from which information is transferred to a more permanent store. It is therefore viewed as a limited capacity retrieval system (Fuster, 1995). Miller (1965) was the first to observe that immediate memory can retain about 7 chunks of information at a time, and any more items than that will most likely not be

encoded into long-term memory storage. Immediate memory is long enough to allow a person to respond to ongoing events and typically lasts 30 seconds to several minutes (Atkinson & Shiffrin, 1971).

Immediate memory may operate as a set of subsystems controlled by a limited capacity executive system known as working memory (Baddeley, 2002). Working memory is the temporary storage and processing system used for problems solving and other cognitive functions that take place over a limited period of time. Nairne (1988; 1990) designed the feature model of immediate memory to account for the major effects observed when memory is tested by immediate serial recall.

Short-term memory capacity is often tested with span tasks. Miller's (1956) Magic number seven (plus or minus two) provides evidence for the capacity for STM. Most adults can store between five and nine items or chunks of items in their STM. Jacobs used the digit span test with every letter in the alphabet and all numbers, with the exception of "w" and the number 7 because they had two syllables. He found that people find it easier to recall numbers rather than letters, with average number span being 9.3 and letter span being 7.3. When participants are required to recall in any order the items on a list, their responses are subject to recency effect, which states that items at the end of the list are more likely to be recalled than items stated earlier (Atkinson & Shiffrin, 1971).

Immediate memory tasks such as list learning and story memory assess the STM capacity in participants and are useful in determining verbal deficits. List learning tasks require the participant to repeat a series of words presented orally, and test rote verbal memory functioning. The lists are usually presented multiple times, and a positive learning curve is seen in healthy adults (Randolph, 2012). Deficits in language have been implicated in list learning performance.

Gathercole and Baddeley (1990) found that children with unspecified language disorders exhibited greater difficulty repeating and recalling words learned in a list, which they concluded was due to a deficit in phonological storage system. Weismer, Evans, and Hesketh (1999) also found that children with specific language impairments had significantly worse word recall than children without language deficits. They concluded that children with language impairment exhibited a limited STM capacity, which seems to hinder proper phonological processing. Mainela-Arnold and Evans (2005) also assessed list learning in children with specific language impairment. They found that language impaired children exhibited significantly greater difficulty recalling low-frequency words than high frequency words, but in general their results suggested that short-term and working memory capacity was impacted by language knowledge. The authors concluded that children with specific language impairments are more likely to have impaired short-term capacity with regards to verbal information. Children with a diagnosis of dyslexia performed worse than typically developing children on word list recall, which suggests that dyslexics tend to have less efficient STM rehearsal and encoding mechanisms (Kramer, Knee, & Delis, 2000). Diaz et al. (2014) found that list learning ability was significantly correlated with language proficiency in older monolingual adults, indicating that participants with lower language proficiency were more likely to make errors in the list learning task. This research indicates that list learning ability is affected by the participant's age as well as their language proficiency and verbal abilities. Individuals with reading disabilities and lower language proficiency would be expected to recall fewer words in a list than typically developing monolingual individuals.

Story memory and recall tasks require the participant to repeat back stories presented to them orally. As with list learning, story memory is highly correlated with verbal abilities and

language proficiency (Cain, Oakhill, & Bryant, 2004). For example, children with autism generally have greater impairments in verbal abilities and verbal processing than typically developing children (Williams et al., 2005). On story retelling tasks, children with autism exhibited lower scores than typical participants, and had generally lower receptive vocabulary abilities (Gabig, 2008). These results suggest language processing significantly affect performance on verbal memory tasks such as story recall. As such, individuals, such as Russian-American immigrants with lower language proficiency would be expected to have greater difficulty with story memory tasks. Jordan, Tyner, and Heaton (2013) found that verbal knowledge is related to encoding and accounted for the most variance on overall verbal memory tasks, including story memory ability. These results suggest that verbal abilities will help predict performance on story memory and list learning tasks. Verbal abilities are an important consideration when assessing bilingual individuals in their L2, because lower L2 abilities will contribute to poorer performance on list learning and story memory measures, and it will be important to separate lower verbal abilities due to L2 proficiency from an actual verbal memory deficit in bilingual populations.

List learning performance has been implicated in deficits with executive functions, and been shown to affect frontal areas of the brain. Stuss et al. (1996) found that participants with frontal lesions performed significantly worse than monolinguals on a list learning measure, and that older individuals performed similarly to those with frontal lesions on this task. This indicates that list learning abilities decline as participants age, and that frontal regions of the brain are implicated in list learning ability. Krueger and Salthouse (2011) found that age was significantly correlated with list learning performance, and higher episodic memory was associated with greater recall of words. The left temporal lobe has been implicated in verbal

memory abilities. Adults with temporal lobe epilepsy, specifically with a left hemisphere seizure focus, exhibited deficits with list learning and story memory tasks, indicating that the left temporal lobe is implicated in these processes (Gascoigne et al., 2014). The left hippocampal area is also associated with learning unrelated word lists, specifically the left dentate gyrus (Travis et al., 2014). The inferior parietal cortex has been shown to maintain attention during verbal working memory tasks, and verbal recall was associated with activation in the medial temporal lobe (Nee & Jonides, 2013). Tomlinson et al. (2014) found that participants exhibited greater impairments in list learning accuracy when their superior right cerebellar hemisphere was receiving continuous disruption via burst stimulation. This effect was not seen with left cerebellar activation, leading the authors to conclude that the right cerebellar hemisphere is implicated in verbal short-term memory as well.

Immediate Memory in Bilinguals

As previously discussed, verbal knowledge and language proficiency play a large role in verbal short-term memory performance. It is therefore important to consider these domains when administering and interpreting verbal short-term memory measures with bilingual populations, as they tend to perform lower than monolinguals on verbal tasks, even though this does not necessarily constitute a deficit in verbal short-term memory (Bialystok et al., 2009; Mindt et al., 2008). Ardila and colleagues (2000) found that Spanish-speaking bilinguals performed better on short-term verbal memory tasks in their L1 (Spanish) than their L2 (English). This suggests that a bilingual effect is indeed present for verbal memory tasks, and bilinguals may be at a disadvantage on such measures in their L2. Cheung and Kemper (1993) found that phonological differences in English and Chinese contributed to significant differences in list recall performance for Chinese-English bilinguals and Chinese and English monolinguals.

Hammer et al. (2012) found that story recall performance in bilingual children depended on cultural factors such as what language they were read to at home, what language was used most often at home, and how often the subjects spoke English at home and at school. Language familiarity in bilinguals was shown to affect immediate list recall, with bilinguals less familiar with the L2 making more errors in recalling the words from an orally presented list (Thorn, Gathercole, & Frankish, 2005; 2002). Although not much evidence exists for bilingual performance with regards to verbal short-term memory, it would be reasonable to expect that bilinguals who are more familiar and proficient with their second language are likely to make fewer mistakes in list learning and recall measures in L2. The bilingual individual's cultural context is also another factor to consider when predicting performance on immediate memory measures. Bilinguals who are more exposed to the L2 at home, by reading books and watching television in the L2 for example, and at school or work are more likely to perform similarly to monolinguals on L2 list learning and story memory measures.

Attention

Attention is the ability to retain and respond to stimuli for a certain amount of time. It also refers to the capacities or processes of how subjects become receptive to stimuli (Miller & Cohen, 2001). One of the characteristics of the attentional system is limited capacity, which means that only a limited amount of processing activity can take place at one time (Lang, 2000). Therefore, if the attentional system is engaged, it can interfere with a second task having similar processing requirements (Posner, 1980). Another characteristic of the attentional system involves bottom-up processing, which moves attention towards salient attention-grabbing stimuli, such as an alarm. Top-down processing is more goal-oriented, and can therefore be

strong enough to override stimulus-driven responses (Engel, Fries, & Singer, 2001). Bilinguals who are completing tasks in their L2 may have to override the initial impulse to think and respond in their L1, and are therefore expected to engage in top-down processing to maintain attention on the task. Therefore, it is reasonable to expect that bilinguals may have superior abilities to suppress unwanted responses and maintain attention than monolinguals (Kaushanskaya, Blumenfeld, & Marian, 2011; Hummel, 2002; Ostrosky-Solis & Lozano, 2006; Roselli & Ardila, 2003).

One way to conceptualize attention is to consider four broad types of attention. Immediate attention refers to the amount of information that can be grasped at once. It may be considered a form of working memory, but it is an integral part of attentional functioning (MacKay et al., 2004). Sustained attention refers to the subject's readiness to detect rarely and unpredictably occurring signals over prolonged periods of time (Sarter, Givens, & Bruno, 2001). Divided attention is a process involving the ability to attend to and respond to more than one task at a time, or to multiple elements of a task, essentially considered to be multi-tasking (Kane & Engle, 2002). Finally, alternating attention is a process that allows individuals to shift their focus of attention and move between tasks having different cognitive requirements (Knudsen, 2007). These processes are sensitive to damage involving any part of the attention system.

The digit span task is common measure that can often be used to assess attention span. Digit span has been used to investigate cognition, along with reaction time. As Wambach et al. (2011) stated, the origins of digit span as a psychological construct have gone back to Leibniz in the eighteenth century, who suggested that individuals have a finite capacity to maintain information in their minds. In the late nineteenth century, Wilhelm Wundt studied digit span to measure the scope of consciousness, and was one of the first to develop a measure of digit span

for this purpose. Binet and Simon included two exercises involving verbally repeating strings of numbers in their 1908 scales, and Wechsler included both forward and backward digit span in his 1939 scales (Ramsay & Reynolds, 1995). There are often two modalities in a digit span task: forward and backward. Forward digit span is thought to be a measure of attention as it exposes the subject to increasingly larger, or smaller, amounts of information and tasked with repeating the information immediately. The amount of information correctly repeated is considered indicative of the size of the subject's auditory attentional capacity (Randolph, 2012). The backward digit span test is usually used as more of a measure of working memory, as it requires retaining the information presented and manipulating it in some way. For example, the Digit Span test in the Wechsler Intelligence Scales can be used to measure immediate verbal recall as well as verbal working memory. The subject is required to repeat an increasing series of numbers first forward, then backward. This task involves auditory attention and short-term retention capacity (Wechsler, 2008). The digit span task is very useful in clinical settings to differentiate various neuropsychological or cognitive disorders, including dementia, depression, and malingered neurocognitive dysfunction (Reese, Suhr, & Riddle, 2012; Hale, Hoepfner, & Fiorello, 2002). Digit span is influenced by demographic factors, such as age and educational level. In older individuals, digit span performance sometimes becomes worse over time (Mathias et al., 2002). Other studies suggest that older individuals perform worse on digit span measures (Sebastian & Mediavilla, 2015; Sebastian & Hernandez-Gil, 2012). Educational level has been shown to have a positive effect, leading to better performance on digit span tasks (Choi et al., 2014). Digit span has been shown to be an effective tool in identifying patients with delirium and dementia (Leung et al., 2011).

The prefrontal cortex is among the many brain structures involved in attention. Specifically, the right prefrontal cortex mediates the ability to control and shift attention (Rubia, Alegria, & Brinson, 2014; Kane & Engle, 2002). The prefrontal areas are also involved in inhibiting distractor effects and dividing attention, including performing two tasks at once (Medeiros-Ward, Watson, & Strayer, 2015; Sebastian et al., 2014). The anterior cingulate cortex is also engaged when there is processing of new information or solving novel problems (Cassaday, Nelson, & Pezze, 2014; Hwang et al., 2014). Damage to any of these areas can lead to deficits in attention, such as an inability to inhibit distractors, divide attention between two tasks, or learning novel tasks or problems (Weible, 2013; Li et al., 2013). The right inferior parietal appears to be associated with forward digit span tasks in children (Rossi et al., 2013). Additionally, Brodmann's area 40 (supramarginal gyrus) and the inferior frontal gyrus and Broca's area were activated during digit span tasks (Romero, Walsh, & Papagno, 2006). Digit span tasks have also been shown to activate the right middle and left precentral gyrus, the right middle and medial frontal gyri, the right inferior parietal lobule, and the left middle and inferior frontal gyri (Tsukiura et al., 2001).

Symbol substitution tasks, such as Coding from the RBANS or the Wechsler tests, are measures of brief, focused, visual attention, visual scanning, visuomotor coordination, and processing speed (Randolph, 2012). Coding usually consists of blank squares paired with an assigned number. Above the blank boxes is a printed key that pairs the numbers with a different nonsense symbol. The subject has to fill in the blanks with the corresponding symbol.

Coding tasks have been shown to activate the dorsolateral prefrontal cortex, the supramarginal gyrus, and the inferior frontal gyrus (Rypma, et al., 2006). Periventricular white matter hyperintensities, which are commonly seen in aging patients, have been associated with

slowed processing speed and worse performance on coding tasks (van den Heuvel et al., 2006). Individuals with a diagnosed TBI showed greater activation of the middle frontal gyrus, superior parietal cortex, basal ganglia, and anterior cingulate on a coding task, when compared to healthy controls (Kohl et al., 2009). These results suggest that these areas of the brain require greater activation for individuals with a TBI and may lead to fatigue earlier than in healthy controls. In healthy adults, the dorsolateral PFC was positively associated with the individual's performance speed, and greater PFC activation was observed in slower individuals (Rypma & Prabhakaran, 2009). The ventrolateral PFC, specifically the inferior frontal gyrus, and the inferior parietal cortex, specifically the angular gyrus and supramarginal gyrus, were also shown to be activated during coding tasks (Biswal, et al., 2010).

Attention and Bilinguals

The digit span task is a commonly used measure of immediate verbal recall, attentional capacity, and working memory. Cultural factors such as educational level, language proficiency, and level of acculturation have been shown to affect digit span performance in bilinguals (Karakas et al., 2002; Ostrosky-Solis & Lozano, 2006). Ostrosky-Solis and Lozano (2006) found that level of education in a Spanish-speaking sample was positively associated with better performance on the digit span task. Kaushanskaya, Blumenfeld, and Marian (2011) found that bilingualism had a stronger effect on digit span tasks than monolinguals, with bilinguals that had higher digit span scores performed better on vocabulary tasks than bilinguals with lower digit span scores, indicating that bilinguals rely more on attentional and working memory systems to support word retrieval more so than monolinguals. Thorn and Gathercole (1999) also reported that bilinguals with a higher vocabulary were able to recall more items in a digit span task. Pae and Sevick (2011) examined L1 and L2 digit span, reading fluency, and comprehension in a

group of Korean-English bilinguals. They found that L1 (Korean) digit span performance accounted for significant variance in L2 (English) reading fluency and comprehension.

Therefore, bilinguals may rely more on their attentional capacities to complete verbal tasks in their L2. Additionally, decreased digit span ability has been associated with a failure to acquire the L2 and greater deficits in pseudoword decoding in bilinguals (Hummel, 2002). Digit span ability relies on attention and short-term memory, which are domains heavily used by bilinguals when learning an L2 (Ardila, 2002). Therefore, deficits in digit span may be related to difficulty in learning the L2 for bilinguals. Bilinguals with a specific language impairment showed reduced performance on digit span, and their digit span performance predicted grammar abilities, indicating that digit span ability in bilinguals is closely tied to L2 language processes (Ziethé, Eysenck, & Doellinger, 2013). In the context of this study, it is expected that bilinguals with higher L2 proficiency would exhibit better performance on digit span than bilinguals with lower L2 proficiency.

Nonverbal neuropsychological measures, such as coding tests, are often used with non-native English speakers in an effort to minimize cultural and linguistic factors that may influence performance. These tests do not rely on vocabulary or other verbal abilities, which would suggest that bilinguals and monolinguals should not have significant differences in performance. Roselli and Ardila (2003) found a strong association between educational level and performance on nonverbal neuropsychological measures, including coding. Harris (2003) reported relatively strong relationships between cultural factors, specifically education and language preference, and the Processing Speed Index on the *Wechsler Adult Intelligence Scales*, 3rd edition (WAIS-III; Wechsler, 1997). Harris, Wagner, and Collum (2007) found no differences between monolingual and bilingual groups on a coding measure; however, in the dominant Spanish

speaking group, less educated participants performed lower than Spanish bilinguals with higher educational levels. Therefore, although there is less linguistic loading, it appears coding tasks are sensitive to years of education. It is expected that bilinguals with higher levels of education will therefore perform better than bilinguals with less education. Razani et al. (2007) found that Mexican-American levels of acculturation affected performance on a coding task, where higher American acculturation was correlated with better scores on the coding task. The authors also concluded that language proficiency, cultural familiarity with testing procedures, test-taking approach, and participant comfort with lengthy testing contributed to the overall scores and should be considered when evaluating participants from a different cultural background. Therefore, bilinguals with higher levels of acculturation to the mainstream (American) culture are expected to perform similarly to monolinguals and exhibit fewer deficits on processing speed measures such as coding.

Language

Language is the ability to acquire and use complex systems of communication. Language proficiency is the ability of an individual to speak or perform in an acquired language. In bilinguals, early exposure to a second language, and subsequent linguistic development, has been shown to positively impact cognitive and executive functioning abilities, such as memory, task switching, inhibition, and planning (Carlson & Meltzoff, 2008; Bialystok, 2005). Bilinguals tend to perform worse on language tasks, such as verbal fluency and picture naming, when compared to monolinguals. Therefore, it is important to be aware of the bilingual's length of exposure to the L2, and it is expected that bilinguals who have spoken their L2 longer would have fewer deficits on tasks of verbal fluency and picture naming.

Verbal naming tasks can be used as a measure of dysnomia if naming is impaired. These confrontation measures provide information about the accuracy and response time of word retrieval, and it gives some indication of vocabulary level. Given that confrontation naming tasks are very verbal in nature, it is expected that bilinguals would exhibit a slower response time, and generally lower naming abilities when compared with monolinguals (Gollan et al., 2005). A common naming task is the *Boston Naming Test* (BNT; Kaplan, Goodglass, & Weintraub, 1983). This test consists of pictures of items ranging from common items at the beginning of the test to more complex and obscure words at the end of the test. The BNT has been used as part of dementia evaluations, as it can help identify individuals with Alzheimer's disease (Diehl et al., 2005; Williams et al., 2007; Brouillette et al., 2011) The BNT is sensitive to the extent of the participant's vocabulary and educational level, which are also important factors to consider in assessing bilingual individuals.

Verbal fluency tests are also used as a measure of language and executive functioning. These tests require word generation either based on a particular letter (phonemic fluency) or specific category of object (semantic fluency) in a short time span. Semantic fluency is a direct assessment of expressive language skills that are often impaired in global and expressive aphasia (Randolph, 2012). Semantic fluency was also shown to be sensitive to dementia as well as aphasia (Arroyo-Anllo et al., 2012; Thompson et al., 2012; Catani et al., 2013).

Confrontation naming tasks were shown to be correlated with the functioning of the bilateral inferior temporal lobes (Melrose et al., 2009). The BNT was associated with primarily left-hemisphere regions, specifically the left anterior to posterior medial temporal gyrus and superior temporal gyrus, as well as the left inferior parietal cortex (Baldo et al., 2013). Magnetic resonance diffusion tensor imaging yielded significant diffusivity measurements in the

left and right posterior occipital-parietal cortex, right parietal supramarginal gyrus, and right frontal precentral gyri on a confrontation naming task in patients with mild cognitive impairment (Rose et al., 2006). Confrontation naming tasks appear to rely heavily on left temporal and parietal regions, indicating language and visual perception faculties are involved on this measure.

Participants with major depression exhibited deficits in semantic fluency, with less activation in the right hippocampal gyrus, the right fusiform gyrus, and the right supplementary motor area (Backes et al., 2014). Melrose et al. (2009) found that semantic fluency was associated with the inferior frontal gyrus and temporal regions. Reduced semantic fluency was associated with less activation in the left parietal cortex and smaller bilateral cerebellum gray matter volumes in individuals with early Parkinson's disease (Ellfolk et al., 2014). Semantic fluency in young adults showed fMRI activation in the left superior temporal gyrus, left cuneate gyrus, left medial frontal area, the right caudate nucleus, and the left middle frontal area, whereas in older participants there was activation in the left superior temporal, right middle frontal areas, right inferior frontal, left rostral, and the left inferior temporal areas (Meinzer et al., 2009). The studies indicate that semantic fluency tends to be associated with bilateral frontal and temporal areas, as well as the left parietal. Impairment in these areas is likely to impact semantic fluency accuracy and response times.

Language Proficiency and Bilinguals

Research indicates that bilingual individuals tend to perform better on language tasks when they are more proficient both in their L1 and L2. Bilinguals' L1 can also help prime their ability to recall words in their L2. There is also evidence that bilinguals' L1 influences their ability to learn their L2, which is known as cross-language activation (Bobb, Hoshino, & Kroll, 2008).

Von Holzen and Mani (2012) examined how toddlers' L2 (English) proficiency primed recognition of target words in their L1 (German). The words were either phonologically related (i.e., slide and kleid) or phonologically related through translation. The results of their study indicated that bilingual toddlers were using cross-language activation, which provides evidence that bilingual children use cross-talk when becoming fluent in their L2, and that the L1 will therefore affect their rate of fluency in the L2 if the words are phonologically similar in some way.

Bilinguals tend to perform worse than monolinguals on verbal tasks such as picture-naming (Pelham & Abrams, 2014). Gollan et al. (2005) compared the performance of bilinguals and monolinguals on a task of picture naming. The bilingual group was Spanish-English college students compared to a monolingual group of English-speaking college students. The bilinguals named pictures slower than monolinguals, which is consistent with previous research. However, the task of picture classification did not yield any group differences, indicating that the bilingual disadvantage in language may manifest more distinctly when the task involves lexical representations, such as letters and words, more so than images.

Bilinguals may have more difficulty with confrontation naming tasks due to the habitual use and continued maintenance of both their L1 and L2, which may lead to inaccurate picture identification more often than in monolinguals who only need to maintain one language. Pelham and Abrams (2014) investigated the advantages and disadvantages of early Spanish-English bilinguals with a picture naming task, selected from the Snodgrass and Vandewart (1980) picture set, and the ANT to evaluate attention. Both early and late Spanish-English bilinguals demonstrated difficulties with lexical access on the naming task, but outperformed the monolingual group on the ANT. These findings indicate that the advantages and disadvantages

for bilinguals are due to the habitual use of both languages, rather than learning the second language in childhood.

Bilingual performance on naming tasks may be due to language proficiency and age of arrival (if the bilingual individual is also an immigrant), both of which can affect L2 proficiency and naming ability. Ivanova and Costa (2008) found that bilinguals were slower in picture naming tasks than monolinguals. The results also indicated that bilinguals have a naming disadvantage in their L1 as well as L2. Gollan and colleagues (2008) examined age effects in a group of Spanish-English bilingual adults who were administered a picture-naming task. They were required to name a portion of the pictures in English only, then another portion in Spanish only, and a third portion in whatever language came to mind when they saw the picture. The study found that bilinguals named pictures more slowly than monolinguals, in either language. Additionally, older bilinguals exhibited slower naming speed than younger bilinguals, suggesting slowed processing in the acquired language (L2) for older bilinguals. Pelham and Abrams (2014) however, found that age was not a significant predictor of picture naming ability in bilingual children. Rather, picture-naming performance in bilinguals was more significantly affected by habitual use of the L2 in bilingual children. Pavlenko and Malt (2011) also examined object naming in Russian-English bilinguals, looking at the cross-language effect and age of arrival into the L2 environment. There were three groups of bilinguals: early, childhood, and late bilinguals (L1 Russian, L2 English). The results indicate that Russians who arrived to the United States earlier had the greatest L2 influence, and the lowest L1 proficiency. Additionally, L1 word use is susceptible to L2 influence even for concrete, familiar nouns. Picture naming, therefore, seems to be a weakness for bilinguals, due to cross-language effects and the mediation of both languages in the process of identifying and naming. As these studies

suggest, bilingualism negatively affects the ability to produce words in a picture-naming task both in the L1 and L2, and the cross-language effect leads to poorer performance even in the subject's dominant language.

Verbal fluency is another aspect of language assessed with bilinguals. Verbal fluency is comprised of a semantic, or categorical, component, where individuals have to produce words from a particular category in a short time span, such as one minute. Phonemic fluency is another component of verbal fluency, where the participant must produce words starting with a particular letter, also in a short time span (Hirshom & Thompson-Schill, 2006). Rosselli and colleagues (2000) examined the impact of bilingualism on verbal fluency and repetition in older Hispanic bilinguals. Semantic and phonemic fluency was assessed using a picture, and having the participants generate words within the phonemic or semantic categories. The participants were also assessed on repetition, which involved the Sentence Repetition subtest from the *Multilingual Aphasia Examination*, Spanish and English versions (MAE; Benton & Hamsher, 1989; Rey & Benton, 1991). Results were compared to English and Spanish monolinguals. Results indicated equal performance on phonemic fluency and repetition. Bilinguals who learned English prior to the age of 12 performed significantly better on English repetition and produced more words in the semantic fluency task.

Sandoval and colleagues (2010) investigated the bilingual disadvantage in verbal fluency by comparing dominant and non-dominant language fluency. The bilingual group exhibited fewer correct responses and slower response time than monolinguals in both dominant and non-dominant language naming. The bilingual group also exhibited more cross-language effects when speaking their non-dominant language, such as replying with more cognate responses. The

authors concluded that bilingual fluency would be maximized when the cross-language interference is minimized.

Parker Jones et al. (2012) used functional magnetic resonance imaging (fMRI) to see which areas of the brain were activated during word retrieval, word recognition, and articulation. Bilinguals were shown to have increased activation in five left frontal and temporal regions, specifically the planum temporale, superior temporal gyrus, pars opercularis, and pars triangularis, during naming and reading in a single language context (either their L1 or L2). These results suggest that bilingualism places additional demands on processing that is also used in monolingual speech production. Guo et al. (2011) compared two groups of Chinese-English bilinguals on picture naming tasks while being scanned with an fMRI. Specifically, they focused on local inhibition, control exerted on a restricted set of memory representations, or global inhibition, or the activation and inhibition of the complete language system. They found that the dorsal anterior cingulate cortex and the supplementary motor area are activated in local inhibition and the left frontal gyrus and parietal cortex are implicated more in global inhibition. Switching into the L2 (English) engaged more anterior areas such as the left superior temporal gyrus, while switching into the L1 (Chinese) showed more activation in the posterior regions of the attentional network such as the left precuneus and left superior parietal gyrus. Therefore, language switching appears to incorporate attentional faculties as well as the left temporal areas, which are responsible for language expression. Bilinguals appear to activate more cognitive areas when required to switch languages, which may explain slower response times and greater inaccuracy on verbal fluency and naming measures.

