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# Contextualized Recognition of Fingerspelled Words

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## ABSTRACT

Fingerspelling, an aspect of American Sign Language, is difficult for second language English-speaking adults to learn (Bahleda, 1998), yet mastery is required by professional ASL-English interpreters. This study compared novice and expert interpreters' interpretation of fingerspelled words under the assumption that exposure to priming material in their L1, English, would enable the interpreters to recognize those terms when fingerspelled in their L2, ASL. In this study, participants (15 novices, 15 experts) were asked to interpret an ASL text with 25 "carefully" fingerspelled words embedded. Ten subjects were not given priming materials, ten a list of words in printed English that represented the "carefully" fingerspelled words in the ASL text, and ten were given a printed English story synopsis with the "carefully" fingerspelled words embedded. Overall, there was evidence of an L1 priming effect as the interpreters who were given access to the English words interpreted more of the fingerspelled words correctly than the interpreters who were given no priming materials (*p=0.04). As predicted, the experts did significantly better at recognizing the "carefully" fingerspelled words than the novices (*p=0.00). As there was no significant difference across the three conditions for the experts (no priming, list of words, story synopsis), they may have been more balanced bilinguals than the novices. However, the expert interpreters who were given no L1 priming materials did not perform significantly better than the novices in any of the three conditions. The five novices who were given a list of words as priming material were more accurate than the ten novices in the other two conditions (no priming and story synopsis). There was also no significant difference for the five novices who were given the list of words as compared to the three expert groups. Tentatively, it would seem that experts without priming materials experienced a depressed ability to read fingerspelling and novice interpreters benefited greatly from the provision of a list of English words.

## INTRODUCTION

One aspect of American Sign Language (ASL) is the use of fingerspelled words, and the ability to both comprehend and produce these is required by professionals working as sign language interpreters. However, as noted in the literature, ASL is a difficult language for English-speaking hearing students to acquire (Jacobs, 1996; Kemp, 1998; Patrie & Johnson, 2011). To date, there have been few studies that examined how fingerspelling is acquired or strategies interpreters use to enhance their ability to comprehend fingerspelling. Instead, anecdotal reports from educators indicate that it is difficult for second language (L2) English-speaking adult learners to learn fingerspelling (Bahleda, 1998; Stratiy, 1989; Wilson, 2011).

In a qualitative study of ASL students and their teachers, McKee and McKee (1992) found that both agreed that learners had difficulty in producing and reading fingerspelling, and in the latter case, perhaps due to a lack of exposure to the "temporal, fleeting nature" of the orthography of fingerspelling (p. 143). Patrie (1989) described learning to read fingerspelling as "the single most difficult task for American Sign Language (ASL) interpreters" (p. i). She also noted "it [was] not unusual for an interpreter to interrupt the flow of communication in order to ask for repetition of the fingerspelled word" (Patrie, 1989, p. 11).

Perhaps to deal with the challenge of reading fingerspelling, a common practice in the interpretation field is to review materials related to the content of the ensuing discourse. These materials could be the minutes of meetings, PowerPoint presentations, or any number of written materials in English. This begs the question, how does this preparation in English help interpreters comprehend and translate fingerspelled words in an ASL narrative?

## RESEARCH

The literature identified at least seven types of approaches to fingerspelled words commonly appearing in ASL discourse - letter-by-letter spelling, rapidly spelled, lexicalized, acronyms, abbreviations, blends, and carefully fingerspelled words. Wager (2012) described "letter-by-letter" spelling as a very deliberate articulation of each letter of a word or name, with extended pausing between the letters. A signer used it when requested to repeat their initial spelling of a word (Wager, 2012, p. 6) or in response to a request for a name (Patrie & Johnson, 2011). Some fingerspelled words were labeled "rapidly spelled" when they appeared upon second or subsequent mention (Patrie & Johnson, 2011; Thumann, 2009; Wager, 2012). As rapidly spelled, they underwent a bit of compression and it was slightly more difficult to identify discrete units (letters), as they were produced as one constantly moving unit (Thumann, 2009). In a study of such words, Wager (2012) found an increase in dropped letters and an increase in signing speed between first "carefully" and second mention or "rapidly" fingerspelled words.

Other words were once described as "borrowed" from English and are represented by fingerspelling. These have been referred to as "lexicalized fingerspelling" (Battision, 1978) or "loan signs" (Padden, 1998). These fingerspelled words include adjectives like "all," adverbs such as "early," nouns like "bank," and verbs such as "hurt." Such words go through a process of lexicalization to become more sign-like, perhaps due to the pressure to conform to a maximum of two handshapes (Padden, 1998; Thumann, 2009), as is the norm for ASL signs (Valli & Lucas, 2005). This lexicalization process involves a deletion in "letters, changes in handshape or orientation, changes in movement, and changes in location" (Thumann, 2009, p. 105). It also involves the adoption of signing patterns similar to a regular ASL sign (Thumann, 2009), to the point where the word "no longer actually represents spelling" but becomes one entire unit (Patrie & Johnson, 2011, p. 68).

In addition to rapidly spelled words, lexicalized spelling, and letter-by-letter spelling, ASL also includes acronyms, abbreviations (Padden, 1998; Patrie & Johnson, 2011) and blends (Patrie & Johnson, 2011). Similar to letter-by-letter spelling and abbreviations, acronyms include every letter of the English word. However, "Acronyms differ from abbreviations in that the sequence of characters represented by each of the first letters of a sequence of words is itself a pronounceable word" in spoken English, such as NASA and AIDS (Patrie & Johnson, 2011, p. 69). Abbreviations, on the other hand, either maintain the first letter of the English words, or the

first and medial letter of a word (Padden, 1998). Abbreviations in ASL include F-B for "feedback" and W-D for "withdraw" (Padden, 1998, p. 48). A blend includes "an abbreviation blended with a word or an acronym" such as the word "GMAT" which is pronounced in English as "G" followed by the word "MAT" (Patrie & Johson, 2011, p. 69). Padden (1998) gave a number of examples of compound signs that included both a sign and fingerspelled component, such as DEAD+E-N-D and B-E-L-L+BOY (p. 53-54).

The final group of fingerspelled words identified in the literature (Patrie & Johnson, 2011; Thumann 2009; Wager, 2012), and the focus of this study, have been described as "carefully" fingerspelled words. They are "carefully spelled" typically on first mention and include words, such as proper names (Thumann, 2009; Wager, 2012). Such words have also been characterized as "full, formal fingerspelling" (Valli & Lucas, 2005, p. 66.) In addition to proper names, some content words (nouns, verbs, adjectives, or adverbs) are also "carefully" spelled (Wager, 2012).

