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VERBAL FLUENCY: NORMS FOR THE LAKOTA POPULATION IN SEMANTIC AND PHONEMIC FLUENCY TASKS

by

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Master of Arts

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This thesis, submitted by Larissa M. Jordan in partial fulfillment of the requirements for the Degree of Master of Arts from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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This thesis is being submitted by the appointed advisory committee as having met all the requirements of the School of Graduate Studies at the University of North Dakota and is hereby approved.

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PERMISSION

Title Verbal Fluency: Norms of the Lakota Population in Semantic and Phonemic Fluency Tasks

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Degree Master of Arts

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Larissa M. Jordan

July 21, 2014

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ABSTRACT

The Lakota language in western South Dakota is spoken by a people group with a rich cultural and religious heritage. The Lakota language, still spoken by elderly Lakota people, is slowly vanishing as the majority of people in younger generations are no longer learning Lakota and with it the semantic knowledge of how Lakota speakers view the world. This study was completed to gather semantic information about the animals that bilingual Lakota English speakers name in English and in Lakota.

An additional objective of this study was to develop normative data for the Lakota people on phonemic (letter P) and semantic (animal) verbal fluency tasks in Lakota and in English. Verbal fluency tasks are commonly used in the medical field as a way to evaluate and treat neurological impairments such as stroke or brain injury. Without having this normative data, medical professionals are forced to compare the number of responses by the Lakota people to monolingual English speakers.

Ninety-six participants, fifty-three monolingual English and forty-three bilingual Lakota English speakers, were asked to complete phonemic and semantic verbal fluency tasks in English and also in Lakota for Lakota English speakers. Results revealed Lakota speakers name more words in English than in Lakota on both tasks, and they do not name as many English P words during phonemic tasks as monolingual English speakers do. Four common animals, *dog*, *cat*, *horse*, and *cow*, were named in the top ten most frequently occurring animals by all three groups, but differences were seen among the groups as well.

CHAPTER 1

INTRODUCTION

The Ethnologue is known by linguists around the globe as the main resource for information regarding the 7,105 known living languages (Lewis, Simons, and Fennig 2013) spoken throughout the world. By using the Expanded Graded Intergenerational Disruption Scale (EGIDS), the Ethnologue is able to quantify each language's likelihood of extinction using a scale from 1-10 (Lewis, Simons, and Fennig 2013). English, for example, is given the language status ranking of 1 as its likelihood of extinction is rare (Lewis, Simons, and Fennig 2013). However, languages ranked 6b or 7 are considered to be "in trouble" and it is estimated that this is true for 1,481, or 21%, of languages described by the Ethnologue (Lewis, Simons, and Fennig 2013). One of these languages considered to be in trouble with a ranking of 6b is Lakota spoken by the Lakota people in western South Dakota in the United States of America. Ralph Waldo Emerson once said, "Language is a city to the building of which every human being brought a stone." As languages become extinct, the world loses not only the phonemes and syntax of the spoken language, but the culture and values represented in the semantics as well. Emerson's city of language loses key neighborhoods. The stones that Emerson was describing appear to be crumbling.

In an effort to maintain these crumbling stones, individuals and organizations around the world are working to document and attempting to revitalize the various languages in danger of becoming extinct. By using phonemic, syntactic, and semantic information from these languages, linguistic researchers are able to create a fuller picture of the varying components of language and how humans communicate. Multiple theories have been created by linguists throughout the years in an attempt to quantify the various parts of languages, including the area of semantics. One of these theories, Prototype Theory, suggests that there are prototypes, or "central or typical members of a category such as BIRD or FURNITURE, but then a shading off into less typical or peripheral members" (Saeed 2009, 37). Determining which members are typical and which are peripheral vary among languages and cultures. Prototype Theory can provide insight into the Lakota culture and what is important to the Lakota people by examining which words and concepts are prototypical for them.

Gathering this data about the Lakota language now ensures it will still be available for future linguistic analysis. In addition to data collection for future theoretical evaluation, this project will also gather information for practical application. Instead of gathering data the usual way to apply to Prototype Theory (i.e., having participants rate a list of words from most typical to least typical), this project will use the principles of Prototype Theory to apply to data obtained from semantic verbal fluency tasks. Normative data for both semantic and phonemic verbal fluency tasks for the bilingual Lakota English speakers is an additional goal of this study. Verbal fluency tasks are commonly used for evaluation and treatment of individuals with suspected or confirmed neurological infarcts such as traumatic brain injury or strokes.

Individuals who have suffered from a stroke suddenly find themselves with physical, cognitive, and/or language changes, and often these changes are significant. In order to provide appropriate care to these people, speech-language pathologists must conduct appropriate assessments in order to determine at what level the person is currently functioning. This information is then compared to normative data to attempt to quantify the cognitive and/or language change these people have experienced. This comparison between the person's current level of performance and what can be expected of a functional adult is vital in order to show progress and for insurance payment. It also allows speech-language pathologists and other professionals to determine if a deficit does in fact exist.

In working with the Lakota people as a speech-language pathologist in western South Dakota, this researcher has not been able to find normative data for the Lakota population in many areas, including verbal fluency tasks. This makes evaluation and treatment of the Lakota who have experienced strokes difficult and incomplete. In addition to ensuring the responses of the Lakota people on verbal fluency tasks will be available for further research in future generations, this project will also provide preliminary normative data which will give greater insight to the medical community for the evaluation and treatment of this population.

CHAPTER 2

LAKOTA

The Oglala Lakota Sioux, a Native American tribe, live in western South Dakota. It is estimated that this people group began to arrive to the Black Hills region in approximately 1826, after being forced out of Minnesota by the Chippewa (Milton 1977, 23). The Lakota people are part of the Sioux tribe (Hoover et al. 2005, 44), which divided into three groups based on geographical categories and represent common language dialects: Dakota in the east, Nakota in the middle, and Lakota in the west. The speakers of these three dialects are able to understand each other since the main difference among the dialects is the initial phoneme (Powers 1977, 160). The seven Lakota tribes in western South Dakota include Sans Arc, Two Kettle, Blackfoot Sioux, Brule, Minneconjou, Hunkpapa, and Oglala (Hoover et al. 2005, 44). The word *Oglala* means "they scatter their own" (Hoover et al. 2005, 46) and this tribe had the most members (Hassrick 1964, 3).

The Lakota were a nomadic people whose movement revolved around the movements of the buffalo (Hassrick 1964, 171). Hassrick (1964, 171) explains that the Lakota only had belongings which were moveable by a dog, by a horse, or by themselves. Dogs, and later horses, were crucial to moving the tipis and assisting with carrying food and supplies (Hassrick 1964, 177). A limited number of buffalo were killed based on the current needs of the Lakota, as they did not want excess meat which would spoil

(Hassrick 1964, 175). Vegetables and nuts were gathered to provide food through the winter months (Hassrick 1964, 176). According to Hassrick (1964, 209), the Lakota "[…] were hunters first, gatherers second, and farmers never!" Although the Lakota travelled throughout the plains and Black Hills, they enjoyed returning to familiar locations and utilized the bounty of the earth throughout the seasons (Hassrick 1964, 187). Their connection with the earth and its creatures is also reflected in Lakota religion.

Milton (1977, 15) says that all animals, but particularly the buffalo, were important to the Sioux since they provided food, housing, weapons, and tools. Although all animals are important to the Lakota, Milton (1977) points out that some animals are more celebrated than others. The Lakota revere the buffalo, eagle, bear, and wolf more than the coyote (Milton 1977, 188).

The history of the Oglala Lakota is filled with conflict with the United States government regarding who had legitimate right to the land. Many battles occurred, with perhaps the most famous being the tragedy at Wounded Knee in 1890. A full historical evaluation of the Oglala Lakota is beyond the scope of this paper; however, by the end of these encounters, the once nomadic Native Americans were placed on reservations around the United States.

The Pine Ridge Reservation in western South Dakota was formed in 1889, an area of 2,786,540 acres or 4,353 square miles (Powers 1977, 197). Of the remaining Sioux, approximately two-thirds live in western South Dakota, west of the Missouri River, with the majority at the Pine Ridge Reservation (Milton 1977, 121). These Sioux are Lakota, specifically Oglala (Milton 1977, 131). Native Americans were not granted citizenship of the United States of America until 1924 (Eder and Reyhner 1988, 41). The Native

Americans were not left to their own devices on these reservations, however. Instead, the United States government created a government entity to oversee the affairs of the Native Americans.

The Bureau of Indian Affairs was established to assist the Native Americans, including the Lakota (Jones 1991, 32). In an attempt to "Americanize" the Native Americans, the Bureau of Indian Affairs sought to educate Native American children by sending them to boarding schools (Jones 1991, 33). In 1879, the first off-reservation school for Native American children was opened in Carlisle, Pennsylvania (Eder and Reyhner 1988, 38). The director of the Carlisle school, Captain Richard Henry Pratt, felt the goal of his boarding school was "to take the 'Indian' out of his Indian students" (Eder and Reyhner 1988, 38). At these schools, Native American children were forbidden from speaking their native language, and were taught English instead (Jones 1991, 33). Not only were the native languages banned, the tribal traditions were also discouraged as they were considered to be enemies of progress (Eder and Reyhner 1988, 29). Physical appearance and clothing were also altered as men were required to cut their hair and women to grow theirs out (Eder and Reyhner 1988, 31). These attempts at assimilation led to the disintegration of the Native American cultures (Reyhner 1988, 10). Most, if not all, of the Native Americans did not wish to replace their language, religion, culture, their very way of life, in favor of the unfamiliar ways of the early Americans, but the Bureau of Indian Affairs was making the decisions.

The Bureau of Indian Affairs also played a role in the religion of the Lakota and other Native American tribes. The leaders within the Bureau of Indian Affairs forbade the Native Americans' ways of expressing their religions, including dancing (Jones 1991,

33). Initially, the Sun Dance was forbidden in 1881, followed by a banning of all aspects of traditional religious gatherings in 1885 (Eder and Reyhner 1988, 38). It was not until 1934, ten years after the Native Americans became legal American citizens, that the Indian Reorganization (Wheeler-Howard) Act was passed which allowed religious freedom (Eder and Reyhner 1988, 43).

These attempts at assimilation were not desired by many Native Americans, but refusing to allow their children to go to the boarding schools or continuing to practice their religion meant those who refused were not given the same materials and resources as those who did not refuse (Jones 1991, 35). The Lakota were left with a difficult choice.

Milton (1977, 133) notes that since the Sioux were placed on reservations, they have lived in poverty. According to the United States 2010 census, there are 308 million people currently living in the United States, with 18,830 individuals living on the Pine Ridge Reservation and 13,586 living in Shannon County, South Dakota where part of the Pine Ridge Reservation is located (US 2010 census interactive map). Those living below poverty level in the entire state of South Dakota make up 13.8% of the population of 814,180 (US 2010 census state quick facts). The poverty level in Shannon County, South Dakota, is 49.5% (US 2010 census state quick facts). In 2010, the national unemployment rate was 9.6% (Bureau of Labor Statistics Databases), and 4.8% in South Dakota (Bureau of Labor Statistics State). As would be expected with the high poverty level, the unemployment rate for individuals living in Shannon County, South Dakota was also high with a rate of 12.6% (Bureau of Labor Statistics Local).

Powers (1977, 109) states that all full blooded Lakota aged sixty-five and older are bilingual in English and in Lakota. Of the Oglala Lakota people as a whole, 68% are

bilingual, and only 17% do not know any of the Lakota language (Powers 1977, 109). Powers (1977, 109) does note that the older generations of Lakota speakers are concerned that the younger generations are not learning Lakota as they once did. The Ethnologue and linguists are also concerned about the survival of Lakota and consider Lakota to be a language that is threatened (Lewis, Simons, and Fennig 2013). Attempts have been made to include the Lakota language into the education of younger Lakota children via schools and entertainment, including the popular children's television show the Berenstain Bears.

The Lakota language has eight vowels, three of which are nasal, and twenty-eight consonants, including voiced, aspirated, and glottalized (Powers 1977, 209). Based on the Lakota Language Consortium's "Lakota Letters and Sounds" (2004) descriptions, the Lakota phonemes have been placed into the International Phonetic Alphabet chart layout with an unofficial orthography written in parentheses. See Appendix A.

The history of the Oglala Lakota Sioux is a complicated one filled with attempts to keep their culture, religion, and language, while also trying to adapt to a more permanent, and less nomadic, way of life. A Lakota song, sung at festivals and celebrations, summarizes this challenge:

> (In Lakota)
> Maȟpiya Luta, Lakotamayaši na
> Iyotiyewakiye lo.
> Oyate kin heyakeyape lo.
>
> (In English)
> Red Cloud, you told me to be an Indian
> But it's hard to do.
> That's what the people are saying.
>
> (Powers 1977, 155).

CHAPTER 3

VERBAL FLUENCY

3.1 Basics of Verbal Fluency

The definition of the term "verbal fluency" means different things to different people. In the field of speech-language pathology, "fluency" is most often used when describing a person who stutters and has a "fluency disorder" or is "dysfluent." Instead of "verbal fluency," the term often used by speech-language pathologists is "generative naming" or "divergent naming." For the purpose of this study, the definition of Patterson (2008, 105) best describes verbal fluency tasks "[they] are category-naming tasks that obligate divergent thinking within one's semantic space." Patterson's definition is most commonly used by speech-language pathologists, neuropsychologists, and researchers.

There are several types of verbal fluency: semantic fluency, phonemic fluency (occasionally called letter fluency or initial letter fluency), verb or action fluency, and more recently, excluded letter fluency. Typically each of these tasks requires the participant to complete the task in sixty seconds. In the semantic fluency task, individuals are asked to name words from a specific semantic category. Common categories include colors, animals, towns, and fruits (Issacs and Kennie 1973). The phonemic fluency task involves having participants name words beginning with a specific letter, such as F. Although the word *phonemic* indicates relating to sounds, phonemic fluency tasks

actually explore a person's ability to state words beginning with a certain letter when written orthographically. Words such as *phone* which phonetically begin with /f/ would not count in an F phonemic fluency task since these words begin with a P orthographically. Unlike phonemic fluency tasks, excluded letter fluency tasks sound just like its name. For these tasks, the participants are asked to name as many words as they can that are not spelled with a specific letter such as E or A. Verb or action fluency tasks ask participants to name verbs or action words. The specific categories and letters vary and are chosen by the professionals giving the task.

Each of these verbal fluency tasks originated from a similar task in the mid-1900s. In 1938, Louis Leon Thurstone published his work *Primary Mental Abilities* in which he describes seven primary mental abilities including "word fluency." The origins of verbal fluency tasks can be linked to Thurstone's Primary Mental Abilities Test, and more specifically, to the Word Fluency Test portion (Thurstone 1938). Unlike modern day verbal fluency tasks which require participants to verbally state the words, Thurstone's evaluation required participants to write as many words as they could think of beginning with a specific letter in five minutes (Tombaugh, Kozak, and Rees 1999, 168). In the early 1960s, Thurstone's word fluency evaluation evolved into a phonemic fluency task with the letters F, A, and S (Bechtoldt, Benton, and Fogel 1962). Questioning the best letters to use, Borkowski, Benton, and Spreen (1967) evaluated twenty-four of the twenty-six letters of the English alphabet, excluding X and Z. They classified three ranks of difficulty: easy (H, D, M, W, A, B, F, P, T, C, S), moderate (I, O, N, E, G, L, R), and hard (Q, J, V, Y, K, U) (Borkowski, Benton, and Spreen 1967). This research provided

invaluable insight into attempts to establish consistency for future verbal fluency tests for standardized neurological evaluations.

Verbal fluency tasks are commonly part of neurological evaluations to determine if a problem is present and are performed by physicians, neuropsychologists, psychologists, occupational therapists, and speech-language pathologists, among others. One common test, the Montreal Cognitive Assessment (Nasreddine et al. 2005), includes a phonemic fluency task and requires the participant to name eleven words or more in one minute in order to receive a point to add to the total score. The original version of the Montreal Cognitive Assessment requires participants to name words beginning with the letter F, while alternate versions ask participants to name words beginning with the letter S or B (Nasreddine et al. 2005). All of these letters are considered to be an easy difficulty level according to the work by Borkowski, Benton, and Spreen (1967).

In addition to determining whether or not a patient presents with a neurological deficit, verbal fluency tasks in standardized assessments can play a role in determining how much impairment is present. The Boston Diagnostic Aphasia Examination (Goodglass and Kaplan 1983) uses a semantic fluency task to help quantify the severity of language deficits with individuals who have suspected aphasia, an expressive and/or receptive language disorder caused by a neurological injury. The Neurosensory Center Comprehensive Examination for Aphasia (Spreen and Benton 1969) and later the Multilingual Aphasia Examination (Benton and Hamsher 1983) also evaluate aphasia deficits, but both examinations chose to use a phonemic fluency task instead of a semantic fluency task like the Boston Diagnostic Aphasia Examination uses. Professionals attempting to determine the impact of dementia may use the Arizona

Battery for Communication Disorders of Dementia (Bayles and Tomoeda 1993) which includes a semantic fluency task for individuals with suspected dementia.

Besides evaluating for the presence of a neurological disorder and determining the severity of deficits, the results of verbal fluency tasks are also used as predictors of future neurological deficits. Early intervention for suspected developing neurological deficits can build a person's cognitive reserve and may delay the onset of these diseases and/or reduce the severity. Verbal fluency tasks have also been used as a way to analyze differences among languages. By completing semantic, phonemic, and excluded letter fluency tasks with varying peoples around the world, linguists, neuropsychologists, and cognitive scientists have a greater understanding of semantics, communication, and the role of the brain. Interestingly, the average number of responses for semantic fluency tasks stated in a single minute is not identical across languages. The following sections will explore the evaluation procedures and normative data for verbal fluency tasks in languages around the world.

3.2 Rules for Administering & Scoring Verbal Fluency Tasks

Although it is generally agreed upon that individuals participating in verbal fluency tasks are given only sixty seconds to complete each task, the precise requirements on what constitutes an accurate response varies among studies. Table 1. summarizes responses which were or were not allowed for several semantic studies:

Table 1. Semantic Task Scoring Criteria from Literature Review

Author and Year	**Gender Variations**	**Age Variations**	**Species Variations**	**Other Comments**
Cavaco et al. (2013)	Not Allowed	Not Allowed	Not Allowed	
Peña-Casanova et al. (2009)			Not Allowed	
Kavé (2005)	Not Allowed	Allowed	Not Allowed	
Tallberg et al. (2008)			Allowed	
Elkadi et al. (2006)				Allowed each unique animal name
Khalil (2010)				Avoid alternative names

As can be seen from the table, some studies such as Cavaco et al. (2013), Peña-Casanova et al. (2009), and Kavé (2005) did not allow both supra-ordinations and subspecies to count as acceptable responses, while Tallberg et al. (2008) did allow this. Several empty boxes in the table indicate the author(s) of the study did not specifically specify if responses such as gender or age variations counted as an appropriate response. Two studies, Elkadi et al. (2006) and Kahlil (2010), provided general instructions regarding which answers were allowed. Please refer to Appendix B for additional information on semantic verbal fluency scoring criteria.

Unfortunately, discrepancies also exist for phonemic fluency tasks, although more similarities in scoring are evident than in the semantic fluency tasks. Table 2. breaks down possible responses and how they were scored:

Table 2. Phonemic Task Scoring Criteria from Literature Review

Author and Year	Root Variations	Numbers	Slang	Common Foreign Words	Homonyms (if said both meanings)	Proper Nouns
Cavaco et al. (2013)	Not Allowed	Allowed 1 Response	Allowed	Allowed	Allowed	
Peña-Casanova et al. (2009)	Not Allowed					Not Allowed
Tallberg et al. (2008)	Not Allowed		Allowed		Allowed	Not Allowed
Khalil (2010)	Not Allowed					Not Allowed
Costa et al. (2013)	Not Allowed					Not Allowed
Kosmidis et al. (2004)	Not Allowed					Not Allowed
Ratcliff et al. (1998)	Not Allowed	Not Allowed				Not Allowed
Cauthen (1978)	Not Allowed	Not Allowed				Not Allowed
Machado et al. (2009)	Not Allowed			Allowed	Allowed	Not Allowed
Tombaugh, Kozak, and Rees (1999)	Not Allowed					Not Allowed
Gladsjo et al. (1999)	Not Allowed					Not Allowed
Kavé (2005)			Allowed	Allowed	Allowed	

The majority of studies only gave participants credit for the first answer if multiple answers were given containing the same root word (e.g., love, loves, loving) (Cavaco et al. 2013, 264; Peña-Casanova et al. 2009, 398; Tallberg et al. 2008, 481; Khalil 2010, 1031; Costa et al. 2013; Kosmidis et al. 2004; Ratcliff et al. 1998, 118; Cauthen 1978, 127; Machado et al. 2009, 56; Tombaugh, Kozak, and Rees 1999, 169; Gladsjo et al. 1999, 151). Proper nouns were also not allowed by the majority of studies reviewed (Peña-Casanova et al. 2009, 398; Tallberg et al. 2008, 481; Khalil 2010, 1031; Machado et al. 2009, 56; Gladsjo et al. 1999, 151; Costa et al. 2013; Kosmidis et al. 2004, 165; Ratcliff et al. 1998, 117-8; Cauthen 1978, 127; Tombaugh, Kozak, and Rees 1999, 169). As with the semantic tasks table, empty boxes in this table indicate information was not stated regarding the potential responses. Please refer to Appendix B for additional information on phonemic verbal fluency scoring criteria.

In addition to incongruities regarding the criteria for correct responses, studies varied by what participants were included or excluded based on education levels. Cavaco et al. (2013, 263) excluded individuals with less than or equal to four years of education from phonemic verbal fluency tasks. Cavaco et al. (2013, 263) reasoned that spelling is learned in a classroom and participants with limited education would not be able to score as well as other participants. Although individuals with limited education were excluded from phonemic verbal fluency tasks, Cavaco et al. (2013, 263) decided to include these participants in semantic animal naming tasks as they believed learning about animals is learned in early childhood and outside the classroom. In their Greek study, Kosmidis et al. (2004, 169) chose to exclude individuals that were illiterate and had no formal education. Ratcliff et al. (1998, 116) specifically chose illiterate and uneducated individuals for their study of semantic and phonemic fluency tasks. Their participants did very poorly on phonemic fluency tasks, even when instructions were changed from asking participants to name words beginning with a specific letter to words beginning with a specific sound (Ratcliff et al. 1998, 117). In their Portuguese study, Machado et al. (2009, 56) also excluded illiterate individuals.

The instructions given to participants in order to complete each of the tasks also varied from study to study. In Table 3., a comparison of some of the main themes in the instructions is provided:

Table 3. Semantic and Phonemic Task Instructions from Literature Review

Author and Year	Prompted	Focused on Speed	Gave an Example	Participants Decided Category Members	Said Length of Test
Peña-Casanova et al. (2009)	Yes; After 10 seconds				
Elkadi et al. (2006)		Yes	Yes		Yes
Tombaugh, Kozak, and Rees (1999)					
Tallberg et al. (2008)				Yes	
Khalil (2010)					
Costa et al. (2013)			Yes		
Kosmidis et al. (2004)		Yes			
Ratcliff et al. (1998)			Yes		
Gladsjo et al. (1999)					

For semantic animal naming tasks, each study asked their participants to name animals, but, as can be seen from the table, some studies focused on speed of completing the task while others wanted to ensure understanding by providing an example. Three studies, Tombaugh, Kozak, and Rees (1999), Khalil (2010), and Gladsjo et al. (1999), did not have any information included in the table, although the instructions they gave their participants was included in their studies. More detailed information regarding the specific instructions given by these studies can be found in Appendix C. The scoring criteria, participants in the study, and instructions for the verbal fluency tasks varied from study to study, and the results did as well. The next section will review several studies and the results of verbal fluency tasks completed in languages around the world.

3.3 Verbal Fluency Tasks & Other Languages

3.3.1 Phonemic Fluency Tasks & Other Languages

The following review of recent studies shows the results of semantic and phonemic verbal fluency tasks in selected languages around the world. In addition to the different languages evaluated, each study had a different number of participants, ages, and educational levels. Table 4. shows a comparison of the languages, number of participants, tasks given, and the potential significance of gender, age, and education on phonemic tasks.