Grogan et al. (2009) assessed semantic and phonemic fluency in bilinguals who spoke English as their L2, compared to English monolinguals. They also examined activation in the

brain using an fMRI to see how these tasks were activated in the brain. The participants were assessed both in their L1 and L2. They found that the left inferior temporal cortex was activated during semantic fluency tasks, which was similar for both L1 and L2 speech production. They also found that the pre-supplementary motor area and the caudate nucleus were activated during phonemic fluency tasks. The effect in the left caudate was stronger for L2 than L1. The authors did not find a significant effect of language on phonemic fluency, with no difference between the L1 and L2; however, there was a significant effect for category fluency. Functional brain imaging research studying the effects of bilingualism has shown that bilingualism leads to more activation in the left frontal and temporal areas, which are associated with switching (as from one language to another) and the performance of verbal tasks.

Visuospatial/Construction Abilities

Visuospatial abilities fall under the umbrella of visual perception. Visual perception refers to the ability to process and interpret the visual information in the environment. Visual functions can be classified into verbal/symbolic and configural stimuli. Visual symbolic stimuli involve the shapes of words or numbers whereas configurations involve reproducing pictures and designs (Attree, Turner, and Cowell, 2009; Molinari et al., 2004). Visual processing requires ocular movement, visual tracking, and ocular feedback, all of which contributes to visuospatial and perceptual processing (Tibber et al., 2010). Construction is the ability to reconstruct a design or image either through drawing or copying the design in some way (Mervis, Robinson, & Pani, 1999).

There are a number of categories of visual perception and visuospatial assessments, including tests of unilateral attention (i.e., cancellation tasks and line bisection tasks), visual

scanning tasks, color perception tasks, visual recognition tasks (i.e., facial recognition, figure/design recognition), visual organization (i.e., incomplete visual stimuli, fragmented visual stimuli; Lezak et al., 2012). This section of the literature review will focus on visuospatial and construction measures, as those parallel areas assessed by the RBANS.

Construction

Visuospatial construction combines visual perception with motor response. It involves the ability to see an object or picture as a set of parts and then to construct a replica of the original design from the parts. It is a central cognitive ability which involves tasks like drawing, buttoning, constructing models, making a bed, and putting together furniture (Mervis, Robinson, & Pani, 1999). Constructions may either be two-dimensional (drawing or constructing simple stick patterns) or three-dimensional (assembling patterns of blocks) (Kashyap et al., 2011). Drawing tasks are comprised of copying figures and free drawing. Figure copy tasks are a measure of visual construction and usually involve a complex geometrical shape that the subject is required to duplicate.

Line orientation tasks measure the ability to estimate angular relationships between line segments by visually matching the stimulus lines to an array of radii (Spencer et al., 2013). Line orientation tasks measures have been used in the identification of dementia (Janvin et al., 2006; Poletti et al., 2012).

Visuospatial/construction abilities as discussed in this section are primarily associated with a wide range of neurocognitive functions. Deficits with copying tasks tend to be associated with parietal lobe lesions (Lopes, Simoes, & Leal, 2014). Specifically, figure copy and line orientation tasks overlap in the right inferior parietal, temporal, and frontal areas (Biesbroek et al., 2014). Figure copy tasks such as the RCFT are associated with inferior parietal as well as

frontal lobe function (Antshel et al., 2008). The RCFT has also been associated with bilateral temporal-parietal function, as well as right frontal lobe and occipital lobe activation (Melrose et al., 2013). Free drawing tasks, such as the clock drawing test, has been associated with bilateral parietal and posterior temporal lobes as well as the right middle frontal gyrus (Matsuoka et al., 2013; de Guise, 2010; Parks et al., 2010). In more free-drawing tasks, such as drawing faces, fMRI has indicated activation in the right occipital lobe, middle temporal, and the right inferior temporal lobe (Schaer, Jahn, & Lotze, 2012). Line orientation and similar figure rotation tasks are associated with the right posterior parietal lobe (Tranel et al., 2009), inferior frontal gyrus, the posterior part of the dorsal intraparietal sulcus, and the anterior insula (Milivojevic, Hamm, & Corballis, 2009). In general, visuospatial abilities are associated with parietal lobe functioning, as well as prefrontal, inferior and posterior temporal functioning. The activation of multiple areas of the brain indicates that visuospatial and construction tasks are extremely complex and require the collaboration of many functions in order to be executed properly.

Visuospatial Abilities and Bilinguals

Drawing ability is used as a measure of visuospatial ability, and in certain tests, can be used to measure cognitive flexibility. Bialystok and Shapero (2005) investigated the ability of bilingual children to identify simple shapes hidden in complex drawings (*Children's Embedded Figure Task*; CEFT; Witikn et al., 1971), as well as having them identify ambiguous figures (i.e., vase-face, duck-rabbit). Bilinguals performed better than monolinguals on the ambiguous figures task, being able to identify both components of the figure more times than monolinguals. The authors concluded that bilinguals may be able to comprehend and reinterpret complex figures better than monolinguals, due to superior inhibition and interference suppression, which allowed for easier conflict resolution when interpreting ambiguous images.

There have been some reported cultural differences in visuospatial abilities. Research in clinical populations has indicated that brain-injured individuals with an educational background in a non-English language performed worse than English monolinguals on tests of memory, verbal ability, and visual ability (Walker et al., 2010). Boone et al. (2007) examined ethnicity and cognitive test performance in patients from a neuropsychology clinic and found that non-native English speakers performed significantly worse on tests of language, attention, and constructional ability (RCFT), but performed similarly to English speakers on measures of processing speed, visual memory, verbal memory, and executive functioning. Kissler et al. (2012) examined the performance of native and non-native English speakers on a neuropsychological battery, with results indicating that native English speakers outperformed the non-native English speakers on language tasks as well as a trail-making measure. The two groups did not have significant differences on tasks of executive functioning, motor speed, verbal memory, or visuospatial ability.

Construction Abilities and Bilinguals

The maintenance of two languages may not significantly affect bilingual performance on constructional measures, such as block design, visual-motor integration tasks, and figure copy. Garratt and Kelly (2007) found no significant differences between bilingual and monolingual children on visuospatial ability subtests of the NEPSY, and concluded that the NEPSY is relatively insensitive to bilingualism in this domain. In a study of pre-reading skills in Egyptian bilingual children, results indicated no significant differences in bilingual and monolingual groups on visual processing via the *Beery-Buktenica Developmental Test of Visual-Motor Integration* (Beery VMI; Beery & Beery, 2006), and the authors concluded that visual integration and perception ability does not necessarily pertain to language proficiency (Tahan, Cline, &

Messaoud-Galusi, 2011). Festman, Rodriguez-Fornells, and Munte (2010) investigated cross-language interference in bilinguals on various cognitive tasks. They found that the ability to mediate and control both languages did not appear to have an effect on block design performance, as bilinguals with lower language control performed similarly on the measure as bilinguals with greater language control. Therefore, language interference did not appear to affect constructional ability in this study. Additionally, Bartolotti and Marian (2012) did not find significant differences in block design scores for bilinguals and monolinguals, concluding that language interference in bilinguals does not affect constructional abilities significantly.

There is a paucity of research on the effects of acculturation and bilingualism on visuospatial tasks in a non-clinical population (Bialystok, 2009). The results thus far remain varied on whether bilingualism and culture influence performance on visuospatial and construction tasks for diverse populations. There may be cultural effects for visuospatial abilities, but it does not appear that constructional tasks are affected by language or culture. One of the goals of the proposed study is to examine the effects of bilingualism and acculturation in a non-clinical population to evaluate if visuospatial and constructional functioning is significantly different between bilingual and monolingual groups, and if these results would be affected by levels of acculturation.

CHAPTER III

METHODOLOGY

This chapter is organized into four sections: (1) Research Questions (2) Participant Selection; (3) Procedures; (4) Instrumentation, Validity, and Reliability; and (5) Statistical Procedures and Data Analysis. The purpose of this chapter is to describe the recruitment and selection of participants, procedures involved in data collection, and the instruments utilized.

Research Questions

- R1: What is the difference in RBANS scores for Russian bilinguals and monolinguals in the domains of Immediate Memory, Visuospatial/Constructional, Language, Attention, and Delayed Memory?
- R2: How does acculturation affect RBANS scores for Russian bilinguals?
- R3: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Index scores mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?
- R3₁: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Immediate Memory (Bialystok et al., 2009; Mindt et al., 2008) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?
- R3₂: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Visuospatial/Constructional scores (Kisser et al., 2009) mediated by levels of acculturation (Birman

& Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R3₃: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Language scores (Ivanova & Costa, 2008; Gollan et al., 2008) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R3₄: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Attention (Kaushanskaya, Blumenfeld, & Marian, 2011) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R3₅: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Delayed Memory scores (Bialystok et al., 2009; Mindt et al., 2008) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

Participant Selection

This study compared Russian bilingual adults with monolingual English-speaking adults, and examined the effects of acculturation, age, and numbers of years in the United States on bilingual test performance. The Russian bilingual participants were adults (age 18 and over) from the former Soviet Union or a current Russian-speaking nation, or American-born bilinguals

who spoke Russian as a first language. The 48 Russian bilingual participants were recruited through the Russian Language department at a Midwestern university, and two Russian Jewish charity organizations. These organizations work with and aid many Russian immigrants, and therefore have very close connections to the Russian community in the Midwestern city from which the Russian bilingual sample was collected. The monolingual, English-speaking control group were comprised of a sample of 20 undergraduates enrolled in Educational Psychology courses at a large Midwestern university. The English-speaking college students received extra credit in their psychology classes for participating in the study. For the Russian bilingual sample, a \$5 donation to Jewish Family and Children's services was made for each participant.

Procedures

Permission to recruit undergraduate students in psychology classes and Russian bilinguals was obtained through the university's Institutional Review Board and the university departments. Russian bilinguals learned of the study through professors from the Russian Language department at a Midwestern university and community outreach members of a Russian Jewish charity organization. University students that comprised the monolingual group learned of the study through an online sign up system to which they had access through course enrollment. This researcher, a graduate student from the department of Educational Psychology, who had completed extensive training in the administration of standardized measures, conducted all data collection. Data were collected and organized by this researcher. Upon arrival to their scheduled appointment, participants read and signed an informed consent document that had been approved by the university Institutional Review Board. All participants involved in this study participated in multiple assessments in a process that took approximately one hour. Each

participant was assessed during one meeting. The researcher and examiner was an advanced graduate student who had considerable training in psychological and neuropsychological assessment; specifically in the administration and scoring of the assessments utilized. Data were collected over the course of multiple semesters in 2015 and 2016. All participants were administered the *Peabody Picture Vocabulary Test*, 4th Edition (PPVT-4; Dunn & Dunn, 2007) and the *Repeatable Battery for the Assessment of Neuropsychological Status Normative Update* (RBANS; Randolph, 2012) according to procedure specified in the test manuals. Russian bilingual participants were also administered the *Language, Identity, and Behavioral Acculturation Scale* (LIB; Birman & Trickett, 2001).

Instrumentation

Demographics Questionnaire

All participants were administered a demographics questionnaire that asked participants to provide their age, gender, handedness, if have a diagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD) or a specific learning disability, if a history of traumatic brain injury or stroke was present, medications, physical or mental health diagnoses, years of education and level of education, years of formal education in Russian, years in the United States, current occupation, ethnicity (Russian/Belarusian/Ukrainian/Jewish/Other), religious affiliation, country of origin, language spoken most frequently in work and home settings, and socio-economic status. Socio-economic status was measured by an index consisting of a combination of income, education, and occupation. Participants' yearly income was reported as falling into one of the following categories: a) \$0-\$30,000; b) \$30,000-\$60,000; c) \$60,000-\$100,000; or d) over \$100,000.

These ranges correspond to the income indices described in the 2010 U.S. Census: poverty level, lower middle class, upper middle class, and upper class (DeNavas-Walt & Proctor, 2014).

The Repeatable Battery for the Assessment of Neuropsychological Status

The Repeatable Battery for the Assessment of Neuropsychological Status Normative Update (RBANS; Randolph, 2012) is a neuropsychological battery developed for the purpose of identifying and characterizing abnormal cognitive decline in older adults, and can also be used as a neuropsychological screening battery. The RBANS can be administered to participants aged 12 years, 0 months through 89 years, 11 months. It was administered to both the bilingual and monolingual groups. The RBANS was originally developed as a test for the diagnosis and characterization of dementia among the elderly; however, its use has since extended to a wide range of other clinical populations such as depression, stroke, and brain injury (Lezak et al., 2012). The battery consists of five Indices: Attention, Language, Visuospatial/Constructional Abilities, Immediate Memory, and Delayed Memory, and 12 subtests that comprise the indexes. A Total Scale score is also provided, which is a compilation of the Index scores. The advantage of administering the RBANS is the relatively quick administration time, which takes about 30 minutes. Each index score is reported as a standard score with a mean of 100 and a standard deviation of 15. Line Orientation, Picture Naming, List Recall, and List Recognition yield percentile ranges rather than scaled scores. With regard to subtest reliability for the norming sample, “the average subtest-level reliabilities range from .50 (Figure Copy) to .85 (List Learning)...However, most subtest-level reliabilities are sufficient for interpretation, particularly when index level scores may not be available” (Randolph, 2012, p. 41). It is a continuous set of variables.

Immediate Memory Index

The RBANS Immediate Memory Index is a measure of verbal short-term memory, comprised of List Learning and Story Memory subtests. The Immediate Memory index for the norming sample has an internal consistency overall average reliability of .88 and a stability coefficient of .73 in ages 12-19, and .62 for ages 20-89 (Randolph, 2012).

The List Learning subtest assesses the ability to retain and repeat back a series of words, and contains words of appropriate difficulty, brevity, and meant to minimize cultural and educational issues (Randolph, 2012). The stability coefficient for the List Learning subtest for the norming sample is .68 for the 12-19 age group and .49 for the 20-89 age group (Randolph, 2012).

The Story Memory subtest consists of a 12-item story, read for immediate recall over two trials. The scoring is based upon verbatim recall and designed to measure working memory (Randolph, 2012). The stability coefficient for the norming sample for the Story Memory subtest is .65 for the 12-19 age group, and .45 for the 20-89 age group (Randolph, 2012).

Visuospatial / Constructional Index

The Visuospatial / Constructional index assesses visuospatial processing and motor coordination in a construction task. It is comprised of the Figure Copy and Line Orientation subtests. It has a stability coefficient of .53 for ages 12-19, and .65 for ages 20-89 in the norming sample (Randolph, 2012).

Figure Copy is a test of visuospatial processing as well as a measure of visual memory (Lezak et al., 2012). The Figure Copy subtest required that the participant be shown a multipart geometric drawing and who then was asked to make a copy of the design on their own paper. The stability coefficient for Figure Copy is .46 for the 12-19 age group and .47 for the 20-89 age group in the norming sample (Randolph, 2012).

The Line Orientation subtest is a test of visuospatial skills and measures the participant's ability to match the angle and orientation of lines in space. For this subtest, each participant was required to identify which two lines from a series match the orientation of the stimulus lines. The Line Orientation subtest has a stability coefficient of .72 for ages 12-19, and .49 for ages 20-89 for the norming sample (Randolph, 2012).

Language Index

The Language Index summarizes functioning on confrontation naming and semantic fluency tasks. It is comprised of the Picture Naming and Semantic Fluency subtests. It has a stability coefficient of .79 for ages 12-19, and .64 for ages 20-89 for the norming sample (Randolph, 2012).

The Picture Naming subtest required the participant to name the picture presented to them. It is a measure of verbal confrontation naming. The stability coefficient for the Picture Naming subtest is .73 for ages 12-19 and .50 for ages 20-89 for the norming sample (Randolph, 2012).

The Semantic Fluency subtest required the participant to name as many items as they can think of in a particular category. The stability coefficient of the Semantic Fluency subtest is .67 for ages 12-19 and .49 for ages 20-89 for the norming sample (Randolph, 2012).

Attention Index

The Attention Index evaluates working memory and task attention, which are components of executive functioning (Lezak et al., 2012). It is comprised of Digit Span and Coding subtests, which require the ability to retain information in working memory and quickly scan and sequence simple visual information. The stability coefficient in the norming sample for the Attention Index is .69 for ages 12-19, and .77 for ages 20-89 (Randolph, 2012).

The Digit Span subtest required the participant to repeat a series of digits that are read aloud and the digits increase in length. The participant is required to repeat those numbers back to the examiner in the same sequence. Digit Span is primarily a measure of the participant's short-term sequential auditory memory and attention (Randolph, 2012). Additionally, it assesses the participant's ability to retain several elements that do not have a logical relationship, manipulate the information, and repeat it back in the same sequence, all of which involve working memory (Lezak et al., 2012). The stability coefficient for the Digit Span subtest in the norming sample is .59 for ages 12-19, and .73 for ages 20-89 (Randolph, 2012).

The Coding subtest required the participant to copy symbols paired together with other unrelated symbols within a time limit. Coding assesses the ability to learn an unfamiliar task, and involves speed and accuracy of visual and motor coordination, speed of mental operation, attentional skills, visual scanning, and cognitive flexibility (Randolph, 2012). The stability coefficient for the Coding subtest in the norming sample is .75 for ages 12-19, and .76 for ages 20-89 (Randolph, 2012).

Delayed Memory

The Delayed Memory index assesses the retrieval of information presented earlier in the assessment. It involves attentional processes that will allow the information to be properly encoded into long-term memory. It is comprised of List Recall, List Recognition, Story Recall, and Figure Recall. The stability coefficient for the Delayed Memory Index in the norming sample is .70 for ages 12-19, and .77 for ages 20-89 (Randolph, 2012).

The List Recall subtest required the participant to recall any words they can remember from the List Learning subtest administered earlier. It primarily assesses delayed memory and how well the participant was able to attend and encode information presented earlier in the

testing session. The List Recall stability coefficient in the norming sample is .66 for ages 12-19, and .60 for ages 20-89 (Randolph, 2012).

List Recognition is a test of long-term memory storage. The examiner reads a list of words, which is comprised of target words that the participant has heard before and distractor words. The participant has to indicate whether the word being read is one previously heard in the List Learning subtest. The List Recognition stability coefficient in the norming sample is .70 for ages 12-19, and .27 for ages 20-89 (Randolph, 2012).

Story Recall also assesses long-term memory by cuing the participant to recall a story heard previously in the Story Memory subtest. The participant is required to recall as much of the story as possible. The stability coefficient for the Story Recall subtest in the norming sample is .48 for ages 12-19, and .52 for ages 20-89.

The Figure Recall subtest assesses the participant's ability to recall the figure drawn in the Figure Copy subtest. The participant is then required to draw the figure from memory. The stability coefficient for the Figure Recall subtest in the norming sample is .58 for ages 12-19, and .55 for ages 20-89.

Peabody Picture Vocabulary Test – 4th Edition

Both Russian bilingual and English-speaking monolinguals were administered the *Peabody Picture Vocabulary Test*, 4th Edition (PPVT-4; Dunn & Dunn, 2007) as a measure of English language proficiency. The PPVT-4 is a norm-referenced wide range instrument for the measure of receptive vocabulary of children and adults, and can be administered to participants ages 2 years, 6 months to 90 years, 0 months. It consists of training items followed by test items, which are comprised of color pictures as responses per page. The participant was asked to point to the picture that illustrates the word that the examiner says. The PPVT-4 has an internal

consistency overall average in the norming sample of .97 for Form A (the Form used in this study) and .96 for Form B of the test. The stability coefficient of the PPVT-4 in the norming sample is .92 (Dunn & Dunn, 2007).

The Language, Identity, and Behavioral Acculturation Scale

The Language, Identity and Behavioral Acculturation Scale (LIB; Birman & Trickett, 2001) consists of 50 items measuring acculturation to Russian and American cultures independently. It was administered only to the Russian bilingual group as a measure of their acculturation level to both Russian and American culture. The LIB yields an overall American Acculturation Index (AAI), Russian Acculturation Index (RAI), and separate subscales that assess language (Language Competence Subscale), identity (Identity Acculturation Subscale), and behavioral acculturation (Behavioral Acculturation Subscale). Each subscale has items with a 1-4 Likert scale. The score for each subscale is computed by adding the value of the Likert items and then computing the mean. The overall AAI and RAI indices are the means of the three subscale means. Therefore, the LIB scale is a continuous variable. The reliability of for the overall AAI and RAI were .90 and .94 respectively in 162 participants in a previous study (Birman, Trickett, & Vinokurov, 2002).

The Language Competence Subscale is comprised of 18 items in which participants rated their ability to speak and understand Russian and English. In their 2001 study, Birman and Trickett found the Cronbach's alpha reliability coefficients to be .95 for the Russian language subscale and .90 for the English language subscale in 144 participants. In their 2002 study sample, the reliability coefficients were .95 for the Russian language subscale and .91 for the English language subscale for 162 participants (Birman, Trickett, & Vinokurov, 2002).

The Identity Acculturation Subscale consists of 14 statements regarding identification with the Russian and American cultures. The subscale assessed the degree of identification with each culture and the extent to which the respondents feel positively or negatively with their identification. Their 2001 study yielded reliability coefficients of .92 for American identity and .93 for Russian identity in 144 participants (Birman & Trickett, 2001). In their 2002 sample, reliability was .92 for American identity and .93 for Russian identity (Birman, Trickett, & Vinokurov, 2002).

The Behavioral Acculturation Subscale consists of 19 items regarding American and Russian culture. It asked the participants to rate the extent to which they engage in behaviors associated with each culture (such as language use, media, music, entertainment, food). In their 2001 study sample, reliabilities were .77 for the American scale and .85 for the Russian subscale in 144 participants (Birman & Trickett, 2001). In their 2002 study sample, the reliability coefficients were .77 for the American subscale, and .84 for the Russian subscale in 162 participants (Birman, Trickett, & Vinokurov, 2002).

Statistical Procedures and Data Analysis

Descriptive analyses were conducted to ascertain the makeup of the present sample for gender, ethnicity, medical/psychological diagnoses, and years in the United States. Additionally, descriptive statistics were reported for means and standard deviations of the PPVT-4 and RBANS scores. Analysis using a Pearson's correlation was performed to examine the relationship between RBANS Index and subtest scores, PPVT-4 scores, and the LIB American Acculturation Index (AAI) and Russian Acculturation Index (RAI).

Multivariate Analysis of Variance

To investigate the R1, a multivariate analysis of variance (MANOVA) was conducted to assess for significant differences between the bilingual and monolingual groups on the RBANS Indices (Immediate Memory, Visuospatial/Constructional, Language, Attention, and Delayed Memory) and subtests (List Learning, Story Memory, Figure Copy, Semantic Fluency, Digit Span, Coding, Story Recall, and Figure Recall). The RBANS scores served as the dependent variables, while group participation (either bilingual or monolingual) served as the independent variable.

Mediated Path Model

For the R2 and R3, a mediated path model was employed to investigate how acculturation level affected RBANS performance in the Russian bilingual group. The path model examined the effects of age and number of years a Russian bilingual participant has lived in the United States on RBANS scores. Effects of American acculturation on RBANS scores were examined separately from Russian acculturation effects on RBANS scores, as American and Russian acculturation are separate constructs measuring different cultures.

CHAPTER IV

RESULTS

The results provide information regarding the relationship between neuropsychological test performance and level of acculturation in a sample of Russian bilingual adults. A sample of monolingual English-speaking college students was used as a control condition. These results have implications regarding the relationship between bilingualism, acculturation, and ensuing test performance for Russian-speaking bilingual adults and for monolinguals residing in the United States. In this chapter, the results of implemented statistical analyses are presented. This chapter is composed of three sections: (1) description of the sample, (2) results and analyses, and (3) summary of the statistical analysis.

Results and Analyses

Demographics of the Sample

Participants were divided into two groups: the experimental group composed of Russian-speaking bilingual adults from a large Midwestern city, and the control group, comprised of English-speaking monolingual participants who were undergraduates recruited from a Midwestern Educational Psychology department research pool.

Bilingual Group Descriptive Statistics

The experimental group was composed of 48 Russian bilingual adults (15 females and 33 males) residing in a mid-sized Midwestern city. These participants were recruited through the Russian Language department in a second large Midwestern city,, Jewish Family Services,, and the Jewish Federation of a large Midwestern city. An inclusion criterion for this group was that they were required to speak Russian as a first language. They ranged in age from 19 to 78 years

(mean = 37.17, median = 28). The ethnicity of the sample was self-reported as follows: Russian (14.6%), Belarussian (14.6%), Ukrainian (6.3%), and Jewish (64.6%). Five participants (6.8%) reported a history of Attention- Deficit/Hyperactivity Disorder (ADHD). The majority of the participants identified as right-hand dominant (91.7%), with most of the remaining participants identifying as left-hand dominant (6.3%), and one participant identifying as having equal dominance in both hands (2.1%). Eight of the Russian-speaking participants were born in the United States (16.7%), with the majority being from Russian-speaking nations of the former U.S.S.R. (83.3%). All of the Russian-speaking participants born in the United States were children of first-generation immigrants. The number of years living in the United States ranged from 15 to 52 years (mean = 22.94, standard deviation = 6.647). Russian bilingual participants under the age of 28 have spent an average of 88% of their lives in the United States, whereas bilingual participants over the age of 28 spent an average of 52% of their lives in the United States. Twenty-five of the participants (52.1%) received some formal education in Russian (participants attended a school/university in a Russian-speaking country), indicating that these participants attended school in their country of origin. The level of formal Russian education ranged from finishing the 1st grade to finishing medical school in their country of origin. With regards to level of education, seven of the participants received a high school education (14.6%), thirteen have a bachelor's degree (27.1%), twenty-two have completed a master's degree (45.8%), and six participants have completed a doctoral program or medical doctor degree (12.5%). Eight of the participants identified as students in college, with one junior in college (2.1%), three college seniors (6.3%), and four graduate students (8.3%). Participants over the age of 28 on average had a master's degree, whereas participants under the age of 28 tended to have a bachelor's degree or less. Annual family income for the Russian speaking participants

was as follows: income greater than \$100,000 (45.8%), \$60,000 – \$99,000 (37.5%), \$30,000 - \$59,000 (12.5%), and two individuals reported an annual income less than \$29,000 (4.2%). A majority of the participants described their religion as Jewish (66.7%). Other reported religious affiliations were Christian (4.2%), Atheist (27.1%), and one individual indicated an unspecified other religion (2.1%). Fourteen participants reported speaking primarily English at home (29.2%), and thirty-three participants reported speaking primarily Russian at home (68.8%). In the work setting, the majority of participants reported speaking English (97.9%), and one participant reported speaking primarily Russian (2.1%).