Unlike letter-by-letter spelling, which is slowly done and which includes all of the letters of an English word, "carefully" spelled words occur more rapidly and there may be some deletion of letters. Also compared to second mention words, the letters in a "carefully" spelled word are typically more hyperarticulated with few omissions and held over a longer signing period (Patrie & Johnson, 2011). Each handshape in a "carefully" fingerspelled word has also been likened to a complete morpheme/sign in ASL, where the fingerspelled word TROUT includes four separate ASL morphemes" (T,R,O,U) as the "T" is repeated (Patrie & Johnson, 2011, p. 59).

Patrie and Johnson (2011) have suggested that "carefully" fingerspelled words are produced "roughly ahead of the signer's ipsilateral shoulder (the shoulder on the same side of the body as the hand doing the fingerspelling)" (pp. 73, 75). Signer's may orient the audience toward a "carefully" spelled word by looking at or pointing to the hand that is doing the spelling (Patrie & Johnson, 2011). While spelling a "carefully" spelled word, a signer will mouth the word as it appears in spoken English, but typically does not mouth the individual letters (Patrie & Johnson, 2011).

Several authors have begun to investigate the frequency of fingerspelling in signed languages. Padden and Gunsauls (2003) examined short narratives by 18 Deaf native and 18 Deaf non-native signers of ASL and "transcribed a continuous segment of 150 signs" to see how many tokens were fingerspelled (p. 24). The texts by the native signers contained 18% fingerspelling, while the texts of the non-native signers had 15% (Padden & Gunsauls, 2003).

Morford and MacFarlane (2003) looked at a corpus of ASL stories created by 27 different signers with a total of 4,111 signs. They broke the stories down into three different genre types and calculated the percentage of fingerspelling as compared to total signs produced. The average was 6.4 % across genre types, with a range of 3.3% for narratives, 4.8% for formal presentations, and 8.7% in casual texts (Morford & MacFarlane, 2003, p. 220). Given these numbers, fingerspelled words are something interpreters must be able to translate.

Looking specifically at what is fingerspelled, Padden and Gunsauls (2003) examined portions of a corpus used by Lucas, Bayle and Valli (as cited in Padden and Gunsauls, 2003) and in particular, 10 minute segments from 14 different native signers who produced a total of 2,164

fingerspelled words. They found that 70% of the fingerspelled words were nouns, which were fairly evenly split between proper nouns (32.1%) and common nouns (35.4%) (Padden & Gunsauls, 2003, p. 19). Next came adjectives (10.1%) and verbs (6.3%), while prepositions, adverbs, conjunctions, pronouns, interjections, articles, and affixes, ranged from 3.8% down to 0.5% respectively (Padden & Gunsauls, 2003, p. 19).

In their study, Padden and Gunsauls (2003) noted that fingerspelling may be used by some Deaf signers due to a stylistic preference. They also found that "Talking about events or describing a process or procedure often elicits more frequent fingerspelling, especially if the topic is a technical one, such as problems with blood clots." (p. 24).

Turning to the canon on ASL acquisition, research on the ability of adults as second language learners to acquire fingerspelling is fairly limited. One of the earliest studies compared three groups, which included hearing, English speaking undergraduate students, Deaf undergraduate students, and 12 staff members of the National Technical Institute for the Deaf (six Deaf, six hearing). The focus was on the subjects' ability to comprehend computer-generated words in printed English as well as words spelled out using pictures of ASL signs used to represent the English alphabet (Zakia & Haber, 1971). The subjects saw two types of words, nonsense and real.

The authors found a significant difference between the experts (12 staff members) and the novice signers (Deaf students) in their ability to read fingerspelled words, where the experts did better with longer words (Zakia & Haber, 1971). A high correlation was noted between the ability of novice signers, the Deaf students, to read "real" words spelled out with the English alphabet as compared to "real" words spelled out with pictures of the ASL alphabet ($r=0.71$, $p<0.01$) or "nonsense" words spelled in English or ASL ($r=0.55$, $p<0.01$) (Zakia & Haber, 1971, p. 112). This suggests perhaps some relationship between reading printed English words and recognizing words through the ASL alphabet.

In terms of the overall cognitive process of learning to comprehend fingerspelling in ASL, Patrie (1989) and Patrie and Johnson (2011) equated it to the process of reading in English. Patrie and Johnson (2011), for example believed a good reader of English was better able to comprehend fingerspelled words. To do so, an individual could choose to equate each handshape with a letter of the English alphabet, and from there determine the intended word (Patrie, 1989), similar to a phonics approach to reading English words. On the other hand, while watching fingerspelling, an individual may determine the English equivalent of a fingerspelled word in its entirety (gestalt) due to its physical manifestation (shape of letters, speed of production, modulations in height, and length of palm movement) (Patrie, 1989). Zakia and Haber (1971) came to a similar conclusion, that novices may focus on the individual parts of a fingerspelled word while experts looked at the gestalt. They wrote that "a highly experienced reader" attended to "the total pattern of the finger configuration" (Zakia & Haber, 1971, p. 114). In a later study, Patrie (1989) also argued against a strategy of focusing on parts of the word as she believed it caused an increase in a viewer's cognitive load and decreased their ability to read a spelled word.

Having some context could be important for the comprehension of fingerspelled words. Bahleda (1998), for example argued, "Students need to be exposed to fingerspelling in context, within sentences, and at a normal pace" (p. 25). A recent study by Wilson (2011), however, found a difference in philosophy between Deaf and hearing ASL instructors in terms of the

importance of context. She argued that students could more readily predict the fingerspelled word SUBWAY if given the sentence "DO YOU WANT TO EAT AT S-U-B-W-A-Y?" (Wilson, 2011, p. 60), as they could guess the word was related to eating. However when asked about the importance of teaching this, 22 Deaf ASL instructors rated its importance significantly lower than 22 hearing instructors of ASL (Wilson, 2011).

Other strategies were noted in the literature. Patrie (1989) believed good readers tended to make use of multiple strategies and could identify the role of the word (as verb, noun, etc.) while poor readers seemed to lack this ability. Wilson (2011) identified how some texts on fingerspelling instruction emphasized the strategy of identifying the movement of individual letters. Some students, for example, were taught to recognize that handshapes, such as "B," were letters going upwards in direction (Wilson, 2011). Students were also taught to recognize letters moving down, such as "Q" and letters which ended in a closed hand, like "A" or "S" (Wilson, 2011). In addition, the letters "J" and "Z" were taught based on their unique movements and "G" and "H" were referred to as horizontal letters (Wilson, 2011, p. 30).