3.3.1.1 Letters Used in Phonemic Tasks

Of the studies which evaluated phonemic fluency tasks, the letters F, A, and S were used in five studies including Portuguese, Swedish, Italian, Canadian English, and American English with Caucasians and African Americans (Machado et al. 2009; Tallberg et al. 2008; Costa et al. 2013; Tombaugh, Kozak, and Rees 1999; Gladsjo et al. 1999). In their Canadian English study, multiple letters were chosen for phonemic fluency tasks including the letters S, G, U, N, F, T, J, and P (Cauthen 1978). A study of elderly American English speakers utilized the letters C, F, and L as these letters are used in some standardized testing (Sumerall et al. 1997). Since the letters F, A, and S are not present or may not occur as frequently in other languages, several studies chose to use their own letters for phonemic verbal fluency tasks. The letters M, P, and R were used in the Spanish and another Portuguese study (Peña-Casanova et al. 2009; Cavaco et al. 2013). Not following traditional phonemic fluency rules, Van der Elst et al. (2006) asked their Dutch participants to name 4-letter words beginning with M. Arabic participants were evaluated using the letters W, R, and G (Khalil 2010). In their Greek study,

Kosmidis et al. (2004) chose the letters (X) Chi, (∑) Sigma, and (A) Alpha. Ratcliff et al. (1998) evaluated the letters P and S in their Haryanvi, a dialect of Hindi, study. Hebrew participants were asked to name three letters: *bet* /b/, *gimel* /g/, and *shin* /ʃ/ (Kavé 2005).

3.3.1.2 Phonemic Tasks & Gender

Although the letters chosen for phonemic fluency tasks varied, similarities can be found in the results of these studies. For the majority of studies, gender did not have an effect (Cavaco et al. 2013; Machado et al. 2009; Tallberg et al. 2008; Khalil 2010; Kosmidis et al. 2004; Van der Elst et al. 2006; Kavé 2005; and Gladsjo et al. 1999). However, in their Italian study, Costa et al. (2013) found that females scored better than males did in F, A, and S phonemic fluency tasks. A slight improvement for females over males was also seen in one of the Canadian English studies (Tombaugh, Kozak, and Rees 1999). The remaining studies did not discuss gender effects, perhaps because this was not evaluated or no effects were observed.

Table 4. Phonemic Task Results from Literature Review

Author & Year	**Language**	**Number of Participants**	**Letters Used**	**Responses Varied Based on Gender**	**Responses Varied Based on Age**	**Responses Varied Based on Education**
Cavaco et al. (2013)	Portuguese	950 Ages 18-98	M, R, & P	No	Yes	Yes
Machado et al. (2009)	Portuguese	345 Ages 60-93	F, A, & S	No	No	Yes
Peña-Casanova et al. (2009)	Spanish	346 Ages 50-94	M, R, & P	No	Yes	Yes
Tallberg et al. (2008)	Swedish	165 Ages 16-89	F, A, & S	Yes	Yes	Yes
Khalil (2010)	Arabic	215 Ages 18-59	W, R, & G	No	Yes	Yes
Costa et al. (2013)	Italian	335 Ages 20-90	F, A, & S	Yes	Yes	Yes
Kosmidis et al. (2004)	Greek	300 Ages 18-79	(X) Chi, (∑) Sigma, & (A) Alpha	No	Yes	Yes
Ratcliff et al. (1998)	Haryanvi (Hindi dialect)	90 Ages 34-55	P & S			Yes
Van der Elst et al. (2006)	Dutch	1,856 Ages 24-81	4-letter M words	No	Yes	Yes
Kavé (2005)	Hebrew	369 Ages 18-85	*bet* /b/, *gimel* /g/, & *shin* /ʃ/	No	Yes	Yes

Table 4. cont.

Author & Year	Language	Number of Participants	Letters Used	Responses Varied Based on Gender	Responses Varied Based on Age	Responses Varied Based on Education
Tombaugh, Kozak, and Rees (1999)	Canadian English	1,300 Ages 16-95	F, A, & S	Yes	Yes	Yes
Sumerall et al. (1997)	American English	47 Ages 70-95	C, F, & L			Yes
Gladsjo et al. (1999)	Caucasian & African American English	768 Ages 20-101	F, A, & S	No	No	Yes
Cauthen (1978)	Canadian English	115 Ages 20-94	S, G, U, N, F, T, J, & P	No	Yes	Yes

3.3.1.3 Phonemic Tasks & Age

Age, with older individuals naming fewer words than the younger participants, was also a pattern observed with phonemic fluency tasks (Cavaco et al. 2013; Peña-Casanova et al. 2009; Khalil 2010; Costa et al. 2013; Kavé 2005; Tombaugh, Kozak, and Rees 1999). Age was not a significant predictor for phonemic fluency responses in Swedish speakers (Tallberg et al. 2008). Unlike the Tallberg et al. (2008) Swedish study, the Hebrew study by Kavé (2005) showed that age was the only significant predictor for phonemic fluency tasks. Although an important factor in their study with Greek participants, age did not have as large an impact as higher education levels did (Kosmidis et al. 2004). Age did not have an impact on the Dutch participants until after age fifty when the number of responses began to decline (Van der Elst et al. 2006). Age did not play a consistent role in the linear regression model for Brazilian individuals in the Portuguese study (Machado et al. 2009). For Canadian English speaking participants aged twenty to fifty-nine, age was not a factor (Cauthen 1978). In older individuals, those with higher IQs (ratings from 119-140) scored comparably with younger participants, but the same cannot be said for older individuals with lower IQs (Cauthen 1978).

3.3.1.4 Phonemic Tasks & Education

Education also plays a crucial role in phonemic fluency tasks. Higher levels of education resulted in more words produced (Cavaco et al. 2013; Peña-Casanova et al. 2009; Khalil 2010; Costa el al. 2013; Kosmidis et al. 2004; Ratcliff et al. 1998; Kavé 2005; Tombaugh, Kozak, and Rees 1999; Machado et al. 2009; Gladsjo et al. 1999). Length of education was a significant predictor for the Swedish and Dutch participants in

phonemic fluency tasks (Tallberg et al. 2008; Van der Elst et al. 2006). In their Dutch study, Van der Elst et al. (2006) discovered that the differences in number of words produced based on educational levels was not linear. Specifically, there was less of a difference between the number of words produced by average educated and high educated individuals than between average educated and low educated Dutch participants (Van der Elst et al. 2006). Similarly, Canadian English speaking participants showed the least amount of change between groups of thirteen to sixteen years of education and seventeen to twenty-one years of education (Tombaugh, Kozak, and Rees 1999, 170). In the American English study, participants with sixteen years of education or more produced additional responses than did those with less education (Sumerall et al. 1997). Education played a greater role than age did in Portuguese phonemic fluency tasks (Cavaco et al. 2013). In his study with Greek participants, Kosmidis et al. (2004) believed greater education levels had a larger impact on phonemic verbal responses than age. Please see Appendix D for additional information.

3.3.2 Semantic Fluency Tasks & Other Languages

Table 5. shows comparisons of studies from languages around the world, the number of participants, the tasks completed, and the possible significance of gender, age, and education on semantic verbal fluency tasks.

Table 5. Semantic Task Results from Literature Review

Author & Year	Language	Number of Participants	Categories Used	Responses Varied Based on Gender	Responses Varied Based on Age	Responses Varied Based on Education
Cavaco et al. (2013)	Portuguese	950 Ages 18-98	animals	No	Yes	Yes
Peña-Casanova et al. (2009)	Spanish	346 Ages 50-94	animals, fruits & vegetables, & kitchen tools	Yes	Yes	Yes
Tallberg et al. (2008)	Swedish	165 Ages 16-89	animals	Yes	Yes	Yes
Khalil (2010)	Arabic	215 Ages 18-59	animals	No	Yes	Yes
Costa et al. (2013)	Italian	335 Ages 20-90	animal, color, & fruit	Yes	Yes	Yes
Kosmidis et al. (2004)	Greek	300 Ages 18-79	animals, fruit, & objects	Yes	Yes	Yes
Ratcliff et al. (1998)	Haryanvi (Hindi dialect)	90 Ages 34-55	animals & fruits			Yes
Van der Elst et al. (2006)	Dutch	1,856 Ages 24-81	animals & professions	Yes	Yes	Yes
Kavé (2005)	Hebrew	369 Ages 18-85	animals, fruit & vegetables, & vehicles	No	Yes	Yes

Table 5. cont.

Author & Year	Language	Number of Participants	Categories Used	Responses Varied Based on Gender	Responses Varied Based on Age	Responses Varied Based on Education
Gladsjo et al. (1999)	Caucasian & African American English	768 Ages 20-101	animals	No	Yes	Yes
Elkadi et al. (2006)	Australian English	257 Ages 56-67	animals	N/A	No	Yes
Lee, Yuen, and Chan (2002)	Cantonese	475 Ages 13-46	animals, fruits & vegetables, emotions,& musical instruments	No	No	Yes
Ryu et al. (2012)	Korean	3,025 Ages 60-96	animals	No	Yes	Yes
Wang et al. (2011)	Han Chinese	465 Ages 16-75	animals	No	Yes	Yes
Stewart et al. (2001)	Caucasian & African Caribbean English	285 Ages 55-75	animals	Yes	Yes	Yes
Capitani, Laiacona, and Barbarotto (1999)	Italian	266 Ages 18-96	animals, fruits, tools, & vehicles	Yes	Yes	Yes
Ostrosky-Solis et al. (2007)	Spanish	2,011 Ages 16-96	animals	No	Yes	
Tombaugh, Kozak, and Rees (1999)	Canadian English	1,300 Ages 16-95	animals	Yes	Yes	Yes

3.3.2.1 Categories Used in Semantic Tasks

Unlike the differences seen in the letters chosen for the phonemic fluency tasks, the topics for semantic fluency tasks was much more consistent. Nine of the studies chose to evaluate animals including Portuguese, Spanish, Australian English, Swedish, Arabic, Han Chinese from mainland China, Korean, Canadian English, American English in Caucasians and African Americans, and British English in African Caribbean individuals (Cavaco et al. 2013; Ostrosky-Solis et al. 2007; Elkadi et al. 2006; Tallberg et al. 2008; Khalil 2010; Wang et al. 2011; Ryu et al. 2012; Tombaugh, Kozak, and Rees 1999; Gladsjo et al. 1999; Stewart et al. 2001). Peña-Casanova et al. (2009) evaluated animals, fruits and vegetables, and kitchen tools in their Spanish study. In their Hong Kong Chinese (Cantonese) study, Lee, Yuen, and Chan (2002) asked their adolescent participants to name animals, fruits and vegetables, emotions, and musical instruments, and the adult participants to name animals and fruits and vegetables. Costa et al. (2013) evaluated Italians' abilities to name animal, color, and fruit semantic categories, while Capitani, Laiacona, and Barbarotto (1999) examined animals, fruits, tools, and vehicles in their Italian study. Greek individuals were asked to name animals, fruits, and objects (Kosmidis et al. 2004). Animals and fruits were the chosen categories by Ratcliff et al. (1998) in their examination of Haryanvi speakers. In addition to animals, Van der Elst et al. (2006) also evaluated professions in their Dutch subjects. For the Hebrew study, Kavé (2005) looked at the number of animals, fruit and vegetables, and vehicles participants could say in a single minute. Every study reviewed which evaluated semantic fluency tasks included an evaluation of animal production.

3.3.2.2 Semantic Tasks & Gender

The majority of studies showed that gender did not have a significant impact on semantic naming tasks for animals (Cavaco et al. 2013; Ostrosky-Solis et al. 2007; Peña-Casanova et al. 2009; Tallberg et al. 2008; Khalil 2010; Wang et al. 2011; Lee, Yuen, and Chan 2002; Kosmidis et al. 2004; Ryu et al. 2012; Van der Elst et al. 2006; Kavé 2005; Gladsjo et al. 1999). Men were found to name more animals than females in the Canadian English speaker study by Tombaugh, Kozak, and Rees (1999). Likewise, females produced fewer results than did males on semantic verbal fluency tasks for British English African Caribbean participants (Stewart et al. 2001, 524). In their Italian study, Costa et al. (2013) found that females scored better than males did for animal naming, the exact opposite of the Tombaugh, Kozak, and Rees (1999) and Stewart et al. (2001) findings. Other semantic categories had greater discrepancies. When naming fruits and vegetables as well as kitchen tools, Spanish women were able to name slightly more in these categories than their male participants were (Peña-Casanova et al. 2009). Females named more fruits than the male participants did in the Greek study, but this gender difference was not seen when the participants named animals or objects (Kosmidis et al. 2004). Gender was not a significant main effect for animals, fruits and vegetables, emotions, or musical instruments in individuals speaking Hong Kong Chinese, specifically Cantonese (Lee, Yuen, and Chan 2002). Of the four categories evaluated by Capitani, Laiacona, and Barbarotto (1999), men named more tools and women named more fruits, but when considering the results of all four tasks together, gender differences were not seen. Dutch males scored higher than females on the profession semantic task, but gender did not play a role in the animal semantic task (Van der Elst et al. 2006).

3.3.2.3 Semantic Tasks & Age

As seen in phonemic fluency tasks, an important factor in semantic fluency tasks was age with older individuals naming fewer animals than their younger participants (Cavaco et al. 2013; Ostrosky-Solis et al. 2007; Peña-Casanova et al. 2009; Khalil 2010; Wang et al. 2011; Costa et al. 2013; Kosmidis et al. 2004; Ryu et al. 2012; Van der Elst et al. 2006; Kavé 2005; Tombaugh, Kozak, and Rees 1999; Gladsjo et al. 1999; Capitani, Laiacona, and Barbarotto 1999; Stewart et al. 2001). Age was a significant predictor for Swedish, Hebrew, and Dutch participants in semantic fluency tasks (Tallberg et al. 2008; Kavé 2005; Van der Elst et al. 2006). A linear decline in number of answers given was seen for semantic animal naming in Dutch participants (Van der Elst et al. 2006). For Canadian English speakers, age did not affect number of responses until around age sixty (Tombaugh, Kozak, and Rees 1999). Age had a greater effect for Hebrew participants completing semantic fluency tasks versus phonemic fluency tasks (Kavé 2005). Khalil (2010, 1033) in his work with Arabic speakers also discovered mean differences for age groups was greater in his animal naming semantic fluency task than phonemic fluency tasks where he required participants to name words beginning with W, R, and G.

3.3.2.4 Semantic Tasks & Education

Education also had an impact on semantic fluency tasks, as it did with phonemic fluency tasks, with higher levels of education resulting in greater number of words produced (Cavaco et al. 2013; Ostrosky-Solis et al. 2007; Peña-Casanova et al. 2009; Elkadi et al. 2006; Khalil 2010; Wang et al. 2011; Lee, Yuen, and Chan 2002; Costa et al. 2013; Ryu et al. 2012; Van der Elst et al. 2006; Kavé 2005; Tombaugh, Kozak, and Rees

1999; Gladsjo et al. 1999; Capitani, Laiacona, and Barbarotto 1999; Stewart et al. 2001). Education levels did not result in greater number of responses for semantic fruit and vegetables or kitchen tools naming tasks, but was seen for animal naming tasks (Peña-Casanova et al. 2009). Education was a significant predictor for Swedish participants (Tallberg et al. 2008). Kosmidis et al. (2004) felt higher education had a greater impact on their Greek participants' number of responses than age did. Kavé (2005) found with his Hebrew participants that both age and level of education predicted semantic fluency tasks. When comparing phonemic fluency tasks to semantic fluency tasks, higher education levels played a greater role with phonemic fluency tasks, although it was important for both tasks (Ratcliff et al. 1998). For individuals with at least twelve years education, scores were higher for animal semantic naming tasks (Elkadi et al. 2006, 39). Please see Appendix D for more specific information.

3.3.3 Impact of Other Factors in Verbal Fluency Tasks

Although the majority of studies focused on gender, age, and education, as described above, some studies chose to evaluate other possible factors that may affect number of words produced. Mood did not have a significant relationship for semantic animal naming tasks in Australian English speaking women (Elkadi et al. 2006). The Ratcliff et al. (1998) study of Haryanvi largely illiterate and uneducated speakers revealed more accurate responses for semantic fluency tasks than for phonemic fluency tasks. In fact, 26% of these participants were unable to name any words beginning with a specific sound during the phonemic fluency portion of the evaluation (Ratcliff et al. 1998). In his study of Canadian English speakers, Cauthen (1978) suggests that age alone

does not have as great an impact on phonemic fluency scores as intelligence does. Specifically, Cauthen (1978) found that participants over age sixty who scored in the highest IQ range (119-140) scored comparably with younger participants, but this was not seen for older individuals with lower IQ scores. High scores on the Mini-mental State Examination have been connected with higher numbers of F, A, and S words produced by participants during phonemic verbal fluency tasks (Machado et al. 2009). Intelligence scores may also have an impact on semantic animal naming tasks. Tombaugh, Kozak, and Rees (1999) discovered a positive correlation between the number of animals Canadian English speaking participants named and vocabulary scores on the Wechsler Adult Intelligence Scale – Revised (WAIS-R).

Attention has also been given to how quickly participants name words within the tasks, errors made during the tasks, and comparisons between semantic and phonemic verbal fluency tasks. By evaluating the number of appropriate responses in fifteen second intervals, Elkadi et al. (2006) discovered the mean number of words for Australian English speaking women was around ten words for the initial fifteen seconds and decreased to approximately three words during the last fifteen seconds of the one minute animal semantic naming task. Perseveration errors, or the number of repeated words, were examined in the Arabic study (Khalil 2010). The mean for perseveration in all the phonemic naming tasks was 0.20, while the mean for animal naming perseveration errors was 2.13 (Khalil 2010). Individuals had a more difficult time not repeating themselves in semantic versus phonemic naming tasks, possibly due to the fact that there are fewer possible correct answers for animal naming than phonemic naming tasks. Kosmidis et al. (2004) also noted that greater number of repetitions of words during a task was seen in

more highly educated participants. The frequency of participants who repeated themselves within thirty seconds after the initial response, known as proximal perseverations, and the number of participants who repeated themselves thirty seconds after the initial response, known as distal perseverations, were 23% and 28%, respectively (Sumerall et al. 1997). Surprisingly, 40% of participants named words using the same stem in the phonemic fluency task, despite being specifically asked not to do this (Sumerall et al. 1997). Almost 13% named proper nouns, in spite of instructions prohibiting them (Sumerall et al. 1997). In the Italian study, more responses were seen for semantic fluency tasks than phonemic fluency tasks (Costa et al. 2013). The letters used for phonemic fluency tests does impact the number of words produced according to the Tombaugh, Kozak, and Rees (1999) study. Cauthen (1978) might disagree, as this Canadian study found that the correlation between more frequently occurring letters at the beginning of words to less frequently occurring letters at the beginning of words does not vary based on participants' IQs.

More recently, focus has been shifted to bilingual participants and participants from various ethnic groups. Gladsjo et al. (1999) completed a study with Caucasian and African American native English speakers. They learned that the results for these two groups varied based on education levels and ethnicity (Gladsjo et al. 1999). Unfortunately, limited normative data is available on the various ethnic groups around the world, and often these groups are compared to the ethnic majority. The Gladsjo et al. (1999) study showed if African Americans were treated as if they were Caucasians, a high false positive rate resulted. In fact, the false positive rate was greater than two times the accepted rate for false positives (Gladsjo et al. 1999). A study of African Caribbean

British English speakers revealed this population named fewer animals during semantic verbal fluency tasks than did African Americans when compared with other studies (Stewart et al. 2001). Not only is the majority ethnic group, Caucasian, different from other ethnic groups, such as African American, the study by Stewart et al. (2001) shows there is not simply a distinction from majority and minority ethnic groups, but also among minority ethnic groups.

The preceding literature review summarized studies from the following languages: Portuguese, Spanish, Australian English, Swedish, Arabic, Han Chinese in mainland China, Hong Kong Chinese Cantonese, Italian, Greek, Korean, Haryanvi a dialect of Hindi, Dutch, Hebrew, Canadian English, American English, American English in both Caucasians and African Americans, and British English in African Caribbean individuals. Please see Appendix D for additional information. The following section will discuss research on bilinguals and verbal fluency tasks.

3.4 Verbal Fluency Tasks and Bilingual Speakers

Many factors may affect verbal fluency test results including gender, age, and education, although results of the impact of these categories varies from study to study and language to language. The following studies evaluated bilingual speakers to determine what, if any, impact speaking more than one language has on phonemic and semantic verbal fluency tasks.

Although the majority of the studies examined their participants in English, bilingual participants spoke numerous different languages. In the Luo, Luk, and Bialystok (2010) study, eighteen different languages were represented in addition to English

including French, Cantonese, Hebrew, Hindi, Italian, Punjabi, Farsi, Gujarati, Japanese, Korean, Mandarin, Pakistan, Portuguese, Spanish, Tagalog, Tamil, Toisan, and Urdu. Russian, Korean, Chinese, Spanish, Japanese, Creole, Polish, or Portuguese were the other languages besides English which were spoken in the Portocarrero, Burright, and Donovick (2007) study. Participants in the de Picciotto and Friedland (2001) research spoke English and Afrikaans. The Kamat et al. (2012) participants spoke Marathi and Hindi. Rosselli et al. (2002), Rosselli et al. (2000), Gollan, Montoya, and Werner (2002), and Sandoval et al. (2010) chose to examine bilinguals fluent in English and Spanish.

3.4.1 Phonemic Fluency Tasks & Bilingual Speakers

Table 6. compares phonemic verbal fluency studies completed on bilingual speakers and includes the author, language, number of participants, tasks completed, and potential differences in the number of words named between monolingual and bilingual participants.

Table 6. Phonemic Task Results for Bilingual Studies

Author & Year	**Language Tested In**	**Number of Participants**	**Task Details**	**Bilingual Differences**
Luo, Luk, and Bialystok (2010)	English	60 Ages 18-22	F, A, & S	Yes
Portocarrero, Burright, and Donovick (2007)	English	78 undergraduates	F, A, & S	No
Rosselli et al. (2002)	English & Spanish	82 Ages 50-84	F, A, & S	No
Rosselli et al. (2000)	English & Spanish	82 Ages 50-84	F, A, & S	No
Gollan, Montoya, and Werner (2002)	English	60 Ages 18-22	A, E, L, M, D, F, R, P, S,& C	Yes
Kamat et al. (2012)	Marathi	174 Ages 18-60	/p/ [‘paa’], /ɑ/ [‘a’], & /s/ [‘saa’]	N/A no monolinguals tested
Sandoval et al. (2010)	English	60 Ages 16-25	24 double letters	Yes

3.4.1.1 Letters Used in Phonemic Tasks

Many of the studies examined asked their participants to name the letters F, A, and S during phonemic fluency tasks (Luo, Luk, and Bialystok 2010; Portocarrero, Burright, and Donovick 2007; Rosselli et al. 2002; Rosselli et al. 2000). Gollan, Montoya, and Werner (2002) had their participants name words beginning with the following letters: A, E, L, M, D, F, R, P, S, and C. Twenty-four double letter combinations were required for individuals participating in the Sandoval et al. (2010) study.

3.4.1.2 Comparisons of Monolingual and Bilingual Participants

Monolinguals named the same number of words as bilingual participants did in the following studies: Portocarrero, Burright, and Donovick (2007); Rosselli et al. (2002); and Rosselli et al. (2000). Gollan, Montoya, and Werner (2002) and Sandoval et al. (2010) found bilingual subjects named fewer responses than monolinguals did. Luo, Luk, and Bialystok (2010) discovered bilinguals with high vocabularies named more words than monolinguals or other bilinguals with low vocabularies. No differences were seen between the monolinguals and low vocabulary bilingual groups (Luo, Luk, and Bialystok 2010).

3.4.2 Semantic Fluency Tasks & Bilingual Speakers

Table 7. compares semantic verbal fluency studies completed on bilingual speakers and includes the author, language, number of participants, tasks completed, and potential differences in the number of words named between monolingual and bilingual participants.

Table 7. Semantic Task Results for Bilingual Studies

Author & Year	**Language Tested In**	**Number of Participants**	**Task Details**	**Bilingual Differences**
Luo, Luk, and Bialystok (2010)	English	60 Ages 18-22	clothing items & female names	No
Portocarrero, Burright, and Donovick (2007)	English	78 undergraduates	animals & items found in a kitchen	Yes
Rosselli et al. (2002)	English & Spanish	82 Ages 50-84	animal	Yes
Rosselli et al. (2000)	English & Spanish	82 Ages 50-84	animal & fruit	Yes

Table 7. cont.

