STUTTERING CHARACTERISTICS OF GERMAN-ENGLISH BILINGUAL SPEAKERS

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Abstract

To date, limited research has been reported on stuttering and bilingualism. Existing data reports conflicting results on stuttering characteristics across languages of bilingual people who stutter (PWS). Investigations to date include language acquisition, language proficiency, cultural influence, and linguistic as well as phonetic aspects in bilinguals PWS. Thus, assumptions on causal factors of stuttering are plenty, but research is missing to either support or refute those assumptions. Small sample sizes have been an additional obstacle. The purpose of this study was to analyse stuttering characteristics in German – English bilingual PWS. 15 German – English bilingual PWS, ranging in age between 10 and 59 years (mean = 25) were investigated. For all of the participants, German was acquired first (L1) and English second (L2). L2 exposure ranged from 5 to 20+ years (mean = 10). 15 minute conversational speech samples were collected in each language. In addition, an English proficiency test (Cloze Test) and a post-conversational questionnaire were administered. Analysis focused on differences in stuttering severity across languages, the distribution of stuttered content and function words across languages, and possible relationships between L2 proficiency and stuttering. Results indicated significantly more stuttering in L1 compared to L2. In L1, stuttering occurred significantly more often on content words. In L2, no significant difference between stuttering on function and content words was observed. For percentage of syllables stuttered, across language analysis detected significantly more stuttering on content words in German (L1) and more stuttering on function words in English (L2). No direct correlations between stuttering and language proficiency have been found. Results are discussed in light of current theories of stuttering and relationships to past findings are drawn.

Introduction

1. Monolingual Stuttering Research

1.1 Definition of Stuttering:

Present day scholars have not been able to agree on either a consistent definition of developmental stuttering (Bloodstein, 1995; Onslow 1996; Perkins, 1997) nor on a consistent measurement for the assessment of developmental stuttering (Ambrose & Yairi, 2001; Onslow & Packman, 2001; Teesson et al., 2003; Yairi et al., 2001). Persons who stutter (PWS) show differing arrangements of conditions and the appearance of stuttering varies individually (Onslow, 1996; Williams, 2006). Due to the lack of a uniform definition of stuttering, Bloodstein (1995) suggests that it is best to characterise stuttering by what is measurable. Chronic stuttering is distinguished when: (a) symptoms have lasted for more than 6 months, (b) more than 3% out of 100 syllables are stuttered, (c) disfluencies are involuntary, (d) sound, syllable and word repetitions with more than 2 iterations occur, (e) sound prolongations longer than 1 second occur, (f) broken words occur, (g) a fixed posture is observed, (h) an increase of pitch or volume occurs, (i) a word is spoken with excessive visible or audible tension, and (j) associated physical movements occur (Bloodstein, 1995; Nicolosi et al., 2004; Natke, 2000; Ochsenkühn & Thiel, 2005; Wendlandt, 1998; Yairi, 1997). Missing from this array of measurable behaviours are factors such as psycho-social and emotional impairment.

Another way of measuring disfluency types for the assessment and diagnosis of stuttering is to count the number of Stutter-Like-Disfluencies (SLDs) and Other Disfluencies (ODs) per 100 syllables spoken. If a child exhibits more than 3 SLDs per 100 syllables, stuttering should be suspected in that child (Ambrose & Yairi, 1999). The terminology accounts for "the fact that judgments of overt speech behaviour as ´stuttering´ are made in the ear of the listener" (Yairi et al., 2001: p. 587). A SLD is defined as a disfluency that consists of part-word repetitions, prolongations, blocks, and to some extent single syllable word

repetitions (Ambrose, 2006). In contrast, ODs consist of interjections (e.g., “hm”, “um”, “äh”), revision/ abandoned utterances (e.g., “Helen went/ Helen took her bike to school”, “I thought/ Why don´t we go and see that movie?”), and multi-syllable/ phrase repetitions (e.g., “maybe, maybe”, “I would like I would like to go home”) (Ambrose & Yairi, 1999).

1.2 Theories of Stuttering:

Bloodstein (1995) suggests that theories of stuttering can be organised into three main categories, (1) theories of the etiology of stuttering, (2) theories of the moment of stuttering, and (3) theories that derive from reformulation of previous theories. Of particular interest in the present research are theories concerning the moment of stuttering. A wide range of theories concerning the moment of stuttering have been proposed. The general logic behind these theories is to view the stuttering event as either a breakdown in fluency or as an anticipation struggle preceding speech production. One popular breakdown theory is the Demand and Capacity Model proposed by Starkweather (1987). This model assumes there is an imbalance between “the demands for fluency from the child’s social environment” and “the child’s cognitive, linguistic, motor, or emotional capacities for fluent speech” (Bloodstein, 1995: p. 73). This breakdown theory contributes to a disposition of stuttering and the need for further environmental factors to elicit stuttering.

A popular theory that addresses the moment of stuttering is the Covert Repair Hypothesis (Kolk & Postma, 1997). The theory is derived from Levelt´s Perceptual Loop Theory of Self-Monitoring (Levelt, 1989). According to the Covert Repair Hypothesis, PWS) differ from non-stutterers (NS) in the sense that the phonetic planning preceding speech production yields more errors. The reaction to these speech planning errors in PWS and NS is the same. However, PWS seem to have more errors in the speech plan, which results in more repair reactions. Thus, stuttering reveals itself in these repair reactions. The nature of stuttering depends on where the error is discovered during the speech plan of a word. This is

because the repair reaction may differ according to the time the error is being detected, which, as a result, maintains itself in a different type of disfluency (Postma & Kolk, 1993; Kolk & Postma, 1997).

Bernstein Ratner (1997) also proposed a theory based on Levelt´s Perceptual Loop Theory of Self-Monitoring. This theory considers moments of stuttering from a psycholinguistic perspective. Her theory refers to two concepts of stuttering: the loci of stuttering and the frequency of stuttering. The former concept is concerned with consistency effects due to production difficulty, such as certain phonemes or planning difficulty with sentence elements. The latter concept is concerned with the consistency of stuttering according to different levels of linguistic difficulty within different speaking tasks. Bernstein Ratner´s research supports a grammatical and syntactical influence on stuttering in children.

Finally, it is important to note that a majority of past and present day theories of stuttering tend to focus on English speaking PWS. While there are no obvious reasons to suggest that English-based theories of stuttering cannot be applied universally, there have been few attempts to consider the cause of stuttering on the basis of the particular language spoken by a PWS (Bernstein Ratner & Benitez, 1985; Bernstein Ratner, 2004; Roberts, 2002).

1.3 Linguistic Aspects of Stuttering

Linguistic influences on the stuttering event have been evaluated for over 70 years. Dating back to the work of Brown (1937; 1945), it has become apparent that in adults there are several linguistic variables that are closely associated with moments of stuttering. These are: (1) word class, (2) word length, (3) sentence position, (4) phone a word starts with, and (5) linguistic stress (Dworzynski et al., 2003). Results showed that stuttering occurred more frequently on (1) content words than on function words, (2) longer words (containing 5 or more phonemes) than on shorter words, (3) the first three words of an utterance**,** (4) words beginning with consonants opposed to words beginning with vowels; in particular on

phonemes other than /w, h, t, θ/, and (5) the stressed syllable in a multi-syllabic word (Brown, 1945; Dworzynski et al., 2003). Based on the relationship between these linguistic variables and moments of stuttering, Brown assigned a weighting value of 1 to each of these variables. Accordingly, a word that contained a number of variables prone to stuttering (e.g., content word, longer word, first 3 words of an utterance, word beginning with consonants, stressed syllable in a multi-syllabic word), would receive a high word weighting. Words with high word weighting were more likely to be stuttered than words with low weighting.

There has been considerable interest in examining the contention that differential stuttering occurs on content and function words. In general, adults stutter more on content words (Au-Yeung et al., 1998; Brown, 1945; Dayalu et al., 2002; Howell et al., 1999), which include nouns (e.g., mouse, car, Thomas), main verbs (e.g., eat), and modifiers (e.g., beautiful, cold, tall). Content words contain the semantic information of an utterance and are regarded as an "open" word category because the vocabulary of this linguistic set continuously expands (Dayalu et al., 2002). Furthermore, content words are typically expected to be more difficult as they usually are multi-syllabic, carry primary stress, have consonants as the initial sound, have late-emerging consonant strings, and have late-emerging consonants as the initial sound (Dayalu et al., 2002; Howell et al., 1999). In comparison children stutter more on function words (Bernstein Ratner, 1997; Bloodstein & Grossman, 1981; Graham et al., 2004; Howell, 2007), which are regarded as highly practised high frequency words (Dworzynski et al., 2003). In contrast to content words, function words hold the grammatical and functional information of an utterance. Moreover, function words have a limited set of possible meanings attached and are simpler in type with respect to linguistic markers (Dayalu et al., 2002). Function words include articles (e.g., the, a, an), pronouns (e.g., his, she, I, it, you, me, these), verbal auxiliaries (e.g., have been + verb, am + verb), and modals (e.g., can, may, will, shall, must), deictics (e.g., over there, up there, down there, right here), prepositions (e.g., under, next, on, against, like). Function words are regarded as a

"closed" word category because the vocabulary of this linguistic set is unlikely to grow (Dayalu et al., 2002).