Monolingual Group Descriptive Statistics

Participants were 20 undergraduate students (4 males and 16 females) enrolled in psychology courses at a large Midwestern university. They ranged in age from 18 to 35 years of age (mean = 20.45; median = 19). All the participants self-reported their ethnicity as Caucasian. Four participants (20%) reported a history of Attention-Deficit/Hyperactivity Disorder (ADHD). A majority of the participants have been living in the United States for at least 4 generations (70%), four participants reported being 3rd generation immigrants (20%), and two participants were 2nd generation immigrants (10%). Annual family income for the monolingual group is as follows: income greater than \$100,000 (15%), \$60,000 – \$99,000 (25%), \$30,000 - \$59,000 (35%), and one individual reported an annual family income less than \$29,000 (5%). Four individuals (20%) preferred not to report their annual family income. All of the participants were recruited through the Educational Psychology research pool. In accordance with the Educational Psychology department procedures, participants were granted extra credit in their corresponding Educational Psychology classes. The Internal Review Board at the institution in which this research was conducted approved this study.

TABLE 1

Descriptive Statistics for the Bilingual Russian and Monolingual English-Speaking Sample

Variable	Bilingual Russian-Speakers		Monolingual English-Speakers	
	<i>N</i>	(%)	<i>N</i>	(%)
<i>Gender</i>				
Male	33	68.8	4	20.0
Female	15	31.2	16	80.0
<i>Ethnicity</i>				
Russian	7	14.6	0	0
Belarussian	7	14.6	0	0
Ukrainian	3	6.3	0	0
Jewish	31	64.6	0	0
Caucasian	--	--	20	100.0
<i>Diagnoses</i>				
ADHD*	5	10.4	4	20
<i>Generations in U.S.</i>				
Not Born in the U.S.	40	83.3	0	0
1 st Generation	8	16.7	0	0
2 nd Generation	0	0	2	10.0
3 rd Generation	0	0	4	20.0
4 th Generation	0	0	14	70.0

N = 48 for the bilingual sample; *N* = 20 for the monolingual sample.

*ADHD = Attention-Deficit/Hyperactivity Disorder

Descriptive Statistics of Measures Used

Descriptive statistics for this sample, including means and standard deviations for scores from the *Repeatable Battery for the Assessment of Neuropsychological Status Normative Update* (RBANS; Randolph, 2012) and the *Peabody Picture Vocabulary Test*, 4th Edition (PPVT-4; Dunn & Dunn, 2007), appear in Table 2. The RBANS normative data, which is based on a representative sample of the general population, specifies a population mean score of 100 and a standard deviation of 15 for all index scores (Immediate Memory, Visuospatial/Constructional, Language, Attention, Delayed Memory, and Total Scale Score). As the values in Table 2 indicate, mean scores from the bilingual sample in the present study ranged from 93.42 (Language) to 104.54 (Visuospatial/Constructional), with all mean scores falling within the

expected average range, as this sample is largely composed of neurotypical adults. None of the participants reported a history of strokes, seizures, or traumatic brain injury. Nine of the participants reported a diagnosis of ADHD, and no other neurocognitive or psychiatric diagnoses were reported. Mean scores from the monolingual sample ranged from 98.15 to 105.55, with all mean scores again falling within the expected range. The RBANS normative data specifies a mean scaled score of 10 and a standard deviation of 3 for the following subtests: List Learning, Story Memory, Figure Copy, Semantic Fluency, Digit Span, Coding, Story Recall, and Figure Recall. Mean scaled scores from the current bilingual sample ranged from 8.79 (Figure Recall) to 11.04 (Figure Copy), with all mean scaled scores falling within the expected average range. Mean scaled scores for the monolingual group ranged from 8.45 (Digit Span) to 12.10 (Coding), with all mean scaled scores again falling within the expected average range. On the RBANS, Line Orientation, Picture Naming, List Recall, and List Recognition subtests yield percentile ranges (< 2, 3-9, 10-16, 17-25, 26-50, 51-75, < 75) rather than scaled scores. These results are summarized in Table 3. Line Orientation scores for the bilingual population have a bimodal distribution, with the majority of scores falling between the 26-50th percentiles and 51-75th percentiles ($n = 16$). The most common percentile range for monolingual participants on Line Orientation was 26-50th percentiles ($n = 7$). For Picture Naming, the majority of bilingual participants had scores in the 51-75th percentile range ($n = 19$), whereas scores for the monolingual participants was a bimodal distribution with a majority of the scores falling in the 51-75th and greater than 75th percentiles ($n = 6$). On the List Recall subtest, the majority of bilingual and monolingual scores were in the 26-50th percentile range ($n = 17$ and $n = 8$, respectively). The most common scores for the List Recognition subtest were in the 51-75th percentile range for both the bilingual ($n = 44$) and monolingual ($n = 13$) groups. The PPVT-4

standard score has a population mean of 100 and a standard deviation of 15. The mean standard score for the bilingual group was 100.75 and the mean standard score for the monolingual group was 105.10, which are both within the expected range.

TABLE 2

Mean and Standard Deviation Statistics for the PPVT-4 and RBANS Index and Scaled Scores

Variable	Bilingual Mean	Bilingual SD	Monolingual Mean	Monolingual SD
PPVT-4	100.8	10.2	105.1	8.5
RBANS Index Scores				
Immediate Memory	100.8	11.6	105.6	17.7
Visuospatial/Constructional	104.5	12.8	101.2	14.3
Language	93.4	14.8	99.5	12.4
Attention	101.9	13.5	102.0	12.9
Delayed Memory	96.3	8.5	98.2	9.9
<i>RBANS Subtest Scores</i>				
List Learning	10.9	2.6	11.3	3.7
Story Memory	9.4	2.7	10.7	3.5
Figure Copy	11.0	2.9	11.5	3.5
Semantic Fluency	9.2	2.6	10.3	4.1
Digit Span	10.0	2.5	8.5	2.0
Coding	10.5	3.0	12.1	2.8
Story Recall	8.9	2.0	11.6	3.7
Figure Recall	8.8	3.6	10.95	3.4

N = 68

TABLE 3

Frequency of Percentile Ranges for RBANS Line Orientation, Picture Naming, List Recall, and List Recognition

Percentile ranges	<i>Line Orientation</i>		<i>Picture Naming</i>		<i>List Recall</i>		<i>List Recognition</i>	
	Bil.	Mono.	Bil.	Mono.	Bil.	Mono.	Bil.	Mono.
<2	0	1	6	0	0	0	0	0
3-9	1	5	8	1	1	2	2	4
10-16	0	1	0	3	1	0	2	3
17-25	3	0	13	0	1	0	0	0
26-50	16	7	1	4	17	8	0	0
51-75	16	2	19	6	15	2	44	13
>75	12	4	1	6	13	8	0	0

Note. Bil. = Bilingual Sample; $N=48$

Mono. = Monolingual Sample; $N=20$

Correlations of the Test Scores

Analysis using Pearson's correlation was performed to assess the relationship between each of the RBANS Index and subtest scores, the PPVT-4 standard scores, and the *Language, Identity, and Behavioral Acculturation Scale* (LIB; Birman & Trickett, 2001) American Acculturation and Russian Acculturation Indices (AAI and RAI, respectively) for the bilingual group. Results of the correlation analysis appear in Table 4.

TABLE 4

Correlations Between RBANS scores, Peabody Picture Vocabulary Test-4 scores, and LIB American Acculturation Index and Russian Acculturation Index

	LIB AAI	LIB RAI	PPVT-4	Age	Years in the U.S.
Age	-0.317*	0.267	-0.271	1.000	0.501***
Years in the U.S.	0.208	-0.183	0.290*	0.501***	1.000
LIB American Acculturation Index	1.000	-0.471**	0.589**	-0.317*	0.208
LIB Russian Acculturation Index	-0.471**	1.000	-0.255	0.267	-0.183
Peabody Picture Vocabulary Test-4	0.589**	-0.255	1.000	-0.271	0.290*
Immediate Memory	0.429**	-0.318*	0.146	-0.237	0.098
Visuospatial/Constructional	-0.009	0.047	-0.089	-0.085	-0.341*
Language	0.637**	-0.425**	0.385**	-0.347*	0.235
Attention	0.239	-0.149	0.077	-0.177	-0.296*
Delayed Memory	-0.004	0.049	0.102	0.424**	0.180
List Learning	0.303*	-0.005	0.165	-0.084	0.110
Story Memory	0.318*	-0.374**	0.087	-0.253	0.024
Figure Copy	0.027	-0.028	-0.130	-0.186	-0.390**
Semantic Fluency	0.488**	-0.300*	0.189	-0.180	0.263
Digit Span	0.339*	-0.236	0.064	-0.210	-0.335*
Coding	0.056	0.014	0.062	-0.067	-0.156
Story Recall	0.128	-0.278	0.140	0.322*	0.336*
Figure Recall	-0.077	-0.102	0.075	0.131	-0.086

*Denotes significance at $p < .05$

**Denotes significance at $p < .01$

The RBANS Language Index score was significantly correlated with the LIB American Acculturation Index (AAI), the LIB Russian Acculturation Index (RAI), and the PPVT-4 scores. The RBANS Immediate Memory Index was significantly correlated with the LIB AAI and RAI scores, and was also correlated with most of the RBANS Index and scaled scores. List Learning

and Digit Span subtest scores were correlated with the LIB AAI. Story Memory and Semantic Fluency subtest scores were significantly correlated with LIB AAI and RAI. Russian bilingual participant age and the number of years in the United States were significantly correlated.

Additionally, participant age was significantly correlated with LIB AAI, the RBANS Language and Delayed Memory Indices, and the Story Recall subtest. Number of years in the United States was significantly correlated with the PPVT-4, the RBANS Visuospatial/Constructional and Attention Indices, and the Figure Copy, Digit Span, and Story Recall subtests.

Statistical Assumptions

Data were assessed to ensure that the assumptions of the analyses were met. Skewness and kurtosis tests indicated that most variables closely approximated a normal distribution, with the exception of the RBANS Visuospatial/Constructional ($p = 0.0036$), RBANS Language ($p = 0.0301$), and RBANS Delayed Memory ($p = 0.0319$). Q-Q plots indicated that all variables closely approximated a normal distribution. Scatterplots were used to assess for linearity and homoscedasticity of the relationships among variables. The scatterplots demonstrated relationships between all pairs were linear. The width of the scatterplots was approximately the same for RBANS Immediate Memory, Language, and Delayed Memory. The width of the scatterplots was more clustered for the following: RBANS Visuospatial/Constructional, Attention, Total Scale Score, and the PPVT-4. Therefore, it is important to interpret the values on those tests with caution as it may over-estimate the relationship between those variables and the dependent variables. With regard to multicollinearity, a variance inflation factor (VIF) greater than 10 was considered to indicate the presence of multicollinearity (O'Brien, 2007). No evidence of multicollinearity were found across the models, with VIF models ranging from 1.39 to 1.76.

Research Questions and Analyses

R1: What is the difference in RBANS scores for Russian bilinguals and monolinguals in the domains of Immediate Memory, Visuospatial/Constructional, Language, Attention, and Delayed Memory?

A one-way multivariate analysis of variance (MANOVA) was conducted to determine differences between bilingual and monolingual performance on the RBANS. The data overall follows a multivariate normal distribution. A Box's test was conducted to address equality of variances. The result of the Box's test was significant ($p < .0001$), indicating the homogeneity of covariances cannot be assumed. A Levene's test was employed to assess for equality of variances between the two groups. The Levene's test found that the assumptions were not met for homogeneity of variances for RBANS List Learning, Semantic Fluency, and Story Recall subtests. As the assumption of equal variances was violated, a rank transformation of the MANOVA was performed, yielding a rank-based statistic that has been shown to be robust to violations of homogeneity of covariances (Nath & Pavur, 1985). MANOVA results revealed significant differences among the bilingual and monolingual categories on the dependent variables of RBANS scores, Wilke's Lambda = 0.529, $\chi^2(13) = 37.846$, $p < .0001$.

A quadratic discriminant analysis was performed with the bilingual or monolingual group participation as predictors of RBANS Index and subtest scores. Loadings less than .40 were not interpreted while loadings greater than .4 are interpreted as important. Standardized function coefficients (see Table 5) revealed that Digit Span (-1.183), Coding (-0.760), Story Memory (0.574), List Learning (0.550), and Story Recall (0.400) were most associated with differences between the bilingual and monolingual group. Group means and standard deviations are shown in Table 2. Bilingual participants performed better on the Digit Span subtest of the RBANS

(mean = 10, SD = 2.5) than monolingual participants (mean = 8.5, SD = 2.0). On the Coding subtest, bilingual participants performed below (mean = 10.5, SD = 3.0) those in the monolingual group (mean = 12.1, SD = 2.8). Monolingual participants also performed better on the Story Memory subtest (mean = 10.7, SD = 3.5) than bilinguals (mean = 9.4, SD = 2.7). Likewise, monolingual participants had higher scores on Story Recall (mean = 11.6, SD = 3.7) than bilingual participants (mean = 8.9, SD = 2.0). On the List Learning subtest, the bilingual group (mean = 10.9, SD = 2.6) performed worse than the monolingual group participants (mean = 11.3, SD = 3.7).

TABLE 5

Results of Discriminant Analysis of Bilingual Versus Monolingual Group Participation Variable

RBANS Indices/Subtests	Standardized Function Coefficient
Constant	-0.987*
<i>Indices</i>	
Immediate Memory Index	-0.227
Visuospatial/Constructional Index	-0.060
Language Index	0.069
Attention Index	0.299
Delayed Memory Index	-0.032
<i>Subtests</i>	
List Learning	0.550*
Story Memory	0.574*
Figure Copy	0.167
Semantic Fluency	-0.290
Digit Span	-1.183*
Coding	-0.760*
Story Recall	0.400*
Figure Recall	0.164

Note. * Absolute values above .4 important.

R2: How does acculturation affect RBANS scores for Russian bilinguals?

R3: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Index scores mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R3₁: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Immediate Memory (Bialystok et al., 2009; Mindt et al., 2008) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R3₂: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Visuospatial/Constructional scores (Kisser et al., 2009) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R3₃: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Language scores (Ivanova & Costa, 2008; Gollan et al., 2008) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R3₄: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Attention (Kaushanskaya, Blumenfeld, & Marian, 2011) mediated by levels of acculturation

(Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

R35: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Delayed Memory scores (Bialystok et al., 2009; Mindt et al., 2008) mediated by levels of acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

American Acculturation Path Analysis

A path analysis was run for American acculturation (LIB American Acculturation Index; AAI). Direct and indirect effects for the mediations of American acculturation for the Bilingual sample are found in Table 6. The paths for each analysis are depicted in Figures 1-5, with only the significant relationships labeled with the coefficients from the analysis. The purpose of this analysis was to evaluate the effects of age and number of years spent in the United States on RBANS scores, mediated by the effects of acculturation levels to American culture.

TABLE 6

Direct, Indirect, and Total Effects for Mediation between RBANS, LIB AAI, Age, and Years in the U.S. for the Bilingual Sample (with Standardized Coefficients)

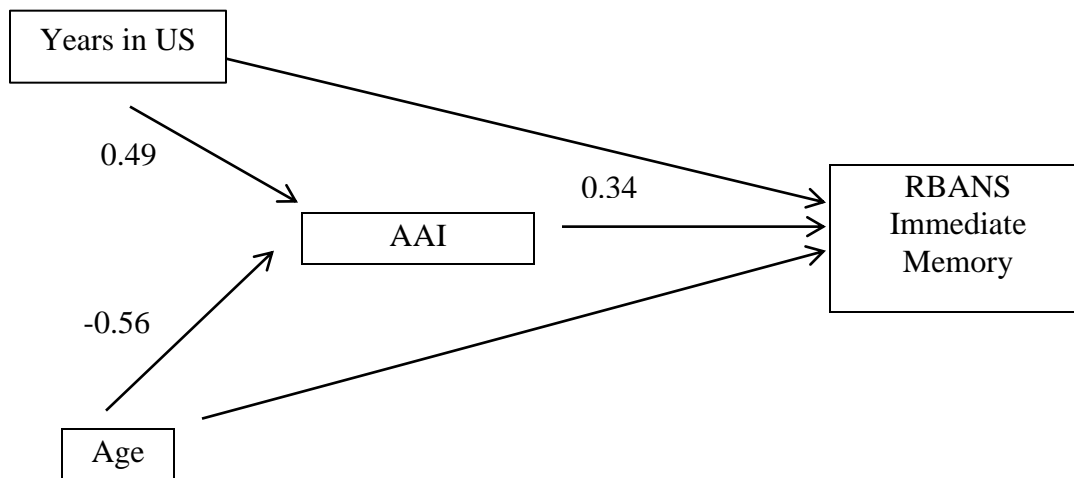
	RBANS Immediate Memory		RBANS Vis./Const.		RBANS Language		RBANS Attention		RBANS Delayed Memory	
	Years in the US	Age	Years in the US	Age	Years in the US	Age	Years in the US	Age	Years in the US	Age
Direct Effect	.121	-.189	-.47**	.201	.32**	-.37**	-.47***	.184	-.143	.56***
Indirect Effect	.17*	-.194*	-.086	.075	.22*	-.26*	.194*	-.03*	.214	.099
Total Effect	.29	-.38**	-.56**	.276	.55***	-.64***	-.276	.154	.071	.66***

*** p<0.01, ** p<0.05, * p<0.1

R3₁: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Immediate Memory (Bialystok et al., 2009; Mindt et al., 2008) mediated by levels of American acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

FIGURE 1

Path Diagram for RBANS Immediate Memory by Years in US, Age and AAI.

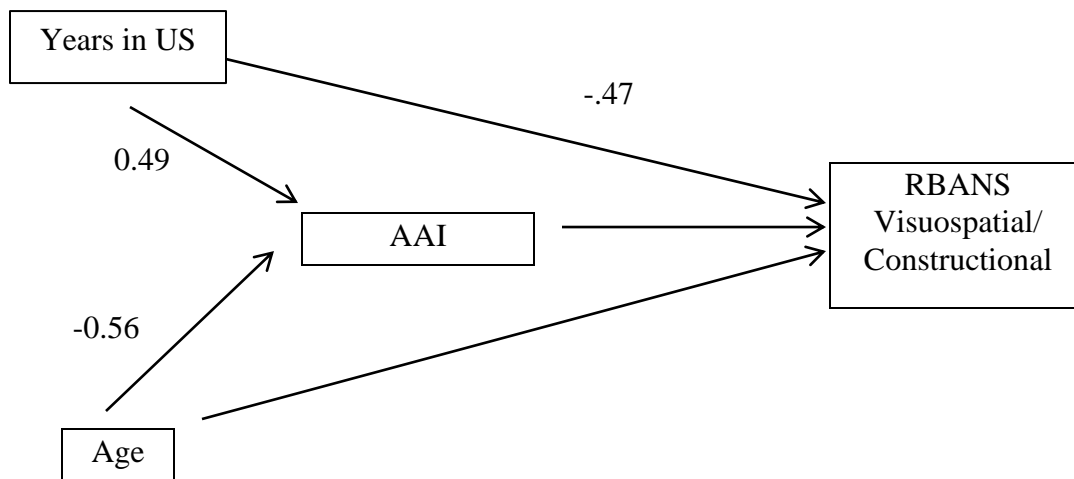


A path analysis was conducted to determine the causal effects among the variables of number of years in the United States, participant age, American acculturation, and the RBANS Immediate Memory Index score. Only standardized path coefficients significant at the .05 level were reported. Number of years in the United States had a significant relationship with American acculturation (AAI; Beta = 0.49), as did age of the participant (Beta = -0.56). Years in the United States had a significant indirect effect on the RBANS Immediate Memory score (Beta = 0.17). Age had a significant indirect effect on Immediate Memory as well (Beta = -0.194) and a significant total effect (Beta = -0.38). Overall, years in the United States and participant age significantly impact AAI, which in turn significantly impacts the Immediate Memory score (Beta = 0.34).

R3₂: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Visuospatial/Constructional scores (Kisser et al., 2009) mediated by levels of American acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

FIGURE 2

Path Diagram for RBANS Visuospatial/Constructional by Years in US, Age and AAI

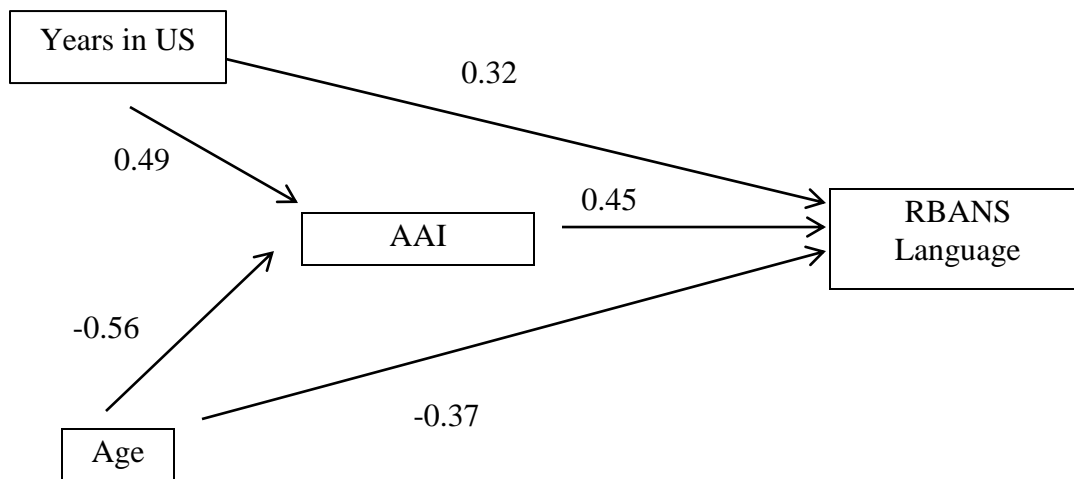


A path analysis was conducted to determine the causal effects among the variables of number of years in the United States, participant age, American acculturation, and the RBANS Visuospatial/Constructional Index score. Only standardized path coefficients significant at the .05 level were reported. Number of years in the United States had a significant relationship with American acculturation (AAI; Beta = 0.49), as did age of the participant (Beta = -0.56). Years in the United States had a significant direct effect on the Visuospatial/Constructional Index (Beta = -0.47) and a significant total effect (Beta = -0.56). Age of the participant did not yield significant effects on Visuospatial/Constructional scores. AAI was not a significant mediator of the relationship between age, years in the United States, and the Visuospatial/Constructional Index.

R3₃: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Language scores (Ivanova & Costa, 2008; Grogan et al., 2009) mediated by levels of American acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

FIGURE 3

Path Diagram for RBANS Language by Years in US, Age and AAI

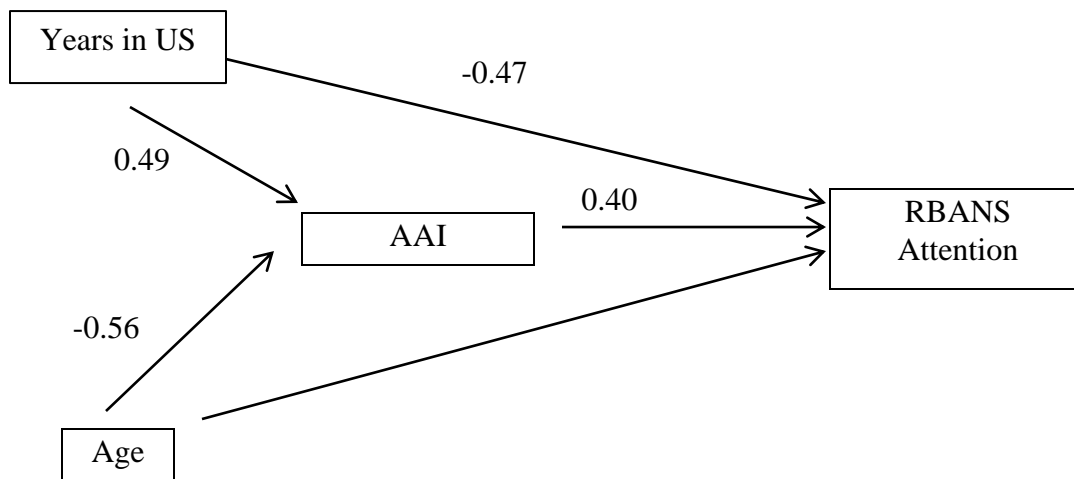


A path analysis was conducted to determine the causal effects among the variables of number of years in the United States, participant age, American acculturation, and the RBANS Language Index score. Only standardized path coefficients significant at the .05 level were reported. Number of years in the United States was significantly related to American acculturation (AAI; Beta = 0.49), as was age of the participant (Beta = -0.56). Years in the United States had a significant direct effect (Beta = 0.32), significant indirect effect (Beta = 0.22), and significant total effect (Beta = 0.55) on the RBANS Language scores. Likewise, participant age had a significant direct effect (Beta = -0.37), indirect effect (Beta = -0.26), and significant total effect (Beta = -0.64) on the RBANS Language Index. Additionally, American acculturation (AAI) significantly mediates the relationship between both age and years in the United States and RBANS Language (Beta = 0.45).

R3₄: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Attention (Kaushanskaya, Blumenfeld, & Marian, 2011) mediated by levels of American acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

FIGURE 4

Path Diagram for RBANS Attention by Years in US, Age and AAI

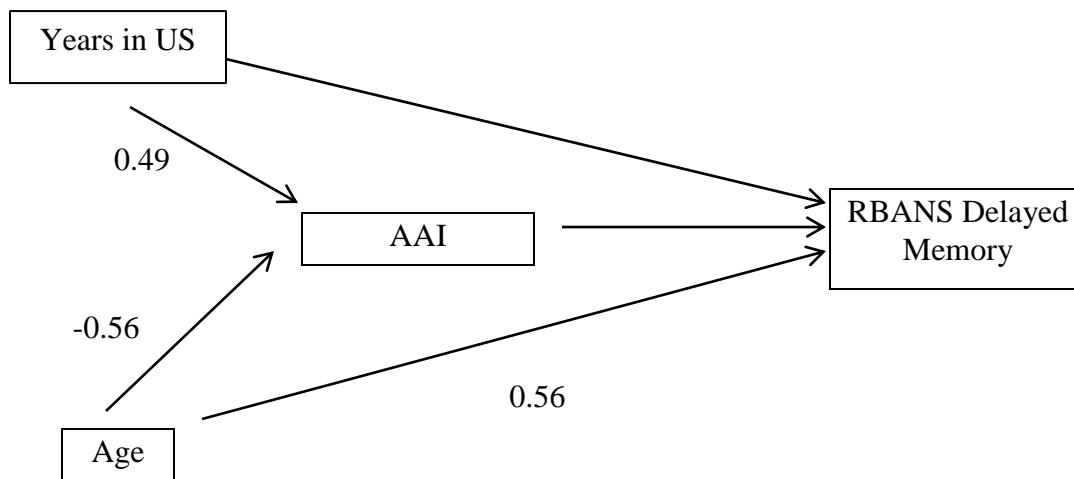


A path analysis was conducted to determine the causal effects among the variables of number of years in the United States, participant age, American acculturation, and the RBANS Attention Index score. Only standardized path coefficients significant at the .05 level were reported. Number of years in the United States was significantly related to American acculturation (AAI; Beta = 0.49), and participant age (Beta = -0.56). The number of years in the United States had a significant direct effect (Beta = -0.47) and a significant indirect effect (Beta = 0.194) on RBANS Attention. Age was found to have a significant indirect effect (Beta = -0.03) on the RBANS Attention score. The relationship between years in the United States and the Attention Index, as well as participant age and the Attention Index, were significantly mediated by American acculturation (Beta = 0.40).