Author & Year	Language Tested In	Number of Participants	Task Details	Bilingual Differences
Gollan, Montoya, and Werner (2002)	English	60 Ages 18-22	occupations requiring an advanced degree, countries in Europe, things that have wheels, musical instruments, vegetables, college majors, sports, fruits, colors, clothing, countries, & animals	Yes
Kamat et al. (2012)	Marathi	174 Ages 18-60	animals	N/A no monolinguals tested
Sandoval et al. (2010)	English	60 Ages 16-25	15 categories	Yes
de Picciotto and Friedland (2001)	English & Afrikaans	30 Ages 60-95	animal	Yes

3.4.2.1 Categories Used in Semantic Tasks

Semantic tasks in the Luo, Luk, and Bialystok (2010) study included clothing items and female names. Gollan, Montoya, and Werner (2002) asked participants to complete the following twelve semantic tasks: occupations that require an advanced degree, countries in Europe, things that have wheels, musical instruments, vegetables, college majors, sports, fruits, colors, clothing, countries, and animals. The Sandoval et al. (2010) study examined fifteen different categories. Animals and items found in a kitchen were examined by Portocarrero, Burright, and Donovick (2007), while animals and fruits were evaluated by Rosselli et al. (2000, 18). De Picciotto and Friedland (2001), Rosselli et al. (2002), and Kamat et al. (2012) focused only on animals in their studies.

3.4.2.2 Comparisons of Monolingual and Bilingual Participants

No differences between monolingual or bilingual participants were found in the Luo, Luk, and Bialystok (2010) study. According to the research completed by Portocarrero, Burright, and Donovick (2007), monolinguals named more words than bilinguals, but only on the semantic animal naming task. Sandoval et al. (2010) as learned that monolinguals generated more words than bilinguals did on fifteen semantic tasks. Rosselli et al. (2002) found that bilingual speakers named fewer animals compared to monolingual English speakers, but the same number of words when compared to monolingual Spanish speakers. Bilingual speakers named fewer fruits and animals when compared to monolingual English speakers and fewer fruits when compared to monolingual Spanish speakers (Rosselli et al. 2000, 18). The bilingual participants in the Gollan, Montoya, and Werner (2002) study named fewer words than monolinguals on all twelve semantic tasks. A correlation between the languages participants said they spoke most frequently did not impact in which language they named the most animals (de Picciotto and Friedland 2001). Kamat et al. (2012) found a correlation between self-rating of fluency in Marathi and Hindi and increased scores on animal semantic naming tasks. Please refer to Appendix E for additional information.

The preceding paragraphs describe the two main types of verbal fluency tasks being completed with bilingual participants. In one type of study, the specific languages the bilinguals speak do not matter as all tasks are completed in a single language. These studies evaluate monolinguals and bilingual speakers in a single language with the belief that bilinguals, due to the very nature of knowing two languages, exhibit a difference in verbal fluency tasks than monolinguals do. The second type of study focuses on a

specific language and compares the results of bilinguals on verbal fluency tasks in two separate languages to results of monolinguals in both languages. These studies often focus on determining differences among specific languages and creating normative data for bilingual speakers.

On verbal fluency and other naming tasks, bilingual speakers may or may not have an advantage due to their bilingualism. In their article, "Does Bilingualism Hamper Lexical Access in Speech Production," Ivanova and Costa (2008) evaluate the belief that bilingualism negatively impacts language production. The study evaluated the speed at which participants named fifty pictures of both high-frequency and low-frequency words (Ivanova and Costa 2008, 279). Participants had the same ranges of age and education levels (Ivanova and Costa 2008, 279) and included monolingual Spanish speakers, bilingual Spanish Catalan bilinguals where Spanish was the dominant and earliest learned language, and bilingual Catalan Spanish speakers where Catalan was the dominant and earliest learned language (Ivanova and Costa 2008, 278-9). Ivanova and Costa (2008, 281) hoped to determine if bilinguals speaking their dominant and earliest learned language (Spanish) were able to name pictures as quickly as the Spanish monolingual participants. In addition, they hoped to see if there was a difference between Spanish Catalan bilinguals naming pictures in Spanish, their dominant and first learned language, and Catalan Spanish bilinguals naming pictures in Spanish, their second language (Ivanova and Costa 2008, 281). Results revealed that Spanish monolinguals had faster response times than bilingual Spanish Catalan speakers, even though Spanish was the preferred and dominant language for both groups (Ivanova and Costa 2008, 281). The response speeds showed greater discrepancy between monolinguals and bilinguals

naming low-frequency words than high-frequency words (Ivanova and Costa 2008, 282). When comparing the bilingual speeds, as predicted by Ivanova and Costa (2008, 282), Spanish Catalan bilinguals had a faster response time than Catalan Spanish bilinguals.

Ameel et al. (2005, 62) also chose to evaluate word naming and categorization of picture cards in French monolinguals, Dutch monolinguals, and Dutch French bilinguals living in Belgium and the same culture. The purpose of their study was to determine how bilingual speakers create a semantic map of both languages. Anyone with even limited exposure to a foreign language realizes that the words (i.e., the combination of phonemes) are different from their own language. In addition to the phonetics and phonology, the semantics (i.e., word meanings) may also differ. For example, Malt, Sloman, and Gennari (2003) explain that in English the word *chair* can be a wooden chair or a stuffed arm chair, but in Chinese the Chinese equivalent for *stuffed arm chair* would be *sofa* not *chair*. The relationships and similarities among objects vary from language to language (Ameel et al. 2005, 61). This study utilized compound bilinguals, which Ameel et al. (2005, 62) define as bilinguals who "learn and use their languages interchangeably in the same environment and in the same situations." Two other classifications of bilinguals exist including coordinate bilinguals who use each language in separate environments, and subordinate bilinguals who learn their second language after childhood (Ameel et al. 2005, 62). The first part of their study asked the three group of participants to name pictures of common storage containers (most similar to *bottles* and *jars* in English) and familiar dishes (most similar to *dishes*, *plates*, and *bowls* in English) (Ameel et al. 2005, 64). Participants were then asked to sort the pictures into groups based on similarities with the instructions to think about the containers' physical

properties such as shape, material, and holding capacity (Ameel et al. 2005, 66). For Dutch monolinguals in the naming task, twelve different names were used, with three main groups that made up 74% of the pictures (Ameel et al. 2005, 67). For French monolinguals in the naming task, fifteen different names were used, with three main groups that made up 58% of the pictures (Ameel et al. 2005, 67). For some of the categories, there was a direct correlation from one language to the other, but the category *fles* in Dutch (roughly translated as *bottle* in English) which contained twenty-five objects according to the Dutch monolinguals, were actually separated into two categories in French including *bouteille* (roughly translated as *bottle* in English) and *flacon* (also roughly translated as *bottle* in English) (Ameel et al. 2005, 67). Interestingly, Dutch monolingual speakers did not provide the same name for any individual picture out of the sixty-seven pictures presented, and French monolingual speakers produced the same names from all participants on only four pictures (Ameel et al. 2005, 68). With the sorting pictures into similarities task, the monolingual groups exhibited a high correlation (0.87 for the bottles set and 0.88 for the dishes set) (Ameel et al. 2005, 69). For the naming task, there was a greater similarity among the words used by bilingual speakers than monolingual speakers when performed in the same language (Ameel et al. 2005, 76). The lines between categories also began to blur as influenced by the other language. For example, bilingual Dutch English speakers use the term (*spuit*) *bus* in Dutch only for objects named *spray* in French even though Dutch monolinguals use (*spuit*) *bus* for multiple kinds of bottles (Ameel et al. 2005, 78). According to Ameel et al. (2005, 78), "Hence, for the bilinguals, the category boundary of the Dutch name *bus* is determined by the boundary of the French category name *spray*." In this study, Dutch had a greater

influence on French than the other way around, perhaps because participants rated themselves to be better Dutch speakers than French speakers (Ameel et al. 2005, 78).

Differences have been shown on verbal fluency and other naming tasks between monolingual and bilingual speakers, even when producing responses in the same language. Bilingualism is not the only area being considered by researchers examining verbal fluency tasks. Researchers are also attempting to quantify what is atypical in hopes of providing more accurate and early diagnoses of people with various neurological impairments.

3.5 Verbal Fluency and Neurological Impairments

In addition to the theoretical implications of verbal fluency tasks found in the studies completed in various languages and evaluating bilingualism, researchers are also applying information from verbal fluency tasks to diagnosing a wide array of neurological disorders. The medical field promotes early detection of neurological impairments in the hopes of providing early treatment in order to reduce the impact of neurological impairments and increase quality of life for these individuals.

A study completed by Brady et al. (2001) evaluated risk of stroke and semantic animal naming decline in verbal fluency as well as other cognitive tasks. Participants were elderly American males participating in a longitudinal study at the Department of Veterans Affairs Medical Center in Boston (Brady et al. 2001, 341). Brady et al. (2001, 342) chose to modify the Framingham stroke risk profile, by excluding age as a risk factor, and included risk factors such as SBP [Systolic Blood Pressure], antihypertensive therapy, diabetes mellitus, current cigarette smoking, cardiovascular disease, atrial

fibrillation, and left ventricular hypertrophy (LVH). Points were given based on the severity of the risk factors (Brady et al. 2001, 342). Results revealed participants who experienced the greatest decline on verbal fluency tasks also had a higher stroke risk (Brady et al. 2001, 344). The significant relationship between risk of stroke and decline in semantic verbal fluency tasks was as large as the relationship between increased age and semantic verbal fluency task decline (Brady et al. 2001, 344). Other neurological evaluations were completed, including memory and visuospatial function, but these tests were not affected by risk of stroke like the verbal fluency task was (Brady et al. 2001, 344). The Brady et al. (2001, 344) study reveals cognitive tasks, including semantic verbal fluency, is negatively impacted by increasing age, but only semantic verbal fluency tasks are affected by an individual's greater risk of stroke.

Verbal fluency tasks have also been used to evaluate individuals with suspected Alzheimer's disease. Clark et al. (2009, 462) chose to complete a longitudinal study which examined phonemic, letters F, A, and S, and semantic, including animals and things found in a supermarket, verbal fluency tasks in individuals with known Alzheimer's disease, normal controls, and a group of individuals who became diagnosed with Alzheimer's disease during the study (but were initially considered to be normal controls). Participants were a minimum of sixty years of age and were recruited from California (Clark et al. 2009, 462). The group of individuals who become diagnosed with Alzheimer's disease, called the preclinical Alzheimer's disease group, scored higher on all tasks than those in the prevalent Alzheimer's disease group, but not as well as participants in the normal control group (Clark et al. 2009, 463). The only task in which the preclinical Alzheimer's disease group scored significantly lower was in the semantic

animal naming task by an average of 0.60 standard deviation units (Clark et al. 2009, 463). Normal controls were able to name more animals in the semantic fluency task than letters in the phonemic fluency task (Clark et al. 2009, 464). Individuals in the prevalent Alzheimer's disease group named fewer items in the semantic fluency tasks than the phonemic fluency tasks, and a difference between the number of animals and supermarket items named was not seen (Clark et al. 2009, 464). Clark et al. (2009, 466) concluded that their research results show semantic verbal fluency tasks may be an effective tool to determine preclinical Alzheimer's disease. Clark et al. (2009, 464) had the unique opportunity to follow the rate of decline in all three groups throughout their longitudinal study, and they learned the prevalent Alzheimer's disease group declined more quickly on all tasks than either of the other two groups. Similarly, the preclinical Alzheimer's disease group declined more quickly on all tasks than the control group of cognitively typical individuals did (Clark et al. 2009, 465). In the control group of cognitively typical participants, scores for phonemic fluency tasks did not decline as quickly as did animal semantic fluency tasks (Clark et al. 2009, 465).

Whyte et al. (2005, 74) wished to determine if elderly Native Americans with probable or possible Alzheimer's disease produced similar scores to Caucasians with suspected Alzheimer's disease on the Consortium to Establish a Registry for Alzheimer's disease Neuropsychological Battery (CERAD-NB). The CERAD-NB evaluates multiple cognitive-linguistic areas including an animal naming semantic verbal fluency task (Whyte et al. 2005, 75). All participants were fluent in English and had no statistically significant differences in age or education level (Whyte et al. 2005, 75-6). Of the Native American participants, 70% were Cherokee and 18% were Choctaw while the remaining

tribes were not described (Whyte et al. 2005, 76). Results of the CERAD-NB showed no significant scoring differences between the Caucasians and Native American participants with suspected Alzheimer's disease (Whyte et al. 2005, 76). Although prior studies of African Caribbean (Stewart et al. 2001) and African American (Gladsjo et al. 1999) individuals revealed varying scores on verbal fluency tasks from other ethnicities, perhaps the effects of Alzheimer's disease negates these differences.

Brain injury due to a motor vehicle accident or assault, for example, is another area that researchers are evaluating with the use verbal fluency tasks. In their study, Axelrod et al. (2001, 249) examined a control group of Hebrew speakers and a group of Hebrew speakers who had sustained a mild head injury approximately one year prior to the testing. Testing included phonemic fluency tasks with the Hebrew letters *shin*, *yud*, and *mem*, and the semantic fluency tasks of animals, as well as fruits and vegetables (Axelrod et al. 2001, 248). As with other studies, educational levels significantly affected both phonemic and semantic fluency results for the control group (Axelrod et al. 2001, 248). Interestingly, the results of participants with a mild head injury over a year ago showed no impact of education (Axelrod et al. 2001, 249). Participants with the history of mild head injury named significantly fewer words in all tasks when compared with the control group (Axelrod et al. 2001, 249).

Verbal fluency tasks have also been used for individuals with amnestic mild cognitive impairment. Nutter-Upham et al. (2008, 231 and 238) examined healthy controls, individuals with amnestic mild cognitive impairment, and participants who had cognitive complaints, but scored within normal limits on neuropsychological evaluations, from northern New England. Five verbal fluency tasks were administered including

phonemic (F, A, and S or B, H, and R), semantic (animals and boys or clothing and girls), switching (fruit and furniture or instruments and vegetables), action (verbs), and another semantic task (naming items found in a supermarket) (Nutter-Upham et al. 2008, 233). Participants with mild cognitive impairment scored significantly lower on phonemic, semantic, switching, and action verbal fluency tasks, but not on the semantic supermarket task (Nutter-Upham et al. 2008, 234). Cognitive complaint participants had mean scores less than the healthy controls, but greater than individuals with mild cognitive impairment, for all verbal fluency tasks (Nutter-Upham et al. 2008, 236). Although there was a significant difference (approximately 1.5 standard deviations) between the low average of participants with mild cognitive impairment and the higher scores produced by healthy controls, the scores of the individuals with mild cognitive impairment scored clinically within the low average range when compared with several tests including the Delis-Kaplan Executive Function System (D-KEFS) (Nutter-Upham et al. 2008, 237). The supermarket semantic naming task was the only verbal fluency tasks that did not show any differences among the three groups evaluated (Nutter-Upham et al. 2008, 238).

Individuals with Parkinson's disease is another population on which data is collected for verbal fluency tasks. In their study, Epker, Lacritz, and Cullum (1999, 427) examined participants with possible or probably Alzheimer's disease, individuals with Parkinson's disease with and without dementia, and normal controls. In addition to examining the number of words produced by each group in semantic animal naming and phonemic F, A, and S fluency tasks, Epker, Lacritz, and Cullum (1999, 428) wished to evaluate if clustering and switching was significantly different among these four groups. As would be expected, the normal control group produced the greatest number of words

in each verbal fluency task (Epker, Lacritz, and Cullum 1999, 428). The group with nondemented Parkinson's disease named more total words than either group with dementia (Epker, Lacritz, and Cullum 1999, 428). This group exhibited significant impairments with the phonemic fluency tasks, but not the semantic fluency task (Epker, Lacritz, and Cullum 1999, 432). Participants with Alzheimer's disease and Parkinson's disease with dementia did not have significant differences on total number of words produced (Epker, Lacritz, and Cullum 1999, 428). Although the three remaining groups scored worse than the control group on all tasks, participants with Alzheimer's disease named the fewest accurate items on the semantic fluency tasks, while both groups of individuals with Parkinson's disease had the most difficulty with phonemic fluency tasks (Epker, Lacritz, and Cullum 1999, 432). Epker, Lacritz, and Cullum (1999, 433) conclude switching and clustering are not as beneficial for diagnostics as word total for these populations.

This chapter has reviewed the usefulness of verbal fluency tasks and results of participants who speaking various languages around the world on these tasks along with the conflicting impact of age, education, and gender. The impact of bilingual speakers and individuals with multiple neurological impairments on verbal fluency tasks has also been explored. In addition to normative data and diagnosis of current and potential neurological disorders, verbal fluency tasks can provide insight into semantics. The specific words individuals use on phonemic and semantic verbal fluency tasks may provide additional information into how semantic information is accessed. Why do monolinguals name more high-frequency words than bilinguals as described in the Sandoval et al. (2010) study? Are the specific words named the same within groups?

Many semantic linguistic theories exist in an attempt to describe the complexity of semantics. In the following chapter, Prototype theory will be discussed in greater detail as well as potential connections with verbal fluency tasks.

CHAPTER 4

PROTOTYPE THEORY

4.1 Rosch's Work

The question regarding how individuals utilize words to communicate has interested linguists and philosophers for decades. One researcher, Eleanor Rosch, proposed that people have typical or key members in each category which she terms "prototypes." According to Rosch (1975, 193), many theories focus on an Aristotelian approach which believes "that categories are logical, clearly bounded entities, whose membership is defined by an item's possession of a simple set of critical features, in which all instances possessing the critical attributes have a full and equal degree of membership." Rosch's Prototype Theory suggests that all words are not prototypical or ideal examples of a specific category, but instead there are ranked order of words some of which are prototypical and others are peripheral. In her study of native English speaking college students, Rosch (1975, 198) asked each participant to rank written words as to how well they belong to a given category. The students were to use numbers from one to seven with one being a good (i.e., prototypical) example and seven meaning the word was a very bad example of the category and may or may not actually belong to the category (Rosch 1975, 198). Ten categories were used including fruits, birds, vehicles, vegetables, sports, tools, toys, furniture, weapons, and clothing, and students were asked to rank fifty to sixty total words (Rosch 1975, 197). Rosch (1975, 198) found that in nine

of the ten categories examined, 95% of the participants agreed that the same objects should be ranked a one, the highest score and indication of the most prototypical items within that category. A comparison to one of Rosch's prior studies which ranked fewer words revealed the same results for categories tested in both studies (Rosch 1975, 198). Table 8. below includes information taken from the Rosch (1975, 232) study and lists types of birds, their rank, and the specific score given by the participants:

Table 8. Rosch (1975) Bird Rankings

Member	**Rank**	**Specific Score**	**Member**	**Rank**	**Specific Score**
Robin	1	1.02	Goldfinch	28	2.06
Sparrow	2	1.18	Parrot	29	2.07
Blue jay	3	1.29	Sandpiper	30	2.40
Bluebird	4	1.31	Pheasant	31	2.69
Canary	5	1.42	Catbird	32	2.72
Blackbird	6	1.43	Crane	33	2.77
Dove	7	1.46	Albatross	34	2.80
Lark	8	1.47	Condor	35	2.83
Swallow	9	1.52	Toucan	36	2.95
Parakeet	10	1.53	Owl	37	2.96
Oriole	11	1.61	Pelican	38	2.98
Mockingbird	12	1.62	Geese	39	3.03
Redbird	13.5	1.64	Vulture	40	3.06
Wren	13.5	1.64	Stork	41	3.10
Finch	15	1.66	Buzzard	42	3.14
Starling	16	1.72	Swan	43	3.16
Cardinal	17.5	1.75	Flamingo	44	3.17
Eagle	17.5	1.75	Duck	45	3.24
Hummingbird	19	1.76	Peacock	46	3.31
Seagull	20	1.77	Egret	47	3.39
Woodpecker	21	1.78	Chicken	48	4.02
Pigeon	22	1.81	Turkey	49	4.09
Thrush	23	1.89	Ostrich	50	4.12
Falcon	24	1.96	Titmouse	51	4.35
Crow	25	1.97	Emu	52	4.38
Hawk	26	1.99	Penguin	53	4.53
Raven	27	2.01	Bat	54	6.15

These rankings are not a reflection of which birds people like the best or discuss the most, but is rather an order of which animals they felt were most "birdlike." Results

ranged from a possible ranking of one, if all participants had ranked the word as prototypical, to seven, if all participants ranked the word as being least "birdlike." The table shows that twenty-six of the fifty-four words were scored between one and two, indicating these were determined to be most "birdlike." *Bat*, the word with the lowest score ranked at fifty-four, was a large 1.62 points away from the fifty-third ranked word, *penguin*, at 4.53. Based on Prototype Theory, *emu*, *penguin*, and *bat* would be peripheral in the category of birds, while *robin*, *sparrow*, and *blue jay* would be central, or prototypical, birds. Rosch's research suggests insight into the structure of semantic organization, namely that some words are not as central to categories as other words are.

Rosch (1978, 28) has been quick to explain that the prototypes in various categories are language and cultural specific. She also discusses some of the limitations of Prototype Theory and clarifies that it is not meant to explain how the distinction between prototypical and peripheral words within a category are determined by children and adults. One of Rosch's (1978, 28-9) principles for the foundation of Prototype Theory is that of "cognitive economy" whose goal is "to provide maximum information with the least cognitive effort" for category systems. Rosch (1978, 33) believes taxonomies provide important information about the relationships among words. Table 9. is a portion of the example from Rosch (1978, 33) about the layout of taxonomies:

Table 9. Rosch (1978) Modified Taxonomy Example

Superordinate	**Basic Level**	**Subordinate**
Furniture	Chair	Kitchen chair
		Living-room chair
	Table	Kitchen table
		Dining-room table
	Lamp	Floor lamp
		Desk lamp

As can be seen from the example, superordinate words include basic level and subordinate words, while basic level words only include subordinate words. In a study by Rosch (1978, 33), participants were asked to name attributes for words belonging to all three levels of the taxonomy for nine categories. Results revealed the fewest attributes were named for superordinate words, while significantly more attributes were named for both basic level and subordinate words (Rosch 1978, 33). There was not a significant difference for number of attributes named for basic level versus subordinate words (Rosch 1978, 33). Basic level words were first named during additional testing (Rosch 1978, 36). Although Rosch (1978, 36) utilizes these three levels of semantic categorization, she also states that the category distinctions are not always easy to determine. She also cautions researchers from trying to discover how prototypical concepts are created and warns them not to consider only one object as being prototypical.

In an earlier experiment, Rosch, Simpson, and Miller (1976) created artificial categories made from dot patterns, stick figures, and letters strings. This experiment allowed the researchers to control the frequency of experience with these categories as participants would not have access to them outside of their project. After learning the

prototypical categories, as defined by Rosch, Simpson, and Miller (1976, 493), participants were asked to provide patterns in the category. Rosch, Simpson, and Miller (1976, 498) report the participants included patterns which were closer to the prototype pattern originally given than those patterns which were less like the prototype pattern, despite having been shown all of the pattern options the same number of times. This preference for naming prototypical items first may extend to other tasks with natural categories including verbal fluency.

A study by Sailor, Zimmerman, and Sanders (2011) examined the age of acquisition of words and word frequency as an impact on verbal fluency tasks for participants with Alzheimer's disease and healthy older adult controls. Verbal fluency tasks evaluated included three semantic (animals, fruits, and vegetables) and three phonemic (F, A, and S) (Sailor, Zimmerman, and Sanders 2011, 2384). Age of acquisition for each of the words was based either on already normed materials or were determined by undergraduate students choosing an age range when they thought the word was learned (Sailor, Zimmerman, and Sanders 2011, 2386). As would be expected, participants with Alzheimer's disease named fewer words for both tasks than the elderly controls did, with greater differences seen during semantic fluency tasks (Sailor, Zimmerman, and Sanders 2011, 2386). The average age of acquisition was higher in phonemic tasks than semantic tasks for both groups (Sailor, Zimmerman, and Sanders 2011, 2387). Participants with Alzheimer's disease named words with a younger age of acquisition than did healthy controls (Sailor, Zimmerman, and Sanders 2011, 2387). When word frequency was controlled, words produced during semantic fluency tasks still had lower age of acquisition for both groups, but the age of acquisition responses did not

vary between those given by normal controls and those with Alzheimer's disease (Sailor, Zimmerman, and Sanders 2011, 2387). Sailor, Zimmerman, and Sanders (2011, 2389) conclude that the impact of age of acquisition does not directly mirror how often the words were exposed to a person as was shown by fruits, animals, and vegetables having both lower word frequencies and age of acquisition than F, A, and S words. Perhaps the age of acquisition of words has more to do with the prototypicality of words than with frequency of occurrence.

Prototype Theory is not without its critics. In her article, "Semantic Change and Cognition: How the Present Illuminates the Past and the Future," Carpenter (2013) notes that Prototype Theory does not explain how words change meaning over time including moving from prototypical to peripheral and vice versa. According to Allwood (1981), linguistic researchers have most often attempted to separate semantics and pragmatics (i.e., how people communicate in different contexts). Although a theoretical distinction may exist, practical communication incorporates semantics and pragmatics. Prototype Theory is one semantic theory that does not account for pragmatics (Allwood 1981). This lack of explanation has caused some researchers to question the credibility of Prototype Theory.