## PRIMING

As mentioned earlier, to enhance their ability to comprehend and then translate fingerspelled words, interpreters often ask for preparation materials from Deaf speakers. The tacit assumption is that such materials act as a prime in their first language (L1) for later recognition of the second language stimuli (L2). A general theoretical model to describe this process of priming is Jim Cummins' (2001) Linguistic Interdependence hypothesis for second-language learning. Cummins (2001) postulated that L1 fluency would facilitate L2 use, as both languages shared a Common Underlying Principle (CUP) or interdependence.

There is a growing body of evidence to support Cummins' conceptualization of CUP in bilinguals, especially research on priming across language pairs. Several authors have noted that bilinguals do not suppress one language when working with the other, and they have argued that there is indeed a shared linguistic repertoire and activation of both languages at once (Moon & Jiang, 2011; Schwartz, Kroll & Diaz, 2007; van Wijnendaele & Brysbaert, 2002). In terms of ASL-English bilinguals, Patrie and Johnson (2011) described it as the activation of "templates" in both languages.

Priming or this activation is typically an unconscious process in which words are automatically encoded in both L1 and L2. This priming can happen at the level of phonology (Kim & Davis, 2003; van Wijnendaele & Brysbaert, 2002), orthography, or semantic meaning (Kim & Davis, 2003). Some authors described it as both bottom-up (from form to meaning) and top-down (from meaning to form) processing (Kim & Davis, 2003; Patrie & Johnson, 2011). For example, a hearing native English speaker who has ASL as a second language may hear the word "blue" and based on the sound (phonology), think of the sign in ASL for BLUE. They may see "blue" in printed form (orthography) and think about the sign for BLUE. They may also see a car drive by that is blue in color and unconsciously or even consciously and physically produce the sign for BLUE in ASL.

Priming has been tested by a number of authors in a variety of ways. Many of the studies looked at immediate priming (Kim & Davis, 2003), and have involved tasks that included "cross-language priming, translation, picture naming, word naming, fragment completion, cross-

language Stroop tasks [a representation of one thing with an inaccurate label attached], and free recall of blocked and mixed word lists" (Gollan, Forster & Frost, 1997, p. 1122). Another form of priming involves the use of homophonic priming (words that share the same rhythm, syllable or sound pattern such as "here" and "hear") (Brysbaert, Van Dyck & Van de Poel, 1999; van Wijnendaele & Brysbaert, 2002). A common experiment for priming includes a Lexical Decision Task (LDT) where the subjects are asked if the stimulus is a real or non-word, and their response time (RT) and error rate (ER) are calculated (Kim & Davis, 2003).

The resulting priming effect can then be facilitory or inhibitory. A facilitory priming effect occurs where a faster or more accurate response rate is noted. An inhibitory priming effect includes either a longer response time or increased inaccuracy in identifying words.

## COGNATES OR NON-COGNATES

An important aspect when looking at priming across languages is whether or not the words under study in the two different languages are cognates or non-cognates. For example, if a French-English bilingual said, "That car looks bleue to me," where the French word "bleue" was used, an English speaker may be able to guess the speaker meant "blue" in English. The two words share a similar phonology (sound), orthography (written spelling), semantic meaning (a color), and linguistic history and so would be considered cognates. However, an English speaker might not be able recognize the sign for BLUE in ASL or the four ASL morphemes B, L, U, E if the word was fingerspelled. This is because English and ASL are non-cognate language (Jacobs, 1996), much as NGT, the sign language of the Netherlands has been characterized as a non-cognate of written Dutch (Ormel, Hermans, Knoors & Verhoeven, 2012).

Other aspects of fingerspelling in ASL suggest it is non-cognate with English verbal spelling. The frequency of fingerspelling in ASL seems to be higher than verbal spelling in spoken English (Padden & Johnson, 2011), for how often do English speakers resort to "Let's go to the s-t-o-r-e now?" and as mentioned earlier, signers may include fingerspelling in as much as 8.7% of a casual text (Morford & MacFarlane, 2003). Padden (1998) has also described fingerspelling as the incorporation of a "foreign" aspect into ASL, the use of English spelling patterns represented by individual signs. These patterns produce ASL morphemes as fingerspelled letters produced in a linear manner and typically across a horizontal plane, so fingerspelling typically goes from left to right for example, though it is not inflected vertically (upwards or downwards) as signs in ASL can be inflected (Padden & Gunsauls, 2003). The result is a system that is not ASL and not English, but instead "at least two levels of representation removed from English: it is a representation of another representation" (Padden, 1998, p. 44).

There seem to be specific rules around what gets fingerspelled in ASL and how (Padden & Gunsauls, 2003). These rules differ from the use of verbal spelling in English. For example, when a person or creature is set free from captivity, the sign FREE may be used, while if something is given away "for free" or at no cost, the concept of "free" might be spelled as F-R-E-E (Padden, 1998, p. 55). Where English creates compound words from two (blackboard, playbill), ASL at times uses a sign and fingerspelling (L-E-G and WORK for "legwork") (Padden, 1998, p. 54). Padden (1998) suggests words were spelled when the ASL sign is "disallowed" (p. 54) as it did not "preserve [the] semantic integrity" of the meaning of the sign (p. 55). Where a signer describes getting an "eyetooth removed," for example, they might spell

"eye" as in E-Y-E TOOTH REMOVED (Padden, 1998, p. 55). To instead sign EYE, TOOTH REMOVED might confuse the audience into thinking the person had both an eye and a tooth removed.

Patrie and Johnson (2011) described how English speakers borrow words, such as rendez-vous from other languages like French, without resorting to verbal spelling ("r-e-n-d-e-z v-o-u-s"). ASL signers, on the other hand, fingerspell the word as it appears in the English orthography, for example by spelling C-A-S-A instead of signing the Spanish sign language sign for HOME (Patrie & Johnson, 2011).

Given that English verbal spelling and orthography is not a cognate for the process of fingerspelling and the phonemes used in ASL, the research on non-cognate languages and bilinguals was reviewed. In a study of non-cognate languages, Korean in Hangul script and printed English, Moon and Jiang (2011) asked Korean-English bilinguals to examine a number of phonemes and then pictures (such as /n/ in English or /ㄴ/ in Korean and a picture of a butterfly). The subjects were to determine if the phoneme they saw in English or Korean was present in the label for the picture they saw next. In essence, the subjects may have seen the letter "n" and then a picture of a butterfly and would be expected to say "no" as the letter was not in the English word for "butterfly." The researchers, however, found the bilingual subjects compared the phoneme to both the English and Korean label, which resulted in a delayed response compared to the response time of the monolingual English or monolingual Korean speakers (Moon & Jiang, 2011), evidence of cross-linguistic priming.