A number of researchers have investigated age-related differences in stuttering on content and function words. Au-Yeung et al. (1998) based their research on the assumption that disfluencies in children are due to the unavailability of the speech plan of content words. Accordingly, disfluencies around function words serve as a delaying strategy when the phonetic plan of the following more difficult word is not yet complete. In order to account for this theory, Au-Yeung et al. (1998) analysed stuttering in phonological words (PW). PWs are defined as "consisting of a single content word as its nucleus and any number of function words that serve as prefixes or suffixes to the content word" (Howell et al., 1999: p. 346). Their results proved that disfluencies were more likely to occur on function words preceding a content word within a PW unit than on function words following a content word in a PW unit. Furthermore, disfluencies on function words were more likely to occur on early positions in a PW. These findings support the theory that the purpose of disfluencies around function words is to allow more time to plan the subsequent content word.

Howell et al. (1999) then proposed the related theory that stuttering on function words is used to prevent stuttering on the following content word within a PW. This theory was tested by investigating the age-related shift from stuttering on function words to content words. It was suggested that as disfluencies around function words decrease with age, more disfluencies should occur on the subsequent content word within a PW. Findings supported this theory and further explained the stuttering pattern for adults. That is, adults cease to use the delaying technique previously reported for children (Au-Yeung et al., 1998), and instead, attempt the content word within a PW directly (i.e., before the phonetic plan of that word is ready). Consequently, stuttering occurs on the first part of the content word for which the phonetic plan is complete and stuttering will last until the phonetic plan for the rest of the word is available. The results of the studies of Au-Yeung et al. (1998) and Howell et al.

(1999) have been further supported by an investigation in Spanish and German speaking PWS (Au-Yeung et al., 2003; Dworzynski et al., 2004). The results of the specific findings related to the presented theories were summarised and became part of the "Execution and Planning (EXPLAN) Theory of Fluency Control" (Howell & Dworzynski, 2005; Howell, 2002; Howell & Akande, 2005; Howell & Au-Yeung, 2002).

A different point of view has been put forward by Dayalu et al. (2002). In this study the adaptation effect was considered as a possible explanation of the age-related change in stuttering on function and content words. This theory is based on the authors' findings that, regardless of word type, the most frequently used words result in less stuttering when compared to less frequently used words. Based on the assumption that function words are frequent, limited in number, and repeatedly used in typical conversations, it was suggested that the repeated use of this closed set of words could cause an adaptation effect. Thus, children stutter more on function words because, due to the age factor, they have not had the same amount of practice compared to adults. The authors referred to this adaptation effect as a "generalized" adaptation that occurs in conversation. This is to clearly differentiate it from the "transitory" adaptation effect that occurs when a passage is repeatedly read without pausing between the readings.

Bernstein (1981), Rispoli and Hadley (2001), and Ripsoli (2003) have suggested a link between the morpho-syntactic complexity of an utterance and the age-related shift from disfluencies on function and content words or certain sentence constituents. This suggestion accounts for differences in the readiness to assemble certain sentence components according to experience and development of the syntactic system over time. Consequently, children will stutter less on function words as their syntactic system develops and certain sentence components can be assembled more quickly. Interestingly, Bernstein Ratner emphasises that function words belong to the syntax plan and are not to be analysed on a lexical level. Furthermore, she refers to a study of Kutas and Van Petten (1994), which suggests that

content and function words could possibly "be processed by different areas of the cerebral cortex, even in children" (Bernstein Ratner, 1997: p. 106-107).

While the effect of stuttering on content and function words appears to be well documented for English speaking PWS, there is less research evaluating this phenomenon on non-English-speaking PWS. Thus far, Dworzynski et al. (2003), Dworzynski et al. (2004), Dworzynski and Howell (2004a, 2004b), Nakte et al. (2004), and Rommel et al. (2004) have found the same pattern for German adults and children. Similar effects have been reported for Portuguese-speaking PWS (Juste & de Andrade, 2004; Andrade & Juste, 2006) and Spanish-speaking PWS (Au-Yeung et al., 2003; Howell et al., 2004). However, Spanish speakers have been reported to stutter more frequently on function words across all age groups (Howell et al., 2004). This contrasts with previous findings for English and German speaking PWS (Au-Yeung et al., 1998; Dayalu et al., 2002; Dworzynski et al., 2003; Dworzynski et al., 2004; Dworzynski & Howell, 2004a, 2004b; Howell et al., 1999; Nakte et al., 2004).

2. Bilingualism and Stuttering

2.1 Definition of Bilingualism

There are two general concepts related to bilingualism: (1) second language acquisition and (2) language proficiency (Bialystok, 2001; Kessler, 1984; Miller, 1984b; Roberts & Shenker, 2007; Romaine, 1989; Shenker, 2004b). Two definitions have been proposed for language acquisition. First, spontaneous or simultaneous bilingualism "refers to those children who speak or have been spoken to in two or more languages in the home since birth and who continue to be spoken to in one or both of those two languages at school or daycare" (Shenker, 2004b: p. 83). Second, consecutive bilingualism "refers to those children who speak or have been spoken to in only one language in the home since birth, who are then exposed to a second language, beginning after the age of 3" (Shenker, 2004b: p. 83). In addition, consecutive bilingualism also "refers to the learning of one language after already knowing another. This is the situation for all those who become bilingual as adults, as well as for many who became bilingual earlier in life" (Halsband, 2006: p. 356).

The concept of language proficiency is difficult to define (Bialystok, 2001; Roberts & Shenker, 2007; Romaine, 1989; Scharff-Rethfeldt, 2005). For example, second language acquisition does not necessarily reflect the expected level of language proficiency. This is the length of time one has known a language may not be revealing of language use (Roberts & Shenker, 2007). Moreover, language proficiency consists of several components with regard to the four language modalities (auditory and written comprehension, as well as verbal and written expression) and the proficiency in each of these modalities can vary over time (Roberts & Shenker, 2007). Additionally, the proficiency and vocabulary in each of these modalities depends on the type (e.g., books, music, conversation, radio, TV), context (e.g., home, friends, school, work), and frequency (e.g., daily exposure, weekly exposure, every now and then) of language input (Bialystock, 2001; Roberts & Shenker, 2007). Thus, bilingualism is subject to change and cannot be defined in terms of proficiency (Bialystok,

2001; Roberts & Shenker, 2007; Romaine, 1989; Scharff-Rethfeldt, 2005). Roberts and Shenker suggest that bilingualism be viewed as a continuum of language ability.

When defining bilingualism, it is important to consider the levels of proficiency that can be expected within certain time frames of language acquisition. According to the Texas Speech-Language-Hearing Association (TSHA), both basic interpersonal communication skills, as well as cognitive and academic language proficiency, are important to consider. Whereas proficiency in interpersonal skills can be expected after being exposed to a language for 1-2 years, cognitive and academic language proficiency cannot be expected before 5-7 years (Gonzalez et al., 2004). Moreover, Scharff-Rethfeldt (2005) emphasised that from a psycho-linguistic point of view no differences have been found between bilingualism and multilingualism. Therefore, Scharff-Rethfeldt concluded that bilingualism and multilingualism can be used interchangeably.

Based on the review provided above, the definition of bilingualism in the present research is as follows: (1) L1 represents the language a child was exposed to first, and is assumed to be the most proficient language, (2) L2 refers to the language the individual learned after having been exposed to L1 (Au-Yeung et al., 2001; Miller, 1984b), and therefore, is considered to be the less proficient language, (3) the individual speaks two or more languages, and (4) the individual has been exposed to L2 for at least 5 years.

2.2 Prevalence of Stuttering in Bilinguals

Lattermann and Shenker (2005) reported that 50% of the world's population is bilingual. Considering the fact that 1% of the world's population stutters (Bloodstein, 1995), the need for specific research in the field of stuttering and bilingualism is apparent. Shenker (2004a) suggested that, due to the difficulty in untangling the many variables contributing to language use and stuttering, bilingualism and stuttering is possibly a neglected field of research. This is not only because stuttering shows a heterogeneous pattern in each individual

but even more so because bilingualism is a heterogeneous phenomenon (Van Borsel et al., 2001). The amount and types of environmental and psycho-social factors on these phenomena, and how they manifest themselves in a person, differ individually. What is known is that stuttering has been recorded in a number of diverse cultural settings around the world, and thus, possibly is a universal phenomenon (Au-Yeung et al., 1998; Bernstein Ratner & Benitez, 1985; Bloodstein, 1995; Jayaram, 1983; Nwokah, 1988; Van Borsel et al., 2001). Moreover, the primary symptoms of stuttering, which in general are blocks, sound and syllable repetitions, and sound prolongations, appear to be the same cross-linguistically (Bernstein Ratner, 2004).