4.2 Prototype Theory & Practical Semantics

In spite of this theoretical concern, Prototype Theory is being applied to practical treatment of individuals with aphasia, a disorder which impedes a person's ability to communicate. Utilizing the principles of Prototype Theory, namely that some words in a category are more prototypical than others, Swathi Kiran (2007) completed a study

comparing teaching typical and atypical words to individuals with aphasia. Participants had fluent aphasia or Wernicke's aphasia, meaning they had difficulties with understanding words spoken by others, but they utilized normal grammar and syntax when speaking themselves. In order to determine what constitutes a typical vs. atypical word, a group of normal participants were asked to rank written words within categories following the rules set forth by Rosch (1975) and ten to fifteen words were chosen from these results as either typical or atypical (Kiran 2007, 24). Results revealed participants who were taught typical (i.e., prototypical) words did not generalize to improvements with atypical (i.e., peripheral) words, but those who focused on atypical words did see an improvement with typical words as well (Kiran 2007, 22). A second study included participants with nonfluent aphasia or Broca's aphasia and also had apraxia of speech, difficulties with communicating spoken words due to word finding deficits and difficulties with motor planning for speech production, respectively. Although the speakers with nonfluent aphasia and apraxia of speech were less responsive to treatments than those with fluent aphasia, when modified to account for the apraxic errors, the same improvements were seen (Kiran 2007, 23). In addition to generalization to typical words by teaching atypical words, the number of sessions required to name all words within a category was also fewer (Kiran 2007, 27). Specifically, those trained on atypical words required eight sessions, while those taught typical words required over three times as long for a total of twenty-six sessions (Kiran 2007, 27). In short, fewer sessions were needed to have the maximum impact on word naming within a category when individuals with both fluent and nonfluent aphasia with and without apraxia of speech were taught atypical versus typical words.

The work completed by Kiran (2007) supports Prototype Theory by showing a difference in the number of words named between groups of participants taught atypical versus prototypical words. If there was no distinction between prototypical and atypical concepts, and words were truly just words, both groups should have needed the same number of sessions to learn only the words presented to them. Instead, Kiran's (2007) research shows a quantifiable discrepancy between not only the amount of time to learn words, but also that generalization occurs from atypical words to prototypical words for persons with aphasia and not vice versa. It would appear teaching atypical words for persons with aphasia activates prototypical words automatically, much like cleaning concrete stairs from the top step allows the water to trickle down and clean the lower steps as well. Although it is possible to clean a bottom step and work one's way up the staircase, just as it is possible to teach people with aphasia only prototypical words, Kiran's (2007) research shows that beginning at the top of the staircase by teaching atypical words is more effective.

Researchers utilizing verbal fluency tasks have also examined the words participants' state using the lens of Prototype Theory. In their study of Portuguese speaking participants living in Brazil, Brucki and Rocha (2004, 1775) discovered that the animals produced during the semantic fluency task differed among educational groups. Illiterates named *horse* and *dog* most frequently, participants with one to four years of education and five to eight years of education named *dog* and *cat* most often, those with nine to eleven years of school named *dog* and *lion* the most, and *dog* and *cat* were also the most frequently named for participants with greater than eleven years of education (Brucki and Rocha 2004, 1775). For all two hundred and fifty-seven participants, 33%

named *dog*, 15.2% named *cat*, and 13.2% named *horse* (Brucki and Rocha 2004, 1775). When analysis was completed with focus on age and gender, *dog* was most frequently named first by participants (Brucki and Rocha 2004, 1775).

A study by Schwartz et al. (2003, 400) examined monolingual English undergraduate students producing phonemic and semantic fluency tasks in two minutes with the ability to name two categories within a single task instead of the typical one. Specifically, participants were asked to name words beginning with A or F, in any order, for phonemic tasks, and words within the categories of animals or fruits, also in any order, for semantic tasks (Schwartz et al. 2003, 400). Subjects named significantly more words in the semantic task with a mean of 39.27 than in the phonemic task with a mean of 17.18 (Schwartz et al. 2003, 404). Significantly more words were named beginning with F than A (Schwartz et al. 2003, 404), although Borkowski, Benton, and Spreen (1967) ranked both letters in the easy category and both letters are commonly used in neuropsychological and speech-language pathology evaluations. Animals were named significantly more often than fruits were (Schwartz et al. 2003, 404). The following Table 10. depicts the animals named by at least eleven of the forty participants, the equivalent of 61.8% of non-unique occurrences (Schwartz et al. 2003, 404):

Table 10. Animals Named by > 60% of Participants in the Schwartz et al. (2003) Study

Animals Named	**Frequency Named (out of 40 Participants)**
Cat	36
Dog	36
Bear	25
Elephant	25
Horse	25
Lion	23
Monkey	23
Whale	22
Bird	21
Zebra	20
Giraffe	19
Mouse	19
Fish	18
Tiger	18
Cow	17
Deer	17
Rat	17
Snake	14
Gorilla	13
Sheep	12
Ant	11
Ape	11
Pig	11

The phonemic fluency task was completed just twenty minutes prior to the semantic fluency task with unrelated neuropsychological testing completed during the twenty minute span (Schwartz et al. 2003, 402). Interestingly, just because a participant named an animal starting with F or A in the phonemic fluency task did not mean it was named in the semantic fluency task. Table 11. compares the frequency of occurrence of words named in the phonemic and semantic fluency tasks:

Table 11. Frequency of Occurrence of Animals in Phonemic and Semantic Verbal Fluency Tasks in the Schwartz et al. (2003) Study

Animals Named	**Phonemic Frequency (out of 38)**	**Semantic Frequency (out of 40)**
Ant	16	11
Fish	13	18
Frog	10	(less than 11 if any)
Aardvark	8	(less than 11 if any)
Anteater	7	(less than 11 if any)

As only words were reported which were named by seven or more participants for phonemic fluency and eleven or more participants for category fluency tasks, it is difficult to know if *frog*, *aardvark*, or *anteater* were named by the same number of people in the phonemic fluency task or not. The word *fish* is more likely to be named by participants when asked for animals than when asked for words staring with F, and the reverse is seen for the word *ant* with more people naming *ant* in phonemic instead of semantic tasks. Words named in the phonemic tasks were "organized along an animate versus inanimate dichotomy" (Schwartz et al. 2003, 404). Semantic tasks were broken into four main clusters for the animal portion of this task including prototypical items, which Schwartz et al. (2003, 405) describe as including cat and dog, wild animals, farm animals, and jungle animals.

The specific words named in verbal fluency tasks by bilinguals is also of interest to researchers. When compared to English monolingual speakers, English Spanish bilingual speakers named words with lower frequency word counts in the semantic fluency tasks, but not in phonemic fluency tasks (Sondoval et al. 2010, 239). Averaging 512.0 occurrences per million, the bilinguals' exemplars named during semantic tasks were fewer than the 690.6 occurrences per million named by monolingual participants.

Cognates, or words that are similar in both languages (e.g., *elephant* in English and *elefante* in Spanish), were also examined. Bilinguals produced significantly more cognates than monolinguals did, although they were found in both groups (Sondoval et al. 2010, 240). More cognates were named during phonemic fluency than semantic fluency tasks (Sondoval et al. 2010, 240).

A study by Anton-Mendez and Gollan (2010, 725) evaluated semantic association in monolingual English and bilingual English Spanish undergraduate speakers whose primary language was English. They examined strong cues in which one response was most common (e.g., *flipper* with the expected response *dolphin*) and weak cues where multiple responses were commonly named (e.g., *chicken* with many responses including *fried*, *eat*, and *scared*) in both monolingual and bilinguals speakers to determine if the words given differed (Anton-Mendez and Gollan 2010, 725). Normative data was obtained from an association normative database (Anton-Mendez and Gollan 2010, 725). The rationale behind the study was that bilinguals may think of words that are commonly occurring in the nontarget language, but are not as common in the target language (Anton-Mendez and Gollan 2010, 724). Bilinguals named significantly more associations not listed in the normative database than monolinguals did when given the strong cues, but this was not seen with weak cues (Anton-Mendez and Gollan 2010, 725). Greater than 50% of associations named by both groups given from weak cues were not provided in the normative data (Anton-Mendez and Gollan 2010, 726). Anton-Mendez and Gollan (2010, 726) suggest that this discrepancy is important for evaluating the typicality of a bilingual's response. They also conclude that bilinguals' semantic networks may be organized differently than monolinguals. If semantic associations are different when

provided strong cues between monolinguals and bilinguals, will words produced in verbal fluency tasks differ as well due to these semantic network variations?

The preceding chapters reviewed a brief account of the Lakota culture and history, an overview of verbal fluency tasks and the research that has been done in other languages and with bilingual participants, and an overview of Prototype Theory and how it is currently being applied to semantic research.

The Lakota Sioux have an intrinsic connection to nature and the animals within western South Dakota. This relationship began when the Lakota were a nomadic people and continues today. Their reliance on animals to survive may be reflected in their language and may be able to be seen in the animals produced during semantic verbal fluency tasks. The basis of Prototype Theory states that some words are more prototypical than others. When applied to verbal fluency tasks, the most frequently named words by participants may reflect this prototypicality.

One of the goals of this paper is to examine the animals named by monolingual English speakers and bilingual Lakota English speakers in English and Lakota to determine if the most frequently named, or prototypical, words vary among the three groups. As the literature review for verbal fluency tasks in other languages has shown, the impact of bilingualism, gender, age, and education varies, and no known data for verbal fluency has been collected on the Lakota prior to this study.

A second goal of this study is to determine normative data for Lakota English speakers on phonemic and semantic verbal fluency tasks in both English and Lakota. It is hypothesized that the English and Lakota English participants in this study will not have

identical prototypical words and that the normative data on phonemic and semantic verbal fluency tasks will vary based on the language spoken and bilingualism.

CHAPTER 5

METHOD

5.1 Participants

Fifty-three monolingual English speakers and forty-three bilingual Lakota English speakers residing in western South Dakota were the participants for this project. Of the original one hundred and eight participants, eight participants, four monolingual English speakers and four bilingual Lakota English speakers, were excluded due to a history of prior known neurological injuries. In addition, three bilingual English speakers, who spoke English and another language, were excluded as was a single monolingual English participant who stopped completing the verbal fluency tasks and refused to continue.

Monolingual participants were obtained from Canyon Lake Senior Center in Rapid City, South Dakota. The Canyon Lake Senior Center has a membership of approximately fifteen hundred people throughout the Rapid City area. Participants were chosen at random on March 13, 14, and 19, 2014, and were tested in one of two quiet rooms.

Bilingual Lakota English participants were tested approximately one hundred and fifteen miles away from Canyon Lake Senior Center in Pine Ridge, South Dakota and the surrounding areas on the Pine Ridge Indian Reservation on March 30, 2014. Due to

difficulties finding fluent Lakota English speakers willing to participate within this close-knit community, since the researcher was not Lakota, additional participants were recruited during the Lakota Omniciye Wacipi, a yearly powwow held approximately fifty miles away from Canyon Lake Senior Center, on April 11, 12, and 13, 2014. The Lakota Omniciye Wacipi is a part of the American Indian Awareness week held at Black Hills State University in Spearfish, South Dakota, designed to provide education about Lakota culture.

Participants ranged in age from under fifty to over ninety years. The youngest monolingual English participants indicated on the survey that they were between ages fifty-five and fifty-nine, while the oldest monolingual English participants marked that they were ninety and over. For bilingual Lakota English speakers, the youngest participants were under age fifty, while the oldest stated they were between the ages of seventy-five and seventy-nine. The following Table 12. depicts the number of participants within each age range:

Table 12. Age Ranges for Monolingual English and Bilingual Lakota English Speakers

Age Range	English speakers	Lakota English speakers
< 50	0	15
50-54	0	8
55-59	4	5
60-64	5	9
65-69	5	3
70-74	16	1
75-79	9	2
80-84	9	0
85-89	1	0
90 and over	4	0

Although originally expected to have mostly elderly Lakota English speakers in this study, over 50% of participants were under age fifty-five. Of the entire forty-three sample of Lakota English speakers, thirty-three ranked their proficiency as knowing "a lot" of Lakota, while ten participants indicated they knew "a little" Lakota, but did say they could carry on a conversation. Of these ten participants who reported they knew "a little" Lakota, nine of them were under age fifty while the remaining participant was aged fifty to fifty-four. All of the Lakota speakers reported they knew "a lot" of English. Surprisingly, several monolingual English speakers felt they knew "a little" English, and, when questioned, reported they felt they did not know "a lot of vocabulary" even though English was their only language for communication.

A total of fifty-five females and forty-one males participated with thirty-five English females, eighteen English males, twenty Lakota English females, and twenty-three Lakota English males. Eighty of the ninety-six participants reported they had resided in South Dakota for over twenty years, seven had lived for less than twenty years, but more than ten years, two had lived for less than ten years, and seven had lived for less than five years in South Dakota. Educational levels ranged from completed some high school to completed graduate school. The educational breakdown for English and Lakota English speakers is listed in Table 13. which follows:

Table 13. Educational Levels for Monolingual English and Bilingual Lakota English Speakers

Educational Levels	**English speakers**	**Lakota English speakers**
Elementary (through 6th grade)	0	0
Middle School/Junior High (through 8th grade)	0	0
Some High School	0	4
Completed High School	15	12
Some College	16	12
Completed College	5	8
Some Graduate School	6	0
Completed Graduate School	11	7

As can be seen from the table, only four of the ninety-six participants did not complete high school. Almost 40% of the sample have completed at least a college degree, and this increases to nearly 70% when expanded to include participants who indicated they have completed some college.

5.2 Procedures

This study was approved by the Oglala Sioux Tribe Research Review Board and the University of North Dakota Institutional Review Board. Black Hills State University Institutional Review Board extended permission to obtain data on their campus during the Lakota Omniciye Wacipi, based on the recommendation of the University of North Dakota Institutional Review Board as an official review was not performed. With their permission, written consent by participants was not required. Instead, participants provided verbal consent after the researcher read a verbal consent form (See Appendix F) and the researcher answered any questions the participants may have had. At the end of the session, subjects were presented with written contact information as well as information stated in the verbal consent form (See Appendix G). The Lakota English

participants were also presented with a small token of sage as a gesture of appreciation and as recommended by the Oglala Sioux Tribe Research Review Board in keeping with cultural expectations.

After giving verbal consent, each participant was asked to complete a short survey written in English asking their gender, age range, highest level of education, length of time living in South Dakota, occupation or former occupation, if they have known neurological deficits (e.g., prior stroke, brain injury, dementia, etc.), the language they speak most at home, any other languages they speak, including their feelings of proficiency, and when they learned the languages (See Appendix H). Participants were given the option to skip any question they did not feel comfortable answering and were asked if they had any questions about the survey or if they had difficulty reading it.

Participants then completed semantic and phonemic verbal fluency tasks. Monolingual participants completed two tasks, one semantic task in English and one phonemic task in English, while bilingual participants completed four tasks total by completing semantic and phonemic tasks in both English and Lakota. The semantic task asked participants to name animals, and the phonemic task asked participants to name words beginning with P. The letter P was chosen as it is present in both Lakota and English. Although the letters F, A, or S are commonly used for English verbal fluency tasks, the letter F is not present in Lakota. The letter A is present, but appears in oral and nasal forms in Lakota and the researcher felt the Lakota participants might limit their responses to only oral forms since this is most common in English. Likewise, the letter S is also present, but the researcher was concerned Lakota participants might limit their productions to words beginning with /s/ instead of also including /ʃ/. Due to these

concerns, the letter P was chosen and although multiple kinds of P are present in Lakota (i.e., aspirated, unaspirated, and glottalized), these are not distinguished in English. The Lakota language does not have an official orthography at this time.

The order of the tasks was randomized with alternating semantic and phonemic tasks, although bilingual participants did not complete the same task (phonemic or semantic) back to back in both languages. English participants were only tested in English, and bilingual Lakota speakers were given tasks in English first based on the recommendation of the translator and to ensure understanding of the task. Thus the English participants had two options for presentation (i.e. phonemic/semantic or semantic/phonemic) and the Lakota participants had two options for presentation (i.e., phonemic/semantic in English and phonemic/semantic in Lakota or semantic/phonemic in English and semantic/phonemic in Lakota). One minute was allowed for each task and the tasks were audio recorded for confirmation of the words participants said and the order in which the words were produced.

Instructions for each task were consistent. Phonemic task instructions were taken from those provided by the Montreal Cognitive Assessment with slight modification (Nasreddine et al. 2005) and said, "Tell me as many words as you can think of that begin with a certain letter of the alphabet that I will tell you in a moment. You can say any kind of word you want, except for proper nouns (like Bob or Boston), numbers, or words that begin with the same sound but have a different suffix, for example, love, lover, loving. I will tell you to stop after one minute. Are you ready? [The researcher then stopped to confirm participant understood instructions. In the rare case that the instructions were not understood, they were repeated and/or the researcher answered the participant's

questions.] Now, tell me as many words [in English] as you can think of that begin with the letter P. Go." For monolingual English participants, the phrase "in English" was omitted. The Lakota English speakers were also instructed before the task that the responses should be in English. For Lakota speakers completing Lakota tasks, the instructions were shortened based on the recommendations of the translator and included only the opening sentence "Tell me as many words in Lakota as you can think of that begin with the letter P. Go." The semantic task instructions were slightly modified from the Cognitive Linguistic Quick Test (Helm-Estabrooks 2001). The researcher stated "I want you to name as many different animals as you can in 1 minute. What animals can you think of? Go" (Helm-Estabrooks 2001). When giving the Lakota tasks to the Lakota bilingual speakers, participants were specifically instructed to provide answers in Lakota. No time was allotted between the ending of the first task and reading the instructions for the second task. The entire participation time for each person was approximately ten to fifteen minutes.

CHAPTER 6

NORMATIVE DATA RESULTS & DISCUSSION

The purpose of this study involved exploring two main themes: to collect normative data for the Lakota population and to apply the principles of Prototype Theory to determine the prototypical animals in the Lakota language. Regarding the normative data aspect, three questions were asked:

(1) Will the Lakota English speakers name more words when they complete the verbal fluency tasks in Lakota versus when they complete the tasks in English?

(2) Will the Lakota English speakers be able to name as many words in English as the monolingual English speakers will on verbal fluency tasks?

(3) Will the Lakota English speakers be able to name as many words in Lakota as the monolingual English speakers name in English?

The following paragraphs will describe the hypotheses for each of these questions as well as results and discussion for the meaning of this information.

6.1 Lakota English: More Words in English or Lakota?

It was hypothesized that the answer to the first question, if Lakota English speakers will name more words in Lakota or English, would be that Lakota English speakers would name more words in Lakota based on the assumption that Lakota would be the preferred language of the elderly Lakota people. Based on the sample, only sixteen

of the forty-three Lakota English participants reported they most often spoke Lakota at home, while eight reported they spoke both or a mixture of Lakota and English, and the final eighteen reported they spoke English most frequently at home. It is unknown why English was most commonly spoken by these Lakota English participants at home. This choice may have been based on preference of speaking English or may be due to non-Lakota speakers living within the home. Although the majority of the sample was not elderly, thirty-three of the participants indicated they spoke "a lot" of Lakota, while only ten described themselves as knowing "a little" Lakota.

A paired-samples t-test was conducted to compare the number of words named during phonemic verbal fluency tasks by Lakota English speakers completing the task in English and completing the task in Lakota. There was a statistically significant difference in the scores for Lakota English speakers completing the phonemic fluency task in English (M = 10.58, SD = 4.71) and Lakota English speakers completing the phonemic fluency task in Lakota (M = 5.05, SD = 3.69); t (42) = 6.58, p = < .001. Thus, bilingual Lakota English speakers produced more English words beginning with P than Lakota words beginning with P. Additional information can be found in Table 14. below:

Table 14. Number of Words Named on Phonemic Tasks by Lakota English Speakers Completing Tasks in English and in Lakota

	Task Completed in English	**Task Completed in Lakota**
Mean	10.58	5.05
Range	1-22	0-15
SD	4.71	3.69

Based on the discrepancy between participants who knew a lot versus a little Lakota, another paired-samples t-test was performed to determine if those who knew a

little Lakota was bringing down the mean for Lakota English speakers completing the phonemic fluency task in Lakota. There was a statistically significant difference between Lakota English speakers completing the phonemic fluency task in Lakota who knew a little Lakota (M = 2.30, SD = 0.95) and those who knew a lot of Lakota (M = 5.88, SD = 3.81); t (40.41) = -4.912, $p < .001$. Lakota English speakers who knew a lot of Lakota named more P words in Lakota than did Lakota English speakers who classified themselves as knowing only a little Lakota. Table 15. shows this comparison:

Table 15. Number of Words Named on Phonemic Tasks in Lakota by Lakota English Speakers who Knew a Little Versus a Lot of Lakota

	A Little Lakota	**A Lot of Lakota**
Mean	2.30	5.88
Range	1-4	0-15
SD	0.95	3.81

Although there was a significant difference on number of words named by Lakota English speakers in Lakota who knew a lot versus a little Lakota during phonemic fluency tasks, the mean for Lakota speakers who knew a lot of Lakota is still quite low (M = 5.88, SD = 3.81) when compared to Lakota speakers who knew a lot of Lakota on English phonemic tasks (M = 9.42, SD = 4.32); t (32) = 4.16, $p < .0001$. Even when considering only those participants who stated they knew a lot of Lakota, Lakota English speakers still name more P words in English than in Lakota. More information is located in Table 16. which follows:

Table 16. Number of Words Named on Phonemic Tasks in English and Lakota by Lakota English Speakers who Knew a Lot of Lakota

	Task Completed in English	**Task Completed in Lakota**
Mean	9.42	5.88
Range	1-20	0-15
SD	4.32	3.81

The reason for this significant discrepancy is not known for certain, but several hypotheses can be made. As mentioned earlier, the majority of Lakota English speakers reported they spoke English in their homes. Lakota is considered to be threatened according to the Ethnologue (Lewis, Simons, and Fennig 2013) as fluent speakers expire and new generations no longer speak Lakota or do not speak it fluently. Perhaps Lakota English participants said fewer words in Lakota because they use Lakota less often as the majority of their interactions are with an English speaking world, even within the Lakota community. It may also be that P is a more difficult letter in Lakota than English for verbal fluency tasks as there may be fewer P words in Lakota or possibly fewer frequently used, salient P words. Also of consideration is that Lakota does not have an official orthography. It is possible the Lakota English speakers had great difficulty with the phonemic verbal fluency task in Lakota because they have limited familiarity with the letters in the Lakota alphabet since a formal orthographic alphabet does not exist. Unlike learning the English alphabet as young children to enhance further reading and writing, the Lakota participants may not have learned a Lakota alphabet. It is unknown how many, if any, of the participants were able to read and write in Lakota.

Another comparison for Lakota English speakers in English versus Lakota can be made with semantic verbal fluency tasks. As with phonemic tasks, a statistically

significant difference was seen between Lakota English participants speaking English (M = 17.98, SD = 6.39) and Lakota (M = 9.93, SD = 4.50) during semantic tasks; t (42) = 8.66, $p < .001$ with participants naming more animals in English than in Lakota. Table 17. provides additional information:

Table 17. Number of Words Named on Semantic Tasks by Lakota English Speakers Completing Tasks in English and in Lakota

	Task Completed in English	**Task Completed in Lakota**
Mean	17.98	9.93
Range	7-34	3-23
SD	6.39	4.50

A comparison between Lakota English speakers who knew a little versus a lot of Lakota on semantic tasks completed in Lakota was made with no statistically significant difference [speakers who knew a little Lakota (M = 9.00, SD = 3.80); speakers who knew a lot of Lakota (M = 10.21, SD = 4.70); t (41) = -.743, p = .462]. See Table 18. for more information:

Table 18. Number of Words Named on Semantic Tasks in Lakota by Lakota English Speakers who Knew a Little Versus a Lot of Lakota

	A Little Lakota	**A Lot of Lakota**
Mean	9.00	10.21
Range	3-14	4-23
SD	3.80	4.70

Even when comparing Lakota English speakers who knew a lot of Lakota on semantic Lakota (M = 10.21, SD = 4.70) and semantic English (M = 16.45, SD = 5.55) tasks, a significant difference is still present with more animals named in English; t (32) = 6.96, $p < .001$. Table 19. provides additional information:

Table 19. Number of Words Named on Semantic Tasks in English and Lakota by Lakota English Speakers who Knew a Lot of Lakota

	Task Completed in English	**Task Completed in Lakota**
Mean	16.45	10.21
Range	7-33	4-23
SD	5.55	4.70

Unlike two of the suggested possibilities as to why a significant difference exists between Lakota English speakers who speak Lakota and English on phonemic tasks, only the frequency of use hypothesis remains valid. The number of P words and the knowledge that Lakota does not have an established orthography should not affect the number of animals named during semantic tasks. Interestingly, the means for Lakota English speakers completing semantic tasks in English (M = 17.98) and Lakota (M = 9.93) are higher than for the phonemic tasks in English (M = 10.58) or Lakota (M =5.05), respectively. Of the four means, the highest two are English semantic and English phonemic completed by Lakota English speakers, which provides additional support to the hypothesis that being in an English environment affects Lakota speakers' abilities to name words in their first learned language. Thirty-two of the forty-three participants reported they learned Lakota before age five, while twenty-three reported they learned English between the ages of five and twelve when they began school, and nine speakers said they learned both English and Lakota before age five.