In a study of Hebrew-English and English-Hebrew bilinguals, again two fairly non-cognate languages, researchers (Gollan, Forster & Frost, 1997) looked at the priming effects of their written orthographies. Of interest to note, the reaction times of the English dominant bilinguals primed in English (L1), the priming effect, was greater (slower response) than the Hebrew dominant bilinguals (Gollan, Forster & Frost, 1997). They also found a stronger priming effect for weaker or unbalanced bilinguals (slower reaction time) when the prime in L1 and target word in L2 were both cognates (Gollan, Forster & Frost, 1997). The relationship was asymmetric however, as no evidence of a priming effect was found when an L2 prime was presented first before a target word in the subjects' L1.

In another study of non-cognate languages (Korean, English), Kim and Davis (2003) ran a number of tests with Korean dominant bilinguals using a Korean prime word in Hangul and a target word in printed English. They too found a clear priming effect from L1 to L2 for both cognate and non-cognate words in a Lexical Decision Task and in an English word classification task. This led the authors to suggest that different types of stimuli (in L1 versus L2) might trigger different types of priming in bilinguals (Kim & Davis, 2003).

Ormel, Hermans, Knoors and Verhoeven (2012) looked at 40 Deaf children in the Netherlands, users of Netherland Sign Language (NGT). The children were asked to judge if a word in Dutch was similar to a picture they were shown, but they were not asked to translate the Dutch words into NGT. Some words had an NGT translation equivalent, a sign that was very iconic in comparison to the picture. Other words had NGT sign translations that were not iconic with the pictures that were shown. There were also some words that were a mismatch for the pictures shown and were unrelated, a Stroop test, but their NGT sign equivalents had a high degree of iconicity to the pictures shown.

The authors found reduced reaction times and fewer errors in the children's responses when there was iconicity between the NGT sign for the stimulus word in Dutch and the picture they were shown (Ormel, et al, 2012). On the other hand, where the NGT sign for the stimulus word and the Dutch label for the picture shared a similar phonology. but unrelated meaning, there was a lengthened reaction time and more errors, an inhibitory effect (Ormel, et al, 2012).

In a similar test, Morford, Wilkinson, Villwock, Piñar and Kroll (2011) studied 19 Deaf adults and asked them to judge English word pairs as semantically similar or dissimilar in meaning. Semantically unrelated English words with phonetically similar ASL translation equivalents included "cleaning" and "counting" (the movements and handshapes are similar), while semantically related English words with phonetically similar ASL translation equivalents included "bird" and "duck" (Morford, et al, 2011, p. 291). While not told to translate the words into ASL, there was evidence ASL was activated. When shown two words in English that shared a similar meaning and a similar phonology in their respective ASL translation equivalents (such as "bird," "duck"), the Deaf adults gave a rapid "yes, similar" response. However, their responses were more delayed when the two words were dissimilar in meaning in English but their ASL translation equivalents were phonologically similar (such as "cleaning" and "counting") (Morford, et al, 2011).

## COGNITIVE LOAD

The last area within the research canon we examined was that of cognitive load. As mentioned earlier, when individuals try to read fingerspelled words, they can reduce their cognitive load by looking at the configuration of the word, rather than individual letters (Patrie, 1989; Zakia & Haber, 1971). They can make use of context to guess the word (Wilson, 2011) or consider the semantic/grammatical role of the word, such as a noun or verb (Patrie, 1989). However, it should be kept in mind that there are many demands placed on interpreters who are simultaneously working between two languages.

Several theoretical models of cognition during the interpretation process have been suggested, and we will look at two specifically which detail how complicated the cognitive load may be on interpreters. Cokely (1992) saw the process as involving at least seven distinct steps, from message reception of the source language followed by preliminary processing, short-term memory retention, and semantic intent realized. This was then followed by semantic equivalent determined in the target language and subsequent syntactic message formulation and finally message production. Gile (1999) suggested three major efforts were required, that of "Listening and Analysis" of the source text, "Production" either into speech or into written notes while working consecutively, and "Memory," specifically working and sensory memory. These three efforts relied on some similar cognitive abilities, such as long-term memory, which they shared or competed for, but they also required their own distinct cognitive abilities as well.

## RESEARCH QUESTIONS

Given the paucity of research on fingerspelling recognition in interpreting specifically and research that supports a priming effect across non-cognate languages with an L1 word for an L2 target, this study looked at the ability of interpreters to comprehend fingerspelling while simultaneously interpreting into spoken English with and without priming materials in their L1. English-dominant adults, who had acquired ASL as a second language, were the focus of this

research. The decision was also made to explore the effect of years of language study on the ability to read fingerspelling and to thus compare novice and expert interpreters.

The null hypothesis was that the performance of the interpreters when interpreting would be similar across conditions, with or without exposure to an L1 prime and regardless of their level of expertise. On the other hand, the research hypotheses were that:

a) the expert interpreters would comprehend and interpret more of the "carefully" fingerspelled words than the novices in all conditions;

b) both the novices and experts would comprehend and correctly interpret more of the "carefully" fingerspelled words in ASL when given a prime in their L1, in either a contextualized environment, a printed story synopsis containing the target words, or a decontextualized environment such as a printed list of words than without such priming;

c) Both the novices and experts would perform better in their interpretation of "carefully" fingerspelled words from ASL to English when primed in L1 in a printed form and in context (a story) than as a list alone (decontextualized).

## METHODOLOGY

To begin the research process, a Deaf native signer who is a renowned storyteller and orator was hired to create a spontaneous short story in ASL of about 20 minutes in duration with a number of characters and places that had to be fingerspelled. The story contained 50 "carefully" fingerspelled words and was divided into two equal parts, Story A and Story B. Each contained 25 "carefully" spelled words and Part B was the focus of this study. "Carefully" fingerspelled words, referring back to the literature, were ones of first mention where there was little chance of deletion of letters and where the production was hyperarticulated, meaning more clearly and slowly produced than upon their second or subsequent mention.

Each interpreter watched both Part A and Part B of the ASL Story. They were instructed that they could not pause or rewind the video. Their performance was video recorded for later analysis. In Part B, the focus of this study, the interpreters were instructed to simultaneously interpret the entire story.

Volunteer interpreters were sought out, and the decision was made to include only individuals who were native English speakers and who were adult learners of ASL. These individuals were divided up into either novice language users (15 individuals) or experts (15 individuals). A novice language user was an individual who had approximately five years of second language acquisition, in keeping with Cummins' (2001) belief that this length of time was needed to gain at least Basic Interpersonal Communication Skills. An expert user was seen as an individual who had a minimum of approximately 10 years of language use and who was certified by the Registry of Interpreters for the Deaf (RID). They were individually assigned a pseudonym such as Alice-N or Beth-E, where the last letter designated their status as an Expert (-E) or Novice (-N). Next, they completed a demographic questionnaire.