R3₅: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Delayed Memory scores (Bialystok et al., 2009; Mindt et al., 2008) mediated by levels of American acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

FIGURE 5

Path Diagram for RBANS Delayed Memory by Years in US, Age and AAI



A path analysis was conducted to determine the causal effects among the variables of number of years in the United States, participant age, American acculturation, and the RBANS Delayed Memory Index score. Only standardized path coefficients significant at the .05 level were reported. Number of years in the United States had a significant relationship with American acculturation (AAI; Beta = 0.49), as well as participant age (Beta = -0.56). Participant age had a significant direct effect on RBANS Delayed Memory scores (Beta = 0.56), as well as a significant total effect (Beta = 0.66). Years in the United States did not have any significant effects on Delayed Memory scores.

Russian Acculturation Path Analysis

The LIB American Acculturation Index and Russian Acculturation Index measure acculturation to different cultures (American and Russian, respectively) and thus represent different constructs. Therefore, these path models are run as separate path models in order to clearly examine the effects of levels of acculturation for each one of the cultures for the Bilingual sample.

A path analysis was run for Russian acculturation (LIB Russian Acculturation Index; RAI). Direct and indirect effects for the mediations of Russian acculturation are found in Table 7. The paths for each analysis are depicted in Figures 6-10, with only the significant relationships labeled with the standardized coefficients from the analysis. The purpose of this analysis was to evaluate the effects of participant age and years in the U.S. on RBANS Index scores, as mediated by Russian acculturation levels.

TABLE 7

Direct, Indirect, and Total Effects for Mediation between RBANS, LIB RAI, Age, and Years in the U.S. (with Standardized Coefficients)

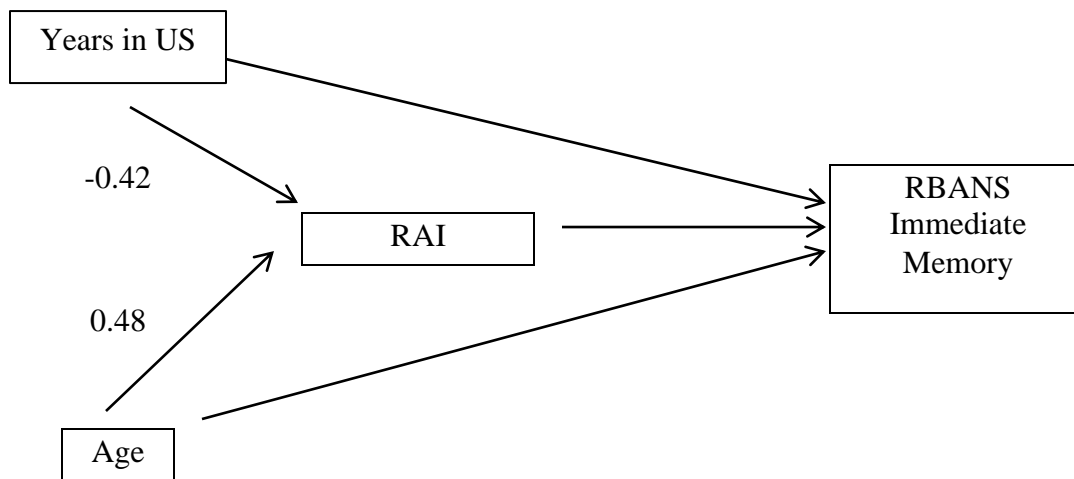
	RBANS Immediate Memory		RBANS Vis./Const.		RBANS Language		RBANS Attention		RBANS Delayed Memory	
	Years in the US	Age	Years in the US	Age	Years in the US	Age	Years in the US	Age	Years in the US	Age
Direct Effect	.20	-.29	-.43**	.15	.46** *	-.52**	-.39**	.08	.09	.49** *
Indirect Effect	.09	-.10	.03	-.03	.09	-.10	.10	-.11	.04	-.05
Total Effect	.29	-.38	.46**	.18	.55** *	-.62***	-.29	.19	.13	.44**

*** p<0.01, ** p<0.05, * p<0.1

R3₁: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Immediate Memory (Bialystok et al., 2009; Mindt et al., 2008) mediated by levels of Russian acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

FIGURE 6

Path Diagram for RBANS Immediate Memory by Years in US, Age and RAI

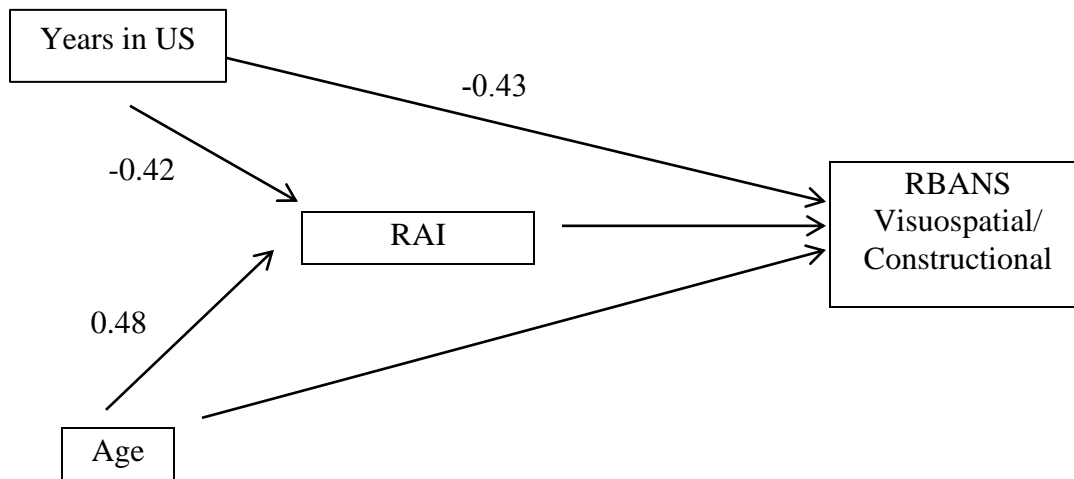


A path analysis was conducted to determine the causal effects among the variables of number of years in the United States, participant age, Russian acculturation, and the RBANS Immediate Memory Index score. Only standardized path coefficients significant at the .05 level were reported. Number of years in the United States had a significant relationship with Russian acculturation (Beta = -0.42). Age also has a significant impact on Russian acculturation (Beta = 0.48). Neither age nor years in the United States have significant direct or indirect effects.

R32: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Visuospatial/Constructional scores (Kisser et al., 2009) mediated by levels of Russian acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007).

FIGURE 7

Path Diagram for RBANS Visuospatial/Constructional by Years in US, Age and RAI

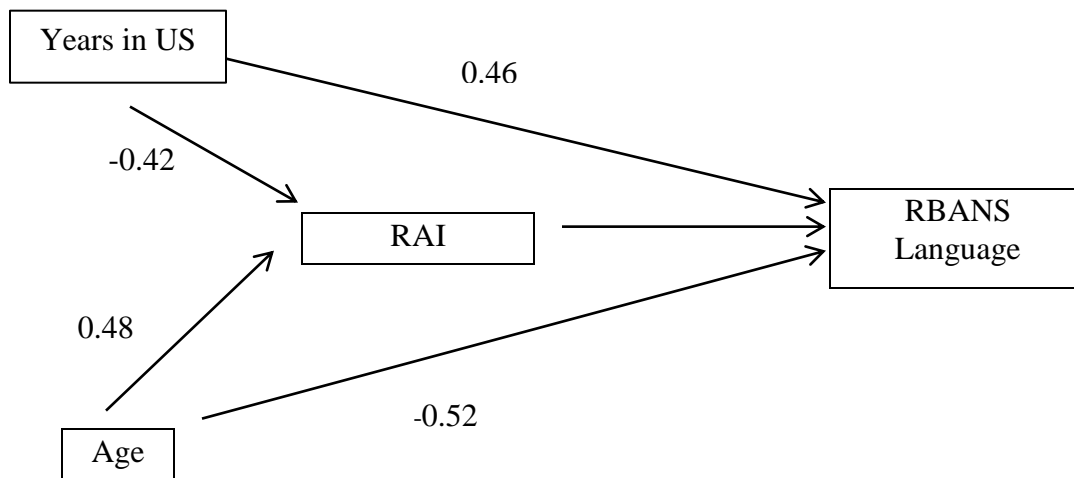


A path analysis was conducted to determine the causal effects among the variables of number of years in the United States, participant age, Russian acculturation, and the RBANS Visuospatial/Constructional Index score. Only standardized path coefficients significant at the .05 level were reported. Number of years in the United States had a significant relationship with Russian acculturation (Beta = -0.42). Age also has a significant impact on Russian acculturation (Beta = 0.48). Years in the United States had a significant direct effect (Beta = -0.43) and a significant total effect (Beta = 0.46) on Visuospatial/Constructional scores. Participant age did not have significant direct or indirect effect on this Index.

R3₃: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Language scores (Ivanova & Costa, 2008; Grogan et al., 2009) mediated by levels of Russian acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

FIGURE 8

Path Diagram for RBANS Language by Years in US, Age and RAI

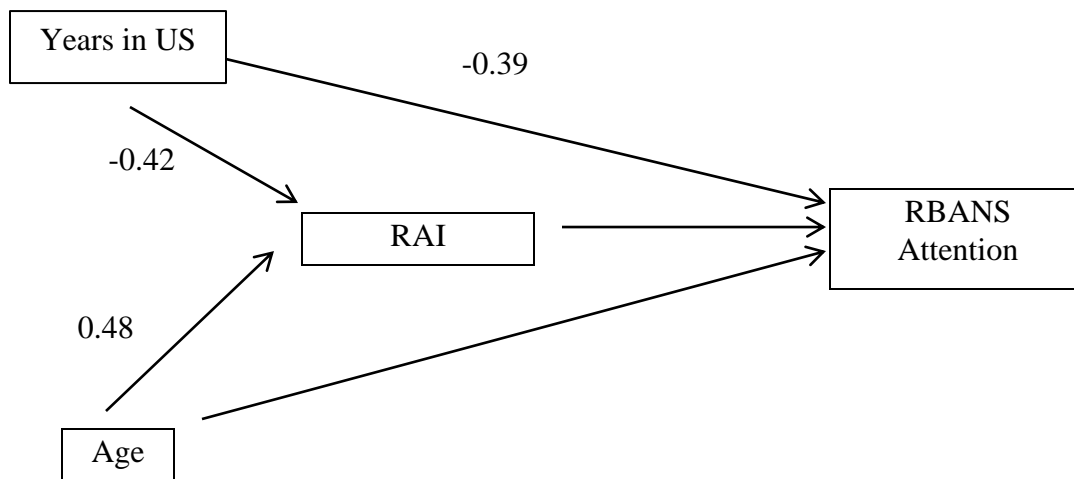


A path analysis was conducted to determine the causal effects among the variables of number of years in the United States, participant age, Russian acculturation, and the RBANS Language Index score. Only standardized path coefficients significant at the .05 level were reported. Number of years in the United States had a significant relationship with Russian acculturation (Beta = -0.42). Age also has a significant impact on Russian acculturation (Beta = 0.48). Years in the United States had a significant direct effect on the Language Index (Beta = 0.46) and a significant total effect (Beta = 0.55). Age also had a significant direct effect (Beta = -0.52) and total effect (Beta = -0.62).

R3₄: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Attention (Kaushanskaya, Blumenfeld, & Marian, 2011) mediated by levels of Russian acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

FIGURE 9

Path Diagram for RBANS Attention by Years in US, Age and RAI

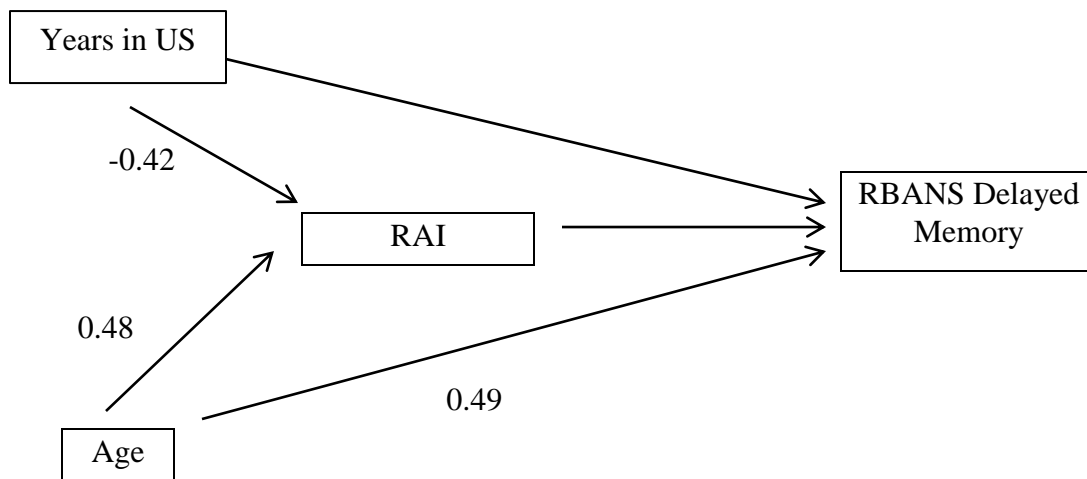


A path analysis was conducted to determine the causal effects among the variables of number of years in the United States, participant age, Russian acculturation, and the RBANS Attention Index score. Only standardized path coefficients significant at the .05 level were reported. Number of years in the United States had a significant relationship with Russian acculturation (Beta = -0.42). Age also has a significant relationship on Russian acculturation (Beta = 0.48). Years in the United States had a significant direct effect on the Attention Index (Beta = 0.48). Years in the United States had a significant direct effect on the Attention Index (Beta = -0.39). Age did not yield significant direct or indirect effects on the Attention Index. Thus, years in the U.S. is the only variable significantly affecting RBANS Attention in this model.

R35: Are the effects of age (Berry et al., 2006) and years in the U.S. (Agranovich & Puente, 2007) on RBANS Delayed Memory scores (Bialystok et al., 2009; Mindt et al., 2008) mediated by levels of Russian acculturation (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007)?

FIGURE 10

Path Diagram for RBANS Delayed Memory by Years in US, Age and RAI



A path analysis was conducted to determine the causal effects among the variables of number of years in the United States, participant age, Russian acculturation, and the RBANS Delayed Memory Index score. Only standardized path coefficients significant at the .05 level were reported. Number of years in the United States had a significant relationship with Russian acculturation (Beta = -0.42). Age had a significant direct effect on RBANS Delayed Memory (Beta = 0.49), as well as a significant total effect (Beta = 0.44). Years in the United States did not have significant direct or indirect effects on Delayed Memory.

Summary

Descriptive results demonstrated average performance within the expected average population range on all administered measures for the sample. Analysis employing the Pearson

correlation indicated positive correlations between the American Acculturation Index (LIB AAI), PPVT-4, and the following RBANS Index and subtest scores at the $p < .05$ level of significance: Immediate Memory index, Language Index, List Learning, Story Memory, and Digit Span subtests. Bilingual participant age was positively correlated with the number of years a participant has lived in the United States. Participant age was positively correlated with LIB AAI, the Delayed Memory Index, and the Story Memory subtest from the RBANS. Age was negatively correlated with the RBANS Language Index. The number of years a bilingual participant has lived in the United States was positively correlated with the PPVT-4 and the RBANS Story Recall subtest. Number of years in the United States was negatively correlated with the Visuospatial/Constructional and Attention Indices, and the Figure Copy and Digit Span subtests from the RBANS. The RBANS Language Index score was the most strongly correlated with AAI and was significant at the .01 level. The Russian Acculturation Index (RAI) was significantly correlated with the following RBANS Index and scaled scores at the $p < .05$ level of significance: Immediate Memory, Language, and Story Memory. The RBANS Language Index was the most strongly negatively correlated with the RAI, and significant at the .01 level as well. The results of the MANOVA yielded significant differences for the RBANS scores between the bilingual and monolingual groups. A discriminant analysis yielded significant differences in group performance for the Digit Span, Coding, Story Memory, and List Learning RBANS subtests.

A mediated path analysis was utilized to assess the overall effects of acculturation on RBANS performance in the bilingual group. Specifically, how age and number of years in the United States affect RBANS Index scores, mediated by level of acculturation to either American (AAI) or Russian (RAI) culture. In several cases, American acculturation (AAI) was found to

significantly mediate between years in the U.S. and RBANS Immediate Memory, Language, and Attention. American acculturation was significantly mediated between age and RBANS Immediate Memory, Language, and Attention as well. The results were more relevant with regards to levels of American acculturation. Russian acculturation was not found to mediate these effects, however, occasional direct effects were found for years in the U.S. on RBANS Visuospatial/Constructional, Language, and Attention Indices. Also within the scope of the Russian acculturation (RAI) mediation, age had direct effects on RBANS Language and Delayed Memory.

CHAPTER V

DISCUSSION

This chapter is divided into four sections: (1) summary of the present investigation; (2) discussion and implications of the relationship between acculturation and neuropsychological test performance in Russian bilingual adults; (3) delimitations and limitations of the study; and (4) directions for future research.

Summary of the Study

The purpose of the present study was to explore the relationship between levels of acculturation and the *Repeatable Battery for the Assessment of Neuropsychological Status Normative Update* (RBANS; Randolph, 2012) in a group of 48 Russian bilingual adults primarily from a large Midwestern city (National Center for Educational Statistics, 2006). A group of 20 college students enrolled at a large Midwestern university were used as a control group consisting of monolingual English speakers. All of the domains assessed on the RBANS were included, which are the Immediate Memory, Delayed Memory, Visuospatial/Constructional, Language, and Attention Indices. The RBANS Indices are comprised of the following subtests: the Language Index (List Learning and Story Memory), Visuospatial/Constructional Index (Figure Copy, Line Orientation), Language (Picture Naming, Semantic Fluency), Attention Index (Digit Span, Coding), and Delayed Memory (List Recall, List Recognition, Story Recall, Figure Recall). Acculturation for the Russian bilingual participants was measured with *The Language, Identity and Behavioral Acculturation Scale* (LIB; Birman & Trickett, 2001). The LIB measures acculturation on three factors or indices: language (English and Russian), cultural identity (American and Russian), and cultural behavior (American and Russian). The LIB yielded mean scores for levels of Russian (Russian

Acculturation Index; RAI) and American (American Acculturation Index; AAI) acculturation. English language proficiency was assessed with the *Peabody Picture Vocabulary Test*, 4th Edition (PPVT-4; Dunn & Dunn, 2007). The PPVT-4 is a measure of English receptive vocabulary. All participants were administered the RBANS and PPVT-4. The Russian bilingual group was also administered the LIB Acculturation Scale. On the PPVT-4, both bilingual and monolingual group scores were within the average ranges. Similarly, RBANS Index scores were within the average ranges for the bilingual and monolingual groups. RBANS subtest scaled scores (for List Learning, Story Memory, Figure Copy, Semantic Fluency, Digit Span, Coding, Story Recall, and Figure Recall) were within the average ranges for the Russian bilingual and monolingual groups. RBANS subtest that yielded percentile ranges (Line Orientation, Picture Naming, List Recall, and List Recognition) were largely within the average ranges for the Russian bilingual group and for the monolingual group as well.

A MANOVA comparing the performance between the Russian bilingual and English speaking monolingual groups yielded significant differences between the groups for Digit Span, Coding, Story Memory, List Learning, and Story Recall subtests, while no significant differences were found for the RBANS Index scores. For the subtest scores with significant differences, the monolingual group performed better than the bilingual group on Coding, Story Memory, List Learning, and Story Recall. The Russian bilingual group performed better than the monolingual group on the Digit Span measure.

A mediated path model was employed to assess the relationship between RBANS scores and American acculturation levels (AAI) in the Russian bilingual group, both directly and as a mediator of the relationships between RBANS, years in the U.S., and age. American acculturation levels significantly mediated the relationship between years in the U.S. and

RBANS Immediate Memory, Language, and Attention scores. The AAI also significantly mediated the relationship between age and the RBANS Immediate Memory, Language, and Attention Indices. For the Russian bilingual group, years in the United States were positively related to American acculturation levels while participant age was negatively related to American acculturation. A separate path analysis was run examining the effects of Russian acculturation on RBANS Index scores for the Russian bilingual group. Russian acculturation levels (RAI) did not significantly mediate the effects of age or years in the U.S. on RBANS Index scores in the bilingual group; however, direct effects were still observed for years in the U.S. on RBANS Visuospatial/Constructional, Language, and Attention Indices. Age also had direct effects on RBANS Language and Delayed Memory within the RAI path analysis.

Discussion and Implication of the Relationship

Discussion

The current study investigated the relationship between level of acculturation, participant age, and number of years in the United States on RBANS performance in Russian bilingual participants. English language proficiency was assessed with the PPVT-4, which is a measure of receptive vocabulary and is utilized as a measure of English language proficiency in bilingual research (Borovsky, Elman, & Fernald, 2012; Dahl & Vulchanova, 2014; Duran, Roseth, & Hoffman, 2010; Hellman, 2011; Kim, 2012; Leacox & Jackson, 2014). This explorative study, done on a population of Russian bilingual adults and a monolingual control group, provides insight into the relationship between bilingualism, acculturation, and neuropsychological test performance, adding to the existing literature on these topics. This is important because there is not much published research on the neuropsychological performance of Russian bilinguals. Despite differences in instrumentation and which languages the bilingual person speaks, previous

studies have found positive relationships between American acculturation and performance on neuropsychological measures. The results of the current study were largely expected, given that higher American acculturation has been shown to affect performance on memory, language, and attention tasks in bilinguals (Agranovich & Puente, 2007; Birman, Trickett, & Buchanan, 2005; Genkova et al., 2014; Kaushanskaya & Yoo, 2013; Mitrushina et al., 2005; Pedraza & Mungas, 2008). Greater levels of American acculturation have been found to be positively related to higher scores on language measures such as semantic fluency and picture naming (Gollan et al., 2005; Ivanova & Costa, 2008; Pavlenko & Malt, 2011; Pelham & Abrams, 2014; Von Holzen & Mani, 2012). Likewise, the level of American acculturation and English language proficiency has been shown to have positive effects on attention tasks such as digit span and coding (Ardila, 2003; Kaushanskaya, Blumenfeld, & Marian, 2011; Ostroski-Solis & Lozano, 2006; Pae & Sevick, 2011). Greater English language proficiency and American acculturation tends to predict better performance on verbal short-term memory tasks such as list learning and story recall (Bialystok et al., 2009; Hammer et al., 2012; Mindt et al., 2008; Razani et al., 2007; Thorn, Gathercole, & Frankish, 2005). Thus, the results of this study support prior research with regards to the effects of American acculturation and English language proficiency on neuropsychological test performance in bilingual groups. This study extends these findings via use of the RBANS with a Russian bilingual population; to the author's knowledge this is the first study to do so. The RBANS is a widely used and well-validated neuropsychological measure, and its ability to assess a wide array of neuropsychological functions in a brief time renders it useful for a variety of populations and it is thus important to explore its validity with a variety of populations. Part of this process is understanding the effects of acculturation on the RBANS for multiple populations. The results of this research also provided more information on the LIB

acculturation scale, and the relationship of this acculturation measure to the RBANS. This study design (measuring acculturation, English language proficiency, and the RBANS) should also be replicated with other Russian bilingual samples, as well as other bilingual populations, which will continue to add to the understanding of how bilingualism and acculturation affect neuropsychological test performance.

The findings from this study also indicate American acculturation was positively correlated with English language proficiency, as measured by the PPVT-4. Thus, in this study, bilingual participants with higher English language proficiency also tended to have higher levels of American acculturation. This is consistent with previous research demonstrating American acculturation levels are related to higher English language proficiency in bilingual individuals (Birman & Trickett, 2001; Birman, Trickett, & Vinokurov, 2002; Gollan et al., 2007). Previous findings have also found that English language competence was a strong predictor of American acculturation and better social adjustment to American culture for bilingual immigrants (Baek Choi & Thomas, 2008; Jiang et al., 2009; Kang, 2006; Saez et al., 2014).

Acculturation

The present study examined acculturation in a population of bilingual immigrants primarily from the former Soviet Union, with a majority of the participants (64.6%) identifying as being ethnically and/or religiously Jewish. Of the bilingual participants, 14.6% identified their ethnicity as Russian, 14.6% identified as Belarussian, and 6.3% identified as Ukrainian. The Russian bilingual participants tended to have higher scores on the American Acculturation Index than the Russian Acculturation Index, which suggests the participants were more engaged with American culture than their native Russian culture. From the results of this study, it is difficult to conclude the extent to which Russian immigrant concentration in a particular area affected

levels of American and Russian acculturation, but this could be an avenue of study in future research. Throughout most of the 20th century, and in the Soviet Union in particular (Jurcik et al., 2013; Russell and Batalova, 2012), Eastern European Jews have felt marginalized in their respective countries of origin, and were more likely to view American culture favorably (Cabassa, 2003; Kliger, 2011; Norton, 2011; Rosner, Gardner, & Hong, 2011). Higher American acculturation levels for the bilingual participants in this study may thus be due to this effect of viewing the United States more favorably than their country of origin. It is also important to consider that the bilingual participants in this study reside in a Midwestern city with a relatively small population of immigrants (6.8% of the total population of the county; an estimated 64,434 individuals out of 1 million), suggesting that the Russian immigrant population for this city is not as large as it would be in larger metropolitan areas (Missouri Census Data Center, 2016). It is reasonable to conclude that smaller Russian immigrant populations are less insulated from American culture, because there would be fewer Russian businesses, foods, and cultural centers with which they could maintain a high level of Russian acculturation (Persky & Birman, 2005; Rebhun, 2014). This contextual factor of size and involvement of the immigrant group in the host society can determine to what extent Russian immigrants would acculturate to American culture (Ando, 2014; Bourhis et al., 2010; Van Tubergen, 2006). In regards to the current study, this suggests that the Russian bilingual population in this study is more integrated with American culture which may be a result of a less insular Russian immigrant community in their particular city.