In addition to the suggestion that fluent Lakota speakers may have more difficulty accessing words due to less frequent use of Lakota than English, it may be possible that the Lakota language does not have Lakota names for animals that are not local to the area or perhaps these animal names have been forgotten. Based on the animals named by

Lakota speakers, described in more detail later, African animals were named including *pawokic'u* 'elephant,' *tahu hanska* 'giraffe,' and *sunglega* 'zebra,' although these were only named by three, two, and one speaker, respectively. It would appear that Lakota does, in fact, have words for nonlocal animals, but the familiarity with these words is not known, nor is it certain if there are as many words for animals in Lakota as in English. The total number of different animals produced by Lakota English speakers in English during semantic verbal fluency tasks was one hundred and fifty compared to eighty-seven different animals during Lakota semantic verbal fluency tasks. This discrepancy may also support the notion that Lakota words have been forgotten or perhaps never learned initially.

For both phonemic and semantic verbal fluency tasks, Lakota English speakers name significantly more words in English than Lakota, the opposite of the initial hypothesis. This may be a result of the differences between the two languages such as having different frequencies of the letter P in each language and a lack of a Lakota orthography impacting phonemic verbal fluency responses. Fewer words for animals in Lakota than in English may have affected semantic verbal fluency results. It may also be due to Lakota English speakers forgetting Lakota due to lack of use in a world with more frequently heard English or lack of knowledge of Lakota words. It may, of course, be a combination of any, or all, of these options, or none at all.

6.2 English vs. Lakota English Naming Words in English

Although Lakota English speakers name more words in English than in Lakota, do they name as many words in English as monolingual English speakers do? The initial

hypothesis for this second question was that Lakota English will not be able to name as many words as Lakota is their first learned language. A paired-samples t-test revealed monolingual English speakers (M = 12.55, SD = 4.13) named significantly more words during phonemic verbal fluency tasks than Lakota English speakers named in English (M = 10.58, SD = 4.71); t (94) = 2.18, p = .032. On the contrary, no statistically significant difference was seen on semantic verbal fluency tasks between monolingual English speakers (M = 18.21, SD = 4.61) and Lakota English speakers completing the task in English (M = 17.98, SD = 6.39); t (74.26) = .199, p = .843. Comparisons can be seen in Table 20. below:

Table 20. Number of Words Named in English by Monolingual English Speakers versus Lakota English Speakers

Phonemic Tasks		
	Monolingual English Speakers	Lakota English Speakers in English
Mean	12.55	10.58
Range	5-23	1-22
SD	4.13	4.71
Semantic Tasks		
	Monolingual English Speakers	Lakota English Speakers in English
Mean	18.21	17.98
Range	8-30	7-34
SD	4.61	6.39

Researchers have considered the impact of bilingualism on speakers completing verbal fluency tasks and the speed required to provide responses quickly. A comparison of English monolingual and bilingual college students in English revealed no significant differences on phonemic F, A, S tasks, but monolinguals named more animals during the semantic task (Portocarrero, Burright, and Donovick 2007, 419-420). A study by Rosselli

et al. (2002, 768) also showed bilingual English Spanish speakers named fewer animals in English on semantic tasks than monolingual English speakers did, but no difference on phonemic F, A, and S tasks was found. Unlike the Rosselli et al. (2002) study, Sandoval et al. (2010, 239) found monolingual English speakers named more words on both phonemic and semantic tasks than English Spanish bilingual speakers did on English tasks. Sandoval et al. (2010, 238) examined fifteen semantic categories and twenty-four double letter phonemic categories. In their evaluation of monolingual English speakers and bilingual speakers during English phonemic F, A, S, and semantic clothing items and female name tasks, Luo, Luk, and Bialystok (2010, 37) found no statistically significant differences on semantic tasks. They chose to subdivide the bilingual group into those with low-vocabulary and those with high-vocabulary based on English vocabulary tests (Luo, Luk, and Bialystok 2010, 34). For phonemic tasks, bilinguals with high-vocabulary named more words than either low-vocabulary bilinguals or English monolinguals, while low-vocabulary bilinguals scored the same as English monolinguals did (Luo, Luk, and Bialystok 2010, 37). Luo, Luk, and Bialystok (2010, 39) concluded vocabulary size had the greatest impact on phonemic fluency tasks. The results of bilingual verbal fluency studies are mixed, and the majority seem to show the opposite of what this study found. Luo, Luk, and Bialystok (2010) suggest that vocabulary size is most important for phonemic fluency tasks, and future research should focus on the vocabulary size of Lakota English speakers to determine what, if any, impact this has on these tasks.

6.3 English vs. Lakota English Naming Words in Lakota

The third and final question regarding Lakota normative data for this study asks if Lakota English speakers will be able to name as many words in Lakota as monolingual English speakers name in English. The initial hypothesis was that there would be no significant difference in number of words named as this testing would be done in the first learned and preferred language for each of these groups. As can be expected from the previously reported data, namely that Lakota English speakers performed worse in Lakota tasks on both phonemic and semantic tasks than on English tasks and worse in English phonemic tasks than monolingual English speakers, Lakota English speakers named significantly fewer words on both phonemic (M = 5.05, SD = 3.69) and semantic (M = 9.93, SD = 4.50) tasks than monolingual English speakers did on phonemic (M = 12.55, SD = 4.13); t (94) = 9.28, $p < .001$ and semantic (M = 18.21, SD = 4.61) tasks; t (94) = 8.87, $p < .001$. Table 21. depicts additional data:

Table 21. Number of Words Named by Monolingual English Speakers in English versus Lakota English Speakers in Lakota

Phonemic Tasks		
	Monolingual English Speakers	Lakota English Speakers in Lakota
Mean	12.55	5.05
Range	5-23	0-15
SD	4.13	3.69
Semantic Tasks		
	Monolingual English Speakers	Lakota English Speakers in Lakota
Mean	18.21	9.93
Range	8-30	3-23
SD	4.61	4.50

As only sixteen of the forty-three Lakota participants reported they spoke only Lakota at home, it may be that these participants would score higher on phonemic and semantic tasks in Lakota when compared with monolingual English speakers completing the tasks in English. Fifteen of the sixteen participants reported they learned Lakota under age five and all sixteen described themselves as knowing a lot of Lakota and English. On phonemic tasks, Lakota speakers who spoke only Lakota at home (M = 6.25, SD = 3.51) still scored significantly lower than monolingual English speakers (M = 12.55, SD = 4.13); t (15) = 5.60, $p < .001$. Likewise, a significant difference was still seen on semantic tasks between Lakota English speakers completing the animal naming task in Lakota (M = 11.81, SD = 5.31) and monolingual English speakers (M = 18.21, SD = 4.61); t (67) = 4.70, $p < .001$ with Lakota English speakers naming fewer animals in Lakota than monolingual English speakers did in English. Table 22. provides more information:

Table 22. Number of Words Named by Monolingual English Speakers in English versus Lakota English Speakers in Lakota who Only Spoke Lakota at Home

Phonemic Tasks		
	Monolingual English Speakers	Only Spoke Lakota at Home
Mean	12.55	6.25
Range	5-23	0-11
SD	4.13	3.51
Semantic Tasks		
	Monolingual English Speakers	Only Spoke Lakota at Home
Mean	18.21	11.81
Range	8-30	5-23
SD	4.61	5.31

6.4 Impact of Gender

In addition to the three questions answered regarding comparisons of monolingual English speakers and Lakota English speakers speaking English and Lakota on both

semantic and phonemic verbal fluency tasks, examinations were made to determine possible effects of gender, age, and education levels. No gender differences were found between monolingual English males and females on phonemic (males M = 12.61, SD = 3.81; females M = 12.51, SD = 4.33; t (51) = -.080, p = .936) or semantic (males M = 18.00, SD = 5.74; females M = 18.31, SD = 4.00; t (51) = .233, p = .817) verbal fluency tasks. No significant gender differences were seen between Lakota English speakers when speaking English on either phonemic (males M = 10.30, SD = 4.99; females M = 10.90, SD = 4.46; t (41) = .410, p = .684) or semantic (males M = 19.35, SD = 7.26; females M = 16.40, SD = 4.94; t (41) = -1.533, p = .133) tasks. Although a significant difference was not seen between Lakota English males and females speaking Lakota on phonemic (males M = 4.87, SD 3.71; females M = 5.25, SD = 3.75; t (41) = .334, p = .740) tasks, a significant difference was seen on semantic tasks with males naming more animals (males M = 11.39, SD = 4.64; females M = 8.25, SD = 3.77; t (41) = -2.413, p = .020). The impact of gender can be found in Table 23.:

Table 23. The Impact of Gender

Phonemic Tasks						
	English Male	English Female	Lakota English Male in English	Lakota English Female in English	Lakota English Male in Lakota	Lakota English Female in Lakota
Mean	12.61	12.51	10.30	10.90	4.87	5.25
Range	6-21	5-23	2-22	1-20	0-15	1-14
SD	3.81	4.33	4.99	4.46	3.71	3.75
Semantic Tasks						
	English Male	English Female	Lakota English Male in English	Lakota English Female in English	Lakota English Male in Lakota	Lakota English Female in Lakota
Mean	18.00	18.31	19.35	16.40	11.39	8.25
Range	8-30	9-29	7-34	8-29	4-23	3-15
SD	5.74	4.00	7.26	4.94	4.64	3.77

The results of this study are consistent with the majority of the literature reviewed regarding no gender differences on phonemic verbal fluency tasks (Cavaco et al. 2013; Machado et al. 2009; Tallberg et al. 2008; Khalil 2010; Kosmidis et al. 2004; Van der Elst et al. 2006; Kavé 2005; and Gladsjo et al. 1999). The comparisons between genders on semantic tasks in this study are less clear cut. A study by Capitani, Laiacona, and Barbarotto (1999) examined the impact of gender on semantic naming tasks. They discovered gender differences in only two of their semantic categories with males naming more tools and females naming more fruits, but no gender differences on animals (Capitani, Laiacona, and Barbarotto 1999, 275). The majority of studies reviewed in this paper also did not show a gender difference when naming animals (Cavaco et al. 2013; Peña-Casanova et al. 2009; Tallberg et al. 2008; Khalil 2010; Wang et al. 2011; Lee, Yuen, and Chan 2002; Kosmidis et al. 2004; Ryu et al. 2012; Van der Elst et al. 2006; Kavé 2005; Gladsjo et al. 1999), although Tombaugh, Kozak, and Rees (1999) did find males named more animals than females in their Canadian English study as did Stewart et al. (2001) in the study of British English African Caribbean participants. No gender differences were found in this study between monolingual English speakers or Lakota English speakers completing tasks in English. Perhaps Lakota English males name more animals in Lakota than females due to culture variances as historically males were the hunters of animals and Lakota English women are not as familiar with the Lakota names of animals. No differences exist between Lakota English males and females when they complete the tasks in English, indicating that Lakota English females are familiar with the names of English animals.

6.5 Impact of Age

In order to evaluate possible significance for differences among ages of participants, a one-way ANOVA was completed. The number of responses on phonemic tasks for monolingual English speakers did not vary by age, F (7, 45) = .984, p = .455. There was also no difference on semantic tasks, F (7, 45) = .839, p = .561. See Table 24.

Table 24. Impact of Age for Monolingual English Participants

Phonemic Tasks			
Monolingual English Ages	Mean	Number of Participants	*SD*
55-59	16.00	4	5.77
60-64	10.80	5	1.92
65-69	10.60	5	2.70
70-74	12.50	16	4.31
75-79	12.89	9	4.62
80-84	13.67	9	4.64
85-89	14.00	1	---
90 and above	10.25	4	.96
Semantic Tasks			
Monolingual English Ages	Mean	Number of Participants	*SD*
55-59	18.50	4	3.32
60-64	16.20	5	5.81
65-69	18.00	5	1.58
70-74	19.81	16	4.48
75-79	19.11	9	5.25
80-84	17.33	9	5.57
85-89	15.00	1	---
90 and above	15.00	4	3.16

Lakota English who knew a little Lakota [F (1, 8) = .371, p = .559] did not vary by age nor did participants who knew a lot of Lakota [F (6, 26) = .632, p = .704] on English phonemic tasks. On English semantic tasks, no differences from age were seen

by Lakota English participants who knew a little Lakota [F (1, 8) = .889, p = .373] or those who knew a lot [F (6, 26) = .847, p = .546]. Refer to Table 25.

Table 25. Impact of Age for Lakota English Participants in English

Phonemic Tasks for those who Knew a Little Lakota			
Lakota English Ages	Mean	Number of Participants	*SD*
< 50	14.67	9	4.15
50 to 54	12.00	1	---
Phonemic Tasks for those who Knew a Lot of Lakota			
Lakota English Ages	Mean	Numbers of Participants	*SD*
< 50	10.17	6	2.32
50-54	11.57	7	5.91
55-59	6.80	5	3.63
60-64	9.11	9	4.76
65-69	9.00	3	4.58
70-74	10.00	1	---
75-79	8.00	2	2.83
Semantic Tasks for those who Knew a Little Lakota			
Lakota English Ages	Mean	Number of Participants	*SD*
< 50	23.67	9	6.71
50 to 54	17.00	1	---
Semantic Tasks for those who Knew a Lot of Lakota			
Lakota English Ages	Mean	Numbers of Participants	*SD*
< 50	18.50	6	8.87
50-54	14.57	7	7.30
55-59	14.20	5	3.56
60-64	18.11	9	2.57
65-69	15.00	3	.00
70-74	23.00	1	---
75-79	14.00	2	2.83

For Lakota English participants who knew a little Lakota [F (1, 8) = 5.255, p = .051] and those who knew a lot of Lakota [F (6, 26) = 1.208, p = .334] on Lakota phonemic tasks, age was not a statistically significant factor. On Lakota semantic tasks,

age did not play a role for either Lakota English participants that knew a little Lakota [F (1, 8) = 1.267, p = .293] or a lot of Lakota [F (6, 26) = .898, p = .511). Please see Table 26 for additional information.

Table 26. Impact of Age for Lakota English Participants in Lakota

Phonemic Tasks for those who Knew a Little Lakota			
Lakota English Ages	Mean	Number of Participants	*SD*
< 50	2.11	9	.78
50 to 54	4.00	1	---
Phonemic Tasks for those who Knew a Lot of Lakota			
Lakota English Ages	Mean	Numbers of Participants	*SD*
< 50	7.67	6	5.16
50-54	4.86	7	2.67
55-59	3.40	5	2.88
60-64	5.67	9	3.54
65-69	9.67	3	5.13
70-74	5.00	1	---
75-79	6.00	2	1.41
Semantic Tasks for those who Knew a Little Lakota			
Lakota English Ages	Mean	Number of Participants	*SD*
< 50	8.56	9	3.75
50 to 54	13.00	1	---
Semantic Tasks for those who Knew a Lot of Lakota			
Lakota English Ages	Mean	Numbers of Participants	*SD*
< 50	11.33	6	6.19
50-54	9.57	7	6.37
55-59	7.80	5	2.95
60-64	10.78	9	3.77
65-69	13.33	3	1.15
70-74	14.00	1	---
75-79	6.00	2	.00

Age was not a factor on either phonemic or semantic tasks by either monolingual English speakers or Lakota English speakers when tasks were completed in English or

Lakota. Limited sample size and spread of ages may have skewed results. Age, with older individuals naming fewer words than the younger participants, was a pattern observed with phonemic fluency tasks within studies in the literature review (Cavaco et al. 2013; Peña-Casanova et al. 2009; Khalil 2010; Costa et al. 2013; Kavé 2005; Tombaugh, Kozak, and Rees 1999). Older individuals named fewer animals than their younger participants in semantic verbal fluency tasks in most of the studies as well (Cavaco et al. 2013; Peña-Casanova et al. 2009; Khalil 2010; Wang et al. 2011; Costa et al. 2013; Kosmidis et al. 2004; Ryu et al. 2012; Van der Elst et al. 2006; Kavé 2005; Tombaugh, Kozak, and Rees 1999; Gladsjo et al. 1999; Stewart et al. 2001).

6.6 Impact of Educational Levels

Educational levels were also examined by way of a one-way ANOVA followed by a post hoc comparison using the Fisher LSD test to determine impact on frequency of words named during phonemic and semantic verbal fluency tasks. For monolingual English speakers completing phonemic tasks, participants with some graduate school named significantly more words than those who had only completed high school, (MD = 4.27, SD = 1.94, p = .033). No other comparisons were significant, including comparing participants who had completed graduate school to participants who had only completed high school. For monolingual English speakers completing semantic tasks, participants with some graduate school again named significantly more animals than those who had completed high school, (MD = 5.47, SD = 2.15, p = .014), but no other assessments were significant. Please see Table 27.

Table 27. Impact of Education for Monolingual English Participants

Phonemic Tasks			
Monolingual English Education Levels	Mean	Number of Participants	*SD*
High School	10.73	15	3.39
Some College	12.19	16	3.17
College	13.80	5	3.42
Some Graduate School	15.00	6	7.18
Graduate School	13.64	11	4.01
Semantic Tasks			
Monolingual English Education Levels	Mean	Number of Participants	*SD*
High School	16.53	15	4.24
Some College	17.94	16	4.43
College	17.00	5	5.10
Some Graduate School	22.00	6	5.69
Graduate School	19.36	11	3.75

No statistically significant results for education were found for Lakota English speakers completing English phonemic tasks. For Lakota English speakers on English semantic tasks, participants who had completed college and graduate school named significantly more words than those who had completed high school, (MD = 5.79, SD = 2.78, p = .044) and (MD = 8.13, SD = 3.74, p = .036). Please refer to Table 28.

Table 28. Impact of Education for Lakota English Participants in English

Phonemic Tasks			
Lakota English Education Levels	Mean	Number of Participants	*SD*
Some High School	8.00	4	4.69
High School	10.75	12	4.43
Some College	9.67	12	5.73
College	12.38	8	5.37
Graduate School	11.29	7	1.80
Semantic Tasks			
Lakota English Education Levels	Mean	Number of Participants	*SD*
Some High School	13.00	4	.82
High School	15.33	12	4.79
Some College	19.58	12	7.44
College	21.13	8	8.04
Graduate School	19.00	7	4.04

A significant difference in favor of those who had completed graduate school compared to those who completed high school was present on Lakota phonemic tasks, (MD = 4.05, SD = 1.72, p = .024). On Lakota semantic tasks, Lakota English speakers who had completed high school named significantly fewer words than participants who had completed some college, (MD = -4.67, SD = 1.64, p = .007), completed college, (MD = -4.75, SD = 1.83, p = .013), or completed graduate school, (MD = -6.36, SD = 1.91, p = .002). Refer to Table 29.

Table 29. Impact of Education for Lakota English Participants in Lakota

Phonemic Tasks			
Lakota English Education Levels	Mean	Number of Participants	*SD*
Some High School	4.25	4	3.30
High School	3.67	12	2.23
Some College	5.33	12	3.92
College	4.75	8	4.59
Graduate School	7.71	7	3.90
Semantic Tasks			
Lakota English Education Levels	Mean	Number of Participants	*SD*
Some High School	8.75	4	2.63
High School	6.50	12	3.06
Some College	11.17	12	6.31
College	11.25	8	1.91
Graduate School	12.86	7	1.95

As might be expected, those with higher education levels named more words on both tasks, although no significant results were seen for Lakota English speakers completing phonemic tasks in English. It would also be anticipated that if those with some graduate school named more words than those who completed high school, as occurred on English phonemic tasks, that participants who completed graduate school would also state more words than those who completed high school. Although this logically makes sense, the data do not support this, most likely due to a small sample and few participants within each education level.

The studies in the literature revealed education had an impact on both semantic and phonemic fluency tasks with higher levels of education resulting in greater number of words produced (Cavaco et al. 2013; Peña-Casanova et al. 2009; Elkadi et al. 2006; Khalil 2010; Wang et al. 2011; Lee, Yuen, and Chan 2002; Costa et al. 2013; Ryu et al. 2012; Van der Elst et al. 2006; Kavé 2005; Tombaugh, Kozak, and Rees 1999; Gladsjo et

al. 1999; Stewart et al. 2001). During an Australian study by Elkadi et al. (2006), it was determined that participants with at least a high school education named more animals during semantic naming tasks. In the current study, individuals who had completed only high school performed significantly worse than those with a higher level of education on phonemic and semantic English tasks completed by monolingual English speakers, semantic English tasks completed by Lakota English speakers, and phonemic and semantic Lakota tasks completed by Lakota English speakers.

6.7 Normative Data Results & Recommendations

The answers to the three normative data questions are as follows:

(1) Lakota English speakers name significantly more words in English than in Lakota on both phonemic and semantic verbal fluency tasks even when taking into account Lakota English participants who report they know a little versus a lot of Lakota.

(2) Lakota English speakers name as many words in English as monolingual English speakers on semantic tasks, but not on phonemic tasks.

(3) Lakota English speakers are not able to name as many words in Lakota as monolingual English speakers name in English even when considering Lakota speakers who report they only speak Lakota at home.

Based on this knowledge, it is recommended that semantic and phonemic verbal fluency tasks be completed in English versus in Lakota as Lakota English speakers perform better on both tasks in English. It is important to note that although Lakota English speakers named more words in English, they do not name as many words on phonemic tasks when compared to English monolingual speakers. Professionals evaluating Lakota English speakers must consider this information in relationship to assessments that have not been normalized on the Lakota population. For example, one task on the Montreal Cognitive

Assessment (MoCA) asks participants to complete a phonemic naming task with the letters F, A, or S, depending on the version (Nasreddine et al. 2005). If participants name eleven words or more, they are given a single point out of thirty possible points for the entire test (Nasreddine et al. 2005). The mean for monolingual English speakers on the letter P during phonemic tasks in this study was 12.55, with a standard deviation of 4.13, above the required eleven on the MoCA. The mean for Lakota English speakers naming P words in English was only 10.58, with a standard deviation of 4.71, below the required score for the phonemic fluency task on the MoCA. Although the F, A, and S letters used on the MoCA are different from the letter P used during the current study, the discrepancy between the phonemic means of monolingual English and bilingual Lakota English speakers suggests researchers and medical professionals should use caution when comparing results of Lakota English speakers to monolingual English speakers. The normative data obtained during this study, although limited due to a smaller sample size, supports the need for additional research in order to provide appropriate evaluation and treatment of Lakota English speakers on verbal fluency tasks, and particularly on phonemic tasks. Additional research is also needed to determine if gender, age, and education levels impact the number of responses on verbal fluency tasks.

CHAPTER 7

PROTOTYPE THEORY RESULTS & DISCUSSION

Obtaining normative data for the Lakota people and comparing it to monolingual English speakers was not the only goal of this paper. The second theme was to determine prototypical Lakota animals as based on the principles of Prototype Theory. The following questions were proposed:

(1) Are there differences in the animals named by the Lakota speakers versus monolingual English speakers during semantic tasks?

(2) Are there differences in the animals named by the Lakota speakers when completing semantic tasks in Lakota versus in English?

(3) What are the prototypical animals in the Lakota culture as determined by applying the principles of Prototype Theory to semantic fluency tasks?