## DATA COLLECTION AND ANALYSIS

This study was conducted within the rubric of a mixed methodology, where both qualitative and quantitative data were collected and interpreted. Within a quantitative framework, the number of "carefully" fingerspelled words correctly identified by each interpreter in Part B while interpreting was tallied and then rank ordered. These ranked numbers were analyzed using non-parametric techniques. Such techniques were used due to the small sample size and inclusion of a non-normative sample, experts and novices. Within a qualitative methodology, the participants of this study were then interviewed and asked to discuss their experience of interpreting fingerspelling.

To begin the study, each interpreter was assigned to a group as an expert or novice. Then they were assigned to one of three conditions, Condition A, B, or C. Table 1 outlines the study design.

*Table 1 Study Design*

| Condition | A No Priming | B List | C Synopsis |
|---|---|---|---|
| Experts | | | |
| Novices | | | |

In Condition A – No Priming, five experts and five novices were not given any background information concerning the words to be spelled in the ASL stimulus videos. After watching Part A of the story and a short break, they were asked to simultaneously interpret Part B.

In the second group, Condition B - List, the five novices and five experts watched Part A of the story, and after a short break, they were given a list of 25 words in printed English which were "carefully" fingerspelled in Part B. They were given two minutes to study the list, and then were instructed to interpret Part B as they normally would.

In Condition C – Synopsis, five experts and five novices watched Part A of the story, and then after a short break, were given a printed English synopsis of Part B and told they had two minutes to read through it. The 25 "carefully" fingerspelled words under investigation in Part B were embedded in the synopsis. They were then asked to interpret Part B as they normally would.

Both Condition B and C made use of delayed priming, where several minutes elapsed between viewing the list or story in printed English and then the interpretation process. The task was similar to a name tasking, where the interpreters were expected to identify the fingerpselled words in Part B of the story while interpreting, and their error rates were compared. Review of the English terms in a list or in a story synopsis in the participants' L1 was believed to prime them to later recognize the words fingerspelled in ASL, their L2. This is similar to studies done with Deaf bilinguals, who were given words in printed English or Dutch which seemed to prime their sign language equivalents (Morford, Wilkinson, Villwock, Piñar & Kroll, 2011; Ormel,

Hermans, Knoors & Verhoeven, 2012).

Qualitative data was also collected, and this was done via a series of questions. The participants were asked to discuss their ability to interpret fingerspelled words and their performance during the study. They were also asked to talk about the impact of having received no preparation materials prior to interpreting or the efficacy of having received priming materials (a list of words or a story synopsis, both with the 25 fingerspelled words included in printed English).

To ensure accuracy in the data collection, the recorded samples of the interpreters were independently scored by two members of the research team. This was done by checking off the number of words "carefully" fingerspelled upon first mention. Two researchers then tallied the number of words correctly interpreted, and a comparison of scores revealed a high inter-rater concordance with only 1 or 2 differences at most (80% concordance), which were resolved after a discussion.

## PARTICIPANTS

Thirty individuals were involved in the study. The following Table 2 – Age and Gender and Table 3 – ASL Use, summarizes the characteristics of the participants.

*Table 2 Age and Gender*

| | M | F | Age | Age | Age | Age | Age | Age |
|---|---|---|---|---|---|---|---|---|
| | | | 21-25 | 26-30 | 41-45 | 46-50 | 51-55 | >=55 |
| Novices | 1 | 14 | 14 | 1 | 0 | 0 | 0 | 0 |
| Experts | 3 | 12 | 2 | 1 | 5 | 2 | 3 | 2 |

Of the participants, four were male (three experts, one novice) and the rest were female. Based on mode, most of the novices were between 21 to 25 years old, and the experts were between 41-45 years of age.

*Table 3 ASL Use*

| | Total Years Using ASL | Age begun ASL | Total Use Hours / Week | Total Social Use of ASL / Week | Total Years Interpreting |
|---|---|---|---|---|---|
| Novice | 6.57 | 16.13 | 14.57 | 12.10 | 1.20 |
| Range | 4 - 13 | 10-20 | 6-30 | 2-70 | 1-1.5 |
| Experts | 21.53 | 21.73 | 29.83 | 6.67 | 19.07 |
| Range | 9 - 37 | 10-37 | 13-60 | 1-20 | 4-36 |

The novices reported on average 6.57 years of ASL use, while the experts were 21.53 years. On average, the novices began learning ASL at a younger age (16.13 years old) compared to the experts (21.73 years old). The experts used ASL on average for twice as many hours as the novices (29.83 hours), but the novices used the language more often in social settings (12.10 hours for the novices per week compared to 6.67 hours per week for the experts).

### POTENTIAL LIMITATIONS

One of the potential limitations of this study is the small sample size and potential lack of generalizability to all ASL – English interpreters. However, it is believed that the reader will find some face validity in the construction of this experimental process, and there is support from the literature, and thus triangulation, of the concept of L1 priming for L2 naming. Comments from the participants also served to triangulate the findings.

A second limitation of this study was the utilization of a spontaneous videotaped sample of ASL. Such a sample provided the participants with a two-dimensional model of language, instead of a three-dimensional model that would be found within a naturalistic setting. This may have impacted the interpreters' ability to see and read the fingerspelled words. The participants, in fact, mentioned a preference for working with live versus videotaped samples. The use of a videotaped model however, allowed for consistency of stimulus presentation. To alleviate this limitation, the video of the signer was projected onto a large screen at life-size dimensions.

A third limitation was the lack of a target language audience. Perhaps the interpreters in the study would have performed differently had there been someone present and who was relying on their work to communicate with the Deaf presenter.

## FINDINGS

### EXPERT VERSUS NOVICE

The participants' scores for Part B were separated by expert and novice and then compared. A Mann-Whitney non-parametric test was run to compare the scores of the 15 novices to the 15 experts, as this was a between group comparison. Where they were asked to interpret Part B as they normally would, the experts as a group did significantly better at identifying the "carefully" fingerspelled words than the novices ($U=43.50$, $Z=-2.87$, $*p = .00$).

Then the performance of the experts was compared to the novices for each of the three different conditions. As six independent groups of interpreters were compared, the chance of identifying some difference between the groups increased, so a Bonferroni correction was performed making the significance level $p=0.008$ (0.05/6).