An issue confronting researchers is that a wide range of conflicting results concerning the nature of stuttering in bilinguals has been reported (Bernstein Ratner & Benitez, 1985; Dale, 1977; Howell et al., 2004; Jankelowitz & Bortz, 1996; Jayaram, 1983; Meline et al., 2006; Nwokah, 1988; Roberts, 2002). A contributing factor might be that, due to the heterogeneous nature of stuttering and bilingualism, the overall picture of stuttering in each individual differs (Bernstein Ratner, 2004). As a result, little is known about the precise relationship between bilingualism and stuttering (Shenker, 2004a). One example demonstrating this issue is research on the prevalence of stuttering in bilinguals. The review of Van Borsel et al. (2001) recalls a number of researchers that have found positive data to support the assumption that bilingualism could cause stuttering or that there is a higher prevalence of stuttering in bilingual speakers compared to monolingual speakers (Bloodstein, 1995). Howell et al. (2003) reported in their literature review that stuttering has been suggested to be more prevalent in children who learn English as L2. Furthermore, Au-Yeung et al. (2001) found evidence that children (i.e., girls) are more prone to stuttering if they are exposed to L2 either between 0-6 year of age, with an especially high prevalence within age 3 (43,75%), or after age 12. The age range of 0-6 being a critical time for stuttering to occur in bilinguals has previously been reported by Stern (1948). In other words, there might be a

positive cause-and-effect relationship between stuttering and bilingualism for some PWS that is possibly due to age and gender. If so, bilingualism would only be one factor of a variety of factors that contribute to the occurrence of stuttering (Van Borsel et al., 2001). However, there is a lack of credible research to support the suggestion that bilingual speakers are more prone to developing stuttering than monolingual speakers (Van Borsel et al., 2001; Roberts & Shenker, 2007). Roberts and Shenker (2007) point out that if bilingualism was at the origin of stuttering, there would need to be a higher prevalence of stuttering in countries with more bilingual or multilingual speakers compared to countries with more monolingual speakers. However, no research to support this hypothesis has been reported thus far.

Other features evaluated in bilingual PWS include remission and stuttering severity. There are reports that bilingual children who stutter show a slightly higher chance of remission than monolingual children who stutter (Ambrose, 2006; Bernstein Ratner, 2005a). Furthermore, the suggestion has been made that language competency supports remission (Bernstein Ratner, 2005a). Stuttering characteristics and severity are also reported to differ according to the particular language spoken by the bilingual PWS (e.g., Jankelowitz & Bortz, 1996; Jayaram, 1983; Nwokah, 1988). This suggestion is supported by a recent investigation in the cortical representation of language in bilinguals whereby different parts of the brain are activated for each individual speaker as well as for each language spoken by the same individual speaker (Halsband, 2006).

Stuttering can be displayed in three different ways in a bilingual PWS. The three possibilities are (1) Stuttering is only demonstrated in one language but not the other, (2) Stuttering occurs in both languages but dissimilarly and, (3) Stuttering occurs similarly in both languages. Limited data exists to support the occurrence of stuttering in one language only (Possibility 1). Dale (1977) examined four Spanish-English speaking adults who lived in the USA since their birth but spoke Spanish at home. All participants exclusively exhibited stuttering in Spanish (L1). Dale attributed the fact that none of the individuals were found to

stutter in English (L2) to environmental pressure to speak Spanish fluently. Despite this report, it does not seem to be the norm that stuttering occurs in one language only (Van Borsel et al., 2001). Furthermore, if disfluencies only occur in L2 and no signs of tension are observed, it is suggested that low proficiency might be at the origin of these disfluencies. Thus, the disfluencies should not be mistaken as stuttering (Bernstein Ratner, 2004; Gonzalez et al., 2004; Van Borsel et al., 2001). Conversely, most research examining stuttering in bilingual speakers has reported stuttering to occur in both languages (Possibilities 2 & 3). In particular, research tends to support the Difference-Hypothesis (Possibility 2), which refers to rdiffering characteristics of stuttering in L1 and L2 (e.g., Bernstein Ratner & Benitez, 1985; Jankelowitz & Bortz, 1996; Jayaram, 1983; Nwokah, 1988). There are also reports of stuttering occurring equally in both languages (Possibility 3), which is referred to as the Same-Hypothesis (Van Riper, 1971; Lebrun et al., 1990). However, the numbers of studies supporting the Same-Hypothesis are fewer compared to those supporting the Difference-Hypothesis. In regard to the Difference-Hypothesis, language proficiency levels (Jankelowitz & Bortz, 1996), as well as syntactical and grammatical differences (Bernstein Ratner & Benitez, 1985), has been reported to account for the distinction of stuttering patterns in the two languages. A summary of the past studies examining differing stuttering characteristics in bilingual speakers is provided in Table 1.

Table 1: Summary of past studies examining stuttering behaviour in bilingual speakers. The table includes the number of participants in each study, the sequence of language acquisition (L1 and L2), the severity of stuttering across languages and information on language proficiency in case of simultaneous L1/ L2 acquisition. In all of the listed studies, L1 was considered the more proficient language.

Study	Number of participants	Languages spoken	Language revealing more stuttering
Dale, 1977	4	Spanish – English	Spanish (less proficient)
Jayaram, 1983	10	Kannada (L1) –English (L2)	Kannada (L1)
Bernstein Ratner & Benitez,1985	1	Spanish – English	English
Nwokah, 1988	16	Igbo (L1) – English (L2)	For some L1, for others L2; no significant difference
Jankelowitz & Bortz, 1996	1	Afrikaans – English	Afrikaans (less proficient)
Roberts, 2002	2	French (L1) – English (L2)	English (L2)
Roberts, 2002	2	French (L1) – English (L2)	No significant difference between stuttering across language groups
Howell et al., 2004	1	Spanish – English	Spanish (more proficient)
Meline et al., 2006	1	Chinese (L1) – English (L2)	Chinese (L1)

2.3 Linguistic Characteristics of Stuttering in Bilinguals

As far as linguistic factors in bilingual PWS are concerned, the relationship between syntactic complexity and probability of stuttering has been noted by several researchers (Bernstein Ratner & Benitez, 1985; Jankelowitz & Bortz, 1996; Gonzalez et al., 2004). Moreover, the suggestion has been made that syntax has a greater influence on stuttering than phonology. Bernstein Ratner and Benitez (1985) drew this conclusion from an examination of one simultaneous English-Spanish bilingual PWS. Despite the fact that 71% of the verbs in Spanish begin with a vowel compared to only 6% of English verbs, in both Spanish and English a high frequency of stuttering occurred on verbs. Recall that Brown (1945) suggested that words containing a word initial consonant were far more likely to be stuttered compared to words beginning with a vowel. The pattern of stuttering reported by Bernstein Ratner and Benitez (1985) then appears to minimise the possible phonological influence on stuttering. That is they suggested that stuttering is more likely to occur on verbs and on minor syntactical boundaries, such as verb phrases.

Dworzynski and Howell (2004a, 2004b) have also considered the linguistic characteristics of stuttering in various languages; however, their comparisons are based on examination of monolingual PWS. For example, these researchers examined both German and English PWS and suggested that cross-linguistic differences in the structure of syllables, as well as in the sequence of words within a sentence, might have an impact on the rate of stuttering. Interestingly, it was suggested that language proficiency could be linked with the stuttering pattern on content and function words. According to Howell et al. (2004), who investigated an 11-year-old Spanish (L1) - English (L2) PWS, stuttering occurred more on function words in L2 (English) and showed more of an adulthood pattern in L1 (Spanish) (i.e., more stuttering on content words). The results of Howell et al., are intriguing and suggest a differential pattern of stuttering on word type in bilinguals. At present, there has been no

further research to either support or refute the contention of a content-function word dichotomy in bilinguals who stutter.

2.4 Language Proficiency and Stuttering in Bilinguals

An important issue in the discussion of bilingual aspects of stuttering is language proficiency. Nwokah (1988) stated that English (L2) was considered either easy to speak because it required considerable planning and anticipation, or difficult to speak for the very same reasons. According to Nwokah, the ability to formulate and process language has an impact on stuttering. This suggestion is supported by Jankelowitz and Bortz (1996) who looked at 1 simultaneously bilingual English-Afrikaans speaking PWS. Language proficiency was tested in both languages and English was found to be the more proficient language. In regard to stuttering, the authors concluded that disfluencies occurred more frequently in Afrikaans (less proficient language) and suggested difficulties with linguistic formulation to be the source of this phenomenon. Furthermore, Jankelowitz and Bortz (1996) reported that both OD and SLD type disfluencies were higher in the less proficient language. Roberts (2002) examined 2 balanced and 2 non-balanced bilingual French-English speaking PWS. Similarly to the findings of Jankelowitz and Bortz (1996), results of the non-balanced bilingual PWS showed more stuttering in English (L2).

The results presented above would appear to indicate that language proficiency can impact on the frequency of disfluencies. However, there appears to be an equal number of studies that have found more stuttering in L1 (or the more proficient language) compared to L2 (or the less proficient language). For example, Howell et al. (2004), Meline et al., (2006), and Jayaram (1983) reported more severe stuttering in L1 (or the more proficient language). Howell et al. examined 1 Spanish more proficient language) - English (less proficient language) PWS, Meline et al. examined 1 Chinese (L1) – English (L2) PWS, and Jayaram examined 10 Kannada (L1) – English (L2) PWS. However, Meline et al. (2006) suggested

that recent treatment in L2 might have been a threat to the internal and external validity of the study. Furthermore, brain functioning (Meline et al., 2006) and phonetic characteristics (Jayaram, 1983) have been suggested as influential factors on stuttering characteristics across languages. In conclusion, it remains to be determined whether language proficiency is closely linked to stuttering severity in bilingual speakers.