In the current study, bilingual participant age ranged from 19 to 78 (mean age = 37.17, median age = 28). The current study found that participant's age was negatively related to American acculturation, suggesting that the younger the participant, the higher their American

acculturation levels. American acculturation level was found to significantly mediate the relationship between RBANS Immediate Memory, Language, and Attention Index scores and age. Thus, by only considering the direct relationship between participant age and the aforementioned RBANS Index scores, the full impact of age for bilingual participants would not be captured, because age significantly influences American acculturation levels, and American acculturation in turn significantly influences those RBANS Indices. The results from this study indicate that younger bilingual participants, who have lived in the United States for a greater portion of their lives, are more acculturated to American culture than older bilinguals, and likely have higher English language proficiency. All of these factors have been shown to affect levels of acculturation to the secondary culture in bilingual individuals (Baek Choi & Thomas, 2009; Birman & Trickett, 2001; Kuo & Roysircar, 2004). Age of the participant is an important determinant in American acculturation levels, as younger bilinguals tend to acculturate to their new culture more readily than older bilingual immigrants (Abreu et al., 2013; Berry et al., 2006; Bialystok et al., 2009; Klinger, 2007; Schwartz et al., 2010; Titzmann & Jugert, 2015; Verkuyten, 2005).

The majority of the bilingual participants in this study were born in the former U.S.S.R. (83.3%), and 16.7% were born in the United States. The number of years bilingual participants resided in the United States ranged from 15 to 52 years (mean = 22.94 years). The results found that the number of years a Russian bilingual participant has lived in the United States was significantly and positively related to American acculturation levels. This means that more years these bilingual participants have spent in the United States, the higher levels of American acculturation they reported. This is consistent with existing research that the length of time a bilingual immigrant has resided in the United States is positively related to higher levels of

American acculturation (Bialystok et al., 2009; Kuo & Roysircar, 2004; Lopez & Bui, 2014; Tartakovsky, 2012).

There was also significant mediation of American acculturation between the number of years a bilingual participant has resided in the United States and the Immediate Memory, Language, and Attention Indices. The Immediate Memory Index of the RBANS measures short-term encoding and learning of verbal information, the Language Index measures expressive language ability, and the Attention Index of the RBANS measures auditory registration, with the digit span subtest, and visual scanning and processing speed (Randolph, 2012). Immediate Memory and Language Indices are certainly among the language-heavy tasks, requiring bilingual participants to encode verbally presented information and work with items in their L2 (English; Arentoft et al., 2012; Saldivar, 2005; Tourgeman et al., 2009). The results of the current study suggest that the level of American acculturation has significant effects on more language-based aspects of the RBANS battery. Therefore, in this study, greater American acculturation seemed to significantly affect some areas of neuropsychological test performance (Agranovich & Puente, 2007; Agranovich et al., 2011; Birman, Trickett, & Vinokurov, 2002; Boone et al., 2007).

In the current study, American acculturation was found to be significantly positively correlated with the PPVT-4, which is a test of receptive language and utilized as a measure of English language proficiency. This suggests that Russian bilingual participants who have higher levels of American acculturation tended to be more proficient in English receptive language than participants with lower levels of American acculturation. The existing literature is consistent with this finding, indicating that English language proficiency is an important factor in understanding levels of American acculturation, with greater English proficiency contributing to

higher American acculturation levels in immigrants (Birman, Trickett, & Vinokurov, 2002; Remennick, 2004; Safdar, Calves, & Lewis, 2012).

Russian acculturation level did not have significant mediations, meaning that it did not significantly affect or mediate RBANS Index scores for bilingual participants. This suggests that in this study there was not a direct relationship between Russian acculturation levels and RBANS Index scores. Additionally, Russian acculturation did not significantly mediate any of the relationships between RBANS scores and either age or years in the U.S. This is consistent with expectations as acculturation to a foreign culture would likely not impact performance on a neuropsychological battery that has been normed to American culture, as long as that level of acculturation did not affect acculturation to the American culture. This divergence in this study between the two acculturation indices (significant indirect effects for the American index, and insignificant indirect effects for the Russian index) underlines this logic.

These results indicate that participants who more closely adhere to Russian culture tend to perform worse on the aforementioned RBANS subtests, which rely more heavily on English language ability. When included in the path analysis, however, this relationship was found to be insignificant, suggesting that the relationship between RAI and RBANS performance is not robust, when controlling for the major determinants of years in the U.S. and age. This means that Russian acculturation levels did not have a significant effect on RBANS scores. Thus, in this study, Russian acculturation, or acculturation to the heritage culture in general, was not as important as American acculturation for understanding cultural effects on these neuropsychological test measures. This is likely due to the fact that the measures used are normed on a monolingual American population, and the tests are administered in English. American acculturation and English language proficiency are related, therefore, higher American

acculturation is likely to predict better performance on English-based neuropsychological measures. Existing research confirms the finding that heritage culture acculturation levels do not affect performance on neuropsychological measures as much as American acculturation (Arentoft et al., 2012; Boone et al., 2007; Coffey et al., 2005).

Memory

The results of the current study found a significant positive relationship between American acculturation (AAI) and the Immediate Memory Index for the Russian bilingual group. When comparing Russian bilingual performance on the RBANS to the monolingual control group, significant differences were found for Story Memory, List Learning, and Story Recall subtests. For all of these measures, the Russian bilingual group performed worse than the monolingual group. The mediated path analysis found that bilingual participant age and years in the United States significantly impacted level of American acculturation, which in turn impacted Immediate Memory. There was also a significant indirect effect of years in the United States on the Immediate Memory score, meaning that through American acculturation, the number of years in the United States significantly affected bilingual performance on RBANS Immediate Memory. Although the length of time a participant has lived in the United States did not directly affect Immediate Memory, this factor should still be taken into consideration by practitioners when interpreting these scores for bilingual populations, due to its indirect effect, through the level of American acculturation. The results suggest that bilinguals who are more highly acculturated to American culture may perform better on short term verbal recall measures than bilinguals who are less acculturated to American culture. As the Immediate Memory tasks on the RBANS are language-based, it makes sense that higher American acculturation is related to better performance on this index. Existing research has found that American acculturation level

significantly affects bilingual performance on verbal short-term memory measures (Bialystok et al., 2009; Hammer et al., 2012; Mindt et al., 2008). English language proficiency, which contributes to the American acculturation level (Berry et al., 2006; Boone et al., 2007; Kaushanskaya & Marian, 2009), has been found to positively effect verbal short-term memory performance in bilinguals (Kaushanskaya & Yoo, 2013; Thorn, Gathercole, & Frankish, 2005; Yoo & Kaushanskaya, 2012).

The study found that the monolingual group performed significantly better than the Russian bilingual group on the List Learning, Story Memory, and Story Recall subtests on the RBANS. Although no significant differences were found for the RBANS Indices between the two groups, the results indicate English speaking monolinguals in this study had an advantage over the Russian bilinguals on verbal short-term and some delayed memory measures. These results are consistent with the literature that bilinguals generally tend to perform worse on verbal memory measures in their L2 than monolinguals even when they are proficient in their L2 (Ardila et al., 2000; Bialystok et al., 2009; Mindt et al., 2008).

The results of this study did not yield a significant relationship between American acculturation and the Delayed Memory Index for the Russian bilingual group. This may suggest that for this sample, delayed memory processes relied less on L2 language proficiency, and would therefore be less affected by cultural factors, including acculturation. Thorn, Gathercole, and Frankish (2002) found that bilinguals tend to recall items better in their first language (L1) than their second (L2), thus recall for L2 would be generally worse; however, there is a paucity of research regarding the effects of bilingualism on strictly L2 item recall. It is possible for the participants in this sample, delayed recall tasks were not as affected by English language proficiency and American acculturation level as are verbal short-term memory measures. Given

that there is not a great deal of literature regarding the bilingual effects on delayed verbal memory, this may be an avenue for further research as it applies to bilingual populations.

Attention

This study found that American acculturation in Russian bilingual participants was not significantly correlated with the Attention Index. However, Digit Span, a subtest within the Attention Index, was positively correlated with American acculturation, meaning that higher levels of American acculturation are related to better performance on the Digit Span subtest. The results indicate that older Russian bilingual participants performed better on the Attention Index, and bilinguals who have spent more time in the United States tended to have lower scores on this index. The mediation modeling results indicated that living in the United States longer is associated with lower performance on the Attention Index, but American acculturation level counteracts this effect to some extent. Therefore, bilingual participants who have lived in the United States longer and are more acculturated to American culture perform better on the Attention Index than bilinguals who have lower levels of American acculturation. It is unclear from a research perspective why the number of years in the United States would negatively affect Attention Index scores, and this is another avenue for possible future research. Overall, higher levels of American acculturation tended to be associated with better performance on the Attention Index.

The effect of age evidenced in the results of this study could be indicative of education level differences in the bilingual participants. Russian bilingual participants over 28 years of age in this study tended to have higher levels of education (i.e., on average a master's degree), whereas younger participants under the age of 28 tended to have a bachelor's degree or less. Thus, an education effect may be contributing to better performance on the Attention Index.

Prior research has found that bilinguals with higher levels of education tend to perform better on attention measures, particularly digit span (Karakas et al., 2002; Ostrosky-Solis & Lozano, 2006). For example, research with Spanish monolinguals has found that older adults tend to perform better on digit span measures than younger adults (Sebastian & Mediavilla, 2015; Sebastian & Hernandez-Gil, 2012), whereas other studies find that younger English-speaking adults perform better on digit span (Kemtes & Allen, 2008; Mathias et al., 2002; Muangpaisan et al., 2010). Overall, there does not appear to be a consensus regarding age effects on the digit span measure.

In comparing performance between the monolingual English speakers and Russian bilinguals, differential findings were noted for the subtests comprising the Attention index. The monolingual participants performed significantly better than the Russian bilinguals on the Coding subtest, and the Russian bilingual group performed significantly better than the monolingual group on the Digit Span subtest. One reason for these results may be that English language proficiency did not have a significant effect on the Digit Span measure for the Russian bilingual group. Russian bilinguals in this sample tended to be more educated than the monolingual control group which was comprised of undergraduate students. Thus, level of education may have contributed to a higher vocabulary for the Russian bilinguals, which in turn led to better digit span performance in the bilingual group when compared to the monolingual controls. Research has shown that bilinguals with a more extensive vocabulary have a tendency to perform higher on digit span measures than bilinguals with lower vocabulary scores (Kaushanskaya, Blumenfeld, & Marian, 2011; Thorn & Gathercole, 1999). Likewise, lower digit span scores have been shown to relate to lower L2 abilities in bilingual groups (Ardila, 2003; Hummel, 2002; Pae & Sevic, 2011; Ziethe, Eysholdt, & Doellinger, 2013), but higher level of

education has been shown to improve digit span performance in bilingual groups (Bialystok, Majumder, & Martin, 2003; Ostrosky-Solis & Lozano, 2007).

The monolingual group performed better than the Russian bilingual group on the Coding measure and some research suggests older participants tend to perform worse on processing speed measures such as Coding (Fry & Hale, 2000; Joy, Kaplan, & Fein, 2004). While the Russian bilingual group (mean age = 37.17) was on average 17 years older than the monolingual group (mean age = 20.45) the majority of the sample fell within the same age band and thus age alone likely does not account for these differences; more research on this finding is needed. Neither American nor Russian acculturation were significantly correlated with the Coding subtest and thus acculturation may not impact the Coding measure for Russian bilinguals. Prior research suggests level of education has a salient effect on coding/processing speed measures in bilinguals. Roselli and Ardila (2003) found a strong positive association between education level and performance on nonverbal processing speed measures. Level of education and language preference have been previously shown to affect processing speed measures on the *Wechsler Adult Intelligence Scales*, 3rd edition (WAIS-III; Wechsler, 1997; Harris, 2003; Razani et al., 2007). The results are not congruent with the research with regards to education, as the bilingual group on average was more educated than the monolingual group, but performed worse on the measure. It is possible the group differences for the Coding subtest are due to small sample size, which makes drawing conclusions more difficult.

Language

The Language Index of the RBANS was significantly correlated with American acculturation, Russian acculturation, and PPVT-4 scores. This means American acculturation, Russian acculturation, and English language proficiency positively affected the scores of the

Language Index. Participant age for the Russian bilingual group was negatively related to the Language Index scores, which indicates that younger bilingual participants performed better on the Language Index measures. However, given that American acculturation significantly mediated this relationship, it means that American acculturation levels counteracted this age effect to an extent. This means that older bilingual participants who were highly acculturated to American culture performed better on the Language Index than those of the same age who were not as acculturated to American culture.

Younger bilingual participants performed better on the Language Index than their older counterparts. This age effect may be due to the fact that Russian bilinguals younger than 28 in this study have spent an average of 88% their lives in the United States, as compared to Russian bilinguals over the age of 28 who have spent an average of 52% of their lives in the United States. Younger Russian bilinguals in this study therefore would seem more likely to participate in American culture than Russian culture. These results are consistent with the existing literature, which finds that English language proficiency and higher American acculturation levels are significant predictors of performance on language-based tasks, including picture naming and semantic fluency (Gollan et al., 2005; Pavlenko & Malt, 2011; Pelham & Abrams, 2014). Ivanova and Costa (2008) noted bilingual age effects on language, with younger bilingual individuals being more likely to acquire their L2 faster than older bilinguals, and tending to be more proficient in their L2 as well. Bilingualism significantly affects performance on language measures, especially when bilinguals are assessed in their second language (Grogan et al., 2009; Van Holzen & Mani, 2012; Remmenick, 2004; Rosselli et al., 2000).

Visuospatial/Constructional Abilities

The Visuospatial/Constructional Index of the RBANS assesses figure construction and visual-spatial analysis. The results of this study did not find significant acculturation effects on the Visuospatial/Constructional Index; however, Russian bilingual participants who spent more years in the United States performed worse on the Visuospatial/Constructional Index than bilinguals who have not lived in the United States as long. The reason for the effect of years in the United States on the Visuospatial/Constructional Index remains unclear. It is possible there are Russian culture effects that are contributing to this relationship that were not assessed with the acculturation measure used in the current study. The findings from this study are consistent with the existing literature, which generally suggests that bilingualism, English language proficiency, and acculturation do not significantly affect performance on visuospatial or construction measures (Kisser et al., 2012; Walker et al., 2010).

Implications for the Practice of Neuropsychology

The findings of this study could be used to inform neuropsychological assessment, inform practitioners about the effect of acculturation on Russian bilinguals, and potentially improve diagnostic accuracy with Russian bilingual individuals in a clinical setting. This study illustrates the importance of acculturation in interpreting neuropsychological test scores for bilingual immigrant participants. Overall, bilinguals tend to perform worse than their monolingual peers on language-based measures (Arentoft et al., 2012; Bialystok et al., 2009; Boone et al., 2007; Patton et al., 2003; Saez et al., 2014; Whitfield et al., 2000). The results of the current study suggest that levels of American acculturation significantly affect the language and memory tasks on the RBANS for largely neurotypical Russian bilinguals (i.e., no participants reported a history of brain injury or stroke; 6.8% of the participants reported a

history of Attention Deficit/Hyperactivity Disorder). Higher levels of American acculturation were found to be significantly related to higher scores on RBANS Immediate Memory, Language, and Attention Indices. As the RBANS is a commonly used neuropsychological measure used in clinical settings (Rabin, Barr, & Burton, 2005; Rabin, Paolillo, & Barr, 2016), the results are relevant to clinicians evaluating bilingual immigrants, especially those who are Russian speakers. Results of this study suggest practitioners should consider the American acculturation levels of Russian bilingual patients to better conceptualize RBANS results, especially with regards to tasks of naming, semantic fluency, verbal short-term memory, and digit span, all of which were significantly affected by American acculturation levels in the current study.

When comparing Russian bilingual RBANS scores to the monolingual control group, the results found that the bilingual group performed significantly worse on List Learning, Story Memory, Story Recall, and Coding than their monolingual counterparts. Caution should be exercised in generalizing these results to other groups but some preliminary suggestions for practice would suggest neuropsychologists consider that some areas of verbal memory and attention/processing speed may exist for this group. Thus, when interpreting verbal memory measures, especially with regards to List Learning, Story Memory, and Story Recall, practitioners may see lower scores on these subtests with Russian bilingual patients than they would for same-aged English-speaking monolinguals. The finding that the bilingual group did more poorly on the Coding subtest is less easily explained. It is possible that age may affect Coding performance, with older participants scoring lower on this subtest, but the small sample size of the study does limit some hypothesis generation.

The Russian bilingual group performed significantly better than the monolingual group on the Digit Span subtest. Level of education and English language proficiency may have contributed to higher Digit Span scores for the Russian bilingual population when compared to the monolingual group. Practitioners should not expect lower Digit Span scores for Russian bilinguals simply due to acculturation and language differences, unless the bilinguals being assessed are not fully proficient in English or have lower verbal ability. Practitioners should assess English language proficiency and ascertain level of education for bilingual participants, as those factors appear to affect Digit Span scores more than acculturation in this population (Bialystok, Majumder, & Martin, 2003; Kaushanskaya, Blumenfeld, & Marian, 2011; Ostrosky-Solis & Lozano, 2007; Thorn & Gathercole, 1999).

The results indicated that levels of acculturation for Russian bilinguals were significantly affected by the age of the participant and the number of years they have resided in the United States. Living in the U.S. for a longer period of time is associated with better RBANS performance along the Language Index, and greater American acculturation enhances that positive relationship. Generally, older bilingual participants in this study tended to perform worse on the Language Index, but a higher level of American acculturation that can result from greater age counteracted the negative relationship in this study. Based on the results of this study, practitioners should therefore suspect that older Russian bilinguals may perform worse on language-related neuropsychological measures, unless they have high levels of American acculturation. Additionally, bilinguals who have spent more time in the United States should be expected to be more acculturated to American culture and may perform better on language measures of the RBANS. Therefore, along with the age of the participant, practitioners should investigate how many years the bilingual participant has resided in the United States as well as

determine how exposed they may be to American culture (Arentoft et al., 2012; Saez et al., 2014).

Level of American acculturation, participant age, and years spent in the United States are all important considerations in assessing Russian bilinguals and interpreting RBANS scores. Bilingual immigrants may be at a disadvantage with regards to some elements of neuropsychological assessments, which, in the United States, are usually administered in English and normed on the United States population. American acculturation level, age, and number of years in the United States were shown to be significant factors affecting RBANS Immediate Memory, Language, and Attention Indices in the bilingual group. Practitioners working with bilingual populations should be vigilant that bilinguals may perform worse than monolinguals on language-based neuropsychological measures, so practitioners must determine to what extent these scores are affected by the patient's level of American acculturation and English language proficiency. If an American acculturation scale is unavailable for a particular population, knowing the number of years that bilingual patient has resided in the United States, and administering an English proficiency measure, such as a PPVT-4, may help practitioners understand how these factors are contributing to RBANS test performance.

Practitioners should also be aware of the community their bilingual patients reside. As mentioned earlier, Russian bilinguals that reside in more culturally secluded communities (e.g., in a big Russian immigrant community) are likely to have lower levels of American acculturation than bilinguals that reside in more diverse areas or in communities with a smaller number of immigrants in general. Thus, practitioners need to have an understanding of the bilingual/immigrant community characteristics in their area. When these factors are not taken into consideration, RBANS scores for the specified domains may be a lower estimate of abilities

for bilingual participants, and practitioners run the risk of incorrectly interpreting the results due to a possible underestimate of verbal and memory abilities. Therefore, in order to accurately conceptualize RBANS scores for Russian bilingual populations and provide appropriate and cogent diagnoses and recommendations for further treatment, the aforementioned factors should be assessed.

Delimitations and Limitations of the Study

Delimitations

The current study may be considered an appropriate preliminary analysis of the relationship of RBANS and PPVT-2 performance and acculturation factors in Russian bilinguals. As such, the conclusions drawn in this document should be considered preliminary and, similar to any emerging research findings, need to be replicated before definitive conclusions could be drawn. It is important to note, however, that there is a paucity of research involving this population via the use of common English language and American-normed neuropsychological tests such as the PPVT-2 and RBANS. The purpose of this study was to assess acculturation effects on neuropsychological test performance in a population that is not often researched in this regard. Using a monolingual English-speaking control group in this study allowed for a comparison between the Russian bilingual and monolingual groups on RBANS scores, and indicated that some significant differences in RBANS performance were found between the two groups. This study provided information on acculturation in a group of Russian bilinguals from one large Midwestern city, which adds to the body of research on Russian bilingual performance on neuropsychological measures. Additionally, investigating acculturation effects on a specific neuropsychological battery, the RBANS, contributes to the advancement of research on this

particular battery, which is commonly used in neuropsychological evaluations (Rabin et al., 2016).

Limitations

The primary limitation of the current study was the sample size; therefore, the results should be interpreted and generalized with caution. Additionally, this study targeted a very specific group (Russian bilinguals), which limits the generalizability of the results to other bilingual populations. The monolingual control group in this study was relatively small as well ($N = 20$), and was a homogenous sample of mostly female college students. None of the monolingual group members identified as Jewish, whereas more than half of the bilingual group identified as ethnically Jewish. This cultural difference between the groups may have made it more difficult to compare pure monolingual-bilingual group differences. Limited statistical power (.04 for the MANOVA; 0.23 for the mediation analysis) due to the modest sample size in the present study ($N = 48$ for the bilingual group and $N = 20$ for the monolingual group) may have played a role in limiting the significance of some of the statistical comparisons conducted. Despite the small sample size, the statistical analyses employed yielded low to moderate power, indicating that the results can still be somewhat generalizable.

Bilingual participant age and the number of years they have resided in the United States are significantly correlated with each other, which means that it may be difficult for models, such as the mediated path model, to pick up isolated effects of one or the other. This effect may explain some of the inconsistencies in the results of the path analyses. The use of a bigger and more diverse sample size (with regards to age and number of years in the U.S.) may aid in separating the effects of those two variables, and clarify to what extent each variable affects acculturation and RBANS scores.

A majority of the Russian bilingual participants in this study were from a similar middle-class background, from educated families, and many were of Jewish descent, which somewhat limits the generalizability of the study to other Russian bilingual populations. This was an unintentional consequence of the participant recruitment process. Additionally, Russian Jewish immigrants tend to have different cultural considerations, as previously mentioned, that may not generalize to other Russian bilingual groups in other locations. Around 46% of the Russian bilingual participants reported an annual family income of at least \$100,000 and 19% had an income in the \$30,000 - \$59,000 range, whereas 15% of the monolingual participants reported an annual income of at least \$100,000 and 35% of monolinguals reported an income of \$30,000 - \$59,000 range. Therefore, since the bilingual and monolingual groups are not matched on socioeconomic status, it becomes more difficult to compare the groups and draw meaningful conclusions from the comparisons.

The Russian bilingual participants were also recruited in mainly one large Midwestern city, which as discussed above, might significantly impact the level of American acculturation, due to limited opportunities to maintain close ties to Russian culture. Thus, this particular sample may have higher levels of American acculturation than other Russian bilingual groups from different areas of the country. The monolingual control group was comprised of participants residing in a college-centered different Midwestern town, which adds to the homogeneity of this sample, and makes it more difficult to generalize to other populations.

This study only utilized one neuropsychological measure, the RBANS, which limited the neuropsychological constructs assessed. Constructs such as executive functioning, sensory-motor functioning, and visual immediate memory, for example, are not directly assessed with the RBANS and were therefore not investigated in this particular study. Additionally, both bilingual

and monolingual groups were comprised of adults over the age of 18. By investigating only adult participants, the results of this study are less generalizable for populations under 18 years of age. Despite these limitations, the results of this particular study offer insight into a particular group of Russian bilinguals residing in a large Midwestern city, and adds to the body of research on acculturation and neuropsychological performance in specific bilingual populations.

Directions for Future Research

Research with Different Bilingual Populations

Further research into the topic of acculturation effects on neuropsychological test performance should assess different groups of bilinguals (e.g., Hispanic Americans, Asian Americans, Middle Eastern Americans, other European American groups). Replicating this study with other bilingual populations may yield a clearer understanding of the effects of acculturation and other factors including age, years spent in the United States, education level, and socio-economic status on RBANS scores, and whether those patterns are consistent with the patterns observed in the current study. Further research should also examine the effects of American acculturation on younger Russian bilinguals, as this study only investigated adult participants. Russian bilingual children and adolescents may have different patterns of performance on neuropsychological measures and factors such as acculturation, age, and years in the United States may affect scores in different ways than with the Russian bilingual adult group. Within the Russian-speaking community, further research should examine acculturation effects in more urban areas with larger concentrations of Russian bilinguals. Previous research has hinted that bilinguals residing in bigger cities with larger multicultural populations may become insulated in their cultural community and be less likely to acculturate to American culture (Birman, Trickett, & Vinokurov, 2002; Jia, Aaronson, & Wu, 2002). Other studies have found

that Russian bilinguals in multicultural metropolitan areas tend to be more proficient in both L1 and L2, and have more support from their cultural community, leading to higher levels of acculturation (Jasinskaja-Lahti & Liebkind, 2000; Jasinskaja-Lahti, Horenczyk, & Kinunen, 2011; Rhodes et al., 2013; Safdar, Calves, & Lewis, 2012; Stewart et al., 2008). Thus, further research with Russian bilinguals in larger metropolitan areas may be beneficial to fully understand the effects of environment on acculturation and ensuing neuropsychological test performance. Further research should also replicate this study with other bilingual Eastern European populations (e.g., Polish, Serbian, Hungarian, etc.) to assess for variations in acculturation effects and group differences. Studies have found age and educational effects significantly impacted neuropsychological performance in a group of Serbian nationals (Obradovic et al., 2012). English language proficiency for Polish English Learner students was found to significantly affect performance on working memory and semantic fluency measures (Lockiewicz & Jaskulska, 2015). Thus, there may be cultural differences in other Eastern European populations, and these considerations should be investigated further for greater insight into RBANS performance across cultures.

Research with Bilingual Clinical Populations

To build upon the current study, future research should assess for differences in RBANS test performance with clinical bilingual populations, and with Russian bilinguals in particular given this sample was assumed to be generally neurotypical. Exploration of the relationship between acculturation and neuropsychological test scores within clinical samples would offer insight into patterns of performance on neuropsychological measures such as the RBANS. For example, individuals with attention deficit/hyperactivity disorder (ADHD) tend to exhibit dysfunction with list and story recall (Bailey et al., 2011; Bolden et al., 2012; Egeland et al.,

2010; Kane, Walker, & Schmidt, 2011; Rohlf et al., 2012) as well as digit span measures (Hale et al., 2007; Fried et al., 2016; Karatekin, White, & Bingham, 2008; Kim et al., 2014). Russian bilingual individuals with ADHD may exhibit a different relationship between acculturation and neuropsychological abilities (Lezak et al., 2012; Mor Yitzhaki-Amsalem, & Prior, 2015). Further research may also examine bilingual and cultural effects on neuropsychological test performance in individuals with brain injury (Clune-Ryberg et al., 2011; Boone et al., 2007; Russell et al., 2011). Psychiatric conditions such as major depression have been shown to affect performance on semantic fluency (Backes et al., 2014; Tzang et al., 2015). Thus, studying these effects would add to the literature on Russian bilinguals and how depressive disorder affects digit span and other neuropsychological domains. Further research should also examine differences in neuropsychological measures for Russian bilinguals with dementia or neurological conditions such as Parkinson's disease, in order to assess the differences in memory, language, and attention abilities when compared with healthy bilingual adults (Brice, Wallace, & Brice, 2014; Melrose et al., 2009; Nebreda et al., 2011; Perani & Abutalebi, 2015). This is especially relevant as the RBANS is a commonly used measure in dementia evaluations (Rabin et al., 2016), and bilingual effects on neuropsychological measures are important in general diagnostic accuracy and treatment planning (Bialystok et al., 2009; Bialystok, Craig, & Luk, 2008; Mindt et al., 2008) and important for understanding bilingual effects on dementia (Alladi et al., 2013; Bialystok, Craik, & Freedman, 2007; Gollan et al., 2010).