*Table 4 Experts Compared to Novices Across Conditions*

| | Novice No Prep | Novice List | Novice Story |
|---|---|---|---|
| Expert No Prep | U=3.50, Z=-1.89, p=0.06 | U=10.00, Z=-0.52, p=0.69 | U=6.00, Z=-1.37, p=0.22 |
| Expert List | U=0.00, Z=15,00 *p=0.007 | U=9.00, Z=-0.76, p=0.55 | U=0.00, Z=-2.62, *p=0.007 |
| Expert Story | U=0.00, Z=-2.62, *p=0.007 | U=9.50, Z=24.50, p=0.55 | U=0.50, Z=-2.51, *p=0.007 |

As can be seen in Table 4, there was a significant difference in four conditions where the experts were more accurate than the novices. This occurred between the experts who were given a printed list of words and the novices were given no preparation materials (*p=0.007) and the same expert group and the novices who were given a printed story synopsis (*p=0.007). Also, the experts who were given a printed story synopsis were more accurate than the novices who were given no materials (*p=0.007) or the novices who were given a story synopsis (*p=0.007).

There was, however, no significant difference between the novices who were given the printed list of words and any of the expert groups in any of the three conditions. Nor was there a difference between the experts and novices who were given no preparation materials (p=0.06) or the experts who were given no preparation materials and the novices who were given the printed story synopsis (p=0.22).

## PRIMING EFFECT

The performance of the ten interpreters (five novices, five experts) who were given no preparation materials was compared to the 20 interpreters (10 experts, 10 novices) who were given some form of priming material (list or story synopsis). A significant difference was found (U=53.00, Z=-2.08, *p=0.04), where those given the priming materials did better than those who were given nothing to study.

In a comparison across the three conditions (no preparation, list of words and story synopsis), a significant difference was found in the Kruskal Wallace non-parametric ANOVA (Chi Square = 6.43, *df* = 2, **p* = .04). This prompted a comparison of the three conditions individually. Again, as the chance of mistakenly finding some difference increased as the number of comparisons grew, a Bonferroni correction was performed making the significance level p=0.016 (0.05/3).

As a group, the 10 interpreters (experts and novices combined) who were given the list of words did significantly better than the 10 who were given no priming information (*U* =18.50, *Z*

=-2.40, *$p$ = .015). However, there was no significant difference between the 10 interpreters who received no preparation materials and the 10 who were given the story synopsis (U=34.50, Z=-1.17, p=0.25). Likewise, the 10 who were given the list of words and the 10 who were given the story synopsis showed no significant difference (U=29.50, Z=-1.56, p=0.12).

### WITHIN GROUPS

The final analysis looked within each group to see if the type of priming information or lack of said had an impact on the performance of the novices or experts separately. A Bonferroni correction was performed making the significance level p=0.016 (0.05/3). The following Table 5 shows how the five novices with the list of words did better than the five novices who were given no preparation materials (*p=0.007) and better than the five novices given the story synopsis (*p=0.015).

*Table 5 Novices by Conditions*

| | Novice No Prep | Novice List | Novice Story |
|---|---|---|---|
| Novice No Prep | | U=0.00, Z=-2.64, *p=0.007 | U=7.50, Z=-1.06, p=0.31 |
| Novice List | U=0.00, Z=-2.64, *p=0.007 | | U=1.00, Z=-2.44, *p=0.015 |
| Novice Story | U=7.50, Z=-1.06, p=0.310 | U=1.00, Z=-2.44, *p=0.015 | |

When the experts were compared across conditions, there was no significant difference between any of the conditions.

*Table 6 Experts by Condition*

| | Expert No Prep | Expert List | Expert Story |
|---|---|---|---|
| Expert No Prep | | U=8.50, Z=-0.85, p=0.42 | U=8.00, Z=-0.94, p=0.42 |
| Expert List | U=8.50, Z=-0.85, p=0.42 | | U=12.00, Z=-0.10, p=1.00 |
| Expert Story | U=8.00, Z=-0.94, p=0.42 | U=12.00, Z=-0.10, p=1.00 | |

## QUALITATIVE DATA

Turning to the qualitative data, a constant-comparative method was used to identify major categories and their properties in the 30 interviews with the participants. Five major categories were identified which included Strategies for Success, Interpreting as Interaction, the Priming Effect, Cognitive Load, and the Importance of Context (see Table 7).

### STRATEGIES FOR SUCCESS

When asked "What would have made it easier for you to comprehend the fingerspelling and interpret it?," a number of strategies were suggested by the interpreters in preparation for interpreting. Prior to testing, four experts and one novice talked about predicting potential vocabulary. Some practiced fingerspelling the list of words or story synopsis when they were given the material. When asked why she did that, Barb-N said, "So if he did them faster than he did, I would be able to pick out, like… whether it was an open handshape or closed one." When asked if it helped, she replied, "For some of them, yes. Not all of them. But some of them, when I missed them the first time, I was able to look back and think of ...the rise and fall of the fingerspelling." Olga-E tried to separate out the types of fingerspelled words in the stories she was given into proper nouns and others.

Four mentioned the need for an introductory video of the speaker (Carla-N, Irene-N, Olga-E) or an excerpt from the actual story (Joy-E). Two novices said a map of Kansas, one of the topics in the story, would have been helpful. Three experts and four novices wanted to keep the list of words while they were interpreting.

While they were interpreting, the participants mentioned a few things that made fingerspelling easier to deal with. Some said they consciously omitted town names or used a superordinate, such as "suburbs" (Jackie-N, Ivy-E, Mark-N). According to Ivy-E, "English doesn't need that level of detail all the time." Gail-N and Anne-E mentioned trying to lip-read the speaker while he was signing.

Thirteen of the 30 interpreters (six experts and seven novices) talked about immediately forgetting the names of the signer's siblings or struggling to remember them after they were spelled and later mentioned by just their name signs. Strategies used to compensate for this included saying "older sister or sisters" (Barb-N, Darlene-E, Eugene-E, Ivy-E) or "siblings" (Eugene-E, Olive-N) on subsequent mention. Some said nothing when the names came up (Eugene-E) or didn't know what to say (Gail-N). Another strategy used by Grace-E when the different siblings were mentioned was to say, "And the three of us, and the four of us, and the seven of us."

### INTERPRETING AS INTERACTION

Based on the comments of the participants', one of the categories that was identified in the interviews was that of interpreting as an interactive process. Fourteen of the participants (six experts and eight novices) in this study wanted to work with a live model instead of videotaped

story or mentioned how it would be a different process. In fact, Nadia-N used the term "negotiate," and Karen-N said while working with real individuals, "I have the leeway to interact with them."