2.5 Differences in Language and Stuttering Behaviour in English and German

German and English are both non-tonal Indo-European languages (The American heritage dictionary of the English language, 1992). German originates from the West Germanic sub branch of the Germanic branch of Indo-European; whereas English derives from the Low German subgroup of the West Germanic family (Garry & Rubino, 2001). Consequently, both languages spring from the Indo-European family tree, and thus, share certain similarities. However, German and English languages differ along several domains, including syllable structure and phonology (Bernthal & Bankson, 2004; Wiese, 1996). First, the languages differ with regard to the number of consonant and vowel phonemes characterising the language. German contains 26 consonants and 20 vowels with frequent use of a glottal stop (Wiese, 1996), while English contains 24 consonants and 20 vowels (Crystal, 2003). It is noteworthy, however, that the distribution of consonants and vowels may vary in both languages according to different accents and dialects. Second, German requires a syllable onset. Consequently, when a word starts with a vowel, a glottal stop is produced before the vowel. The same applies for compound words; a glottal stop is produced between the first and second constituent of a compound word whenever the second constituent begins with a vowel (Terrell & Kopleck, 1993). Thus, German vowels generally have a stronger onset compared to English. Third, German syntax rules allow for greater flexibility in word order compared to English (Dworzynski et al., 2003).

At present there has been no research examining stuttering behaviour in German-English bilinguals. However, there has been research examining the stuttering characteristics of German speakers compared to English speakers. Dworzynski and Howell (2004b) found German speakers to generally show a higher percentage of stuttering compared to English speakers. Interestingly, although the highest percentage of stuttering in both languages was found for content words (compared to function words), German content words were more phonetically complex than English content words. Thus, Dworzynski and Howell attributed the higher percentage of stuttering in German to a higher level of phonetic complexity in content words compared to English. There are also reports of differences in German and English in regard to the types of SLDs produced. For both languages, stuttering seems to occur most often on part word repetitions (Ambrose & Yairi, 1999; Natke et al., 2006). However, the stuttering rate for part word repetitions was found to be much higher in English than in German (Natke et al., 2006). For English, the next most frequent SLD is one-syllable word repetition, which is followed by disrhythmic phonation (prolongations, blocks, broken words). The reverse was found for German PWS: the second most frequent SLD was disrythmic phonation, which is followed by one-syllable word repetitions. These differences in stuttering behaviour for German and English speakers would suggest that a differential pattern of stuttering would likely occur in German-English bilingual speakers.

Statement of the Problem

In summary, there has been limited research evaluating stuttering characteristics of bilingual PWS. The results of these past studies have been mixed in regard to the frequency of stuttering that is found in L1 (or the more proficient language) compared to L2 (or the less proficient language) (e.g., Dale, 1977; Howell et al., 2004; Jankelowitz & Bortz, 1996; Jayaram, 1983; Meline et al., 2006; Nwokah, 1988; Roberts, 2002). Furthermore, there are reports of a reversal in the content-function word dichotomy of stuttering and word type found for bilingual stutterers (Howell et al., 2004); however, these findings have yet to be validated. The literature review for the present study failed to find any reports on stuttering behaviour in German-English bilinguals. This is peculiar because the comparison of past reports of stuttering in monolingual German and monolingual English stutterers indicates differences in stuttering behaviour (Dworzynski et al., 2003; Natke et al., 2006). In regard to the influence of language proficiency on stuttering severity in bilingual PWS, mixed results have been reported (Howell et al., 2004; Jankelowitz & Bortz, 1996; Jayaram, 1983; Meline et al., 2006; Nwokah, 1988; Roberts, 2002). Thus, it is yet to be determined how language proficiency relates to stuttering in bilingual PWS. The purpose of the present study was to examine stuttering behaviour in German-English bilingual speakers. The following research questions were posed:

(1) Does severity of stuttering differ between L1 and L2?

(2) Does stuttering occur more often on content words in L1 and more often on function words in L2?

(3) Is language proficiency related to stuttering behaviour?

Method

Participants

Participants for this study included 15 individuals (4 females, 11 males) who spoke German as L1 and English as L2. The participants ranged in age from 10 to 59 years with a mean age of 25 years (SD = 13). Most of the participants were recorded in Germany from the metropolitan areas of Munich (5 participants), Frankfurt (3 participants), Mainz (3 participants) and Bremen (3 participants). One participant was recorded in Christchurch at the Department of Communication Disorders of the University of Canterbury. No attempt was made to control for the data collection setting (e.g., home versus clinic). However, the ambient noise levels in each setting were judged to be sufficiently low so as to allow for audio recording of speech. The participants were recruited by contacting self-help organisations and local speech-language therapists as well as through direct contact with participants who were known to the researcher. Copies of the advertisements used to recruit participants are provided in Appendices A and B. A total of 14 participants reported previously receiving treatment for stuttering with the duration of treatment ranging from 3 months to 144 months and a mean treatment period of 50 months (SD = 43.3).

All participants reported L2 exposure of at least 5 years. Additionally, in order to be eligible for participation in the study, each participant had to meet the following criteria: (1) exhibit more than 3% syllables stuttered in a spontaneous speech sample of 300 words in L1, (2) present with an isolated developmental fluency disorder; free of any other communication disorder, and (3) classification as a PWS by a speech-language therapist. Sex, age, amount of previous treatment, and stuttering severity were not controlled for in the present study. The general characteristics of the participants are provided in Table 2. The study was approved by the Human Ethics Committee at the University of Canterbury. Informed consent was obtained either directly from the participant, if over 18 years of age, or one of the parents. The

Table 2: General characteristics of participants. (M) and (F) refer to the distinction of sex (Male and Female), L3/ L4 to additional languages known to the participant. Results are based on the post-conversation questionnaire. The overall mean and standard deviation (SD) is provided.

Participant	Sex	Age	L2 exposure in years*[1]	L3/ L4	Stuttering onset in years*	Amount of treatment in months*	Perception of stuttering severity
1	M	16	5	Russian	6	96	L1
2	M	16	6	Latin	5-6	24	L2
3	M	17	7	Russian, Spanish	7	3	L2
4	F	41	> 20	Italian, French	3-4	30	L2
5	M	18	5.5	-	5	144	L2
6	M	19	8	Latin	11	36	Same
7	M	19	11	Latin	4	90	L2
8	M	21	7	French, Latin	2-3	72	L2
9	F	15	5	Spanish, Latin	3-5	7	Same
10	M	40	>20	French	4	10	L2
11	M	36	12	French, Italian	6-7	26	L2
12	F	15	5	French	5	120	L1
13	F	26	8	French	3-4	50	L2
14	M	59	>20	French	7-8	-	Same
15	M	10	5.5	Maori	4	36	L2
Mean		25	9.7		5.3	49.6	
SD		13	5.5		2.1	43.3	

[1] * indicates that the numbers presented are estimates, based on each participant's best knowledge. For statistical analysis, mean values were used.

information sheets for adults and children/ parents as well as the applicable consent forms are provided in both languages in Appendices C and D.

Data Collection

The data collected in the present study involved obtaining an estimate of each participant's English language proficiency through administration of a Cloze Test. In addition, a conversational speech sample, as well as a post-conversational questionnaire, was collected. The order, in which the Cloze Test and speech sample were obtained, was randomised across participants. The specific details related to each of these data collection tasks are provided below.

Cloze Test. The cloze procedure (Taylor, 1953) is a test for language ability. It contains a written text with deleted passages (words or letters), which the reader is required to fill in. Good understanding of language context, as well as a large vocabulary, is necessary to successfully complete the task (Kobayashi, 2002). The Cloze Test used for this study was taken from Evans (2002) and administered to provide an estimate of L2 proficiency. The Cloze Test involved filling-in anywhere from 1 to 5 letters in 30 blanks in order to make the presented text comprehensive. Prior to administration of the test, each participant was provided with two similarly constructed practice exercises. A copy of the Cloze Test used in the present study is presented in Appendix E.

Conversational Speech Sample. A 15-minute conversational speech sample was collected for each participant's L1 and L2. The researcher served as the discourse partner. The topics of conversation included hobbies, vacation plans, favourite movies or books, school or work. During collection of the L2 samples, there was a deliberate attempt to discuss topics that were familiar to the participants so as to avoid any possible "breakdowns" in communication. In all cases, the participants were encouraged to produce exclusively English words during their L2 conversation. During those instances, when a participant was unable to

recall a L2 word in their conversation, the researcher did not provide help. Rather, the flow of the conversation continued. In order to avoid sampling biases, the order of language sampling (L1 versus L2) was randomised across participants. All samples were video recorded (SONY Handycam Video 8, CCD-TR 340 E PAL), and subsequently, transferred to a DVD format.