Research with Other Neuropsychological Constructs

The RBANS is only one measure of neuropsychological status, targeting memory, visuospatial and constructional ability, language, and attention. Further research with Russian bilinguals should incorporate other neuropsychological measures that are commonly used in

assessment and diagnosis (Rabin et al., 2016) to determine if differences between Russian bilinguals and American monolinguals are present in these measures as well. For example, executive functioning measures such as color-switching tasks (e.g., the Stroop task; Stroop, 1935), trail making tasks (*The Trail Making Test*; TMT; Reitan & Wolfson, 1985), or tower tests such as the *Tower of London Test* (Culbertson & Zillmer, 2005) or the Tower Test from the *Delis-Kaplan Executive Function System* (D-KEFS; Delis et al., 2001) are common measures of executive functioning (Rabin et al., 2016). Likewise, memory assessments such as the *Wechsler Memory Scale, Fourth Edition* (WMS-IV; Wechsler, Coalson, & Raiford, 2008) and the *California Verbal Learning Test, Second Edition* (CVLT-II; Delis et al., 2000), visuospatial measures such as the *Rey-Osterreith Complex Figure Test* (ROCFT; Rey, 1941), attention measures such as the digit span task from the *Wechsler Adult Intelligence Scale, Fourth Edition* (WAIS-IV; Wechsler, 2008) and the *Conners Continuous Performance Test, Second Edition* (CPT-II; Conners et al., 2000), and language measures such as the *Boston Naming Test* (BNT; Kaplan, Goodglass, & Weintraub, 2001) may also be used in further research to evaluate acculturation and language effects with Russian bilinguals as well as other bilingual populations. Thus, examining acculturation effects in bilingual populations with these measures will add to understanding of these effects, and lead to more accurate diagnosis and treatment planning. One of the findings of this study indicated that acculturation levels did not significantly affect delayed memory scores for the bilingual population. There is a paucity of literature on this finding, and the reason for this effect is unclear from the findings. Further research with regard to delayed memory performance in bilinguals may yield more information regarding the relationship of acculturation to this domain. American acculturation levels as well as other factors may affect

performance on executive functioning measures such as these for the Russian bilingual population.

Conclusions

The results of this study suggest that within this population of Russian bilinguals, American acculturation had significant effects on RBANS Immediate Memory, Attention, and Language Indices. American acculturation in this sample of Russian bilinguals was significantly affected by the age of the bilingual participant and the number of years they have lived in the United States. Russian acculturation did not significantly affect RBANS performance, suggesting this construct is not as vital for these participants for understanding RBANS scores.

Analysis of the mediated path analysis found that American acculturation significantly mediated the relationships among age, years in the United States, and RBANS Immediate Memory, Language, and Attention for Russian bilinguals. Immediate Memory and Language were shown to rely more heavily on language, as these measure verbal immediate memory, semantic fluency, and naming. The number of years bilingual participants lived in the United States had a positive direct effect on the RBANS Language score, whereas age had a negative direct effect. American acculturation also had a significant effect on the RBANS Attention Index. The mediated path analysis also found that years in the United States had a negative direct effect on the Attention Index score. The number of years a participant had lived in the United States was found to positively effect American acculturation and negatively affect Russian acculturation levels. Inversely, age had a negative effect on American acculturation and a positive effect on Russian acculturation. This suggests that older bilingual participants in this study were likely to be less acculturated to American culture and vice-versa. These findings support a significant relationship between acculturation factors (AAI, RAI, age, years in the

United States) and the Immediate Memory, Language, and Attention Indices of the RBANS. English language proficiency (PPVT-4) was significantly correlated with American acculturation in a positive direction, indicating that higher English language proficiency contributes to higher American acculturation levels for these participants.

In conclusion, there is a need for further research with this population before we can confidently say that acculturation significantly affects RBANS test performance in particular domains with bilingual Russians. However, this analysis builds upon previous studies and suggests that similar relationships between levels of acculturation, memory, language, and attention tasks were found. The results of the current study outline factors for consideration in administering the RBANS to bilingual clients, including assessing for English language proficiency and measuring American acculturation levels. Utilizing both measures gives a more complete picture of the bilingual individual's performance on the RBANS and could lead to more accurate diagnoses and better treatment planning.

REFERENCES

- Abe-Kim, J., Okazaki, S., & Goto, S. G. (2001). Unidimensional versus multidimensional approaches to the assessment of acculturation for Asian American populations. *Cultural Diversity and Ethnic Minority Psychology, 7*(3), 232.
- Agranovich, A.V., Panter, A.T., Puente, A.E., & Touradji, P. (2011). The culture of time in neuropsychological assessment: Exploring the effects of culture-specific time attitudes on timed test performance in Russian and American samples. *Journal of the International Neuropsychological Society, 17*(4), 692-701.
- Agranovich, A.V. & Puente, A.E. (2007). Do Russian and American normal adults perform similarly on neuropsychological tests? Preliminary findings on the relationship between culture and test performance. *Archives of Clinical Neuropsychology, 22*(3), 273-282.
- Albert, R. T., Albert, R. E., & Radsma, J. (2002). Relationships among bilingualism, critical thinking ability, and critical thinking disposition. *Journal of Professional Nursing, 18*(4), 220-229.
- Alladi, S., Bak, T. H., Duggirala, V., Surampudi, B., Shailaja, M., Shukla, A. K., ... & Kaul, S. (2013). Bilingualism delays age at onset of dementia, independent of education and immigration status. *Neurology, 81*(22), 1938-1944.
- Antshel, K. M., Peebles, J., Abdul-Sabdur, N., Higgins, A. M., Roizen, N., Shprintzen, R., ... & Kates, W. R. (2008). Associations between performance on the Rey-Osterrieth Complex Figure and regional brain volumes in children with and without Velocardiofocal syndrome. *Developmental Neuropsychology, 33*(5), 601-622.
- Ardila, A. (2003). Language representation and working memory with bilinguals. *Journal of Communication Disorders, 36*(3), 233-240.
- Ardila, A., Bertolucci, P. H., Braga, L. W., Castro-Caldas, A., Judd, T., Kosmidis, M. H., ... & Rosselli, M. (2010). Illiteracy: the neuropsychology of cognition without reading. *Archives of Clinical Neuropsychology, 25*(8), 689-712.
- Ardila, A., & Moreno, S. (2001). Neuropsychological test performance in Aruaco Indians: An exploratory study. *Journal of the International Neuropsychological Society, 7*(4), 510-515.
- Ardila, A., Rosselli, M., Ostrosky-Solís, F., Marcos, J., Granda, G., & Soto, M. (2000). Syntactic comprehension, verbal memory, and calculation abilities in Spanish-English bilinguals. *Applied Neuropsychology, 7*(1), 3-16.

- Arentoft, A., Byrd, D., Robbins, R. N., Monzones, J., Miranda, C., Rosario, A., ... Rivera Mindt, M. (2012). Multidimensional effects of acculturation on English-language neuropsychological test performance among HIV+ Caribbean Latinas/os. *Journal of Clinical and Experimental Neuropsychology*, 34(8), 814-825.
- Arroyo-Anlló, E. M., Lorber, M., Rigaleau, F., & Gil, R. (2012). Verbal fluency in Alzheimer's disease and Aphasia. *Dementia*, 11(1), 5-18.
- Atkinson, R.C. & Shiffrin, R.M. (1968). Human memory: A proposed system and its control processes. In Spence, K. W. & Spence, J. T. (Eds.). *The Psychology of Learning and Motivation: Advances in Research and Theory (Vol. 2)* (pp. 89-195). New York, NY: Academic Press.
- Atkinson, R. C. & Shiffrin, R. M. (1971). *The control processes of short-term memory*. Stanford, CA: Stanford University Press.
- Attree, E. A., Turner, M. J., & Cowell, N. (2009). A virtual reality test identifies the visuospatial strengths of adolescents with dyslexia. *CyberPsychology and Behavior*, 12(2), 163-168.
- Backes, H., Dietsche, B., Nagels, A., Stratmann, M., Konrad, C., Kircher, T., & Krug, A. (2014). Increased neural activity during overt and continuous semantic verbal fluency in major depression: mainly a failure to deactivate. *European Archives of Psychiatry and Clinical Neuroscience*, 264(7), 631-645.
- Baddeley, A. (2003). Working memory and language: an overview. *Journal of Communication Disorders*, 36(3), 189-208.
- Baek Choi, J. & Thomas, M. (2009). Predictive factors of acculturation attitudes and social support among Asian immigrants in the USA. *International Journal of Social Welfare*, 18(1), 76-84.
- Bailey, U. L., Derefinko, K. J., Milich, R., Lorch, E. P., & Metze, A. (2011). The effects of stimulant medication on free recall of story events among children with ADHD. *Journal of Psychopathology and Behavioral Assessment*, 33(4), 409-419.
- Baird, A. D., Ford, M., & Podell, K. (2007). Ethnic differences in functional and neuropsychological test performance in older adults. *Archives of Clinical Neuropsychology*, 22(3), 309-318.
- Baldo, J. V., Arevalo, A., Patterson, J. P., & Dronkers, N. F. (2013). Grey and white matter correlates of picture naming: Evidence from a voxel-based lesion analysis of the Boston Naming Test. *Cortex*, 49(3), 658-667.

- Bartolotti, J. & Marian, V. (2012). Language learning and control in monolinguals and bilinguals. *Cognitive Science*, 36(6), 1129-1147.
- Beery, K. E., Buktenica, N. A., & Beery, N. A. (2006). *Beery VMI: Administration, scoring and teaching manual*. Minneapolis, MN: Pearson.
- Bemak, F., Chung, R. C. Y., & Pedersen, P. (2003). *Counseling refugees: A psychosocial approach to innovative multicultural interventions*. Westport, CT: Greenwood Publishing Group.
- Ben-Shalom, U. & Horenczyk, G. (2003). Acculturation orientations: A facet theory perspective on the bidimensional model. *Journal of Cross-Cultural Psychology*, 34(2), 176-188.
- Benton, A. L., Hamsher, K. D., & Sivan, A. (1989). *Multilingual aphasia examination*. Iowa City, IA: AJA Associates.
- Berry, J.W. (1990). Psychology of acculturation: Understanding individuals moving between cultures. In R.W. Brislin (Ed.), *Applied cross-cultural psychology* (pp. 232-253). Thousand Oaks, CA: Sage.
- Berry, J.W. (1997). Immigration, acculturation, and adaptation. *Applied Psychology: An International Review*, 46(1), 5-68.
- Berry, J.W. (1998). Acculturation stress. In K.M. Chun, P. Balls Organista, & G. Marin (Eds.), *Readings in ethnic psychology* (pp. 117-122). New York, NY: Routledge.
- Berry, J.W. (2005). Acculturation: Living successfully in two cultures. *International Journal of Intercultural Relations*, 29(6), 697-712.
- Berry, J. W., Phinney, J. S., Sam, D. L., & Vedder, P. (2006). Immigrant youth: Acculturation, identity, and adaptation. *Applied psychology*, 55(3), 303-332.
- Bialystok, E. (1999). Cognitive complexity and attentional control in the bilingual mind. *Child Development*, 70(3), 636-644.
- Bialystok, E. (2009). Bilingualism: The good, the bad, and the indifferent. *Bilingualism: Language and cognition*, 12(1), 3-11.
- Bialystok, E. (2010). Global-local and trail-making tasks by monolingual and bilingual children: Beyond inhibition. *Developmental Psychology*, 46(1), 93-105.
- Bialystok, E. (2013). The impact of bilingualism on language and literacy development. In K. T. K Bhatia & W. C. Ritchie (Eds.), *The Handbook of Bilingualism and Multilingualism, Second Edition* (pp. 624-648). Malden, MA: Blackwell Publishing.

- Bialystok, E., Craik, F. I., & Freedman, M. (2007). Bilingualism as a protection against the onset of symptoms of dementia. *Neuropsychologia*, *45*(2), 459-464.
- Bialystok, E., Craik, F., & Luk, G. (2008). Cognitive control and lexical access in younger and older bilinguals. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *34*(4), 859-873.
- Bialystok, E., Craik, F.I.M., Green, D.W., & Gollan, T.H. (2009). Bilingual minds. *Psychological Science in the Public Interest*, *10*(3), 89-129.
- Bialystok, E. & Feng, X. (2008). Language proficiency and executive control in proactive interference: Evidence from monolingual and bilingual children and adults. *Brain and Language*, *102*(2-3), 93-100.
- Bialystok, E., Luk, G., & Kwan, E. (2005). Bilingualism, biliteracy, and learning to read: Interactions among languages and writing systems. *Scientific Studies of Reading*, *9*(1), 43-61.
- Bialystok, E., Majumder, S., & Martin, M. M. (2003). Developing phonological awareness: Is there a bilingual advantage? *Applied Psycholinguistics*, *24*(1), 27-44.
- Bialystok, E. & Shapero, D. (2005). Ambiguous benefits: the effect of bilingualism on reversing ambiguous figures. *Developmental Science*, *8*(6), 595-604.
- Biesbroek, J. M., van Zandvoort, M. J. E., Kuijf, H. J., Weaver, N. A., Kappelle, L. J., ... & Postma, A. (2014). The anatomy of visuospatial construction revealed by lesion-symptom mapping. *Neuropsychologia*, *62*, 68-76.
- Birdsong, D. (2014). Dominance and age in bilingualism. *Applied Linguistics*, *35*(4), 374-392.
- Birman, D., & Taylor-Ritzler, T. (2007). Acculturation and psychological distress among adolescent immigrants from the former Soviet Union: Exploring the mediating effects of family relationships. *Cultural Diversity and Ethnic Minority Psychology*, *13*(4), 337-346.
- Birman, D. & Trickett, E.J. (2001). Cultural transitions in first-generation immigrants: Acculturation of Soviet Jewish refugee adolescents and parents. *Journal of Cross-Cultural Psychology*, *32*(4), 456-477.
- Birman, D., Trickett, E.J., & Vinokurov, A. (2002). Acculturation and adaptation of Soviet Jewish refugee adolescents: Predictors of adjustment across life domains. *American Journal of Community Psychology*, *30*(5), 585-607.
- Biswal, B. B., Mennes, M., Zuo, X. N., Gohel, S., Kelly, C., Smith, S. M., ... & Dagonowski, A. M. (2010). Toward discovery science of human brain function. *Proceedings of the National Academy of Sciences*, *107*(10), 4734-4739.

- Bluvshtein, M. (2004). *Repeatable Battery for the Assessment of Neuropsychological Status (RBANS): Russian Language Adaptation*. Minneapolis, MN: Capella University.
- Bobb, S. C., Hoshino, N., & Kroll, J. F. (2008). The role of language cues in constraining cross-language activity. *EUROSLA Yearbook*, 8(1), 6-32.
- Bolden, J., Rapport, M. D., Raiker, J. S., Sarver, D. E., & Kofler, M. J. (2012). Understanding phonological memory deficits in boys with attention-deficit/hyperactivity disorder (ADHD): Dissociation of short-term storage and articulatory rehearsal processes. *Journal of Abnormal Child Psychology*, 40(6), 999-1011.
- Boone, K.B., Victor, T.L., Wen, J., Razani, J., & Ponton, M. (2007). The association between neuropsychological scores and ethnicity, language, and acculturation variables in a large patient population. *Archives of Clinical Neuropsychology*, 22, 355-365.
- Bonifacci, P., Giombini, L., Bellocchi, S., & Contento, S. (2011). Speed of processing, anticipation, inhibition and working memory in bilinguals. *Developmental Science*, 14(2), 256-269.
- Borovsky, A., Elman, J. L., & Fernald, A. (2012). Knowing a lot for one's age: Vocabulary skill and not age is associated with anticipatory incremental sentence interpretation in children and adults. *Journal of Experimental Child Psychology*, 112(4), 417-436.
- Bourhis, R. V., & Dayan, J. (2004). Acculturation orientations towards Israeli Arabs and Jewish immigrants in Israel. *International Journal of Psychology*, 39(2), 118-131.
- Bourhis, R. Y., Montaruli, E., El-Geledi, S, Harvey, S., & Barrette, G. (2010). Acculturation in multiple host community settings. *Journal of Social Issues*, 66(4), 780-802.
- Brice, A. E., Wallace, S. E., & Brice, R. G. (2014). Alzheimer's Dementia from a bilingual/bicultural perspective: A case study. *Communication Disorders Quarterly*, 36(1), 55-64.
- Brito, N. & Barr, R. (2012). Influence of bilingualism on memory generalization during infancy. *Developmental Science*, 15(6), 812-816.
- Broesch, J., & Hadley, C. (2012). Putting culture back into acculturation: Identifying and overcoming gaps in the definition and measurement of acculturation. *The Social Science Journal*, 49(3), 375-385.
- Bromet, E. J., Gluzman, S. F., Paniotto, V. I., Webb, C. P., Tintle, N. L., Zakhosha, V., ... & Schwartz, J. E. (2005). Epidemiology of psychiatric and alcohol disorders in Ukraine. *Social psychiatry and Psychiatric Epidemiology*, 40(9), 681-690.
- Brouillette, R. M., Martin, C. K., Correa, J. B., Davis, A. B., Han, H., Johnson, W. D., Foil, H. C., Hymel, A., & Keller, J. N. (2011). Memory for names test provides a useful

- confrontational naming task for aging and continuum of dementia. *Journal of Alzheimer's Disease*, 23(4), 665-671.
- Brown, M. J., Cohen, S. A., & Mezuk, B. (2014). Duration of US residence and suicidality among racial/ethnic minority immigrants. *Social Psychiatry and Psychiatric Epidemiology*, 50(2), 257-267.
- Brucki, S. M. D., & Nitrini, R. (2008). Cancellation task in very low educated people. *Archives of Clinical Neuropsychology*, 23(2), 139-147.
- Cabassa, L. J. (2003). Measuring acculturation: Where we are and where we need to go. *Hispanic Journal of Behavioral Sciences*, 25(2), 127-146.
- Cain, K., Oakhill, J., & Bryant, P. (2004). Children's reading comprehension ability: Concurrent prediction by working memory, verbal ability, and component skills. *Journal of Educational Psychology*, 96(1), 31-42.
- Carlson, S.M. & Metzloff, A.N. (2008). Bilingual experience and executive functioning in young children. *Developmental Science*, 11(2), 282-298.
- Carnaghan, E. (2007). Do Russians dislike democracy? *PS: Political Science and Politics*, 40(1), 61-66.
- Carter-Pokras, O., Zambrana, R. E., Yankelovich, G., Estrada, M., Castillo-Salgado, C., & Ortega, A. N. (2008). Health status of Mexican-origin persons: do proxy measures of acculturation advance our understanding of health disparities? *Journal of Immigrant and Minority Health*, 10(6), 475-488.
- Cassaday, H. J., Nelson, A. J. D., & Pezze, M. A. (2014). From attention to memory along the dorsal-ventral axis of the medial prefrontal cortex: some methodological considerations. *Frontiers in Systems Neuroscience*, 8, 1-24.
- Catani, M., Mesulam, M. M., Jakobsen, E., Malik, F., Martersteck, A., Wieneke, C., ... & Rogalski, E. (2013). A novel frontal pathway underlies verbal fluency in primary progressive aphasia. *Brain*, 136(8), 2619-2628.
- Chincotta, D. & Underwood, G. (1996). Mother tongue, language of schooling and bilingual digit span. *British Journal of Psychology*, 87(2), 193-208.
- Cheung, H., & Kemper, S. (1993). Recall and articulation of English and Chinese words by Chinese-English bilinguals. *Memory & Cognition*, 21(5), 666-670.
- Choi, H. J., Lee, D. Y., Seo, E. H., Jo, M. K., Sohn, B. K., Choe, Y. M., ... & Jhoo, J. H. (2014). A normative study of the digit span in an educationally diverse elderly population. *Psychiatry Investigation*, 11(1), 39-43.

- Coderre, E. L., Van Heuven, W. J., & Conklin, K. (2013). The timing and magnitude of Stroop interference and facilitation in monolinguals and bilinguals. *Bilingualism: Language and Cognition*, *16*(2), 420-441.
- Coffey, D.M., Marmol, L., Schock, L., & Adams, W. (2005). The influence of acculturation on the Wisconsin Card Sorting Test by Mexican Americans. *Archives of Clinical Neuropsychology*, *20*(6), 795-803.
- Conners, C. K., Connelly, V., Campbell, S., MacLean, M., & Barnes, J. (2000). Conners' Continuous Performance Test II (CPT II v. 5). *Multi-Health Systems Inc.*, *29*, 175-96.
- Consedine, N. S., Magai, C., Cohen, C. I., & Gillespie, M. (2002). Ethnic variation in the impact of negative affect and emotion inhibition on the health of older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *57*(5), 396-408.
- Cuellar, I., Arnold, B., & Maldonado, R. (1995). Acculturation rating scale for Mexican Americans-II: A revision of the original ARSMA scale. *Hispanic Journal of Behavioral Sciences*, *17*(3), 275-304.
- Cuellar, I., Harris, L. C., & Jasso, R. (1980). An acculturation scale for Mexican American normal and clinical populations. *Hispanic Journal of Behavioral Sciences*, *2*(3), 199-217.
- Culbertson, W. C. & Zillmer, E. A. (2005). *Tower of London: Second edition. Technical manual*. Toronto, ON: Multi-Health Systems, Inc.
- Culhane, S. F. (2004). An intercultural interaction model: Acculturation attitudes in second language acquisition. *Electronic Journal of Foreign Language Teaching*, *1*(1), 50-61.
- Dahl, A. & Vulchanova, M. D. (2014). Naturalistic acquisition in an early language classroom. *Frontiers in Psychology*, *5*, 1-9.
- Day, K., & Cohen, U. (2000). The role of culture in designing environments for people with dementia: A study of Russian Jewish immigrants. *Environment and Behavior*, *32*(3), 361-399.
- De Guise, E., LeBlanc, J., Gosselin, N., Marcoux, J., Champoux, M. C., Couturier, C., ... & Feyz, M. (2010). Neuroanatomical correlates of the clock drawing test in patients with traumatic brain injury. *Brain Injury*, *24*(13-14), 1568-1574.
- D'Elia, L. F., Satz, P., Uchiyama, C. L., & White, T. (1996). *Color Trails Test*. Odessa, FL: Psychological Assessment Resources.
- Delis, D. C., Kaplan, E., Kramer, J. H. (2001). *Delis-Kaplan Executive Function System (D-KEFS): Examiner's manual*. San Antonio, TX: The Psychological Corporation.
- Delis, D. C., Kramer, J. H., Kaplan, E., & Ober, B. A. (2000). *The California Verbal Learning Test-Second Edition: Adult version manual*. San Antonio, TX: The Psychological

Corporation.

- DeNavas-Walt, C. & Proctor, B. D. (2014). Income and poverty in the United States: 2013. *U.S. Department of Commerce, Economics and Statistics Administration*. Retrieved on October 22, 2014 from <https://www.census.gov/content/dam/Census/library/publications/2014/demo/p60-249.pdf>.
- Der Vang, P., & Bogenschutz, M. (2013). Hmong women, marital factors and mental health status. *Journal of Social Work, 13*(2), 164-183.
- Diaz, J., Clendinen, C., Fuentes, C., Goldstein, F., Razani, J., & Morris, R. (2014). The impact of language proficiency on list learning tests for older adults. *Archives of Clinical Neuropsychology, 29*(6), 528.
- Diehl, J., Monsch, A. U., Aebi, C., Wagenpfeil, S., Krapp, S., Grimmer, T., Seeley, W., Forstl, H., & Kurtz, A. (2005). Frontotemporal dementia, semantic dementia, and Alzheimer's disease: the contribution of standard neuropsychological tests to differential diagnosis. *Journal of Geriatric Psychiatry and Neurology, 18*(1), 39-44.
- Dunabeitia, J.A., Hernandez, J.A., Anton, E., Macizo, P., Estevez, A., Fuentes, L.J., & Carreiras, M. (2014). The inhibitory advantage in bilingual children revisited: myth or reality? *Experimental Psychology, 61*(3), 234-251.
- Dunn, L. M. & Dunn, D. M. (2007). *Peabody Picture Vocabulary Test, Fourth Edition: Manual*. Minneapolis, MN: Pearson Assessments.
- Durán, L. K., Roseth, C. J., & Hoffman, P. (2010). An experimental study comparing English-only and transitional bilingual education on Spanish-speaking preschoolers' early literacy development. *Early Childhood Research Quarterly, 25*(2), 207-217.
- Egeland, J., Johansen, S. N., & Ueland, T. (2010). Do low-effort learning strategies mediate impaired memory in ADHD? *Journal of Learning Disabilities, 43*(5), 430-440.
- Elias, N., & Lemish, D. (2011). Between three worlds: Host, homeland, and global media in the lives of Russian immigrant families in Israel and Germany. *Journal of Family Issues, 32*(9), 1245-1274.
- Ellfolk, U., Joutsa, J., Rinne, J. O., Parkkola, R., Jokinen, P., & Karrasch, M. (2014). Striatal volume is related to phonemic verbal fluency but not to semantic or alternating verbal fluency in early Parkinson's disease. *Journal of Neural Transmission, 121*(1), 33-40.
- Emmorey, K., Petrich, J.A.F., & Gollan, T.H. (2013). Bimodal bilingualism and the frequency-lag hypothesis. *Journal of Deaf Studies and Deaf Education, 18*(1), 1-11.