With a live model, they could then stop the speaker when needed (Barb-N, Darlene-E, Helen-N), ask the person to repeat (Felice-N, Irene-N) or clarify what was spelled (Grace-E, Joy-E, Larry-E, Lena-N). They could employ back-channeling (Catrina-E,) like nodding (Catrina-E, Nadia-N), and could shadow the speaker while they spelled (Grace-E, Hope-E, Jackie-N, Karen-N). As Catrina-E put it, "But…that sort of nodding along, if it's a live… speaker, that sort of engagement with the text isn't just with the information, it's actually with the person. So the Deaf person might check in and see that I'm nodding along, or not. Slow down or go back."

### THE PRIMING EFFECT

One of the questions the participants answered in their interview was the impact of the priming materials, the list of words or the story synopsis. Most of the participants described the priming materials in positive terms. Twelve of the 20 who received the materials said it helped (four experts, eight novices), especially when interpreting the names of cities (Alice-N, Eugene-E, Irene-N, Ivy-E) and siblings names (Carla-N, Karen-N). The materials gave them a context (Irene-N) and helped them recall the words (Barb-N, Catrina-E). Ivy-E said due to seeing the synopsis, "I didn't have to see every letter" while interpreting. Eugene-E implied the same thing, and said "Or at some times, like when he fingerspelled Overland Park, I saw O-V and I knew exactly what he was going to fingerspell."

Also six of the 10 interpreters (three experts, three novices) who were not given any priming materials expressed a desire for it. Jackie-N said it would have been helpful and shared, "So yeah, prep definitely would have been nice to… to at least… give me some… idea of the structure so I would be prepared and be able to predict things better." Doris-N said the materials would have given her "… A clue. Like just a little hint of what the topic was. Like he's going to be talking about his family." Gail-N shared, "Um... Because I had no clue, even …what we were going to be talking about…" and later added, "I didn't have a schema of, like, words to expect."

On the other hand, some described the materials as detrimental to their work. Catrina-E expected the words to come up as they were listed and said, "So I had to remind myself that I was watching this…" instead of just reciting the words she had tried to memorize. Three (Carla-N, Fran-E, Olive-N) described how they recognized when they didn't use the words in their interpretation and that seemed to add to their cognitive load. Ivy-E also said it was difficult to identify the fingerspelled words when given a whole story to deal with.

### COGNITIVE LOAD

As mentioned earlier, a number of things were described that increased the interpreters' cognitive load, and so made it more difficult for them to read fingerspelling. For example, one of the most frequently mentioned aspects of the ASL story was pronunciation, and of the 30 participants, 17 mentioned it as a challenge while interpreting for the Deaf speaker (eight experts and nine novices). For example, Helen-H said, "A couple of them I didn't know how to pronounce, so I kind of fixated on that a little bit." Words that were mentioned included "Troost" (Anne-E; Barb-N; Irene-N; Ivy-E; Kendra-E) and "Lenexa" (Eugene-E; Kendra-E).

Several participants (six experts and one novice) described how "confidence" impacted their ability to read fingerspelling, and one mentioned test anxiety (Larry-E), examples of affective filters. Another cognitive demand the interpreters placed on themselves was the challenge of figuring out what was expected in the study. Each was told to interpret the fingerspelled words, but a definition of what constituted a fingerspelled word was not given. Ten (seven experts, three novices) later talked about trying to determine the type of fingerspelled words that were being examined. They wondered if signs like #KS for "Kansas" (Larry-E, Olga-E), #JOB for "job" (Barb-N), or #HS for high school (Fran-E) were considered fingerspelled signs or if they should say every word every time it was spelled, like #DO DO DO, even if done so in succession (Barb-N, Hope-E, Ivy-E, Karen-N, Olga-E).

Some participants described how they monitored their output, thus increasing their cognitive load. Two experts and six novices said when they missed something from an earlier section, it made them miss upcoming information. As Lena-N said, "So, it was hard for me to kind of, keep going after that..." Larry-E described it as, "And because I was in my mental filing cabinet looking for a word, I ended up… missing the fingerspelling." (Larry-E). Elaine-N shared, "…I felt like when I lost my place and I didn't know what he was saying anymore, then I was just start getting like… flustered." As mentioned earlier, three participants (Carla-N, Fran-E, Olive-N) described having memorized the list of words they were given and were mentally going through the list to ensure they had included every word in their target texts.

Two experts described how they were not happy with what they had said. One interpreter characterized it as, "I started it wrong, I backed myself into a corner. I want to say it this way. I don't want to say it that way. And then there's fingerspelling coming at me." (Ivy-E). Another said, "…and then of course, if I missed it the first time or if I thought I caught it the first time and then when he fingerspelled it again, I'm going "Wait did I say that right? Wait!" Now I'm double guessing myself." (Grace-E).

### THE IMPORTANCE OF CONTEXT

Seventeen of the 30 interpreters (eight experts and nine novices) mentioned the need for familiarity with the topic to be able to catch fingerspelling, and 13 (seven experts and ten novices) talked about the need for context. As Ivy-E described it, "It is the human… psychology of it. So… having… context is a big thing for me. So knowing the context. Knowing we were in Kansas. We were going to be in Kansas the whole time." Both Gail-N and Doris-N described it as having "a clue" about what the speaker was describing.

Several experts talked about how it was easier to catch a fingerspelled word when it was preceded or followed by related information (Anne-E, Ivey-E, Kendra-E), what Anne-E called "contextually-based fingerspelling." She also said that it was helpful if the signer paired the spelling with a sign.

Several interpreters described how they used the structure of the narrative as a support. For example, those who weren't given any information identified that there was a story structure (Anne-E, Barb-N, Grace-E, Hope-E, Jackie-N), while those who saw the short synopsis also commented on the benefit of knowing it was a story (Carla-N, Ivy-E, Olga-E, Olive-N). Hope-E said she could "use closure skills on something like stories" and Ivy-E, who saw the synopsis said, "When he started talking about his father in construction I'm like "Oh, that's right. We're

getting near the end. Oh." You know. I kind of forgot the story… So it kind of helped me… know where we were in the story."

As a summary, Table 7 is a synopsis of the major themes and properties as noted in the interviews and qualitative data analysis.