Post-Conversation Questionnaire. Following collection of the conversational speech samples and the Cloze Test, each participant was required to complete a questionnaire, which had been translated into German. The questionnaire was administered last in order to avoid possible biasing of each participant in regards to their natural speaking behaviour. The questionnaire was verbally administered by the researcher and consisted of 14 items and a general case history. Questions 1 to 14 were grouped according to three themes that were considered integral to the hypotheses that were tested in the study. The three themes were: (1) Perception of the motoric complexities of L1 and L2, (2) Perception of the linguistic complexities of L1 and L2, and (3) L2 proficiency. Copies of the questionnaires in both languages are provided in Appendices F and G.

Data Analysis

Fluency Analysis.

The first 300 words comprising each participant's L1 and L2 conversational samples were used for determining the percentage of stuttering. The DVD recording of each participant's conversational language sample was replayed by the researcher as many times as necessary to orthographically transcribe the sample and determine moments of stuttering. The researcher is a bilingual German-English speaker with over 13 years of experience in using English. Instances when participants used German words or sentences within the body of the L2 sample were transcribed in German and included in the analysis of L2 fluency. Based on L1 and L2 transcriptions, the number of stutter-like disfluencies (SLDs) was determined. SLDs were defined as those containing part-word repetitions, prolongations, blocks and/ or

single syllable word repetitions (Ambrose, 2006). Furthermore, if a word was interrupted after the moment of stuttering and not attempted again (i.e., preventing the researcher from identifying the specific word), the moment of stuttering was counted for the fluency analysis but excluded from the content/ function word analysis (see below). In order for speech disfluencies to be diagnosed as stuttering, the participants had to exhibit more than 3 SLDs per 100 words or syllables (Ambrose & Yairi, 1999).

Words Stuttered and Syllables Stuttered. In the present study, two quantitative measurements for the severity of stuttering in L1 and L2 were used: (1) percentage of syllables stuttered (%SS), and (2) percentage of words stuttered (%WS). Bernstein Ratner (2004) noted that English and Spanish have a different amount of multi-syllable words, which results in different overall levels of disfluency when examined according to %SS and %WS (i.e., lower percentages of syllables stuttered might be calculated for languages with higher proportions of multi-syllable words compared to languages with fewer proportions of multi-syllable words). A similar observation was made by Dworzynski and Howell (2004b) for English and German. Therefore, calculation of both %SS and %WS was determined to account for possible differences in the syllabic complexity of L1 and L2 in spite of an equal number of whole word productions. Regardless of the number of SLDs occurring on a single word or syllable (i.e., disfluency clusters), only one stuttering moment was counted for each syllable stuttered or word stuttered. English production of contractions (e.g., it's, he's, that's) were treated as two words but only one syllable. In general, the same approach was applied for the production of German contractions (e.g., *wenn's, geht's*). However, when a contraction referred to an unspecific noun, only one syllable was counted (e.g., *zum Beispiel, zur Zeit*). Interjections (e.g., "hm", "um", "äh"), revisions (e.g., "Helen went/ Helen took her bike to school"), and abandoned utterances (e.g., "I thought/ Why don´t we go and see that movie?") were included in the overall tabulation of the number of syllables and words comprising the 300-word speech sample; however, they were not treated as SLDs. As far as

phrase repetitions are concerned (e.g., “maybe, maybe”, “I would like, I would like to go home”), only newly introduced words were included in the overall tabulation of the number of syllables and words comprising the 300-word speech sample. A list of applied disfluency count rules is provided in Appendix H.

Severity Rating. In addition to the calculation of an overall percentage of stuttering for each participant, the researcher performed a combined qualitative and quantitative estimate of stuttering severity (Lewis & Sherman, 1951) for each participant’s L1 and L2 sample. Severity Ratings were calculated by using the scaling procedures of Onslow et al. (2003). Accordingly, a score ranging from 1 (no stuttering) to 10 (extremely severe stuttering) was assigned to each participant’s L1 and L2 samples, respectively. For English, it has been reported that %SS and SEVs are largely interchangeable (O’Brian et al., 2004a; O’Brian et al., 2004b). Thus, the results and possible correlations of the different measurement types mentioned above were analysed in the context of fluency in bilingual/ multilingual PWS.

Word Length and Stuttering. In order to evaluate the influence of language related differences in word length on stuttering, the total amount of syllables comprising the 300-word samples, as well as the total number of syllables comprising fluently and disfluently produced words, was calculated for the L1 and L2 samples. In addition, the number of syllables comprising stuttered words was calculated for the L1 and L2 samples.

Content and Function Word Analysis.

The distribution of stuttering on content words and function words in L1 and L2 was analysed. Function words included articles (e.g., the, a, an), pronouns (e.g., his, she, I, it, you, me, these), verbal auxiliaries (e.g., have been + verb, am + verb), modals (e.g., can, may, will, shall, must), deictics (e.g., over there, up there, down there, right here), expletives (e.g., there are, it is), particles (e.g., however, if, thus, well, then, no), interjections (e.g., hm, ah, mm), pro-sentences (e.g., yes, okay), conjunctions (e.g., but, and, for, or, so, yet, although, because,

while), and prepositions (e.g., under, next, on, against, like). Content words contained nouns (e.g., mouse, car, Thomas), main verbs (e.g., eat), adjectives (e.g., beautiful, cold, tall), and adverbs (e.g., here, today, tomorrow, later).

Because of the variety of stuttering behaviour displayed, as well as the linguistic differences between German and English, certain rules needed to be applied in order to categorise a stuttering moment according to word type. That is, some verbs in German (L1) have prepositional prefixes (e.g., *weg*gehen = to go towards, or go away, umrühren = to stir) that can occur either before or after the verb, depending on clause type. If a participant stuttered on a prepositional prefix to a verb, the stuttering moment was categorised as occurring on a function word, regardless of sentence position. However, if stuttering occurred on the verb itself (word stem), the stuttering moment was categorised as occurring on a content word. Thus, the first stuttering moment within a word was used for the categorisation of word type according to the %WS. However, the categorisation of word type differed according to %SS if more than one stuttering moment occurred on different syllables of a multi-syllabic word. A full list of rules on the categorisation of word type in L1 and L2 is provided in Appendix I.

Word Length and Stuttering. In order to evaluate word lengths effects on stuttering on different word types, the number of syllables comprising disfluently produced function and content words was calculated.

Questionnaire and Cloze Test.

L2 Proficiency Analysis. Several approaches to estimating L2 proficiency were undertaken. The first approach was to administer a Cloze Test. For each of the 30 blanks comprising the Cloze Test, a maximum score of 1 point was given for each correct answer. The suggestion has been made that exact-word guessing does not necessarily reflect a language skill (Oller, 1972). Therefore, based on the work of Oller (1972) and Kobayashi

(2002), the contextually acceptable word scoring method was used in the present study. Accordingly, spelling mistakes were not taken into account. Furthermore, when more than one answer was possible, a point was given for any given answer as long as the text remained comprehensible and the item was syntactically and grammatically acceptable. In order to calculate a percentage of L2 proficiency, the overall number of correct answers was divided by 30 and multiplied by 100.

The second approach to estimating L2 proficiency was to summarise various questions from the post-conversation questionnaire. Specifically, questions 3, 7, and 9 required the participants to report their overall L2 use, L2 exposure, and estimated L2 proficiency. Question 3 (L2 exposure) was summarised in years. For the analysis, 20 years was the maximum score even if the participants reported longer exposure to L2. Question 7 (L2 use) was reported in percentage. If participants differentiated between various types of media (i.e, internet, books, personal communication), the mean was used for analysis. Finally, Question 9 (estimated L2 proficiency) was reported on a scale from 1 to 10. The number was then transformed into a percentage value. All three L2 proficiency estimates were then treated as separate L2 proficiency measurements. Relationships between the L2 proficiency measurements and language/ stuttering behaviour were drawn.

The third approach to estimating L2 proficiency was for the researcher to assign a percentage of overall proficiency to each participant. On the basis of the L2 conversational samples obtained, the researcher provided an estimate of each participant's L2 proficiency. This estimate was considered to be a subjective rating based on the researcher's personal experience as a L2 speaker of English. An overall percentage of L2 proficiency was assigned to each participant.

Motoric Complexity of L1 and L2. Items 11 and 12 from the post-conversation questionnaire were used to obtain estimates of each participant's perception regarding the motor complexity of L1 and L2. Each of the questions was scored in two ways, with a

maximum score of 4 points possible for a single question. The first part of each question involved a simple yes/no judgement of whether the languages differed in motor complexity. A score of 0 was given for a response of "no" and a score of 1 was given for a response of "yes." The second part of each question involved specifying, which language was more complex. A score of 0 was given for a response of "German" and a score of 1 was given for a response of "English." In general, a high score for this theme was judged to represent low L2 proficiency and/ or high perceived motoric difficulty in speaking L2. In order to calculate the overall perceived motoric difficulty, the results of the two question parts were added and divided by 2.

Linguistic Complexity of L1 and L2. Items 13 and 14 from the post-conversation questionnaire were used to obtain estimates of each participant's perception regarding the linguistic complexity of L1 and L2. Each of the questions was scored in two ways, with a maximum score of 4 points possible for a single question. The first part of each question involved a yes/ no judgement of whether the languages differed in linguistic complexity. A score of 0 was given for a response of "no" and a score of 1 was given for a response of "yes." The second part of each question involved specifying, which language was more linguistically complex. A score of 0 was given for a response of "German" and a score of 1 was given for a response of "English." In general, a high score for this theme was assumed to be indicative of English being perceived as more linguistically complex than German. Furthermore, a high score was also assumed to be indicative of low L2 proficiency. In order to calculate the overall perceived linguistic difficulty, the results of the two question parts were added and divided by 2.