- Engel, A. K., Fries, P., & Singer, W. (2001). Dynamic predictions: Oscillations and synchrony in top-down processing. *Nature Reviews Neuroscience*, 2(10), 704-716.
- Engel de Abreu, P.M.J. (2011). Working memory in multicultural children: Is there a bilingual effect? *Memory*, 19(5), 529-537.
- Engel de Abreu, P. M. J., Baldassi, M., Puglisi, M. L., Befi-Lopez, D. M. (2013). Cross-linguistic and cross-cultural effects on verbal working memory and vocabulary: Testing language-minority children with an immigrant background. *Journal of Speech, Language, and Hearing Research*, 56(2), 630-642.
- Fasfous, A. F., Puente, A. E., Pérez-Marfil, M. N., Cruz-Quintana, F., Peralta-Ramirez, I., & Pérez-García, M. (2013). Is the color trails culture free? *Archives of Clinical Neuropsychology*, 28(7), 743-749.
- Fernandes, M.A., Craik, F.I.M., Bialystok, E., & Kreuger, S. (2007). Effects of bilingualism, aging, and semantic relatedness on memory under divided attention. *Canadian Journal of Experimental Psychology*, 61(2), 128-141.
- Festman, J., Rodriguez-Fornells, A., & Munte, T. F. (2011). Individual differences in control of language interference in late bilinguals are mainly related to general executive abilities. *Behavioral and Brain Functions*, 6(5), 1-12.
- Flannery, W. P., Reise, S. P., & Yu, J. (2001). An empirical comparison of acculturation models. *Personality and Social Psychology Bulletin*, 27(8), 1035-1045.
- Flaskerud, J. H. (2007). Cultural competence: What is it? *Issues in Mental Health Nursing*, 28(1), 121-123.
- Flege, J. E., Yeni-Komshian, G. H., & Liu, S. (1999). Age constraints on second-language acquisition. *Journal of Memory and Language*, 41(1), 78-104.
- Fleith, D. D. S., Renzulli, J. S., & Westberg, K. L. (2002). Effects of a creativity training program on divergent thinking abilities and self-concept in monolingual and bilingual classrooms. *Creativity Research Journal*, 14(3-4), 373-386.
- Fraine, N., & McDade, R. (2009). Reducing bias in psychometric assessment of culturally and linguistically diverse students from refugee backgrounds in Australian schools: A process approach. *Australian Psychologist*, 44(1), 16-26.
- Francis, W.S. & Strobach, E.N. (2013). The bilingual L2 advantage in recognition memory. *Psychonomic Bulletin and Review*, 20(6), 1296-1303.
- Fried, R., Chan, J., Feinberg, L., Pope, A., Woodworth, Y. K., Faraone, S. V., & Biederman, J. (2016). Clinical correlates of working memory deficits in youth with and without ADHD: A controlled study. *Journal of Clinical and Experimental Neuropsychology*, 38(5), 487-496.

- Fry, A. F., & Hale, S. (2000). Relationships among processing speed, working memory, and fluid intelligence in children. *Biological psychology*, *54*(1), 1-34.
- Fuster, J. M. (1995). *Memory in the cerebral cortex: An empirical approach to neural networks in the human and non-human primate*. Cambridge, MA: The MIT Press.
- Gabig, C. S. (2008). Verbal working memory and story retelling in school-age children with Autism. *Language, Speech & Hearing Services in Schools*, *39*(4), 498-511.
- Garratt, L. C. & Kelly, T. P. (2007). To what extent does bilingualism affect children's performance on the NEPSY? *Child Neuropsychology*, *14*(1), 71-81.
- Gasquoine, P.G., Cavazos, A., Cantu, J., & Weimer, A. A. (2010). Bilingualism and Hispanic American intelligence test scores. In E.F. Caldwell (Ed.), *Bilinguals: Cognition, education, and language processing* (pp. 181-199). New York: Nova Science Publishers.
- Gascoigne, M. B., Smith, M. L., Barton, B., Webster, R., Gill, D., & Lah, S. (2014). Accelerated long-term forgetting in children with temporal lobe epilepsy. *Neuropsychologia*, *59*, 93-102.
- Gathercole, S. E. & Baddeley, A. D. (1990). Phonological memory deficits in language disordered children: is there a causal connection? *Journal of Memory and Language*, *29*(3), 336-360.
- Genkova, A. G., Trickett, E. J., Birman, D., & Vinokurov, A. (2014). Acculturation and adjustment of elderly émigrés from the former Soviet Union: A life domains perspective. *Psychosocial Intervention*, *23*(2), 83-93.
- Gollan, T. H., Fennema-Notestine, C., Montoya, R. I., & Jernigan, T. L. (2007). The bilingual effect on Boston Naming Test performance. *Journal of the International Neuropsychological Society*, *13*(2), 197-208.
- Gollan, T.H., Montoya, R.I., Cera, C., & Sandoval, T.C. (2008). More use almost always means a smaller frequency effect: Aging, bilingualism, and the weaker links hypothesis. *Journal of Memory and Language*, *58*(3), 787-814.
- Gollan, T. H., Montoya, R. I., Fennema-Notestine, C., & Morris, S. K. (2005). Bilingualism affects picture naming but not picture classification. *Memory & Cognition*, *33*(7), 1220-1234.
- Gollan, T.H., Montoya, R.I., Fennema-Notestine, C., & Morris, S.K. (2005). Bilingualism affects picture naming but not picture classification. *Memory & Cognition*, *33*(7), 1220-1234.

- Gollan, T.H., Montoya, R.I., & Werner, G.A. (2002). Semantic and letter fluency in Spanish-English bilinguals. *Neuropsychology, 16*(4), 562-576.
- Gollan, T. H., Salmon, D. P., Montoya, R. I., & da Pena, E. (2010). Accessibility of the nondominant language in picture naming: A counterintuitive effect of dementia on bilingual language production. *Neuropsychologia, 48*(5), 1356-1366.
- Goodglass, H., Kaplan, E., & Weintraub, S. (2001). *Boston Naming Test Record Booklet*. Philadelphia, PA: Lippincott Williams & Wilkins.
- Gopaul-McNicol, S. & Armour-Thomas, E. (2002). *Assessment and culture: Psychological tests with minority populations*. San Diego, CA: Academic Press.
- Gordon, M. M. (1964). *Assimilation in American life: The role of race, religion, and national origins*. New York, NY: Oxford University Press.
- Greenberg, A., Bellena, B., & Bialystok, E. (2013). Perspective-taking ability in bilingual children: Extending advantages in executive control to spatial reasoning. *Cognitive Development, 28*(1), 41-50.
- Grogan, A., Green, D. W., Ali, N., Crinion, J. T., & Price, C. J. (2009). Structural correlates of semantic and phonemic fluency ability in first and second languages. *Cerebral Cortex, 19*(11), 2690-2698.
- Guo, T., Liu, H., Misra, M., & Kroll, J. F. (2011). Local and global inhibition in bilingual word production: fMRI evidence from Chinese-English bilinguals. *Neuroimage, 56*(4), 2300-2309.
- Gutierrez-Clellen, V.F., Calderon, J., & Weismer, S.E. (2004). Verbal working memory in bilingual children. *Journal of Speech, Language & Hearing Research, 47*(4), 863-876.
- Gutkovich, Z., Rosenthal, R. N., Galynker, I., Muran, C., Batchelder, S., & Itskhoki, E. (1999). Depression and demoralization among Russian-Jewish immigrants in primary care. *Psychosomatics, 40*(2), 117-125.
- Hale, S. T., Bookheimer, S., McGough, J. J., Phillips, J. M., & McCracken, J. T. (2007). Atypical brain activation during simple and complex levels of processing in adult ADHD: an fMRI study. *Journal of Attention Disorders, 11*(2), 125-140.
- Hale, J. B., Hoepfner, J. A. B., & Fiorello, C. A. (2002). Analyzing digit span components for assessment of attention processes. *Journal of Psychoeducational Assessment, 20*(2), 128-143.
- Hammer, C. S., Komaroff, E., Rodriguez, B. L., Lopez, L. M., Scarpino, S. E., & Goldsteina, B. (2012). Predicting Spanish-English bilingual children's language abilities. *Journal of Speech, Language, and Hearing Research, 55*(5), 1251-1264.

- Harris, J. G., Tulskey, D. S., & Schultheis, M. T. (2003). Assessment of the non-native English speaker: Assimilating history and research findings to guide clinical practice. In D. S. Tulskey et al. (Eds.), *Clinical interpretation of the WAIS-III and WMS-III* (pp. 343-390). San Diego, CA: Academic Press.
- Harris, J. G., Wagner, B., & Cullum, C. M. (2007). Symbol vs. digit substitution task performance in diverse cultural and linguistic groups. *The Clinical Neuropsychologist*, *21*(5), 800-810.
- Hayden, K. M., Makeeva, O. A., Newby, L. K., Plassman, B. L., Markova, V. V., Dunham, A., ... & Roses, A. D. (2014). A comparison of neuropsychological performance between US and Russia: Preparing for a global clinical trial. *Alzheimer's & Dementia*, *10*(6), 760-768.
- Hayrapetian, A.A., Maloian, V.A., Maloian, N.M., Tatevosian, N.E., & Hayrapetian, N.A. (2005). Psychophysiological study of intellectual activity under bilingual conditions. *Human Physiology*, *31*(3), 55-58.
- Hellman, A. B. (2011). Vocabulary size and depth of word knowledge in adult-onset second language acquisition. *International Journal of Applied Linguistics*, *21*(2), 162-182.
- Higby, E., Kim, J., & Obler, L.K. (2013). Multilingualism and the brain. *Annual Review of Applied Linguistics*, *33*, 68-101.
- Hirshom, E. A. & Thompson-Schill, S. L. (2006). Role of the inferior frontal gyrus in covert word retrieval: neural correlates of switching during verbal fluency. *Neuropsychologia*, *44*(12), 2547-2557.
- Hubenthal, W. (2004). Older Russian immigrants' experiences in learning English: Motivation, methods, and barriers. *Adult Basic Education*, *14*(2), 104-126.
- Hummel, K. M. (2002). Second language acquisition and working memory. In F. Fabbro (Ed.) *Advances in the neurolinguistics of bilingualism* (pp. 97-117). Udine, Italy: Forum.
- Hwang, S., White, S. F., Nolan, Z. T., Sinclair, S., & Blair, R. J. R. (2014). Neurodevelopmental changes in the responsiveness of systems involved in top down attention and emotional responding. *Neuropsychologia*, *62*, 277-285.
- Ivanova, I. & Costa, A. (2008). Does bilingualism hamper lexical access in speech production? *Acta Psychologica*, *127*(2), 277-288.
- Janvin, C. C., Larsen, J. P., Aarsland, D., & Hugdahl, K. (2006). Subtypes of mild cognitive impairment in Parkinson's disease: progression to dementia. *Movement Disorders*, *21*(9), 1343-1349.

- Jasinskaja-Lahti, I., Horenczyk, G., & Kinunen, T. (2011). Time and context in the relationship between acculturation attitudes and adaptation among Russian-speaking immigrants in Finland and Israel. *Journal of Ethnic and Migration Studies*, 37(9), 1423-1440.
- Jasinskaja-Lahti, I., Liebkind, K., Jaakkola, M., & Reuter, A. (2006). Perceived discrimination, social support networks, and psychological well-being among three immigrant groups. *Journal of Cross-Cultural Psychology*, 37(3), 293-311.
- Jia, G., Aaronson, D., & Wu, Y. (2002). Long-term language attainment of bilingual immigrants: Predictive variables and language group differences. *Applied Psycholinguistics*, 23(4), 599-621.
- Jiang, M., Green, R. J., Henley, T. B., & Masten, W. G. (2009). Acculturation in relation to the acquisition of a second language. *Journal of Multilingual and Multicultural Development*, 30(6), 481-492.
- Jones, C. J., Trickett, E. J., & Birman, D. (2012). Determinants and consequences of child culture brokering in families from the former Soviet Union. *American Journal of Community Psychology*, 50(1-2), 182-196.
- Jordan, L. L., Tyner, C. E., & Heaton, S. C. (2013). Cognitive predictors of verbal memory in a mixed clinical pediatric sample. *Behavioral Sciences*, 3(3), 522-535.
- Joy, S., Kaplan, E., & Fein, D. (2004). Speed and memory in the WAIS-III Digit Symbol—Coding subtest across the adult lifespan. *Archives of Clinical Neuropsychology*, 19(6), 759-767.
- Jurcik, T., Chentsova-Dutton, Y.E., Solopieieva-Jurcikova, I., & Ryder, A. G. (2013). Russians in treatment: The evidence base supporting cultural adaptations. *Journal of Clinical Psychology*, 69(7), 774-791.
- Kane, M. J. & Engle, R. W. (2002). The role of prefrontal cortex in working-memory capacity, executive attention, and general fluid intelligence: an individual-differences perspective. *Psychonomic Bulletin & Review*, 9(4), 637-671.
- Kane, S. T., Walker, J. H., & Schmidt, G. R. (2011). Assessing college-level learning difficulties and “at riskness” for learning disabilities and ADHD: Development and validation of the Learning Difficulties Assessment. *Journal of Learning Disabilities*, 44(6), 533-542.
- Kang, S. (2006). Measurement of acculturation, scale formats, and language competence: Their implications for adjustment. *Journal of Cross-Cultural Psychology*, 37(6), 669-693.
- Kaplan, E., Goodglass, H., & Weintraub, S. (1983). *Boston Naming Test*. Philadelphia: Lea & Febiger.

- Kashyap, H., Kumar, K. J., Rao, S. L., & Devi, B. I. (2011). Visuo-spatial construction in patients with frontal and parietal lobe lesions. *Neuropsychological Trends*, 9, 31-40.
- Karakas, S., Yalin, A., Irak, M., & Erzenin, O. U. (2002). Digit span changes from puberty to old age under different levels of education. *Developmental Neuropsychology*, 22(2), 423-453.
- Karatekin, C., White, T., & Bingham, C. (2008). Divided attention in youth-onset psychosis and attention deficit/hyperactivity disorder. *Journal of Abnormal Psychology*, 117(4), 881-895.
- Kaushanskaya, M. & Marian, V. (2009). The bilingual advantage in novel word learning. *Psychonomic Bulletin and Review*, 16(4), 705-710.
- Kaushanskaya, M., Blumenfeld, H. K., Marian, V. (2011). The relationship between vocabulary and short-term memory measures in monolingual and bilingual speakers. *International Journal of Bilingualism*, 15(4), 408-425.
- Kaushanskaya, M. & Yoo, J. (2013). Phonological short-term and working memory in bilinguals' native and second language. *Applied Psycholinguistics*, 34(5), 1005-1037.
- Kemtes, K. A. & Allen, D. N. (2008). Presentation modality influences WAIS Digit Span performance in younger and older adults. *Journal of Clinical and Experimental Neuropsychology*, 30(6), 661-665.
- Kharkhurin, A. V. (2007). The role of cross-linguistic and cross-cultural experiences in bilinguals' divergent thinking. In I. Kecskes & L. Albertazzi (Eds.), *Cognitive aspects of bilingualism* (pp. 175-210). Dordrecht: Springer Netherlands.
- Kharkhurin, A. V. (2008). The effect of linguistic proficiency, age of second language acquisition, and length of exposure to a new cultural environment on bilinguals' divergent thinking. *Bilingualism: Language and Cognition*, 11(2), 225-243.
- Kim, S. H., Han, D. H., Lee, Y. S., Kim, B. Cheong, J. H., & Han, S. H. (2014). Baduk (the game of go) improved cognitive function and brain activity in children with attention deficit hyperactivity disorder. *Psychiatry Investigation*, 11(2), 143-151.
- Kisselev, P., Brown, M. A., & Brown, J. D. (2010). Gender differences in language acculturation predict marital satisfaction: A dyadic analysis of Russian-speaking immigrant couples in the United States. *Journal of Comparative Family Studies*, 41(5), 767-782.
- Kisser, J. E., Carrington, R. W., Spencer, R. J., & Waldstein, S. R. (2012). Neuropsychological performance of native versus non-native English speakers. *Archives of Clinical Neuropsychology*, 27(7), 749-755.

- Kliger, S. (2011). Russian-Jewish immigrants in the U.S.: Social portrait, challenges, and ACJ involvement. Retrieved on October 5, 2014 from <http://www.ajcrussian.org/site/apps/nlnet/content2.aspx?c=chLMK3PKLsF&b=7718799&ct=11713359>.
- Knudsen, E. I. (2007). Fundamental components of attention. *Annual Review of Neuroscience*, 30(1), 57-78.
- Kohl, A. D., Wylie, G. R., Genova, H. M., Hillary, F. G., & Deluca, J. (2009). The neural correlates of cognitive fatigue in traumatic brain injury using functional MRI. *Brain Injury*, 23(5), 420-432.
- Kohnert, K. & Windsor, J. (2004). The search for common ground: Part II. Nonlinguistic performance by linguistically diverse students. *Journal of Speech, Language & Hearing Research*, 47(4), 891-903.
- Kormi-Nouri, R., Moniri, S., & Nilsson, L. (2003). Episodic and semantic memory in bilingual and monolingual children. *Scandinavian Journal of Psychology*, 44(1), 47-54.
- Kousaie, S. & Phillips, N.A. (2012). Ageing and bilingualism: Absence of a “bilingual advantage” in Stroop interference in a nonimmigrant sample. *Quarterly Journal of Experimental Psychology*, 65(2), 356-369.
- Kuo, B. C. H. & Roysircar, G. (2004). Predictors of acculturation for Chinese adolescents in Canada: age of arrival, length of stay, social class, and English reading ability. *Journal of Multicultural Counseling and Development*, 32(3), 143-154.
- Kramer, J. H., Knee, K., & Delis, D. C. (2000). Verbal memory impairments in dyslexia. *Archives of Clinical Neuropsychology*, 15(1), 83-93.
- Krueger, L. E. & Salthouse, T. A. (2011). Influence of cognitive abilities and age on word recall performance across trials and list segments. *American Journal of Psychology*, 124(3), 291-300.
- Landry, R. G. (1974). A comparison of second language learners and monolinguals on divergent thinking tasks at the elementary school level. *The modern language journal*, 58(1- 2), 10-15.
- Lang, A. (2000). The limited capacity model of mediated message processing. *Journal of Communication*, 50(1), 46-70.
- Leacox, L., & Jackson, C. W. (2014). Spanish vocabulary-bridging technology-enhanced instruction for young English language learners’ word learning. *Journal of Early Childhood Literacy*, 14(2), 175-197.

- Leung, J. L., Lee, G. T., Lam, Y. H., Chan, R. C., & Wu, J. Y. (2011). The use of the Digit Span Test in screening for cognitive impairment in acute medical inpatients. *International Psychogeriatrics*, 23(10), 1569.
- Levitt, M. J., Lane, J. D., & Levitt, J. (2005). Immigration stress, social support, and adjustment in the first postmigration year: An intergenerational analysis. *Research in Human Development*, 2(4), 159-177.
- Lezak, M. D., Howieson, D. B., Bigler, E. D., & Tranel, D. (2012). *Neuropsychological Assessment, Fifth Edition*. New York, NY: Oxford University Press.
- Li, Q., Yang, W. C., Huang, Y. F., Li, W., Zhu, J., Zhang, Y., ... & Tian, J. (2013). Abnormal function of the posterior cingulate cortex in heroin addicted users during resting-state and drug-cue stimulation tasks. *Chinese Medical Journal*, 126(4), 734-739.
- Liebkind, K. (2006). Ethnic identity and acculturation. In David L. Sam & John W. Berry (Eds.), *The Cambridge handbook of acculturation psychology*. (pp. 78-96). New York, NY: Cambridge University Press.
- Liebkind, K., & Jasinskaja- Lahti, I. (2000). The influence of experiences of discrimination on psychological stress: A comparison of seven immigrant groups. *Journal of Community & Applied Social Psychology*, 10(1), 1-16.
- Lim, M. L., Collinson, S. L., Feng, L., & Ng, T. P. (2010). Cross-cultural application of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS): performances of elderly Chinese Singaporeans. *The Clinical Neuropsychologist*, 24(5), 811-826.
- Ljungberg, J.K., Hansson, P., Andres, P., Josefsson, M., & Nilsson, L. (2013). A longitudinal study of memory advantages in bilinguals. *PLoS ONE* 8(9), 1-8.
- Lopes, R., Simoes, M. R., & Leal, A. J. R. (2014). Neuropsychological abnormalities in children with the Panayiotopoulos syndrome point to parietal lobe dysfunction. *Epilepsy & Behavior*, 31, 50-55.
- Lopez, I. Y. & Bui, N. H. (2014). Acculturation and linguistic factors on international students' self-esteem and language confidence. *Journal of International Studies*, 4(4), 314-329.
- Lovatt, P., Avons, S. E., & Masterson, J. (2000). The word-length effect and disyllabic words. *The Quarterly Journal of Experimental Psychology: Section A*, 53(1), 1-22.
- Luo, L., Luk, G., & Bialystok, E. (2010). Effect of language proficiency and executive control on verbal fluency performance in bilinguals. *Cognition*, 114(1), 29-41.

- MacKinnon, D. G., Shafto, M., Taylor, J. K., Marian, D. E., Abrams, L., & Dyer, J. R. (2004). Relations between emotion, memory, and attention: Evidence from taboo Stroop, lexical decision, and immediate memory tasks. *Memory & Cognition*, 32(3), 474-488.
- Mainela-Arnold, E., & Evans, J. L. (2005). Beyond capacity limitations: Determinants of word recall performance on verbal working memory span tasks in children with SLI. *Journal of Speech, Language, and Hearing Research*, 48(4), 897-909.
- Matera, C., Stefanile, C., & Brown, R. (2011). The role of immigrant acculturation preferences and generational status in determining majority intergroup attitudes. *Journal of Experimental Social Psychology*, 47(4), 776-785.
- Mathias, C. W., Greve, K. W., Bianchini, K. J., Houston, R. J., & Crouch, J. A. (2002). Detecting malingered neurocognitive dysfunction using the reliable digit span in traumatic brain injury. *Assessment*, 9(3), 301-308.
- Matsuoka, T., Narumoto, J., Okamura, A., Taniguchi, S., Kato, Y., Shibata, K., ... & Fukui, K. (2013). Neural correlates of the components of the clock drawing test. *International Psychogeriatrics*, 25(8), 1317-1323.
- McLeay, H. (2003). The relationship between bilingualism and the performance of spatial tasks. *International Journal of Bilingual Education and Bilingualism*, 6(6), 423-438.
- Medeiros-Ward, N., Watson, J. M., & Strayer, D. L. (2015). On supertaskers and the neural basis of efficient multitasking. *Psychonomic Bulletin & Review*, 22(3), 876-883.
- Meinzer, M., Fleisch, T., Wilser, L., Eulitz, C., Rockstroh, B., Conway, T., Gonzales-Rothi, L., & Crosson, B. (2009). Neural signatures of semantic and phonemic fluency in young and old adults. *Journal of Cognitive Neuroscience*, 21(1), 2007-2018.
- Melrose, R. J., Campa, O. M., Harwood, D. G., Osato, S., Mandelkern, M. A., & Sultzer, D. L. (2009). The neural correlates of naming and fluency deficits in Alzheimer's disease: an FDG-PET study. *International Journal of Geriatric Psychology*, 24(8), 885-893.
- Melrose, R. J., Harwood, D., Khoo, T., Mandelkern, M., Sultzer, D. L. (2013). Association between cerebral metabolism and Rey-Osterrieth Complex Figure Test performance in Alzheimer's disease. *Journal of Clinical and Experimental Neuropsychology*, 35(3), 246-258.
- Mervis, C.B., Robinson, B.F., & Pani, J.R. (1999). Visuospatial construction. *The American Journal of Human Genetics*, 65(5), 1222-1229.
- Meuter, R.F. & Allport, A. (1999). Bilingual language switching in naming: Asymmetrical costs of language selection. *Journal of Memory and Language*, 40(1), 25-40.

- Milivojevic, B., Hamm, J. P., & Corballis, M. C. (2009). Functional neuroanatomy of mental rotation. *Journal of Cognitive Neuroscience*, *21*(5), 945-959.
- Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, *63*(2), 81-97.
- Miller, E. K., & Cohen, J. D. (2001). An integrative theory of prefrontal cortex function. *Annual Review of Neuroscience*, *24*(1), 167-202.
- Mindt, M. R., Arentoft, A., Germano, K. K., D'Aquila, E., Scheiner, D., Pizzirusso, M., ... & Gollan, T. H. (2008). Neuropsychological, cognitive, and theoretical considerations for evaluation of bilingual individuals. *Neuropsychological Review*, *18*(3), 255-268.
- Miranda, A. O., & Matheny, K. B. (2000). Socio-psychological predictors of acculturative stress among Latino adults. *Journal of Mental Health Counseling*, *22*(4), 306-317.
- Missouri Census Data Center (2016). *ACS Profile Report: 2015*. Retrieved October 22, 2016 from <http://census.missouri.edu/acs/profiles/report.php?p=27&g=05000US29189>.
- Mitrushina, M., Boone, K., Razani, J., & D'Elia, L. (2005). *Handbook of normative data for neuropsychological assessment* (2nd ed.). New York, NY: Oxford University Press.
- Miyake, A. & Friedman, N.P. (1998). Individual differences in second language proficiency: Working memory as language aptitude. In A.F. Healy & L. E. Bourne, Jr. (Eds), *Foreign Language Learning: Psycholinguistic Studies on Training and Retention* (pp. 339-364). Mahwah, NJ: Lawrence Erlbaum Associates Inc., Publishers.
- Molinari, M., Petrosini, L., Misciagna, S., & Leggio, M. G. (2004). Visuospatial abilities in cerebellar disorders. *Journal of Neurology, Neurosurgery, and Psychiatry*, *75*(2), 235-240.
- Mor, B., Yitzhaki-Amsalem, S., & Prior, A. (2015). The joint effect of bilingualism and ADHD on executive functions. *Journal of Attention Disorders*, *19*(6), 527-541.
- Morrison, M., & James, S. (2009). Portuguese immigrant families: The impact of acculturation. *Family Process*, *48*(1), 151-166.
- Motel, S., & Patten, E. (2013). Statistical portrait of the foreign-born population in the United States, 2011. *Washington, DC: Pew Research Hispanic Center*. Retrieved on September 15, 2014 from <http://www.pewhispanic.org/2013/01/29/statistical-portrait-of-the-foreign-born-population-in-the-united-states-2011/>.
- Nairne, J. S. (1990). A feature model of immediate memory. *Memory & Cognition*, *18*(3), 251-269.