One of the major tenants of Prototype Theory is that some words are prototypical and some words are peripheral within a category. In the Rosch (1975) study of college students ranking birds, a clear distinction was present on words which were most prototypical, as indicated by students giving these words a ranking of a one, and words which were least prototypical, as indicated by a ranking of a seven. Although the semantic verbal fluency task in this study asked participants to name any kind of animal, some participants named birds. Table 30. depicts birds named by two or more monolingual English speakers from the present study and the ranking and specific score taken from the Rosch (1975) study of fifty-four birds:

Table 30. Birds Named by Monolingual English Speakers Compared to Rankings in the Rosch (1975) Study

Bird Name	# of English speakers who said the bird	Rosch (1975) Rank	Rosch (1975) Specific Score
Robin	2	1	1.02
Sparrow	3	2	1.18
Parakeet	2	10	1.53
Eagle	2	17.5	1.75
Pigeon	2	22	1.81
Parrot	6	29	2.07
Pheasant	2	31	2.69
Geese	7	39	3.03
Duck	8	45	3.24
Chicken	18	48	4.02
Turkey	3	49	4.09
Ostrich	3	50	4.12
Penguin	4	53	4.53
Bat	3	54	6.15

Other birds were named by single English participants, and a few birds named by two or more English speakers were not on the Rosch (1975) list. Of the fourteen birds named by two or more English speakers which appeared on the Rosch (1975) list, three of the birds (*robin*, *sparrow*, and *parakeet*) appeared in the first ten ranked birds, indicating high prototypicality. The participants did not only name prototypical birds, but six of the birds (*duck*, *chicken*, *turkey*, *ostrich*, *penguin*, and *bat*) occurred in the last ten ranked birds, indicating low prototypicality. The remaining five birds named appear to be randomly occurring within the chart; however, three birds (*eagle*, *pheasant*, and *geese*) are very common in western South Dakota and two birds (*pigeon* and *parrot*) begin with the letter P. *Pigeon* was named by two participants, once after the phonemic P naming task had been given indicating possible influence. *Parrot* was named by six individuals,

four of these individuals named it after the phonemic P naming task. It would appear the birds named during the semantic animal naming verbal fluency task align with the prototypical rankings organized by participants in the Rosch (1975) study, although they seem to fall at the two extremes of central and peripheral words. Perhaps if the protocol from the Rosch (1975) study were completed with individuals in western South Dakota today, *eagle*, *pheasant*, and *geese* would be considered to be more prototypical.

7.1 Top Ten Words Named by English and Lakota English Speakers in English and Lakota

Table 31. lists the top ten most frequently occurring animals named by monolingual English speakers, Lakota English speakers speaking English, and Lakota English speakers speaking Lakota during semantic animal naming verbal fluency tasks. The number of speakers who said each word are given in parentheses:

Table 31. Top 10 Animals Named by English Speakers and Lakota English Speakers in English and in Lakota

English Animals **Out of 53 Speakers**	**Lakota English Animals Named in English** **Out of 43 Speakers**	**Lakota English Animals Named in Lakota** **Out of 43 Speakers**
1. Cat (48)/ Dog (48)	1. Dog (39) / Horse (39)	1. *Sunka* ‘dog’ (41)
3. Horse (43)	3. Cat (36)	2. *Igmu* ‘cat’ (34) / *Sunkawakan* ‘horse’ (34)
4. Cow (40)	4. Cow (28)	4. *Tatanka* ‘buffalo bull’ (20) / *Wanbli* ‘eagle’ (20)
5. Lion (36)	5. Buffalo (25)	6. *Pispiza* ‘prairie dog’ (17) / *Zuzeca* ‘snake’ (17)
6. Tiger (34)	6. Eagle (24)	8. *Ptegleska* ‘cow’ (16) / *Mato* ‘bear’ (16)
7. Elephant (30)	7. Elephant (23) / Deer (23)	10. *Sungamnitu* ‘coyote’ (15)
8. Deer (24)	9. Elk (19)	
9. Pig (22) / Zebra (22)	10. Bird (18) / Bear (18)	

As can be seen from the table, all three groups named *cat*, *dog*, *horse*, and *cow*, but the remaining six words in the top ten differed among the groups. *Dog* was consistently named by the most speakers in each of the three groups, followed by *cat* and *horse*. Although *cow* was named fourth most frequently for English monolinguals and Lakota English speakers completing the semantic task in English, when Lakota English speakers named *ptegleska* 'cow' in Lakota, they named this word eighth most frequently tied with *mato* 'bear'. Please find a list of all animals named and their frequency of occurrences for English and Lakota English speakers in Appendices I, J, and K.

7.2 Animals Named by English vs. Lakota English in English

A comparison between the animals monolingual English speakers named and Lakota English speakers named in English reveals a total of six of the top ten animals were the same: *cat*, *dog*, *horse*, *cow*, *elephant*, and *deer*. Monolingual English speakers named a total of one hundred and fifty-nine different animals while Lakota English speakers named one hundred and fifty words in English. Table 32. compares the remaining four words for the monolingual English and Lakota English participants naming animals in English which differed between these groups as well as the frequency of occurrence in both languages:

Table 32. Ranking of Animals Not Ranked in 10 Ten by Both English Speakers and Lakota English Speakers in English

Animal	English Frequency Out of 53 Speakers	Lakota English in English Frequency Out of 43 Speakers
Lion	5. (36)	16. (14)
Tiger	6. (34)	18. (13)
Pig	9. (22)	18. (13)
Zebra	9. (22)	16. (14)
Buffalo	26. (11)	5. (25)
Eagle	80. (2)	6. (24)
Elk	24. (12)	9. (19)
Bird	19. (17)	10. (18)
Bear	11. (21)	10. (18)

Although *bear* did not make the top ten list for monolingual English speakers, it follows closely behind at rank eleven. Lakota English speakers completing semantic tasks in English do name African animals such as *lion*, *tiger*, and *zebra*, but not until rank sixteen for *lion* and *zebra* and eighteen for *tiger*. *Pig* also ranks eighteen for Lakota English individuals speaking in English as opposed to ninth for monolingual English speakers. *Elk* ranks higher, at ninth, for Lakota English speakers naming in English when compared to monolingual English speakers who said it twenty-fourth most frequently. *Buffalo* and *eagle*, both important animals in the Lakota religion and culture, rank fifth and sixth respectively for Lakota English speakers, but twenty-six and eightieth, respectively, for monolingual English speakers. Twelve times as many Lakota English participants (twenty-four people) named *eagle* as did monolingual English participants (two people).

Table 33. Ranking of Animals by Canadian English Speakers in the Schwartz et al. (2003) Study, English Speakers, and Lakota English Speakers in English

Top 10 Canadian English Animals Named in Schwartz et al. (2003) Out of 40 Speakers	**English Frequency Out of 53 Speakers**	**Lakota English in English Frequency Out of 43 Speakers**
1. Cat (36)	1. Cat (48)	3. Cat (36)
1. Dog (36)	1. Dog (48)	1. Dog (39)
3. Bear (25)	11. Bear (21)	10. Bear (18)
3. Elephant (25)	7. Elephant (30)	7. Elephant (23)
3. Horse (25)	3. Horse (43)	1. Horse (39)
6. Lion (23)	5. Lion (36)	16. Lion (14)
6. Monkey (23)	21. Monkey (15)	22. Monkey (12)
8. Whale (22)	38. Whale (6)	35. Whale (6)
9. Bird (21)	19. Bird (17)	10. Bird (18)
10. Zebra (20)	9. Zebra (22)	16. Zebra (14)

A study by Schwartz et al. (2003, 400) examined monolingual English undergraduate students at the University of Victoria who produced semantic fluency tasks in two minutes with the ability to name two categories within a single task instead of the typical one. Specifically, participants were asked to name words within the categories of animals or fruits, in any order, for semantic tasks (Schwartz et al. 2003, 400). Animals were named significantly more often than fruits were (Schwartz et al. 2003, 404). Table 33. above compares the top ten words named by Schwartz et al.'s participants to monolingual English and Lakota English participants completing tasks in English from the current study.

Similarities between the three groups can be found in the naming of *cat*, *dog*, *elephant*, and *horse* within the top ten most frequently named words in each group. The participants in the Schwartz et al. (2003) study named *monkey* more frequently (sixth) compared to monolingual English speakers (twenty-one) or Lakota English speakers

completing the semantic task in English (twenty-two). *Whale* was also named much less frequently by either of the two groups in the South Dakota sample with rankings of thirty-eight for monolingual English speakers and thirty-five for Lakota English speakers in English compared to sixth by participants in the Schwartz et al. (2003) study. Although similarities appear when comparing the Canadian English participants in the Schwartz et al. (2003) study to the current sample of participants in western South Dakota, some animals named by the Canadian English speakers are not found in the top ten of words named by the participants in the current study and vice versa. Lakota English speakers who name words in English have some similarities when compared to monolingual English speakers, but their top ten most frequently named animals also reflect their cultural heritage by including animals such as *eagle* and *buffalo*.

7.3 Animals Named By Lakota English in English vs. in Lakota

Differences exist between the animals named by monolingual English speakers and Lakota English speakers who named animals in English. Will the same Lakota English participants produce identical animals in English and Lakota? Of the ten most frequently named words, Lakota English participants named seven of the same animals: *sunka* 'dog'; *igmu* 'cat'; *sunkawakan* 'horse'; *ptegleska* 'cow'; *tatanka* 'buffalo bull'; *wanbli* 'eagle'; and *mato* 'bear.' Lakota English participants named a total of one hundred and fifty animals in English, but only eighty-seven different animals in Lakota. The following Table 34. compares the remaining four words for the Lakota English participants naming animals in English and Lakota which differed between these groups as well as the frequency of occurrence in both languages:

Table 34. Ranking of Animals Not Ranked in 10 Ten by Both Lakota English Speakers in English and in Lakota

Animal	Lakota English in English Frequency Out of 43 Speakers	Lakota English in Lakota Frequency Out of 43 Speakers
Elephant	7. (23)	*Pawokic'u* 32. (3)
Deer	7. (23)	*Tacha* 11. (14)
Elk	9. (19)	*Hehaka* 18. (8)
Bird	10. (18)	*Zintkala* 12. (13)
Pispiza 'prairie dog'	13. (15)	6. (17)
Zuzeca 'snake'	13. (15)	6. (17)
Sungamnitu 'coyote'	22. (12)	10. (15)

Although *deer* did not make it into the top ten for Lakota English speakers speaking in Lakota, it was ranked eleven. *Bird* also did not appear far apart in the two languages with Lakota English speakers in English ranking it tenth and in Lakota ranking it twelfth. *Elk* was ranked twice as high, ninth versus eighteenth, in English and in Lakota, while *prairie dog*, *snake*, and *coyote* were named more frequently in Lakota than in English. The largest discrepancy in ranking was seen with the word *elephant* being ranked seventh in English and thirty-second in Lakota. It is unknown the reasoning behind why some animals are named by Lakota English speakers in English, but not in Lakota. It may be that the animals named in Lakota are most important culturally to the Lakota English speakers and may be used most frequently in culturally significant events including religious gatherings. It is unknown how many animals Lakota English speakers knew outside of the semantic verbal fluency task, and it may be that words such as *pawokic'u* 'elephant' or *hehaka* 'elk', for example, are not familiar to all Lakota English participants. Based on the differences between monolingual English speakers and Lakota English speakers on English and Lakota semantic fluency tasks, *buffalo*, *cat*, *dog*, *eagle*,

and *horse*, would be five prototypical animals both in Lakota and for Lakota English speakers naming words in English.

7.4 Prototype Theory Results

The purpose of this chapter was to review what animals were named by monolingual English and Lakota English speakers based on the principles of Prototype Theory. The three questions presented at the beginning of the chapter are answered below:

(1) Are there differences in the animals named by the Lakota speakers versus monolingual English speakers during semantic tasks?
Yes. Of the top ten most frequently named animals by both monolingual English speakers and Lakota English speakers in English, there were six animals that were the same. These animals were *cat*, *cow*, *deer*, *dog*, *elephant*, and *horse*. When compared to Lakota speakers completing the task in Lakota, monolingual English speakers named four of the same animals. These animals were *cat*, *cow*, *dog*, and *horse*.

(2) Are there differences in the animals named by the Lakota speakers when completing semantic tasks in Lakota versus in English?
Yes. Of the top ten most frequently named animals by Lakota English speakers in English and in Lakota, there were seven animals that were the same. These animals were *bear*, *buffalo*, *cat*, *cow*, *dog*, *eagle*, and *horse*.

(3) What are the prototypical animals in the Lakota culture as determined by applying the principles of Prototype Theory to semantic fluency tasks?
Based on the frequency of words named during the semantic verbal fluency task, the top ten animals named by Lakota English speakers in Lakota are as follows: *dog*, *cat*, *horse*, *buffalo*, *eagle*, *prairie dog*, *snake*, *cow*, *bear*, and *coyote*. There were three words named by Lakota English speakers in Lakota which were not named by these same speakers in English. These animals were *coyote*, *prairie dog*, and *snake*.

The rural geographical location of western South Dakota appears to have impacted the results of the monolingual English speakers and Lakota English speakers as both

groups named animals commonly found in the area. In addition, the Lakota Sioux culture, religion, and heritage seems to have influenced the words selected by the Lakota English speakers.

CHAPTER 8

CONCLUSION

Ralph Waldo Emerson once said, “Language is the archives of history.” The use of language today by Lakota English speakers reflects their culture and is a reflection of their history as a people. This study sought to gather normative data for the Lakota people in order to determine how best to provide evaluation by medical professionals for potential neurological disorders within the Lakota population. Although the sample size was small, as it was difficult to gather Lakota speakers due to their close-knit community, and the testing areas were not identical, as the researcher had to travel to the participants, statistically significant results were found. Lakota English participants were able to name more words beginning with P during phonemic tasks and animals during semantic tasks in English than in Lakota even when accounting for participants who knew a lot versus a little Lakota and participants who only spoke Lakota in the home. Compared to monolingual English speakers, Lakota English speakers were able to name as many animals in English, but were not able to name as many words beginning with P in English. Gender differences were only seen on semantic animal tasks in Lakota with men naming more animals than women. Age differences were not statistically significant for number of words named during semantic or phonemic tasks in any of the three groups of participants. Greater educational levels, particularly greater than completing high school, had a positive impact on the number of words named, although this was inconsistently

seen, most likely due to small sample size. No statistically significant results were found for Lakota English speakers completing English phonemic tasks and education levels. Based on these results, it is recommended that Lakota English speakers be evaluated in English on animal semantic verbal fluency tasks if the examiner is wanting to compare results to monolingual English normative data. If phonemic verbal fluency tasks are needed to be administered, it is suggested that Lakota English speakers be evaluated in English, although examiners must realize normative data obtained from monolingual English speakers is not comparable.

This study also evaluated the prototypical words named by monolingual English speakers and Lakota English speakers completing semantic naming tasks in English and in Lakota. When the top ten words for each of the three groups was compared, the words *dog*, *cat*, and *horse*, in varying orders, were named in the top three. *Buffalo* and *eagle* were also important for Lakota English speakers in English and in Lakota, but not for monolingual English speakers. It is the hope of this researcher that in the future, medical professionals, including speech-language pathologists, and educators will consider the importance of *buffalo* and *eagle* in Lakota culture when working with the Lakota people and will include these words and concepts as appropriate. Further research is needed to explore the intricacies of the semantic framework of the Lakota people both in English and in Lakota. Additional research should also be conducted to examine other phonemic and semantic topics and to ensure the results found in this study. Even though Lakota is a threatened language, these future studies should include tasks in English and in Lakota as there are still individuals who are bilingual in both languages. It is the sincere hope of this researcher that this study will be of practical benefit for the health and wellbeing of

the Lakota people and theoretical use to semantic linguistic research as it contributes to the limited knowledge surrounding semantics and the Lakota people. If "language is a city to the building of which every human being brought a stone," according to Ralph Waldo Emerson, may this study be an attempt at delaying the destruction of a single stone.

APPENDICES

APPENDIX A

LAKOTA IPA

Table 35. Lakota Consonants

	Bilabial	Alveolar	Palato-alveolar	Palatal	Labial-Velar	Velar	Uvular	Glottal
Plosive/Stops	p (p) b (b)	t (t)				k (k) g (g)		ʔ (‘)
Aspirated	p^h (ph)	t^h (th)				k^h (kh)		
Glottal	p’ (p’)	t’ (t’)				k’ (k’)		
Nasal	m (m)	n (n)						
Lateral Approximant		l (l)						
Fricative		s (s) z (z)	ʃ (š) ʒ (ž)			x (x̌)	ʁ (ğ)	h (h)
Affricate			tʃ (č)					
Aspirated			$tʃ^h$ (čh)					
Glottal			tʃ’ (č’)					
Approximant				j (y)	w (w)			

Table 36. Lakota Vowels

	Front	Central	Back	Nasalized
Close				ĩ (iŋ) ũ (uŋ)
Near-close	ɪ (i)			
Close-Mid				
Mid		ə (u)		
Open-Mid	ɛ (e)			
Open			ɑ (a) ɒ (o)	ɑ̃ (aŋ)

APPENDIX B
VERBAL FLUENCY SCORING

Although it is generally agreed upon that individuals participating in verbal fluency tasks are given only sixty seconds to complete each task, the precise requirements on what constitutes an accurate response varies among studies. According to the Cavaco et al. (2013, 264) Portuguese study, "Any repetition of the same animal species (including name variations according to the animal gender or age) was not credited" for semantic fluency tasks. Similarly, in their Spanish study, Peña-Casanova et al. (2009, 397) required that in order for points to be given, participants were not allowed to state "variations within the same specie or supra-ordinations […] if there was more than one representative of the class (e.g., if someone told "bird" and "canary", only "canary" was counted as correct response)." In his Hebrew study, Kavé (2005, 693) also only gave credit for either the category (e.g., *bird*) or subcategory (e.g., *sparrow*), but not both. Unlike Peña-Casanova et al. (2009) and Kavé (2005), Tallberg et al. (2008, 481) chose to count both the general category and the specific example or representative from that class. The Elkadi et al. (2006, 39) test criterion for scoring semantic fluency tasks in their Australian study simply states points were given for "each unique animal name" provided. The rules for Khalil's (2010, 1031) Arabic study do not specify if supra-ordinations count, but simply asked participants to "name as many different types of animals as they could" while avoiding "alternative names." Unlike the Cavaco et al. (2013) Portuguese study, in his Hebrew study Kavé (2005) allowed two points total for

an animal and its offspring, although animals named with different genders counted as a single point. The lack of standardization regarding what is and is not considered to be an animal and a correct response in semantic verbal fluency tasks makes comparing the varying normative data results more difficult.

Unfortunately, discrepancies also exist for phonemic fluency tasks. During phonemic fluency tasks, participants only received credit for the first answer if multiple answers were given containing the same root word (e.g., love, loves, loving) (Cavaco et al. 2013, 264; Peña-Casanova et al. 2009, 398; Tallberg et al. 2008, 481; Khalil 2010, 1031; Costa et al. 2013; Kosmidis et al. 2004; Ratcliff et al. 1998, 118; Cauthen 1978, 127; Machado et al. 2009, 56; Tombaugh, Kozak, and Rees 1999, 169; Gladsjo et al. 1999,151). If multiple numbers were given, only the first word counted (Cavaco et al. 2013, 264). Slang and commonly used foreign words were acceptable, as were homonyms if the participant indicated both meanings (Cavaco et al. 2013, 264; Kavé 2005, 692). Peña-Casanova et al. (2009, 398) informed participants that personal names would not count as accurate responses in phonemic fluency tasks. Tallberg et al. (2008, 481), Khalil (2010, 1031), Machado et al. (2009, 56), and Gladsjo et al. (1999, 151) also excluded proper nouns, as well as repetitions of the same word. Homophones and slang words were allowed, but "inflections, derivations and compounds including previously uttered words were explicitly disallowed to restrict associations to phonological rather than morphological and semantic similarities" (Tallberg et al. 2008, 481). Proper nouns and conjugated verbs were not allowed in the Italian study (Costa et al. 2013). In the Greek study, repetitions and proper nouns did not count as accurate responses (Kosmidis et al. 2004, 165). Both proper nouns and numbers were deemed to be inappropriate

responses in the Haryanvi, a dialect of Hindi, study (Ratcliff et al. 1998, 117-8), and also in the Canadian study (Cauthen 1978, 127). Homonyms were accepted if the participants indicated both meetings, as were commonly used foreign words (Machado et al. 2009, 57). In their Canadian study, Tombaugh, Kozak, and Rees (1999, 169) informed participants that proper nouns were not considered to be acceptable responses. Plurals were not counted as appropriate responses in the Gladsjo et al. (1999, 151) American study.

APPENDIX C
VERBAL FLUENCY INSTRUCTIONS

The instructions given to participants in order to complete each of the tasks also varied from study to study. Peña-Casanova et al. (2009, 397) report they based their instructions on the Barcelona neuropsychological test which state, "I am going to ask you to tell me all the names of animals you remember." If a participant did not begin naming animals within ten seconds, the examiner provided prompts (Peña-Casanova et al. 2009, 397). Elkadi et al. (2006, 39) encouraged participants to name their animals quickly, by giving the following instructions, "In this next task I am going to give you a category and I want you to say, as fast as you can, names of things that belong in that category. You will have one minute. For example, if I say the category is clothes, you could say something like, 'shirt, sweater, belt and so on.' Ready? The category is animals. Tell me as many animal names as you can think of in one minute. Any kind of animal. Start now." Although the instructions are certainly longer than the instructions given in the Peña-Casanova et al. (2009) study, Elkadi et al. (2006) provided an example to clarify possible confusion and to also inform participants to focus on speed. According to Tombaugh, Kozak, and Rees (1999, 169), they based their instructions from the Rosen (1980) study and asked participants to "say the names of as many animals that they could think of." Tallberg et al. (2008) were concerned that their Swedish participants would clearly understand their instructions. Instead of using the word *category*, Tallberg et al. (2008, 481) chose to use the word *group* in the hopes that this term would be more

readily comprehensible to individuals with less education. Tallberg et al. (2008) were also concerned that the participants in their study focus every second on naming animals and not on what constitutes an animal. Specifically, Swedish individuals in the study were told they were to decide which items belonged in each group in order to "prevent subjects from speculating during testing whether, for example, insects are animals" (Tallberg et al. 2008, 481). By doing so, Tallberg et al. (2008) allowed their participants to focus on the task and not worry if their responses would be counted as correct or not. Swedish participants were encouraged to "say as many different words as possible" for semantic, phonemic, and verb verbal fluency tasks (Tallberg et al. 2008). Arabic participants were given identical instructions to those Tallberg et al. (2008) gave to their Swedish participants (Khalil 2010). Costa et al. (2013), concerned for their Italian participants' understanding of the tasks, provided a training trial at the beginning of each of their verbal fluency tasks. Participants in the Greek study were asked to "begin generating items verbally as soon as the researcher announced the category or letter" (Kosmidis et al. 2004, 165). Concerned that their largely illiterate Haryanvi speakers would not understand the phonemic fluency task instructions, Ratcliff et al. (1998, 117) modified the instructions to ask their participants to name words beginning with a specific sound rather than a specific letter. Examples with the phoneme /l/ were also given to ensure understanding (Ratcliff et al. 1998, 118). Gladsjo et al. (1999), in their study of American native English speakers, provided specific instructions to ensure the participants understood the differences between the tasks. For the semantic fluency task, which followed immediately after the three F, A, and S phonemic fluency tasks, Gladsjo et al. (1999,161) chose to clarify "Now we are going to do something a little different.

This time I want you to tell me all of the animal names that you can think of. It doesn't matter what letter they start with. Just tell me all of the animals names that you can think of." The scoring criteria, participants in the study, and instructions for the verbal fluency tasks varied from study to study, and the results did as well.

APPENDIX D

VERBAL FLUENCY TASKS & OTHER LANGUAGES

A review of the current research reveals many studies involving languages around the world for semantic, phonemic, and excluded letter verbal fluency tasks. Cavaco et al. (2013, 263) completed research on semantic and phonemic verbal fluency tasks with individuals living in Portugal who spoke Portuguese as a first language. While evaluating the number of animals and the number of words beginning with M, R, and P each participant produced in Portuguese in one minute, Cavaco et al. (2013, 264) did not find statistically significant differences between males and females for either task. Education and age both impacted scores for Portuguese semantic and phonemic fluency tasks (Cavaco et al. 2013, 267). The number of participant's accurate responses lessened as their ages increased, and increased with higher years of education during both tasks (Cavaco et al. 2013, 267). Although still a factor, age played less of a role than did education for Portuguese phonemic fluency tasks (Cavaco et al. 2013, 267).

In their phonemic verbal fluency test of the letters F, A, and S, Machado et al. (2009) examined elderly Portuguese speakers living in Brazil. They found no statistically significant differences for gender, but education levels had the greatest impact on number of words produced, followed by scores on the Mini-mental State Examination (Machado et al. 2009, 57-8). A positive relationship was found between Mini-mental State Examination scores and number of F, A, and S words produced (Machado et al. 2009,

58). Although higher levels of education resulted in greater numbers of produced words, age did not play a consistent role in the linear regression model (Machado et al. 2009, 58).