Statistical Analysis.

The results obtained in the study were analysed using paired *t*-tests and Pearson Product-Moment correlation coefficients. Differences in the overall amount of stuttering in L1

compared to L2, as well as differences in the amount of stuttering on content words and function words within and between L1 and L2 were tested. Relationships between the various stuttering variables and measures of L2 proficiency were also examined through multiple correlational analyses.

Reliability Measures

Several types of measurement reliability were performed. The first measure was specific to identification of moments of stuttering. The second measure was specific to identification of stuttering severity. The third measure was specific to counting the syllables comprising the 300-word samples. The fourth measure was specific to word type identification of stuttered words (i.e., content and function words analysis). Finally, the fifth measure was specific to estimating the L2 proficiency of the participant based on the 300-word sample. Both intra-judge and inter-judge forms of reliability were undertaken for 3 randomly selected participants (20% of participant samle). When two measurements were applied (i.e., %WS and %SS), the percentages of reliability were summed and divided by 2. The recordings were listened to as many times as necessary to make adequate evaluations. A German speech-language therapist, currently undertaking her PhD, ran the inter-judge reliability test for the German samples and a New Zealand speech-language therapist, currently undertaking her Masters degree, ran the inter-judge reliability test for the English samples. The overall results for the various reliability measures are listed in Table 3.

Table 3: Intra-judge and inter-judge reliability measures for (1) the percentage (%) of syllables stuttered (SS), (2) the percentage (%) of words stuttered (WS), (3) the severity rating (SEV), (4) the number (#) of syllables comprising the 300-word sample, (5) the percentage of stuttering on content words (C), (6) the percentage of stuttering on function words (F), and (7) the L2 proficiency estimate, based on the 300-word sample.

	Reliability measures						
	%SS	%WS	SEV	#syllables	C	F	L2 proficiency
Intra-judge							
L1	97.8	98.3	100	99	95.5	89.5	-
L2	95.6	97.1	97.6	99.4	95.2	95.6	98
Inter-judge							
L1	92.9	91.9	81.3	99.1	88.4	82.6	-
L2	83.8	85.7	97.6	99.6	82.9	76.3	94.3

Results

The results are presented in three sections. The first section contains individual and group results regarding the amount of stuttering in L1 and L2. The second section contains individual and group results concerning the frequency of stuttering on content and function words in L1 and L2. The third section contains results from multiple correlational analyses examining variables of stuttering severity and language proficiency in L1 and L2. Prior to performing any statistical analysis of the percentage data, the values were converted to arcsine values. The arcsine transformation was performed because the means and variances obtained from percentage data are correlated, and thus, not appropriate for inferential statistical analysis (Schiavetti & Metz, 2006).

Stuttering Severity in L1 and L2

Words Stuttered. The percentages of words stuttered for each participant, as well as the group, in the L1 and L2 samples are provided in Table 4. In the L1 samples, percentages of words stuttered ranged from 5% to 38% and averaged 14% (SD = 8.4) for the group. In the L2 samples, percentages of words stuttered ranged from 3% to 37% and averaged 18% (SD = 10.3) for the group. A paired *t*-test was performed to determine whether the group percentage of stuttering differed between L1 and L2. The test was significant [$t(1,14) = 2.72$, $p = .017$], indicating that more stuttering occurred in L2. A display of the overall percentages of stuttering in words, produced as a function of language type, is provided in Figure 1.

Syllables Stuttered. The percentages of stuttering on syllables calculated for each participant in the L1 and L2 samples, as well as the group, are listed in Table 5. In the L1 samples, percentages of stuttering ranged from 3% to 27% and averaged 10% (SD = 6) for the group. In the L2 samples, percentages of stuttering ranged from 2% to 31% and averaged 15% (SD = 8.7) for the group. A paired *t*-test was performed to determine whether the group percentage of stuttering differed between L1 and L2 samples. The test was significant

Table 4: The number (#) and percentage (%) of words stuttered (WS) by each participant in their first language (L1) and second language (L2). The total number of words collected from each participant is derived from a 300-word conversational speech sample. The overall group mean and standard deviation (SD) is also reported.

Participant	Words Stuttered in L1		Words Stuttered in L2	
	#WS/Total Words	% WS	#WS/Total Words	% WS
1	48/300	16	48/300	16
2	73/300	24.3	89/300	29.7
3	36/300	12	52/300	17.3
4	34/300	11.3	59/300	19.7
5	42/300	14	64/300	21.3
6	28/300	9.3	24/300	8
7	27/300	9	72/300	24
8	15/300	5	28/300	9.3
9	14/300	4.7	25/300	8.3
10	30/300	10	56/300	18.7
11	64/300	21.3	110/300	36.7
12	26/300	8.7	9/300	3
13	113/300	37.7	112/300	37.3
14	44/300	14.7	64/300	21.3
15	19/300	6.3	14/300	4.7
Mean	40.9/300	13.6	55.1/300	18.4
SD		8.4		10.3

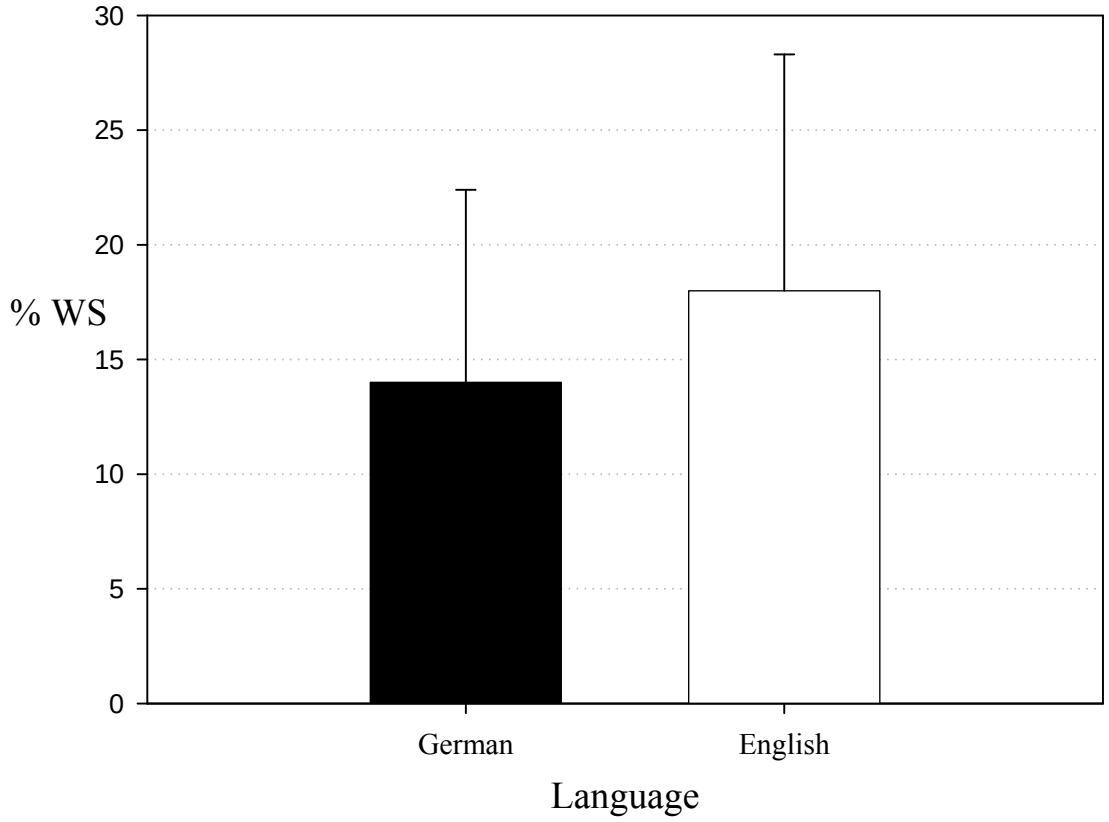

Figure 1: Histogram showing the mean percentage of words stuttered (%WS) in German (L1) and English (L2). The upper limits of the standard deviation are also shown.

Table 5: The number (#) and percentage (%) of syllables stuttered (SS) by each participant in their first language (L1) and second language (L2). The total number of syllables collected from each participant is derived from a 300-word conversational speech sample. The overall group mean and standard deviation (SD) is also reported.

Participant	Syllables Stuttered in L1		Syllables Stuttered in L2	
	#SS/Total Syllables	% SS	#SS/Total Syllables	% SS
1	50/425	11.8	49/360	13.6
2	74/484	15.3	90/337	26.7
3	39/398	9.8	56/362	15.5
4	37/462	8	59/365	16.2
5	43/438	9.8	65/380	17.1
6	28/466	6	24/378	6.3
7	32/496	6.5	75/361	20.8
8	15/441	3.4	28/364	7.7
9	14/408	3.4	26/356	7.3
10	31/453	6.8	61/462	13.2
11	75/447	16.8	126/402	31.3
12	26/467	5.6	9/392	2.3
13	124/462	26.8	113/375	30.1
14	45/502	9	64/392	16.3
15	20/436	4.6	14/342	4.1
Mean	43.5/452.3	9.6	57.3/375.2	15,2
SD		6		8.7

[$t(1,14) = -3.98$, $p = .001$], indicating that more stuttering occurred in L2. A display of the overall percentages of stuttering in L1 and L2 as a group is provided in Figure 2.