*Table 7 Major Themes in the Interviews*

| **Major Themes** | • **Properties** |
|---|---|
| Strategies for Success | • Predicted vocabulary<br>• Practiced fingerspelling the words<br>• Wanted an introductory video, excerpt from the actual story, a map of Kansas, to keep the list of words, to see the tape twice<br>• Practice with two-dimensional models<br>• Separated out the types of fingerspelled words in materials<br>• Used a superordinate such as "suburbs" for town names<br>• Replaced forgotten family names with "sibling" or "sister" etc. |
| Interpreting as Interaction | • Want to work with a live model, to negotiate with speaker (stop them, ask them to repeat or clarify), employ back-channeling (nodding, shadowing) |
| Priming Effect | • Most found priming materials helpful, appreciated getting names of cities, siblings, context, helped with later recall of the words, could look for whole fingerspelled words, not focus on each letter<br>• Those without priming expressed a desire for it<br>• Some found materials detrimental, tried to memorize list of names, recognized when they didn't use the names, found it hard to identify important words from a whole story |
| Cognitive Load | • Increased cognitive load due to pronunciation, affective filters (confidence, test anxiety), attempts to understand expectations of the study<br>• Monitored output |
| Importance of Context | • They wanted to know topic and context, identified story structure and could use closure skills or prediction<br>• Easier to catch a fingerspelled word when preceded or followed by related information<br>• Appreciated it when signer paired the spelling with a sign |

## DISCUSSION

While it is widely acknowledged that recognizing a fingerspelled word in ASL is difficult, there is a paucity of research on the acquisition of this aspect of ASL by hearing, non-native adults. Given the large number of professional interpreters who are second-language learners of ASL, such research is needed to understand how to enhance their linguistic fluency. It is also important to examine the strategies these individuals use to improve their ability to interpret between the languages, such as reading preparation materials in written English, and to examine these

practices for their efficacy. To address this gap in the research, three research hypotheses were formulated.

The first was,

a) Expert interpreters would comprehend and interpret more "carefully" fingerspelled words than the novices in all conditions.

This study found that the 15 experts, as a group, did significantly better than the 15 novices in reading "carefully" fingerspelled words (*$p$ = .00). We also found that the experts who were given the printed story synopsis or the list of words were more accurate than the novices who were also given the story synopsis (*p=0.007) or who lacked priming materials (*p=0.007). Upon a closer examination however, we found that the experts who were given no priming materials performed in a similar manner to all of the three novice groups. It would appear that a lack of priming materials significantly impacted the ability of the expert interpreters in this cohort and that requesting priming materials would enhance their ability to read fingerspelling.

While the experts did better than the novices overall, a closer look at the findings also showed that the five novices who were given the printed list of words to study as a prime performed in a similar manner as the experts without preparation materials (p=0.69), with the printed list of words (p=0.55), or with the printed story synopsis (p=0.55). As will be discussed later, it would appear that novices can greatly enhance their ability to read fingerspelling by getting access to priming materials in their L1 in list form.

Our second research hypothesis was,

b) Both the novices and experts would comprehend and correctly interpret more of the "carefully" fingerspelled words in ASL when given a prime in their L1.

Here our findings indicate that the 20 interpreters who were given the list of words or the story synopsis in printed English as priming material in their L1 did significantly better than the 10 who received no priming materials (*p=0.04). There was evidence therefore, of L1 priming for later L2 naming as the printed materials in English seemed to improve the performance of these interpreters as a group on reading "carefully" fingerspelled words in ASL.

Our third research hypothesis was,

c) Both the novices and experts would perform better in their interpretation of "carefully" fingerspelled words when primed in L1 and in context (a story) than when given a list of English words alone (decontextualized).

Here our results indicated that the provision of a story synopsis to 10 of the interpreters (five experts, five novices) did not lead to significantly better performance as compared to the 10 interpreters (five experts, five novices) who were given a list of the words on their own (p=0.12). Therefore and as a group, the type of L1 priming material did not seem to have a significant impact. When the performance of the expert interpreters was isolated and compared, there was no statistical difference in their performance across the three conditions. However, when just the novices were examined, the five who received a list did significantly better than the five who were given no preparation materials (*p=0.007) and they were more accurate at reading

"carefully" fingerspelled words than the five who were given the story synopsis (*p=0.015). Also the five novices who were given the list of words to study seemed to be as accurate as the experts without preparation materials (p=0.69), the experts with the list to study (p=0.55), and the experts who were given the story synopsis (p=0.55).

Tentatively, a number of conclusions can be drawn from the quantitative data. The first is that the provision of priming materials led to better performance in this group of 30 interpreters when it came to recognizing and interpreting "carefully" fingerspelled words. As found in the interviews, such materials would address their desire for context and to help them form a schema of the presentation. However, the type of materials is important for the novices. They seem to perform better when given a list of words, and the provision of such a list increased their performance to that of the experts in this study.

On the other hand, the provision of preparation materials for the experts is not as clear-cut. While the experts who were given a list of words or story synopsis had higher levels of accuracy as compared to those given no preparation materials, the differences were not statistically significant. The experts in this study, unlike the novices, may have been more balanced bilinguals and so had the ability to comprehend and interpret "carefully" fingerspelled words with or without the aid of preparation materials. Also the small sample size (15 individuals) or the use of non-parametric techniques, may have masked overt differences between the groups. What was clear-cut was that the performance of the experts who received no preparation materials was not statistically better than the novices in any of the three conditions, meaning preparation materials would have potentially enhanced their performance.

Turning to the interviews, one topic in particular was repeatedly mentioned, pronunciation, and it could have caused an increase in the interpreters' cognitive load. Some of the names for places and individuals were unfamiliar to some of the participants, and so while they may have comprehended the "carefully" fingerspelled words on a semantic level (by recognizing when a person's name was spelled as compared to a place name), their ability to then produce the target L2 word was impaired by a lack of phonetic knowledge. According to both Cokely's (1992) and Gile's (1999) models, the challenge for the interpreters seemed to be in the message production stage. This might be an area for consideration in test situations, as knowing how to pronounce words might reduce the mental energy required by the interpretation process and increase accuracy in an interpreter's recognition of "carefully" fingerspelled words.

Several strategies for enhancing fingerspelling recognition were mentioned in the interviews to reduce the participants' cognitive load while working. They talked about using skills such as prediction to enhance their ability to read fingerspelling and some practiced spelling the words prior to interpreting, perhaps an example of self-generation of L1 primes in English to deal with potential L2 target words. They described monitoring and correcting their work in the moment, as Gile (1999) described in his model, and how that took their concentration away from reading fingerspelling. Some wanted to form a schema or know something about the topic to be interpreted, again perhaps an example of using L1 knowledge to prime for L2 recognition. Another strategy the interpreters wanted to use were mnemonic devices, such as lists of names or maps, which they could then refer to while interpreting. This again indicates that the interpreters wanted to use the words from a printed, L1 prime to name an L2 target. This would also mediate the requirement to have names stored in memory throughout an assignment. Other strategies were mentioned, such as using cloze skills to identify words

based on only a few letters (such as when one interpreter saw O-V and knew it meant "Overland Park") or where letters were missed. Finally, several of the participants believed that working with a live model would enhance their ability to interpret or catch fingerspelling, which supports the nature of interpreting, including reading "carefully" fingerspelled words, as an interactive and negotiated process.

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