The Peña-Casanova et al. (2009) study evaluated semantic fluency tasks for animals, fruits and vegetables, and kitchen tools, and phonemic fluency tasks for words beginning with M, P, and R, as well as excluded letter fluency tasks for words excluding the letters A, E, and S in Spanish speaking individuals from multiple Spanish regions. Unlike the Cavaco et al. (2013) findings that gender did not play a role, Peña-Casanova et al. (2009, 399) discovered no gender differences for animal naming, but they were present for fruit and vegetable and kitchen tool semantic naming tasks, with a minimal advantage for females. Older individuals did not name as many items as younger participants in all Spanish semantic, phonemic, and excluded letter fluency tasks (Peña-Casanova et al. 2009, 405). Spanish participants' higher educational levels resulted in more responses for phonemic, excluded letter, and semantic animal naming tasks, but not for semantic fruit and vegetables or kitchen tools naming tasks (Peña-Casanova et al. 2009, 406).

An Australian study, completed by Elkadi et al. (2006), focused solely on semantic fluency tasks, specifically the number of animals named in one minute. The participants utilized were more limited than some other studies discussed, and only women aged fifty-six to sixty-seven years old were included (Elkadi et al. 2006, 38). As with other studies, greater education resulted in more animals named, specifically when participants had at least a high school education (Elkadi et al. 2006, 39). Elkadi et al. (2006) also examined the relationship of mood, as determined by a shortened version of

the Center for Epidemiological Studies Depression scale (CES-D), on the semantic animal task, but did not find any significant relationships. Unlike other studies, Elkadi et al. (2006, 40) focused not only on the number of words produced, but also evaluated the number of words produced in fifteen second intervals. The mean number of words were nine and ten for participants with less than and greater than twelve years of education, respectively, for the initial fifteen seconds and steadily decreased until around two and three words were stated in the last fifteen seconds (Elkadi et al. 2006, 40).

In their study on verbal fluency, Tallberg et al. (2008) used phonemic, semantic, and verb verbal fluency tasks to evaluate Swedish speakers. Participants with the greatest and lowest mean performances for F, A, and S phonemic and animal semantic verbal fluency tasks were the same, although this was not true for verb verbal fluency tasks. Women with an education of greater than twelve years who were between the ages of thirty and sixty-four had the highest mean, while men with an education of less than or equal to twelve years who were between the ages of sixty-five to eighty-nine had the lowest mean (Tallberg et al. 2008, 482). Interestingly, verb verbal fluency tasks had the same group for the lowest mean (i.e., men with an education of less than or equal to twelve years who were between the ages of sixty-five to eighty-nine), but the highest mean was seen in young males aged sixteen to twenty-nine with an education greater than twelve years (Tallberg et al. 2008, 482). Significant predictors in the Tallberg et al. (2008, 482) study include years of education for F, A, and S phonemic tasks, age and years of education for animal semantic tasks, and years of education and gender for verb tasks.

Arabic speakers have also completed semantic and phonemic fluency tasks. In his study, Khalil (2010, 1030-31) did not utilize the traditional F, A, and S frequently used in English tests as these letters did not correlate to Arabic. Instead, the letters W, R, and G were chosen since they frequently begin words in Arabic (Khalil 2010, 1031). Animals was the chosen category for the semantic verbal fluency task (Khalil 2010, 1031). Gender did not play a role in either task, although number of productions increased as participants' education levels increased (Khalil 2010, 1031). Individuals aged thirty to thirty-nine had the highest mean, while the lowest average was seen in participants aged forty to fifty-nine (Khalil 2010, 1032). Age and education showed a significant effect for both semantic and phonemic fluency tasks (Khalil 2010, 1032). Khalil (2010, 1031) also evaluated the perseveration errors and rate for verbal fluency tasks. Greater perseveration errors were seen in the semantic animal task (mean of 2.13) than in the total phonemic naming tasks (mean of 0.20).

While evaluating Han Chinese individuals from mainland China, Wang et al. (2011) completed multiple neuropsychological examinations, including a semantic verbal fluency task where individuals were asked to name animals. Higher education resulted in higher scores, as did younger age (Wang et al. 2011, 130-31). Gender did not have a significant effect on number of words produced (Wang et al. 2011, 131).

Lee, Yuen, and Chan (2002) also gave a series of neuropsychological examinations for adolescents and adults who spoke Hong Kong Chinese, specifically Cantonese. Adapted from the Word Fluency Test (Benton and Hamsher 1983), adolescent participants were asked to complete four semantic verbal fluency tasks including naming animals, fruits and vegetables, emotions, and musical instruments

while adult participants were asked to complete two semantic verbal fluency tasks including naming animals and fruits and vegetables (Lee, Yuen, and Chan 2002). Education was a significant main effect for these tasks, but gender was not (Lee, Yuen, and Chan 2002, 627-8).

In addition to the typical animal, color, and fruit semantic and F, A, and S phonemic verbal fluency tasks, Costa et al. (2013) also asked their Italian participants to complete a phonemic/semantic alternating fluency task. Like semantic and phonemic verbal fluency tasks, participants were only given sixty seconds to complete the phonemic/semantic alternating fluency task (Costa et al. 2013). For this task, Italian participants were asked to begin naming words starting with F then switch to naming animals and continue switching back and forth throughout the task (Costa et al. 2013). The average responses for the phonemic/semantic fluency alternating test was significantly lower than either the semantic or phonemic fluency tasks (Costa et al. 2013). Participants also produced fewer responses on the phonemic fluency tasks than semantic fluency tasks (Costa et al. 2013). A gender difference was seen in this study, showing females scoring better than males in all three tasks. On all three tasks, older individuals named fewer items than the younger participants did, while individuals with greater education produced more answers than the less educated participants (Costa et al. 2013).

A verbal fluency study in Greek, completed by Kosmidis et al. (2004, 165), evaluated semantic verbal fluency tasks for animals, fruit, and objects, as well as phonemic verbal fluency tasks for the Greek letters (X) Chi, (∑) Sigma, and (A) Alpha. Kosmidis et al. (2004, 165) chose these specific Greek letters based on the ratio of words starting with these letters compared with all words present in a Greek dictionary, and

chose letters with a ratio consistent with the F, A, and S in the English language. In addition to obtaining the mean number of responses for education level, age, and gender, Kosmidis et al. (2004, 165) also evaluated the clustering and switching that occurred during each task. Clustering refers to participants naming words which belong to the same subcategory, while switching refers to the "switch" to another cluster of words when the participant cannot think of additional items in the first subcategory (Kosmidis et al. 2004, 165). Subcategories noted for the semantic category animal naming task included farm animals, animals of the Greek forest, tropical animals/animals of the steppe/animals of the jungle/safari animals, reptiles, birds, fish/anything living underwater such as mammals, and insects (Kosmidis et al. 2004, 171). In order to form a semantic cluster, participants needed to produce three or more consecutive words belonging to a single subcategory (Kosmidis et al. 2004, 171). The younger and more educated the Greek participants were, the greater number of switches were observed (Kosmidis et al. 2004, 166-7). Older adults produced the largest cluster sizes, and this age relationship was the only effect on clusters (Kosmidis et al. 2004, 167). In the phonemic fluency tasks, higher education levels in Greek participants resulted in greater total word productions (Kosmidis et al. 2004, 167). Interestingly, the number of repetitions during a task was also greater with more educated participants (Kosmidis et al. 2004, 167). A gender difference was only seen in the semantic fluency task where participants were asked to name fruits, and women produced more correct responses than did the male participants (Kosmidis et al. 2004, 167). Overall, for the Greek participants in the Kosmidis et al. (2004, 167-8) study, the semantic tasks resulted in more switches, bigger clusters, and a larger number of accurate responses than did results in phonemic tasks.

Although both education and age were important factors in their study, Kosmidis et al. (2004, 169) felt higher education had a larger impact on the number of responses than age did.

Ryu et al. (2012, 306), in their study of verbal fluency tasks with elderly Korean speakers, focused on determining normative data for semantic animal naming tasks. Results showed significant effects from age and education, but not from gender (Ryu et al. 2012, 307). Specifically, individuals with higher education and younger participants did better than those with lower education or were older (Ryu et al. 2012, 307).

In their study of largely illiterate and uneducated speakers of Haryanvi, a dialect of Hindi, Ratcliff et al. (1998) chose to evaluate both semantic (animals and fruits) and phonemic (P and S) verbal fluency tasks. Even with changing the phonemic task instructions to naming words beginning with a specific sound instead of a specific letter, 26% of the illiterate participants were unable to produce any responses at all (Ratcliff et al. 1998, 117). Scores for semantic fluency tasks were much higher (Ratcliff et al. 1998, 117). A relationship between higher levels of education and greater number of responses was stronger in the phonemic fluency tasks than in the semantic fluency tasks (Ratcliff et al. 1998, 115).

Van der Elst et al. (2006, 80) changed the rules of the traditional phonemic fluency task by asking their Dutch participants to name 4-letter words beginning with M. They also evaluated semantic verbal fluency tasks with the categories of animals and professions (Van der Elst et al. 2006, 80). Although older individuals did worse on all three tasks, the onset of these changes were not consistent. Changes in the number of answers given for the profession semantic naming task and the 4-letter M phonemic

naming task did not occur until after age fifty, while there was a linear decline in answers for the animal naming task (Van der Elst et al. 2006, 84). Gender differences were not seen for the 4-letter M phonemic task or the animal semantic task, but was present in the profession semantic task where males had higher scores than females (Van der Elst et al. 2006, 80). Educational levels also affected both phonemic and semantic verbal fluency tasks, although there was a greater difference between participants with low levels and average levels of education than between those with average levels and high levels of education (Van der Elst et al. 2006, 84). The greatest predictors varied between low level of education for 4-letter M phonemic naming and profession semantic naming tasks, and age for animal naming tasks (Van der Elst et al. 2006, 84-5).

The Kavé (2005, 690) study of Hebrew speakers evaluated three semantic fluency tasks (animals, fruit and vegetables, and vehicles), and three phonemic fluency tasks (*bet* /b/, *gimel* /g/, *shin* /ʃ/). The majority of the participants, 97%, scored higher on the semantic fluency tasks than the phonemic fluency tasks (Kavé 2005, 694). Higher levels of education resulted in an increased number of responses, and higher ages resulted in a decreased number of responses (Kavé 2005, 696). Regarding predictive values, age was the only significant predictor for phonemic fluency tasks, while age and level of education both predicted semantic fluency tasks (Kavé 2005, 696). Although age was important for both tasks, age had a greater effect in the semantic fluency task (Kavé 2005, 696). Gender did not have significant effects on any of the trials for either phonemic or semantic fluency tasks (Kavé 2005, 696).

A Canadian study of healthy adults focused on multiple letters for phonemic fluency tasks including the letters S, G, U, N, F, T, J, and P (Cauthen 1978, 127). Neither

sex, age, nor intelligence test scores had an effect on the number of produced words for participants aged twenty to fifty-nine (Cauthen 1978, 127). With individuals sixty and older, intelligent test scores were significant, but for any specific letter the interaction between age and IQ was not significant (Cauthen 1978, 128). Participants over age sixty who scored in the brightest IQ range (119-140) scored comparably with younger participants, but the older participants with lower IQ scores did not score as well as the younger participants (Cauthen 1978, 128). Surprisingly, the correlation between more frequently occurring letters at the beginning of words to less frequently occurring letters at the beginning of words did not change across the three IQ ranges, which Cauthen (1978, 128) contributes to speed instead of task difficulty.

Another Canadian study chose to focus on both semantic animal naming verbal fluency and phonemic F, A, and S verbal fluency tasks (Tombaugh, Kozak, and Rees 1999, 167). For F, A, and S tasks, education had the greatest impact on number of words produced with increased education resulting in the most number of words produced (Tombaugh, Kozak, and Rees 1999, 170). Tombaugh, Kozak, and Rees (1999, 170) chose to divide education levels into four categories and they found the number of responses between groups with thirteen to sixteen years of education and seventeen to twenty-one years of education showed the least amount of change. In contrast, older individuals were able to name fewer words than younger Canadian participants and as a whole, females named slightly more words than males did (Tombaugh, Kozak, and Rees 1999, 170). The same pattern was seen in the semantic naming task for higher education causing an increase in responses, but responses remained constant for age until around age sixty when number of responses began to lessen (Tombaugh, Kozak, and Rees 1999,

172). Unlike in the phonemic fluency task where women named more words than men, in the semantic fluency task, men named more animals than females did (Tombaugh, Kozak, and Rees 1999, 172). The Canadian study completed by Tombaugh, Kozak, and Rees (1999) also evaluated reliability by completing testing with thirty-eight individuals who had previously been given the F, A, and S phonemic fluency task an average of 5.6 years ago. They found that the small decrease in number of words produced was not statistically significant (Tombaugh, Kozak, and Rees 1999, 172). Vocabulary scores obtained on the Wechsler Adult Intelligence Scale-Revised (WAIS-R) had a positive correlation with the total number of animals named (Tombaugh, Kozak, and Rees 1999, 173). Tombaugh, Kozak, and Rees (1999, 174) also discovered that the total number of named words varied among the letters F, A, and S.

In an evaluation of American English participants aged seventy to ninety-five, Sumerall et al. (1997, 518) chose to evaluate phonemic verbal fluency tasks beginning with the letters C, F, and L. These letters are used as part of the Controlled Oral Word Association Test (COWAT) which is part of the Multilingual Aphasia Battery (Benton and Hamsher 1983). Individuals with sixteen or more years of education were able to name significantly more words on the phonemic fluency tasks than the less educated participants were (Sumerall et al. 1997, 520). The mean for all three phonemic fluency tasks was 32.9 for individuals aged seventy to eighty and 33.4 for individuals aged eighty-one to ninety-five (Sumerall et al. 1997, 520). Sumerall et al. (1997, 519) also chose to evaluate two types of perseverations: distal (repeated words named more than thirty seconds after the original response) and proximal (repeated words named within thirty seconds after the original response). They found distal perseverations occurred

almost 28% of the time, while proximal perseverations were only seen 23% of the time (Sumerall et al. 1997, 519). Breaking set and naming words that did not begin with the letter being tested on occurred in 4.3% of participants (Sumerall et al. 1997, 519). Although participants were specifically asked to not name proper nouns or words using the same stem, individuals in this study stated proper nouns nearly 13% of the time, while words using the same stem occurred 40% of the time (Sumerall et al. 1997, 520). Although rare, breaking set was seen only in the older age group (ages eighty-one to ninety-five) and with those participants who had less education (Sumerall et al. 1997, 520). Sumerall et al. (1997, 520) suggest that repeated occurrences of breaking set may be of significance for clinical evaluation.

Capitani, Laiacona, and Barbarotto (1999) chose to complete a study to specifically evaluate gender and semantic fluency tasks. The study evaluated animals, fruits, tools, and vehicles for the semantic fluency tasks (Capitani, Laiacona, and Barbarotto 1999, 273). They chose these categories in order to evaluate both natural and man-made items to determine if there were differences (Capitani, Laiacona, and Barbarotto 1999, 274). Participants were from Milan, Italy, with ages ranging from eighteen to ninety-six and a variety of educational levels, were utilized (Capitani, Laiacona, and Barbarotto 1999, 274). Capitani, Laiacona, and Barbarotto (1999, 274) chose to allow "dialectal names or mythological or fictional exemplars (e.g., dragon)" and a subcategory (e.g., *bird*) was only counted as correct if a specific example (e.g., *robin*, *eagle*) was not provided. Of the four categories, participants naming tools gave the fewest responses, while the animal category had the greatest number of correct responses (Capitani, Laiacona, and Barbarotto 1999, 274). The researchers conclude this difference

in responses is a direct result of how many words belong to each category and suggest there are fewer words to name in the tools category (Capitani, Laiacona, and Barbarotto 1999, 274). Greater education levels lead to more responses, while increased age resulted in fewer correct answers (Capitani, Laiacona, and Barbarotto 1999, 276). Regarding gender, differences were only seen in two categories where males named more tools and females named more fruits (Capitani, Laiacona, and Barbarotto 1999, 275). When the scores of all four categories were combined, the impact of gender was not seen (Capitani, Laiacona, and Barbarotto 1999, 275). The Capitani, Laiacona, and Barbarotto (1999) study shows that gender does play a role in some semantic verbal fluency tasks, but variation depends on the specific categories.

In their study, Ostrosky-Solis et al. (2007) chose to evaluate not only the impact of age and education on semantic animal naming fluency tasks, but they also wished to explore if there was a difference for individuals speaking the same language in different countries. Participants were recruited from four states in Mexico and their ages and education ranged from sixteen to ninety-six years and zero to twenty-four years respectively (Ostrosky-Solis et al. 2007, 368). Gender did not have a significant effect on the semantic fluency tasks, but both age and education did (Ostrosky-Solis et al. 2007, 370). Individuals with either zero to four or five to nine years of education were not impacted by age, but participants with ten or more years of education were greatly impacted by age (Ostrosky-Solis et al. 2007, 370). In addition to their own study evaluating education and age, Ostrosky-Solis et al. (2007, 372-3) also chose to complete a literature review comparing the results of their study to other Spanish speaking studies from other countries including Mexico, Argentina, Spain, and the Canary Islands.

Without considering age and education, the results among the studies were different, but when these were examined, the only differences noted were in young participants with higher education (Ostrosky-Solis et al. 2007, 373). Ostrosky-Solis et al. (2007, 373) comment on several difficulties with comparing studies including the potential effects of bilingualism, the variations of instructions for testing, and the chosen criterion for scoring. Their study suggests educational levels and age of participants has a greater impact on semantic animal naming verbal fluency scores than does the country of origin (Ostrosky-Solis et al. 2007, 374).

Interested in the impact of ethnicity on verbal fluency tasks, Gladsjo et al. (1999) evaluated F, A, and S phonemic fluency tasks and animal semantic fluency tasks in Caucasian and African American native English speakers living in California. For F, A, and S phonemic fluency tasks, education levels and ethnicity had the greatest impact on number of words produced in favor of greater education and Caucasian ethnicity (Gladsjo et al. 1999, 156). In addition to education levels and ethnicity, age also had a significant impact for the semantic animal naming fluency task with older age resulting in fewer words named (Gladsjo et al. 1999, 156). Gender did not have a great impact for either type of task (Gladsjo et al. 1999, 155). Although both the Caucasian and African American participants were native English speakers living in California, Gladsjo et al. (1999, 158) discovered that treating African Americans as if they were Caucasians, as is often currently done due to lack of normative data for ethnic groups, resulted in a greater false positive rate for African Americans. In fact, this false positive rate was greater than twice of the accepted rate for false positives (Gladsjo et al. 1999, 158).

In their study of African Caribbean individuals aged fifty-five to seventy-five, Stewart et al. (2001) sought to develop normative data for this aging group and compare results to Caucasian to determine if differences exist. Semantic verbal fluency tasks, specifically animal naming, were included in a battery of tests (Stewart et al. 2001, 519). All participants were born in a Caribbean nation and currently lived in London (Stewart et al. 2001, 519). Higher age had a limiting influence on semantic fluency tasks, as did lower levels of education (Stewart et al. 2001, 524). Females produced fewer results than males on semantic verbal fluency tasks (Stewart et al. 2001, 524). When compared with other studies, Stewart et al. (2001, 526) discovered their participants produced fewer animals in semantic verbal fluency tasks than did African Americans. Stewart et al. (2001, 526) conclude their study by encouraging additional research for ethnic groups as the results of their study reveal questionable validity when comparing ethnic groups on neurocognitive evaluation, including verbal fluency tasks.

The preceding literature review summarized studies from the following languages: Portuguese, Spanish, Australian English, Swedish, Arabic, Han Chinese in mainland China, Hong Kong Chinese Cantonese, Italian, Greek, Korean, Haryanvi a dialect of Hindi, Dutch, Hebrew, Canadian English, American English, American English in both Caucasians and African Americans, and British English in African Caribbean individuals.

APPENDIX E

VERBAL FLUENCY TASKS & BILINGUAL SPEAKERS

Many factors may affect verbal fluency test results including gender, age, and education, although results of the impact of these categories varies from study to study and language to language. The following studies evaluated bilingual speakers to determine what, if any, impact speaking more than one language has on phonemic and semantic verbal fluency tasks.

Luo, Luk, and Bialystok (2010) chose to evaluate college aged bilingual and monolingual speakers to determine their results on verbal fluency tasks in English. Bilingual participants spoke English and one of eighteen other languages (French, Cantonese, Hebrew, Hindi, Italian, Punjabi, Farsi, Gujarati, Japanese, Korean, Mandarin, Pakistan, Portuguese, Spanish, Tagalog, Tamil, Toisan, and Urdu) and all the bilingual participants reported they spoke English and their other language daily (Luo, Luk, and Bialystok 2010, 34). Multiple tests were completed in English, including phonemic fluency tasks for the letters F, A, and S, and semantic fluency tasks with the categories of clothing items and female names (Luo, Luk, and Bialystok 2010, 35). Instructions provided for phonemic fluency tasks excluded repetitions, proper nouns, and numbers as appropriate responses (Luo, Luk, and Bialystok 2010, 35). Although the bilingual participants reported the same self-ranking for English proficiency, they were separated into two groups based on their scores on English vocabulary tests: higher-vocabulary bilinguals and lower-vocabulary bilinguals (Luo, Luk, and Bialystok 2010, 34). Results

revealed no differences among the three groups in the semantic category tasks (Luo, Luk, and Bialystok 2010, 37). On the phonemic fluency task, however, high-vocabulary bilinguals produced more words than either the low-vocabulary bilinguals or the monolinguals of English (Luo, Luk, and Bialystok 2010, 37). The low-vocabulary bilingual group and the monolingual group produced the same number of words on the phonemic fluency tasks (Luo, Luk, and Bialystok 2010, 37). Luo, Luk, and Bialystok (2010, 38) also examined the mean latencies of responses for the verbal fluency tasks and revealed a longer mean latency for both bilingual groups than the monolingual group. Although the higher-vocabulary bilingual group produced more words than the low-vocabulary bilingual group, their mean latencies did not vary (Luo, Luk, and Bialystok 2010, 38). Luo, Luk, and Bialystok (2010, 39) determined that the vocabulary size, and not simply a person's self-report of English proficiency, had the greatest effect on phonemic fluency tasks.

Another evaluation of monolingual and bilingual college students, completed by Portocarrero, Burright, and Donovick (2007), considered the age of arrival to the United States as a possible factor in number of words named on verbal fluency tasks. F, A, and S letters were evaluated for the phonemic fluency tasks, animals and items found in a kitchen were examined for semantic fluency tasks in English, and actions were chosen for verb fluency tasks (Portocarrero, Burright, and Donovick 2007, 417). Bilingual students spoke English and one of the following languages: Russian, Korean, Chinese, Spanish, Japanese, Creole, Polish, or Portuguese (Portocarrero, Burright, and Donovick 2007, 418). Verbal expression and auditory comprehension tests were given to evaluate English language ability, and results showed the bilingual participants who came to the United

States “early” (by age nine) performed better than participants who came to the United States “late” (age ten or later) (Portocarrero, Burright, and Donovick 2007, 418-9). When compared to monolinguals, participants in the bilingual group scored within the normal range for the test, but below the mean of the monolinguals (Portocarrero, Burright, and Donovick 2007, 418). For the phonemic fluency tasks, there was no significant difference between the number of appropriate responses for bilinguals and monolinguals (Portocarrero, Burright, and Donovick 2007, 419). The results of the semantic category tasks were not as clear cut. For animals, monolinguals named more words than bilinguals, but this was not seen for kitchen items (Portocarrero, Burright, and Donovick 2007, 420). No differences were seen for actions during verb naming tasks (Portocarrero, Burright, and Donovick 2007, 420).

De Picciotto and Friedland (2001) completed their animal semantic fluency study with elderly bilingual speakers in South Africa between the ages of sixty and ninety-five. Participants were bilingual speakers who were fluent in both English and Afrikaans and had at least ten years of education (de Picciotto and Friedland 2001, 145 and 147). Three semantic animal naming tasks were required: one in English, one in Afrikaans, and one where the participant could switch between the two languages as they felt it was appropriate (de Picciotto and Friedland 2001, 147). Before the single language only tasks, participants were primed for the language by counting from one to ten in the same language in which they would be completing the task (de Picciotto and Friedland 2001, 147). Age was not a factor for animal semantic naming tasks (de Picciotto and Friedland 2001, 148). Although individuals were asked to self-report which language they used most often, this did not necessarily correlate with the language in which the participants

produced the most words (de Picciotto and Friedland 2001, 149). According to de Picciotto and Friedland (2001, 149), "In fact, 6 of the subjects (approximately 20% of the sample) performed more than one standard deviation better in their L2, even though they spoke their L1 70% of the time or more." Participants aged seventy-five and older named slightly more words when able to speak in either English or Afrikaans than when limited to a single language (de Picciotto and Friedland 2001, 150). From their study, de Picciotto and Friedland (2001, 151) concluded that it is appropriate to evaluate bilingual speakers in either their L1 or L2 as long as they have rated their language proficiency similarly.