Severity Rating. The severity ratings assigned by the researcher for both languages are provided in Table 6. In L1, severity ratings ranged from 2 to 9 and averaged 5.5 (SD = 2.1) for the group. In L2, severity ratings ranged from 2 to 9 and averaged 6 (SD = 2.6) for the group. In order to determine whether stuttering severity differed between L1 and L2, a paired *t*-test was performed. The *t*-test was not significant.

Word Length and Stuttering. The numbers of syllables spoken by each participant and the group in a 300-word sample for L1 and L2 are provided in Table 5. In the L1 samples, the numbers of syllables spoken ranged from 398 syllables to 502 syllables and averaged 452 syllables (SD = 29.6) for the group. In the L2 samples, the numbers of syllables spoken in a 300-word sample ranged from 337 syllables to 462 syllables and averaged 375 syllables (SD = 30) for the group. In order to determine whether the amount of syllables spoken differed between L1 and L2 samples, a paired *t*-test was performed. The test was significant [$t(1,14) = -7.62$, $p < .001$], indicating that significantly more syllables were produced in L1 compared to L2. A display of the overall numbers of syllables spoken in L1 and L2 as a group is provided in Figure 3. Average numbers of syllables comprising both fluent and disfluent words in the L1 and L2 300-word samples are provided in Table 7. The average number of syllables comprising words in the L1 300-word samples ranged from 1.33 to 1.67 syllables and averaged 1.51 syllables (SD = .1) for the group. The average numbers of syllables comprising words in the L2 300-word samples. Results of a paired t-test were significant [$t(1,14) = 7.62$, $p < .001$], indicating that the average word length was significantly longer in L1 compared to L2. The number of syllables comprising stuttered words in the L1 and L2 300-word samples for each participant and as a group are also provided in Table 7. The

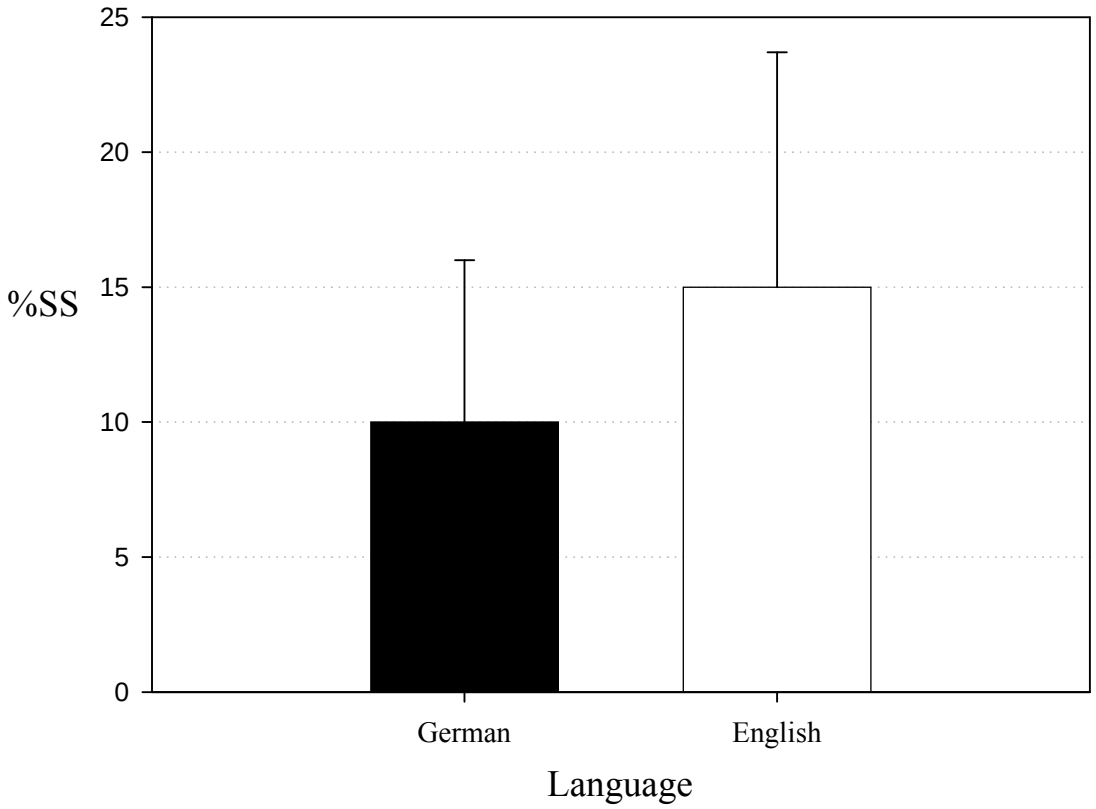

Figure 2: Histogram showing the mean percentage of syllables stuttered (%SS) in German (L1) and English (L2). The upper limits of the standard deviation are also shown.

Table 6: Research rating of stuttering severity in each participant's first language (L1) and second language (L2). The results are based on the 300-word conversational speech samples. The overall mean and standard deviation (SD) is provided.

Participant	Severity Rating in L1	Severity Rating in L2
1	5	3
2	7	8
3	7	8
4	5	6
5	7	8
6	5	3
7	7	9
8	2	4
9	2	3
10	5	7
11	8	9
12	4	2
13	9	9
14	7	8
15	3	3
Mean	5.5	6
SD	2.1	2.6

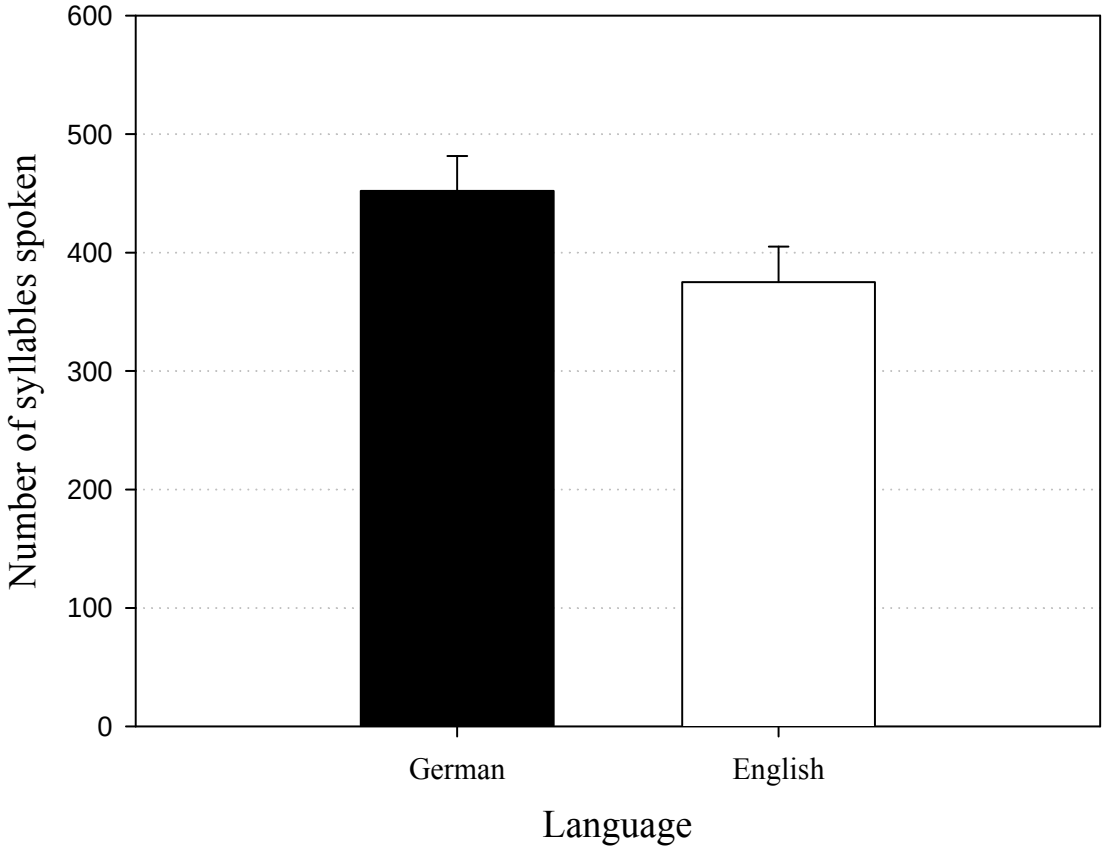

Figure 3: Histogram showing the mean percentage of syllables spoken in German (L1) and English (L2). The upper limits of the standard deviation are also shown.

Table 7: Mean word length in syllables for all words comprising the 300-word sample (overall) and disfluently produced words in each participant's first (L1) and second language (L2). The overall mean and standard deviation (SD) is provided.