- Nairne, J. S. (1988). A framework for interpreting recency effects in immediate serial recall. *Memory & Cognition*, *16*(4), 343-352.
- Namazi, M. & Thoradottir, E. (2010). A working memory, not bilingual advantage, in control attention. *International Journal of Bilingual Education and Bilingualism*, *13*(5), 597-616.
- National Center for Education Statistics (2006). Identification of rural locales. Retrieved on October 25, 2016 from https://nces.ed.gov/ccd/rural_locales.asp.
- Nebreda, M. C., Garcia-Caballero, A., Arsenio, E., Revilla, P., Rodriguez-Girondo, M., & Mateos, R. (2011). A short-form version of the Boston Naming Test for language screening in dementia in a bilingual rural community in Galicia (Spain). *International Psychogeriatrics*, *23*(3), 435-441.
- Nee, D. E. & Jonides, J. (2013). Neural evidence for a 3-state model of visual short-term memory. *Neuroimage*, *74*, 1-11.
- Nyikos, M. & Oxford, R. (1993). A factor analytic study of language-learning strategy use: Interpretations from information-processing theory and social psychology. *The Modern Language Journal*, *77*(1), 11-22.
- O'Brien, R.M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity*, *2007*(41), 673-690.
- Ostrosky- Solís, F., & Lozano, A. (2006). Digit span: Effect of education and culture. *International Journal of Psychology*, *41*(5), 333-341.
- Padilla, R., Steiner, J. F., Havranek, E. P., Beaty, B., Davidson, A. J., & Bull, S. (2011). A comparison of different measures of acculturation with cardiovascular risk factors in Latinos with hypertension. *Journal of Immigrant and Minority Health*, *13*(2), 284-292.
- Pae, H. K. & Sevick, R. A. (2011). The role of verbal working memory in second language reading fluency and comprehension: A comparison of English and Korean. *International Electronic Journal of Elementary Education*, *4*(1), 47-65.
- Parker Jones, O., Green, D. W., Grogan, A., Pliatsikas, C., Filippopolitis, K., Ali ... & Price, C. J. (2012). Where, when and why brain activation differs for bilinguals and monolinguals during picture naming and reading aloud. *Cerebral Cortex*, *22*(4), 892-902.
- Parks, R. W., Thiyagesh, S. N., Farrow, T. F., Ingram, L., Wilkinson, K., Hunter, M. D., ... & Woodruff, P. W. (2010). Performance on the clock drawing task correlates with fMRI response to a visuospatial task in Alzheimer's disease. *International Journal of Neuroscience*, *120*(5), 335-343.

- Patton, D. E., Duff, K., Schoenberg, M. R., Mold, J., Scott, J. G., & Adams, R. L. (2003). Performance of cognitively normal African Americans on the RBANS in community dwelling older adults. *The Clinical Neuropsychologist, 17*(4), 515-530.
- Pavlenko, A. & Malt, B. C. (2011). Kitchen Russian: Cross-linguistic differences and first-language object naming by Russian-English bilinguals. *Bilingualism: Language and Cognition, 14*(1), 19-45.
- Pawliuk, N., Grizenko, N., Chan-Yip, A., Gantous, P., Mathew, J., & Nguyen, D. (1996). Acculturation style and psychological functioning in children of immigrants. *American Journal of Orthopsychiatry, 66*(1), 111-121.
- Pedraza, O., & Mungas, D. (2008). Measurement in cross-cultural neuropsychology. *Neuropsychology Review, 18*(3), 184-193.
- Pelham, S. D. & Abrams, L. (2014). Cognitive advantages and disadvantages in early and late bilinguals. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 40*(2), 313-325.
- Perani, D. & Abutalebi, J. (2015). Bilingualism, dementia, cognitive and neural reserve. *Current Opinion in Neurology, 28*(6), 618-625.
- Persky, I., & Birman, D. (2005). Ethnic identity in acculturation research: A study of multiple identities of Jewish refugees from the former Soviet Union. *Journal of Cross-Cultural Psychology, 36*(5), 557-572.
- Phinney, J. S., Horenczyk, G., Liebkind, K., & Vedder, P. (2001). Ethnic identity, immigration, and well-being: An interactional perspective. *Journal of Social Issues, 57*(3), 493-510.
- Poletti, M., Lucetti, C., Del Dotto, P., Borelli, P., Baldacci, F., Logi, C., & Bonuccelli, U. (2012). The “closing in” phenomenon in Parkinson’s disease dementia and lewy-body dementia. *The Journal of Neuropsychiatry and Clinical Neurosciences, 24*(4), E38-E39.
- Posner, M. I. (1980). Orienting of attention. *Quarterly Journal of Experimental Psychology, 32*(1), 3-25.
- Prior, A. & MacWhinney, B. (2010). A bilingual advantage in task switching. *Bilingualism: Language and Cognition, 13*(2), 253-262.
- Perez-Arce, P. (1999). The influence of culture on cognition. *Archives of Clinical Neuropsychology, 14*(7), 581-592.
- Portocarrero, J.S., Burrig, R.G., & Donovan, P.J. (2007). Vocabulary and verbal fluency of bilingual and monolingual college students. *Archives of Clinical Neuropsychology, 22*(3), 415-422.

- Puente, A.E. & Agranovich, A.V. (2003). The cultural in cross-cultural neuropsychology. In M. Hersen, G. Goldstein, & S.R. Beers (Eds.), *Comprehensive handbook of psychological assessment. Intellectual and neuropsychological assessment* (pp. 321-332). New York, NY: Wiley.
- Puente, A.E., Perez-Garcia, M., Lopez, R.V., Hidalgo-Ruzzante, N.A., & Fasfous, A.F. (2013). Neuropsychological assessment of culturally and educationally dissimilar individuals. In F.A. Paniagua & A. Yamada (Eds.). *Handbook of multicultural mental health: Assessment and treatment of diverse populations* (pp. 225-241). New York, NY: Elsevier.
- Rabin, L. A., Barr, W. B., & Burton, L. A. (2005). Assessment practices of clinical neuropsychologists in the United States and Canada: A survey of INS, NAN, and APA Division 40 members. *Archives of Clinical Neuropsychology*, 20(1), 33-65.
- Rabin, L. A., Paolillo, E., & Barr, W. B. (2016). Stability in test-usage practices of clinical neuropsychologists in the United States and Canada over a 10-year period: A follow-up survey of INS and NAN members. *Archives of Clinical Neuropsychology*, 31(3), 206-230.
- Rafieyan, V., Sharafi-Nejad, M., Khavari, Z., Damavand, A., & Eng, L. S. (2014). Relationship between cultural distance and pragmatic comprehension. *English Language Teaching*, 7(2), 103.
- Ramsay, M. C. & Reynolds, C. R. (1995). Separate digits test: A brief history, a literature review, and a reexamination of the factor structure of the Test of Memory and Learning (TOMAL). *Neuropsychology Review*, 5(3), 151-171.
- Randolph, C., Tierney, M.C., Mohr, E., & Chase, T.N. (1998). The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS): Preliminary clinical validity. *Journal of Clinical and Experimental Neuropsychology*, 20(3), 310-319.
- Randolph, C. (2012). *Repeatable Battery for the Assessment of Neuropsychological Status Normative Update: Examiner's Manual*. New York: Pearson Assessment.
- Rapoport, T., Lomsky- Feder, E., & Heider, A. (2002). Recollection and relocation in immigration: Russian- Jewish immigrants "normalize" their anti- semitic experiences. *Symbolic Interaction*, 25(2), 175-198.
- Rebhun, U. (2014). Immigrant acculturation and transnationalism: Israelis in the United States and Europe compared. *Journal for the Scientific Study of Religion*, 53(3), 613-635.
- Reese, C. S., Suhr, J. A., & Riddle, T. L. (2012). Exploration of malingering indices in the Wechsler Adult Intelligence Scale-digit span subtest. *Archives of Clinical Neuropsychology*, 27(2), 176-181.

- Reitan, R. M., & Wolfson, D. (1985). *The Halstead-Reitan neuropsychological test battery: Theory and clinical interpretation* (Vol. 4). Reitan Neuropsychology.
- Remennick, L. (2004). Language acquisition, ethnicity and social integration among former Soviet immigrants of the 1990s in Israel. *Ethnic and Racial Studies*, 27(3), 431-454.
- Rey, G. J., & Benton, A. L. (1991). *Multilingual Aphasia Examination-Spanish: Manual of instructions*. Iowa City, IA: AJA Associates.
- Rhodes, R. L. (2010). Multicultural school neuropsychology. In D. Miller (Ed.), *Best practices in school neuropsychology: Guidelines for effective practice, assessment, and evidence-based intervention* (pp. 61-77). Hoboken, NJ: John Wiley & Sons.
- Rhodes, S. D., Daniel, J., Song, E. Y., Alonzo, J., Downs, M., & Reboussin, B. A. (2013). Social support among immigrant Latino men: a validation study. *American Journal of Health Behavior*, 37(5), 620-628.
- Riasanovsky, N., & Steinberg, M. (2010). *A History of Russia since 1855* (Vol. 2). New York, NY: Oxford University Press.
- Ricciardelli, L.A. (1992). Creativity and bilingualism. *The Journal of Creative Behavior*, 26(4), 242-254.
- Rivera, L. M. (2000). Acculturation and multicultural assessment: Issues, trends and practice. In L.A. Suzuki & J. G. Ponterotto (Eds.), *Handbook of multicultural assessment* (3rd edition) (pp. 73-91). San Francisco, CA: Wiley and Sons.
- Rivera, L. M. (2010). Acculturation: Theories, measurement, and research. In J. G. Ponterotto, J. M. Casas, L. A. Suzuki, & C. M. Alexander (Eds.), *Handbook of multicultural counseling, third edition* (331-341). Thousand Oaks, CA: SAGE Publishing.
- Rohlf, H., Jucksch, V., Gawrilow, C., Huss, M., Hein, J., Lehmkuhl, U., & Salbach-Andrae, H. (2012). Set shifting and working memory in adults with attention-deficit/hyperactivity disorder. *Journal of Neural Transmission*, 119, 95-106.
- Romero, L., Walsh, V., & Papagno, C. (2006). The neural correlates of phonological short-term memory: a repetitive transcranial magnetic stimulation study. *Journal of Cognitive Neuroscience*, 18(7), 1147-1155.
- Rose, S. E., McMahon, K. L., Janke, A. L., O'Dowd, B., de Zubicaray, G., Strudwick, M. W., & Chalk, J. B. (2006). Diffusion indices on magnetic resonance imaging and neuropsychological performance in amnesic mild cognitive impairment. *Journal of Neurology, Neurosurgery, & Psychiatry*, 77(10), 1122-1128.

- Rosner, J. L., Gardner, W. L., & Hong, Y. (2011). The dynamic nature of being Jewish: Identity centrality and the acculturation of Russian Jews in the United States. *Journal of Cross-Cultural Psychology, 42*(8), 1341-1355.
- Rosselli, M., Ardila, A., Araujo, K., Weekes, V. A., Caracciolo, V., Padilla, M., & Ostrosky-Solis, F. (2000). Verbal fluency and repetition skills in healthy older Spanish-English bilinguals. *Applied Neuropsychology, 7*(1), 17-24.
- Rosselli, M. & Ardila, A. (2003). The impact of culture and education on non-verbal neuropsychological measurements: A critical review. *Brain and Cognition, 52*(3), 326-333.
- Rosselli, M., Ardila, A., Santisi, M.N., Arecco, M.D., Salvatierra, J., Conde, A., & Lenis, B. (2002). Stroop effect in Spanish-English bilinguals. *Journal of the International Neuropsychological Society, 8*(6), 819-827.
- Rossi, S., Lubin, A., Simon, G., Lanoë, C., Poirel, N., Cachia, A., ... & Houdé, O. (2013). Structural brain correlates of executive engagement in working memory: Children's inter-individual differences are reflected in the anterior insular cortex. *Neuropsychologia, 51*(7), 1145-1150.
- Rothe, E. M., Tzuang, D., & Pumariega, A. J. (2010). Acculturation, development, and adaptation. *Child and Adolescent Psychiatric Clinics of North America, 19*(4), 681-696.
- Rubia, K., Alegria, A. A., & Brinson, H. (2014). Brain abnormalities in attention-deficit hyperactivity disorder: a review. *Revista de Neurologia, 58*(1), 3-18.
- Rudmin, F.W. (2003). Critical history of the acculturation psychology of assimilation, separation, integration, and marginalization. *Review of General Psychology, 7*(1), 3-37.
- Russell, J., & Batalova, J. (2012). European immigrants in the United States. *Migration Policy Institute*. Retrieved from <http://www.migrationpolicy.org/article/european-immigrants-united-states> on September 15, 2014.
- Ryan, C. (2013). Language use in the United States: 2011. *United States Census Bureau*.
- Ryder, A. G., Alden, L. E., & Paulhus, D. L. (2000). Is acculturation unidimensional or bidimensional? A head-to-head comparison in the prediction of personality, self-identity, and adjustment. *Journal of Personality and Social Psychology, 79*(1), 49.
- Rypma, B., Berger, J. S., Prabhakaran, V., Bly, B. M., Kimberg, D. Y., Biswal, B. B., & D'Esposito, M. (2006). Neural correlates of cognitive efficiency. *NeuroImage, 33*(3), 969-979.
- Rypma, B. & Prabhakaran, V. (2009). When less is more and when more is more: The mediating roles of capacity and speed in brain-behavior efficiency. *Intelligence, 37*(2), 207-222.

- Saez, P.A., Bender, H.A., Barr, W.B., Rivera-Mindt, M., Morrison, C.E., Hassenstab, J., Rodriguez, M., & Vazquez, B. (2014). The impact of education and acculturation on nonverbal neuropsychological test performance among Latino/a patients with epilepsy. *Applied Neuropsychology: Adult*, 21(2), 108-119.
- Safdar, S., Calvez, S., & Lewis, J. R. (2012). Multi-group analysis of the MIDA model: Acculturation of Indian and Russian immigrants to Canada. *International Journal of Intercultural Relations*, 36(2), 200-212.
- Sakamoto, M., & Spiers, M. V. (2014). Sex and cultural differences in spatial performance between Japanese and North Americans. *Archives of Sexual Behavior*, 43(3), 483-491.
- Sakwa, R. (2011). Russia's identity: Between the 'domestic' and the 'international'. *Europe-Asia Studies*, 63(6), 957-975.
- Sam, D.L. & Berry, J.W. (2010). Acculturation: When individuals and groups of different cultural backgrounds meet. *Perspectives on Psychological Science*, 5(4), 472-481.
- Sandoval, T. C., Gollan, T. H., Ferreira, V. S., & Salmon, D. P. (2010). What causes the bilingual disadvantage in verbal fluency? The dual task analogy. *Bilingualism: Language and Cognition*, 13(2), 231-252.
- Sarter, M., Givens, B., & Bruno, J. P. (2001). The cognitive neuroscience of sustained attention: where top-down meets bottom-up. *Brain Research Reviews*, 35(2), 146-160.
- Schaer, K., Jahn, G., & Lotze, M. (2012). fMRI-activation during drawing a naturalistic or sketchy portrait. *Behavioural Brain Research*, 233(1), 209-216.
- Schmidtke, J. (2014). Second language experience modulates word retrieval effort in bilinguals: Evidence from pupillometry. *Frontiers in Psychology*, 5, 1-16.
- Schroeder, S. R., & Marian, V. (2012). A bilingual advantage for episodic memory in older adults. *Journal of Cognitive Psychology*, 24(5), 591-601.
- Schwartz, S.J., Benet-Martinez, V., Knight, G.P., Unger, J.P., Zamboanga, B.L., Des Rosiers, S.E., Stephens, D., Huang, S., & Szapocznic, J. (2013). Effects of language of assessment on the measurement of acculturation: Measurement equivalence and cultural frame switching. *Psychological Assessment*, 26(1), 100-114.
- Schwartz, S.J., Unger, J.B., Zamboanga, B.L., Szapocznic, J. (2010). Rethinking the concept of acculturation: Implications for theory and research. *American Psychologist*, 65(4), 237-251.
- Sebastian, M. V. & Hernandez-Gil, L. (2012). Developmental pattern of digit span in Spanish population. *Psicothema*, 24(2), 183-187.

- Sebastian, M. V. & Mediavilla, R. (2015). Verbal forward digit span in Spanish population. *Psicothema*, 27(2), 93-98.
- Sebastian, A., Jung, P., Krause-Utz, A., Lieb, K., Schmahl, C., & Tuscher, O. (2014). Frontal dysfunctions of impulse control – a systematic review in borderline personality disorder and attention-deficit/hyperactivity disorder. *Frontiers in Human Neuroscience*, 8, 1-17.
- Shi, L. F. & Zaki, N. A. (2014). Psychometric function for NU-6 word recognition in noise: effects of first language and dominant language. *Ear & Hearing*, 35(2), 236-245.
- Shin, C. N., & Lach, H. W. (2014). Acculturation and health of Korean American adults. *Journal of Transcultural Nursing*, 25(3), 273-280.
- Shuttleworth-Edwards, A. B. (2010). Practitioner guidelines for career counselling in light of cross-cultural influences on WAIS-III IQ test performance. *Journal of Psychology in Africa*, 20(3), 413-419.
- Simon, J.R. & Small, A.M. (1969). Processing auditory irrelevant information: Interference from an irrelevant cue. *Journal of Applied Psychology*, 53(5), 433-435.
- Snodgrass, J. G., & Vanderwart, M. (1980). A standardized set of 260 pictures: norms for name agreement, image agreement, familiarity, and visual complexity. *Journal of Experimental Psychology: Human Learning and Memory*, 6(2), 174-215.
- Spencer, R. J., Wendell, C. R., Giggey, P. P., Seliger, S. L., Katzel, L. I., & Waldstein, S. R. (2013). Judgment of Line Orientation: an examination of eight short forms. *Journal of Clinical and Experimental Neuropsychology*, 35(2), 160-166.
- Stroop, J.R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, 18, 643-662.
- Stuss, D. T., Craik, F. I. M., Sayer, L., Franchi, D., & Alexander, M. P. (1996). Comparison of older people and patients with frontal lesions: Evidence from word list learning. *Psychology and Aging*, 11(3), 387-395.
- Suarez, P.A., Gollan, T.H., Heaton, R., Grant, I., & Cherner, M. (2014). Second-language fluency predicts native language Stroop effects: Evidence from Spanish-English bilinguals. *Journal of the International Neuropsychological Society*, 20(3), 342-348.
- Sullivan, S., Schwartz, S. J., Prado, G., Huang, S., Pantin, H., & Szapocznik, J. (2007). A bidimensional model of acculturation for examining differences in family functioning and behavior problems in Hispanic immigrant adolescents. *The Journal of Early Adolescence*, 27(4), 405-430.
- Swanson, A. (2010). *Semantic ambiguity in the lexical access of verb: How data from monolinguals and bilinguals inform a general model of the mental lexicon*. (Doctoral dissertation). ProQuest Dissertations and Theses database. (UMI No. 3452299).

- Szapocznik, J., Kurtines, W. M., & Fernandez, T. (1980). Bicultural involvement and adjustment in Hispanic-American youths. *International Journal of Intercultural Relations*, 4(3), 353-365.
- Tahan, S., Cline, T., & Messaoud-Galusi, S. (2011). The relationship between language dominance and pre-reading skills in young bilingual children in Egypt. *Reading and Writing*, 24(9), 1061-1087.
- Tartakovsky, E. (2012). Factors affecting immigrants' acculturation intentions: A theoretical model and its assessment among adolescent immigrants from Russia and Ukraine in Israel. *International Journal of Intercultural Relations*, 36(1), 83-99.
- Teske, R. H., & Nelson, B. H. (1974). Acculturation and assimilation: A clarification. *American Ethnologist*, 1(2), 351-367.
- Thompson, C. K., Cho, S., Hsu, C. J., Wieneke, C., Rademaker, A., Weitner, B. B., ... & Weintraub, S. (2012). Dissociations between fluency and agrammatism in primary progressive aphasia. *Aphasiology*, 26(1), 20-43.
- Thorn, A. S. & Gathercole, S. E. (1999). Language-specific knowledge and short-term memory in bilingual and non-bilingual children. *The Quarterly Journal of Experimental Psychology Section A: Human Experimental Psychology*, 52(2), 303-324.
- Thorn, A. S., Gathercole, S. E., & Frankish, C. R. (2005). Reintegration and the benefits of long-term knowledge in verbal short-term memory: an evaluation of Schweickert's (1993) multinomial processing tree model. *Cognitive Psychology*, 50(2), 133-158.
- Thorn, A. S., Gathercole, S. E., & Frankish, C. R. (2002). Language familiarity effects in short-term memory: the role of output delay and long-term knowledge. *Quarterly Journal of Experimental Psychology: Human Experimental Psychology*, 55(4), 1363-1383.
- Tibber, M., Saygin, A. P., Grant, S., Melmoth, D., Rees, G., Morgan, M. (2010). The neural correlates of visuospatial perceptual and oculomotor extrapolation. *PloS One*, 5(3), 1-12.
- Titzmann, P. F. & Jugert, P. J. (2015). Acculturation in context: The moderating effects of immigration and native peer orientations on the acculturation experiences of immigrants. *Journal of Youth and Adolescence*, 44(11), 2079-2094.
- Tomlinson, S. P., Davis, N. J., Morgan, H. M., & Bracewell, R. M. (2014). Cerebellar contributions to verbal working memory. *Cerebellum*, 13, 354-361.
- Tranel, D., Vianna, E., Manzel, K., Damasio, H., & Grabowski, T. (2009). Neuroanatomical correlates of the Benton Facial Recognition Test and Judgment of Line Orientation Test. *Journal of Clinical and Experimental Neuropsychology*, 31(2), 219-233.

- Travis, S. G., Huang, Y., Fujiwara, E., Radomski, A., Olsen, F., Carter, R., Seres, P., & Malykhin, N. V. (2014). High field structural MRI reveals specific episodic memory correlates in the subfields of the hippocampus. *Neuropsychologia*, *53*, 233-245.
- Tse, C.S. & Altarriba, J. (2014). The relationship between language proficiency and attentional control in Cantonese-English bilingual children: evidence from Simon, Simon switching, and working memory tasks. *Frontiers in Psychology*, *5*, 1-18.
- Tsukiura, T., Fujii, T., Takahashi, T., Xiao, R., Inase, M., Iijima, T., ... & Okuda, J. (2001). Neuroanatomical discrimination between manipulating and maintaining processes involved in verbal working memory; a functional MRI study. *Cognitive Brain Research*, *11*(1), 13-21.
- Van den Heuvel, D. M. J., Ten Dam, V. H., De Craen, A. J. M., Admiraal-Behloul, F., Olofsen, H., Bollen, E. L. E. M., ... & Van Buchem, M. A. (2006). Increase in periventricular white matter hyperintensities parallels decline in mental processing speed in a non-demented elderly population. *Journal of Neurology, Neurosurgery & Psychiatry*, *77*(2), 149-153.
- Van Tubergen, F. (2006). Religious affiliation and attendance among immigrants in eight western countries: Individual and contextual effects. *Journal for the Scientific Study of Religion*, *45*(1), 1-22.
- Verkuyten, M. (2005). Ethnic group identification and group evaluation among minority and majority groups: testing the multiculturalism hypothesis. *Journal of Personality and Social Psychology*, *88*(1), 121.
- Von Holzen, K., & Mani, N. (2012). Language nonselective lexical access in bilingual toddlers. *Journal of Experimental Child Psychology*, *113*(4), 569-586.
- Walker, A. J., Batchelor, J., Shores, E. A., & Jones, M. (2010). Effects of cultural background on the WAIS-III and WMS-III performances after moderate-severe traumatic brain injury. *The Australian Psychologist*, *45*, 112-122.
- Wambach, D., Lamar, M., Swenson, R., Penney, D. L., Kaplan, E., & Libon, D. J. (2011). Digit span. In J. S. Kreutzer, J. DeLuca, & B. Caplan (Eds.), *Encyclopedia of Clinical Neuropsychology* (pp. 844-849). New York, NY: Springer Publishing.
- Wechsler, D. (1997). *Wechsler Adult Intelligence Scale – Third Edition: manual*. San Antonio, TX: Pearson Assessment.
- Wechsler, D., Coalson, D. L., & Raiford, S. E. (2008). *Wechsler Adult Intelligence Scale – Fourth Edition*. San Antonio, TX: Pearson Assessment.
- Weible, A. P. (2013). Remembering to attend: The anterior cingulate cortex and remote memory. *Behavioural Brain Research*, *245*, 63-75.

- Weismer, S. E., Evans, J., & Hesketh, L. J. (1999). An examination of verbal working memory capacity in children with specific language impairments. *Journal of Speech, Language, and Hearing Research, 42*, 1249-1260.
- Whitfield, K. E., Fillenbaum, G. G., Pieper, C., Albert, M. S., Berkman, L. F., Blazer, D. G., ... & Seeman, T. (2000). The effect of race and health-related factors on naming and memory the macarthur studies of successful aging. *Journal of Aging and Health, 12*(1), 69-89.
- Windsor, J., Kohnert, K., Loxtercamp, A.L., Kan, P. (2008). Performance on nonlinguistic visual tasks by children with language impairment. *Applied Psycholinguistics, 29*, 237-268.
- Williams, D. L., Goldstein, G., Carpenter, P. A., & Minshew, N. J. (2005). Verbal and spatial working memory in Autism. *Journal of Autism and Developmental Disorders, 35*(6), 747-756.
- Williams, V. G., Bruce, J. M., Westervelt, H. J., Davis, J. D., Grace, J., Malloy, P. F., & Tremont, G. (2007). Boston naming performance distinguishes between Lewy body and Alzheimer's dementias. *Archives of Clinical Neuropsychology, 22*(8), 925-931.
- Wodniecka, Z., Craik, F.I.M., Luo, L., & Bialystok, E. (2010). Does bilingualism help memory? Competing effects of verbal ability and executive control. *International Journal of Bilingual Education and Bilingualism, 13*(5), 575-595.
- Van den Noort, M.W., et al. (2006). Foreign language proficiency and working memory capacity. *European Psychologist, 11*(4), 289-296.
- Yakushko, O. (2010). Stress and coping strategies in the lives of recent immigrants: A grounded theory model. *International Journal for the Advancement of Counseling, 32*, 256-273.
- Yang, S., Yang, H., Lust, B. (2011). Early childhood bilingualism leads to advances in executive attention: Dissociating culture and language. *Bilingualism: Language and Cognition, 14*(3), 412-422.
- Yoo, J. & Kaushanskaya, M. (2012). Phonological memory in bilinguals and monolinguals. *Memory & Cognition, 40*(8), 1314-1330.
- Yoon, E., Chang, C., Kim, S., Clawson, A., Clearly, S. E., Hansen, M., ... & Gomes, A. M. (2013). A meta-analysis of acculturation/enculturation and mental health. *Journal of Counseling Psychology, 60*(1), 15-30.

- Zea, M. C., Asner-Self, K. K., Birman, D., & Buki, L. P. (2003). The Abbreviated Multidimensional Acculturation Scale: Empirical validation with two Latino/Latina samples. *Cultural Diversity and Ethnic Minority Psychology, 9*(2), 107-126.
- Zieth, A., Eysholdt, U., & Doellinger, M. (2013). Sentence repetition and digit span: Potential markers of bilingual children with SLI? *Logopedics Phoniatics Vocology, 38*(1), 1-10.