In their study, "A Cross-Linguistic Comparison of Verbal Fluency Tests," Rosselli et al. (2002) evaluated F, A, and S phonemic fluency tasks and animal semantic fluency tasks in monolingual English and Spanish, as well as bilingual English and Spanish, elderly adults living in Florida. Participants did not have significant variations in their age or education levels, and bilinguals reported they were able to speak, understand, read, and write both languages (Rosselli et al. 2002, 764-5). All participants were given a naming proficiency test and results revealed scores were not statistically different (Rosselli et al. 2002, 771). Concerned that examiners may not understand all the responses due to participants' accents, at the conclusion of the responses, the examiner read back the answers to confirm accuracy (Rosselli et al. 2002, 767). When compared to monolingual English speakers, bilingual English and Spanish speakers named significantly fewer animals when completing the task in English (Rosselli et al. 2002, 768). When compared to monolingual Spanish speakers, bilingual speakers produced the same number of words (Rosselli et al. 2002, 768). There was no significant difference

between the number of bilingual responses in the phonemic verbal fluency task to either the number of responses produced by Spanish monolinguals or English monolinguals (Rosselli et al. 2002, 768). Spanish monolinguals produced the same number of words for each letter F, A, and S, but this was not true for English monolingual speakers (Rosselli et al. 2002, 769). For English monolingual speakers, the letter A produced the fewest responses, while the letter S produced the greatest (Rosselli et al. 2002, 769). Interestingly, there are more words that begin with the letter A in the dictionary than either F or S, and Rosselli et al. (2002, 772) theorize that there is not a direct relationship between frequency of words found in a dictionary and the number of words produced during phonemic verbal fluency tasks. Borkowski, Benton, and Spreen (1967) classified all three letters in the easy level of difficulty for phonemic fluency tasks. In the F, A, and S phonemic fluency tasks, English monolinguals named grammatical words which accounted for 8% of the total words named, a statistically significant difference from the few grammatical words Spanish monolinguals named (Rosselli et al. 2002, 769). Bilingual speakers followed the same pattern and named fewer grammatical words in Spanish than in English (Rosselli et al. 2002, 769). For the semantic animal naming task, the words spoken by Spanish and English monolinguals differed, although the actual number of words were the same (Rosselli et al. 2002, 773). Spanish monolinguals named more birds and insects, which Rosselli et al. (2002, 769-770, 773) attribute to these participants originally being from tropical countries. English monolinguals stated more wild animals, perhaps due to learning from school, television, and books (Rosselli et al. 2002, 773). Bilingual speakers were found to name a greater number of water animals in Spanish than in English (Rosselli et al. 2002, 770).

In their earlier study, Rosselli et al. (2000, 18) also evaluated Spanish English bilingual speakers from Florida on F, A, and S phonemic fluency and animal and fruit semantic fluency tasks. Among the monolingual English speakers, the monolingual Spanish speakers, and the bilingual Spanish English speakers, age and levels of education were the same (Rosselli et al. 2000, 19). All of the bilingual speakers considered Spanish to be their first language, and more than half of them (52%) felt they spoke Spanish better than English (Rosselli et al. 2000, 20). Bilingual participants were asked to complete F, A, and S phonemic fluency tasks and semantic animal and fruit naming fluency tasks in separate trials of English and Spanish with randomized presentation of which language the tasks were to be completed in first (Rosselli et al. 2000, 20). Results revealed bilinguals were able to produce an almost identical number of words when compared to the monolingual groups (Rosselli et al. 2000, 20). When compared to monolingual Spanish speakers, bilinguals were not able to name as many fruits in Spanish (Rosselli et al. 2000, 20). Likewise, when compared to monolingual English speakers, bilinguals were not able to name neither as many fruits in English nor as many animals in English (Rosselli et al. 2000, 20).

Gollan, Montoya, and Werner (2002, 562) chose to evaluate college students who were either English monolinguals or Spanish English bilinguals. Participants were asked to complete ten phonemic fluency tasks using the letters A, E, L, M, D, F, R, P, S, and C, twelve semantic fluency tasks including occupations that require an advanced degree, countries in Europe, things that have wheels, musical instruments, vegetables, college majors, sports, fruits, colors, clothing, countries, and animals, and two proper name tasks (names beginning with the L and M) (Gollan, Montoya, and Werner 2002, 567). The

average ages of participants were not statistically different (Gollan, Montoya, and Werner 2002, 565). Monolinguals completed the tasks only in English, while bilingual participants completed the tasks once in English only and also using whatever combination of English and Spanish they chose (Gollan, Montoya, and Werner 2002, 564). For phonemic fluency tasks, instructions were provided informing participants that proper nouns and words with different endings were not acceptable responses (Gollan, Montoya, and Werner 2002, 565). For semantic fluency tasks, participants were only given a single point if they named both the category (e.g., *bird*) and subcategory (e.g., *eagle*) (Gollan, Montoya, and Werner 2002, 566). Results revealed bilingual participants named significant fewer accurate responses than monolinguals did, particularly in the twelve semantic fluency tasks, although this was seen across all three types of tasks (Gollan, Montoya, and Werner 2002, 566). Specifically, monolinguals produced an average of 1.36 additional words on phonemic tasks, 1.68 additional words on proper name tasks, and 2.92 additional words on semantic category tasks (Gollan, Montoya, and Werner 2002, 566). On semantic fluency tasks, ten, or 30%, of the bilinguals had scores two standard deviations below the average score of the monolinguals, although seven of these ten participants considered English to be their dominant language (Gollan, Montoya, and Werner 2002, 568). Of their responses on the three types of tasks, bilinguals produced more words in phonemic fluency tasks, while monolinguals produced the most words on semantic categories compared to their own responses with phonemic or proper name tasks (Gollan, Montoya, and Werner 2002, 566). Although Gollan, Montoya, and Werner (2002, 568) expected to find that bilinguals produced more correct responses when able to speak English and Spanish compared to speaking English

alone, results did not support this expectation. When bilinguals were able to use either English or Spanish, they produced more Spanish words than English words in phonemic fluency tasks (Gollan, Montoya, and Werner 2002, 568). Gollan, Montoya, and Werner (2002, 569) also expected to find bilinguals produced more errors (intrusions, perseverations, or nonword errors) than monolinguals, but results showed both bilinguals and monolinguals produced an average of the same number of errors, with the most errors seen on semantic fluency tasks. A correlation between number of words produced for phonemic fluency tasks and total number of English words for each specific letter was observed in both bilinguals and monolinguals (Gollan, Montoya, and Werner 2002, 573).

In their study of the Indian languages Marathi and Hindi, Kamat et al. (2012) chose participants with ages ranging from eighteen to sixty to evaluate these cognate languages. According to Kamat et al. (2012, 306), "[c]ognates are words that share phonological form across languages (e.g., the Spanish word for *activity* is *actividad*)." Neuropsychological evaluations were completed, including phonemic, semantic, and action fluency tasks, presented in Marathi, the participants' first language (Kamat et al. 2012, 306). A Bilingualism Index Score was determined by taking participants' self-reports of proficiency in both Hindi and Marathi and dividing these two numbers (Kamat et al. 2012, 307). Animals were evaluated for the semantic fluency task, while the following three Marathi phonemes were targeted for phonemic fluency tasks: denoted in English as /p/ ['paa'], /ɑ/ ['a'], and /s/ ['saa'] (Kamat et al. 2012, 307). Education levels and the Bilingualism Index Score had a significant association with all three verbal fluency tasks (Kamat et al. 2012, 308). Kamat et al. (2012, 308) describe the relationship for Bilingualism Index Score and phonemic and animal fluency tasks as modest, while

the connection with the action fluency task is described as weak. Specifically, participants who self-rated themselves as being more fluent in both Marathi and Hindi produced more words for phonemic and semantic tasks, but this result was not seen for the action task (Kamat et al. 2012, 308). Level of education was the only significant predictor for the action fluency task (Kamat et al. 2012, 308-9).

In their article "What Causes the Bilingual Disadvantage in Verbal Fluency? The Dual-Task Analogy," Sandoval et al. (2010) completed several experiments to gain greater insight into how bilingual speakers complete verbal fluency tasks. Participants in the study included monolingual English speakers and bilingual English Spanish speakers, whose first and preferred language was English (Sandoval et al. 2010, 237). Semantic and phonemic fluency tasks were conducted with fifteen semantic categories and twenty-four double letter phonemic categories (Sandoval et al. 2010, 238). Monolingual named significantly more correct responses than bilinguals on both phonemic and semantic tasks (Sandoval et al. 2010, 239). Participants, both monolingual and bilingual, stated more semantic than phonemic words (Sandoval et al. 2010, 239). Cognates, or words which are very similar in both English and Spanish, such as *elephant* and *elefante*, were produced significantly more by bilinguals than by monolinguals in semantic tasks (Sandoval et al. 2010, 240). More cognates were named in phonemic tasks than in semantic tasks (Sandoval et al. 2010, 240). Regarding first response latencies, monolinguals began naming responses significantly faster than the bilingual participants did, but only in semantic tasks (Sandoval et al. 2010, 240). Although errors were few, bilinguals were noted to have more difficulties with phonemic categories, while monolinguals had equal number of errors on both tasks (Sandoval et al. 2010, 241). Results of a second

experiment showed that bilingual English Spanish speakers produced fewer responses in Spanish, their second, and non-preferred language, than in English (Sandoval et al. 2010, 245). Monolinguals also produced a greater number of high-frequency words than bilinguals, particularly in the semantic tasks, and both groups named more higher-frequency words in semantic than phonemic categories (Sandoval et al. 2010, 239).

APPENDIX F

VERBAL FLUENCY SCORING

You are invited to participate in a research study with the University of North Dakota examining how people use words. You were chosen at random because you are either a native English speaker or a native Lakota speaker. The purpose of this study is to compare how Lakota speakers use words and how English speakers use words. Approximately 100 people will be involved in this study in western South Dakota. Your participation in this study will last 15 to 20 minutes and no further visits will be needed. First, you will be asked to fill out a short form. Your name is not needed. You are free to skip any question you do not want to answer. Then, you will be asked to complete two to four naming tasks each lasting approximately one minute. During these naming tasks, you will be audio recorded to make sure we understand what you say. You have the right to review these recordings. Only the researcher and the translator will have access to these recordings for the purpose of completing the project. They will be erased after we confirm what you said. There are no foreseeable risks to participating. You may not benefit personally from being in this study. However, we hope that, in the future, other people might benefit from this study because it provides additional information about using words. You will not have any cost for being in this research study and you will not be paid. The University of North Dakota and the research team are receiving no payments from other agencies, organizations, or companies to conduct this research study. The records of this study will be kept private to the extent permitted by law. In any report about this study that might be published, you will not be identified. Your study record may be reviewed by government agencies, the University of North Dakota Research Development and Compliance office, the University of North Dakota Institutional Review Board, and the Oglala Sioux Tribe Research Review Board. When we write our report, we will describe the study results in a summarized manner so that you cannot be identified. Your participation is voluntary. You may choose not to participate or you may discontinue your participation at any time without penalty. The researcher conducting this study is Larissa Jordan and you will be provided with a written copy of this information and contact information at the end of this session. Do you have any questions? Do you wish to be part of this study?

APPENDIX G

CONSENT TO PARTICIPATE IN RESEARCH HANDOUT

THE UNIVERSITY OF NORTH DAKOTA
CONSENT TO PARTICIPATE IN RESEARCH

TITLE:
Verbal Fluency: Norms for the Lakota Population in Semantic and Phonemic Fluency Tasks

PROJECT DIRECTOR: *Larissa Jordan, M.S., CCC-SLP*

PHONE # *(417) 540-2775*

DEPARTMENT: *Linguistics*

WHAT IS THE PURPOSE OF THIS STUDY?
You are invited to participate in a research study with the University of North Dakota examining how people use words. You were chosen at random because you are either a native English speaker or a native Lakota speaker. The purpose of this study is to compare how Lakota speakers use words and how English speakers use words.

HOW MANY PEOPLE WILL PARTICIPATE?
Approximately 100 people will be involved in this study in western South Dakota.

HOW LONG WILL I BE IN THIS STUDY?
Your participation in this study will last 15 to 20 minutes and no further visits will be needed.

WHAT WILL HAPPEN DURING THIS STUDY?
First, you will be asked to fill out a short form. Your name is not needed. You are free to skip any question you do not want to answer. Then, you will be asked to complete two to four naming tasks each lasting approximately one minute. During these naming tasks, you will be audio recorded to make sure we understand what you say. You have the right to review these recordings. Only the researcher and translator will have access to these recordings for the purpose of completing the project. They will be erased after we confirm what you said.

WHAT ARE THE RISKS OF THE STUDY?
There are no foreseeable risks to participating.

WHAT ARE THE BENEFITS OF THIS STUDY?
You may not benefit personally from being in this study. However, we hope that, in the future, other people might benefit from this study because it provides additional information about using words.

WILL IT COST ME ANYTHING TO BE IN THIS STUDY? WILL I BE PAID FOR PARTICIPATING?
You will not have any cost for being in this research study. You will not be paid for being in this research study.

WHO IS FUNDING THE STUDY?
The University of North Dakota and the research team are receiving no payments from other agencies, organizations, or companies to conduct this research study.

CONFIDENTIALITY
The records of this study will be kept private to the extent permitted by law. In any report about this study that might be published, you will not be identified. Your study record may be reviewed by government agencies, the University of North Dakota Research Development and Compliance office, the University of North Dakota Institutional Review Board, and the Oglala Sioux Tribe Research Review Board. Officials will make sure the research is safe and that we are protecting research participant's rights. When we write our report, we will describe the study results in a summarized manner so that you cannot be identified. During the naming tasks, you will be audio recorded to make sure we understand what you say. You have the right to review these recordings. Only the researcher and the translator will have access to these recordings for the purpose of completing the project. They will be erased after we confirm what you said.

IS THIS STUDY VOLUNTARY?
Your participation is voluntary. You may choose not to participate or you may discontinue your participation at any time without penalty.

CONTACTS AND QUESTIONS?
The researcher conducting this study is Larissa Jordan. If you later have questions, concerns, or complaints about the research please contact Larissa Jordan at (417) 540-2775 or via email at slpjordan@gmail.com. You may also contact my advisor Dr. Regina Blass at regina_blass@sil.org.

If you have any questions about your rights as a research participant please call the Oglala Sioux Tribe Research Review Board Coordinator at **(605) 867-1704**.
If you have questions regarding your rights as a research subject, you may contact the University of North Dakota Institutional Review Board at **(701) 777-4279**.

- You may also call this number about any problems, complaints, or concerns you have about this research study.
- You may also call this number if you cannot reach research staff, or you wish to talk with someone who is independent of the research team.

- General information about being a research subject can be found by clicking "Information for Research Participants" on the web site: http://und.edu/research/resources/human-subjects/research-participants.cfm

Thank you for participating in this research study. Please feel free to contact me with any questions or concerns.

Sincerely, Larissa Jordan, M.S., CCC-SLP

APPENDIX H

RESEARCH SURVEY

Research Survey

Thank you for agreeing to participate in this research study. Please fill out the questions below. Your name is ***not*** needed. You are free to skip any question you do not want to answer. Your participation is voluntary. You may choose not to participate or you may discontinue your participation at any time without penalty. If you have any questions, please ask the researcher.

What is your gender?

☐ Male ☐ Female

What is your age?

☐ Under 50 years ☐ 50 – 54 years ☐ 55 – 59 years

☐ 60 – 64 years ☐ 65 – 69 years ☐ 70 – 74 years

☐ 75 – 79 years ☐ 80 – 84 years ☐ 85 – 89 years

☐ 90 and over years

What is the highest level of education you finished?

☐ Elementary (through 6th grade) ☐ Middle School/Junior High (through 8th grade)

☐ Some High School ☐ Completed High School

☐ Some College ☐ Completed College

☐ Some Graduate School ☐ Completed Graduate School

How long have you lived in South Dakota?

☐ Less than 5 years ☐ Less than 10 years ☐ Less than 20 years

☐ More than 20 years

What is your current job/former job? If you had several jobs, which one did you have the longest amount of time? (Please print)

_____
___

To your knowledge, have you ever had a stroke/brain injury or other similar disease?

☐ Yes ☐ No

(over)

What language do you speak most often at home?

☐ Lakota ☐ English ☐ Other

_____

What language(s) do you speak?

☐ Lakota ☐ English ☐ Other

_____

How well can you speak Lakota?

☐ Not at all ☐ I know a little ☐ I know a lot/I learned as a child

How well can you speak English?

☐ Not at all ☐ I know a little ☐ I know a lot/I learned as a child

If you marked "other" above for languages you speak, how well can you speak that language?

☐ I know a little ☐ I know a lot/I learned as a child

When did you start to learn to speak Lakota?

☐ Never ☐ Under age 5 years ☐ age 5 years to 12 years

☐ As a teenager ☐ As an adult

When did you start to learn to speak English?

☐ Never ☐ Under age 5 years ☐ age 5 years to 12 years

☐ As a teenager ☐ As an adult

If you marked “other” above for languages you speak, when did you start to learn to speak that language?

☐ Under age 5 years ☐ age 5 years to 12 years

☐ As a teenager ☐ As an adult

Thank you again for completing this survey and participating in this research project.

APPENDIX I

MONOLINGUAL ENGLISH ANIMALS NAMED

Table 37. Names and Frequency of Animals Named by Monolingual English Speakers

Named by #:	**Animals**
48	Cat, Dog
43	Horse
40	Cow
36	Lion
34	Tiger
30	Elephant
24	Deer
22	Pig, Zebra,
21	Bear, Giraffe
20	Coyote, Sheep
19	Mouse
17	Bird, Wolf
16	Chicken, Rabbit, Rat
15	Monkey, Raccoon
14	Antelope
12	Elk, Mountain Lion
11	Buffalo (10) / Bison (1), Hippopotamus, Kangaroo
10	Donkey, Goat, Moose
9	Fox
8	Duck, Snake
7	Goose (5) / Geese (2), Rhinoceros, Skunk
6	Cheetah, Fish, Leopard, Mule, Muskrat, Parrot, Squirrel, Whale
5	Alligator, Beaver, Crocodile, Gopher, Gorilla, Llama, Opossum, Porcupine
4	Aardvark, Calves, Camel, Cougar, Hamster, Human, Lamb, Mink, Penguin, Prairie dog
3	Bat, Bobcat, Ferret, Frog, Gerbil, Hyena, Kitten, Lizard, Mole Ostrich, Partridge, Pigeon, Sparrow, Turkey, Turtle, Weasel
2	Ape, Ass, Baboon, Badger, Bug, Bull, Chimpanzee, Chipmunk, Dolphin, Eagle, Gazelle, Koala, Lemur, Martin, Mountain goat, Muskox, Ocelot, Otter, Panther, Parakeet, Pheasant, Robin, Seal
1	Alpaca, Amphibian, Ant, Armadillo, Blackbird, Bluebird, Caribou Cattle, Cobra, Eel, Emu, Ermine, Felines, Feral hog, Finch, Fly, Gibbon, Hog, Hummingbird, Iguana, Jackal, Jack rabbit, Jaguar, Leopard seal, Man, Marmoset, Mountain sheep, Mule deer, Orangutan, Owl, Oxen, Panda, Pelican, People, Platypus, Polecat, Pony, Porpoise, Puma, Puppy, Quail, Road runner, Rocky Mountain sheep, Rooster, Sea lion, Spider, Stork, Swallow, Tadpole, Tortoise, Toucan, Wallaby, Warthog, Water buffalo, White tiger, Wildcat, Woodchuck

APPENDIX J

LAKOTA ENGLISH ANIMALS NAMED IN ENGLISH

Table 38. Names and Frequency of Animals Named by Lakota English Speakers in English

Named by #:	**Animals**
39	Dog, Horse
36	Cat
28	Cow
25	Buffalo
24	Eagle
23	Deer, Elephant
19	Elk
18	Bear, Bird
17	Giraffe
15	Prairie dog, Rabbit, Snake
14	Lion, Zebra
13	Beaver, Fish, Pig, Tiger
12	Coyote, Monkey
11	Badger, Hawk, Mouse
10	Donkey, Porcupine, Wolf
9	Antelope, Squirrel
8	Raccoon, Turtle
7	Sheep
6	Bobcat, Fox, Goat, Kangaroo, Mountain Lion, Skunk, Whale
5	Chicken, Owl, Rat, Rhino, Turkey
4	Camel, Gopher, Ground hog, Moose, Mule, Robin
3	Alligator, Blue jay, Cheetah, Chipmunk, Duck, Goose (1)/Geese (2), Hippopotamus, Mink, Pheasant, Pony, Weasel
2	Bass, Blackbird, Bull, Gorilla, Grasshopper, Grizzly bear, Hamster, Hyena, Koala bear, Leopard, Lizard, Llama, Magpie, Meadowlark, Muskrat, Ostrich, Otter, Platypus, Rooster, Salamander, Salmon, Shark
1	Ant, Armadillo, Baboon, Big horn sheep, Bluebird, Butterfly, Buzzard, Cattle, Cougar, Cricket, Crocodile, Crow, Dairy Cow, Dolphin, Dragon, Dragonfly, Finch, Flamingo, Fly, Frog, Gazelle, Gerbil, Goldfish, Ground squirrel, Grouse, Guinea Pig, Jaguar, Kitten, Kitty, Kodiak bear, Long horn steer, Lynx cat, Meer cat, Mole, Mountain goat, Mosquito, Octopus, Opossum, Orca, Ox, Panther, Parrot, Peacock, Penguin, Prairie chickens, Polar bear, Porpoise, Puppy, Raven, Scorpion, Seal, Spider, Spotted eagle, Squid, Swan, Termite, Toad, Trout, Tuna, Wallaby, Walrus, Water buffalo, Woodchuck, Yak

APPENDIX K

LAKOTA ENGLISH ANIMALS NAMED IN LAKOTA

Table 39. Names and Frequency of Animals Named by Lakota English Speakers in Lakota

Named by #:	**Animals**
41	Sunka (dog)
34	Igmu (cat), Sunkawakan (horse)
20	Tatanka (buffalo bull), Wanbli (eagle)
17	Pispiza (prairie dog), Zuzeca (snake)
16	Mato (bear), Ptegleska (cow)
15	Sungamnitu (coyote)
14	Tacha (deer)
13	Hogan (fish), Zintkala (bird)
11	Igmutanka (mountain lion)
9	Capa (beaver), Pte (buffalo), Sungmanitu tanka (wolf)
8	Hehaka (elk)
7	Cetan (generic hawk), Kukuse (pig)
6	Keya (turtle), Pahin (porcupine)
5	Igmula (kitten), Maka (skunk), Ptehincala (calf)
4	Hinhan (owl), Kokoyah'anla (chicken), Magaksica (duck) Sungila (fox), Sunhpala (puppy), Wanbligleska (spotted eagle)
3	Iktomi (spider), Itunkala (mouse), Kangi (crow), Kimimela (butterfly), Pawokic'u (elephant), Sunsunla (donkey), Tabloka (male deer), Wiciteglega (raccoon)
2	Anunkasan (bald eagle), Gnaska (frog), Gnugnuska (grasshopper), Hogan tanka (whale), Hoka (badger), Maga (goose), Nata san (bald eagle), Ptewinyela (female buffalo), Tahuhanska (giraffe), Tasunke (horse), Tokala (kit fox), Wabluska (bug)
1	Agleslea (lizard), Cetan luta (red-tailed hawk), Hinhanmakotila (burrowing owl), Igmugleska (bobcat), Ikusonla (mink), Magatanka (goose variant), Mastincala (rabbit), Mato cik'ala (little bear), Mato tanka (big bear), Matotanka (grizzly bear), Mayasleca (coyote in tales), Micha (coyote), Nigesonla (antelope), Pehan (crane), Petewaniyanpi (cow variant), Pteblo (buffalo bull). Sakehanska (grizzly bear), Sinkpe (muskrat), Sintehilo (rattlesnake), Sintesapela (black-tailed deer), Stuswecena (dragonfly), Sunglega (zebra), Sunka tanka (big dog), Sunkawicasa (monkey), Tahcasunkala (sheep), Tasiyagmunka (meadowlark), Tasunka (horse variant), Tatokala (goat), Tawinyela (female deer), Tehmunga (fly), Tezisan (antelope), Wagleza (garter snake), Waglula (worm), Witunkala (mouse), Zica (squirrel), Zintkalato (bluebird)

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