	L1		L2	
Participant	Overall	Disfluent	Overall	Disfluent
1	1.42	1.62	1.2	1.26
2	1.61	1.99	1.12	1.11
3	1.33	1.6	1.21	1.44
4	1.54	2.18	1.22	1.54
5	1.46	2.19	1.27	1.62
6	1.55	2.25	1.26	1.58
7	1.65	2.52	1.2	1.42
8	1.47	2.07	1.21	1.71
9	1.36	1.62	1.19	1.14
10	1.51	2.24	1.54	2.22
11	1.49	1.95	1.34	1.85
12	1.56	1.96	1.31	1.22
13	1.54	1.97	1.25	1.32
14	1.67	1.95	1.31	1.56
15	1.45	1.83	1.14	1.07
Mean	1.51	2	1.25	1.5
SD	.1	.26	.1	.31

average length of disfluent words in L1 ranged from 1.6 to 2.52 syllables and averaged 2 syllables (SD = .26) for the group. The average length of disfluent words in L2 ranged from 1.07 to 2.22 syllables and averaged 1.5 syllables (SD = .31) for the group. A paired *t*-test was performed to determine whether the average syllable length of words produced disfluently differed between L1 and L2. The *t*-test was significant [$t(1,14) = 6.8$, $p < .001$], indicating that the overall length of stuttered words was longer in L1 compared to L2. A display of the word lengths of stuttered words for L1 and L2 as a group is listed in Figure 4.

Content and Function Word Analysis

L1 Stuttering. The percentages of stuttered content and function words for each participant and as a group are listed in Table 10[2]. Percentages of stuttering on content words ranged from 42% to 73% and averaged 55% (SD = 11.07) for the group. Percentages of stuttering on function words ranged from 23% to 56% and averaged 42% (SD = 10.7) for the group. In order to determine whether the percentage of stuttering on content and function words differed in L1, a paired *t*-test was performed. The *t*-test was significant [$t(1,14) = -2.27$, $p = .04$], indicating that more stuttering occurred on content words than on function words in L1. The percentages of syllables stuttered in content and function words for each participant and as a group are listed in Table 9. Percentages of syllables stuttered in content words ranged from 42% to 74% and averaged 57% (SD = 10.7) for the group. Percentages of syllables stuttered in function words ranged from 23% to 56% and averaged 41% (SD = 10.1) for the group. Results of a paired *t*-test were significant [$t(1,14) = -2.94$, $p = .011$], indicating that more stuttering occurred on content words than on function words in L1. A display of the overall percentages of syllables stuttered in content and function words in L1 as a group is

[2] In many cases the combined percentages of disfluencies for content and function words did not sum up to 100% for the participants. This was due to the inclusion of broken words in the overall tabulation of stuttering moments. Although broken words were clearly perceived as moments of stuttering, they could not clearly be identified as either content or function in type, and therefore, were excluded from the content and function word analysis.

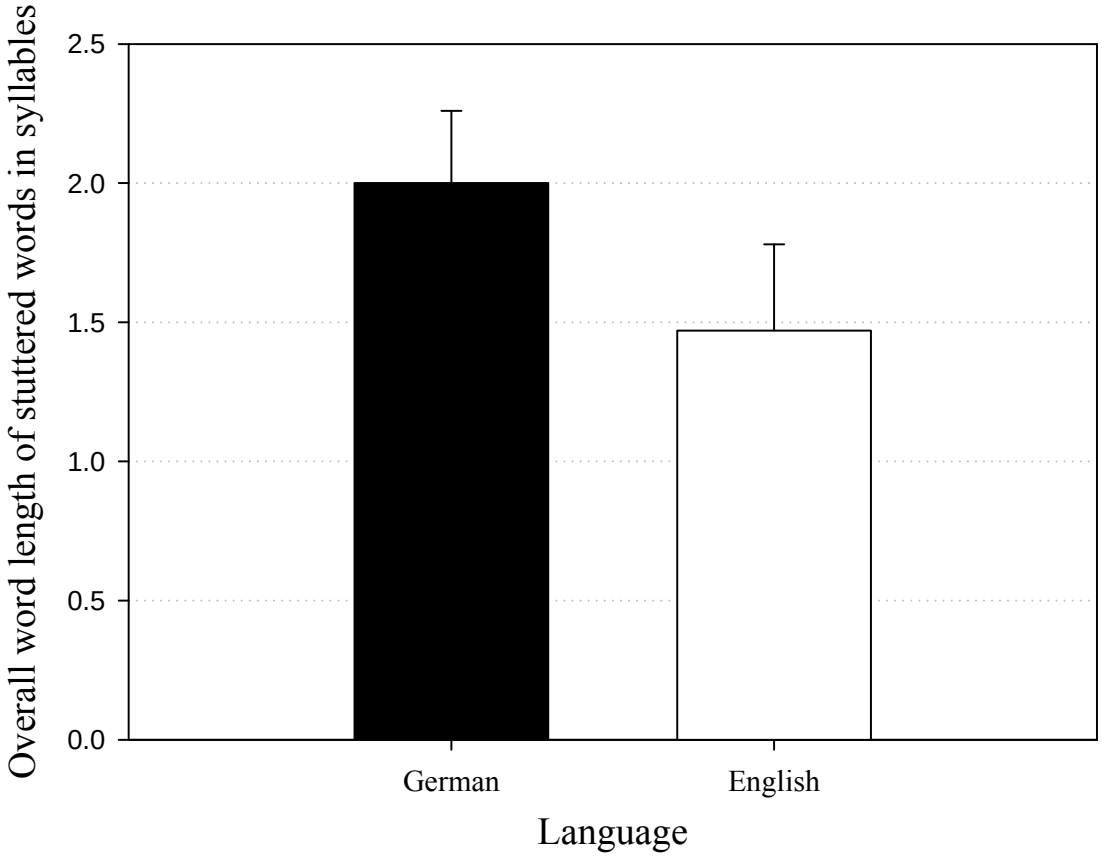

Figure 4: Histogram showing the mean length (in syllables) of stuttered words in German (L1) and English (L2). The upper limits of the standard deviation are also shown.

Table 8 The number (#) and percentage of words stuttered (%WS) according to function (F) and content (C) word status in each participant's first language (L1). The results are based on the total number of words stuttered within a 300-word conversational speech sample. The overall mean and standard deviation (SD) is provided.

	L1 Function Words Stuttered		L1 Content Words Stuttered	
Participant	# F Words / Total # WS	% WS	# C Words / Total # WS	% WS
1	27/48	56.3	20/48	41.7
2	36/73	49.3	37/73	50.7
3	19/36	52.8	16/36	44.4
4	17/34	50	17/34	50
5	12/42	28.6	30/42	71.4
6	9/28	32.1	19/28	67.9
7	10/27	37	17/27	63
8	5/15	33.3	9/15	60
9	7/14	50	6/14	42.9
10	7/30	23.3	22/30	73.3
11	28/64	43.8	36/64	56.3
12	10/26	38.5	14/26	53.9
13	63/113	55.8	48/113	42.5
14	13/44	29.6	30/44	68.2
15	10/19	52.6	8/19	42.1
Mean		42.2		55.2
SD		10.7		11.07

Table 9: The number (#) and percentage of syllables stuttered (%SS) according to function (F) and content (C) word status in each participant's first language (L1). The results are based on the total number of syllables stuttered within a 300-word conversational speech sample. The overall mean and standard deviation (SD) is provided.

	L1 Function Words Stuttered		L1 Content Words Stuttered	
Participant	# F Syllables / Total # SS	% SS	# C Syllables / Total # SS	% SS
1	28/50	56	21/50	42
2	36/74	48.7	38/74	51.4
3	19/39	48.7	19/39	48.7
4	18/37	48.7	19/37	51.3
5	12/43	27.9	31/43	72.1
6	9/28	32.1	19/28	67.9
7	11/32	34.4	21/32	65.6
8	5/15	33.3	9/15	60
9	7/14	50	6/14	42.9
10	7/31	22.6	23/31	74.2
11	28/75	37.3	47/75	62.7
12	10/26	38.5	14/26	53.9
13	64/124	51.6	58/124	46.8
14	13/45	28.9	31/45	68.9
15	10/20	50	9/20	45
Mean		40.6		56.9
SD		10.1		10.7

provided in Figure 5.

L2 Stuttering. The percentages of content and function words that were stuttered upon for each participant and as a group are listed in Table 10. Stuttering on content words ranged from 22% to 68% and averaged 47% (SD = 13.4) for the group. Stuttering on function words ranged from 30% to 78% and averaged 51% (SD = 13.5) for the group. A paired *t*-test was performed to determine whether the percentage of stuttering on content and function words differed in L2. The test was not significant.

The percentages of syllables stuttered in content and function words for each participant and as a group are listed in Table 11. Percentages of syllables stuttered in content words ranged from 22% to 71% and averaged 48% (SD = 14.1) for the group. Percentages of syllables stuttered in function words ranged from 28% to 78% and averaged 50% (SD = 14) for the group. Results of a paired t-test found no significant difference in the percentages of syllables stuttered in content and function words in L2. A display of the overall percentages of syllables stuttered in content and function words in L2 as a group is provided in Figure 6.

L1 versus L2 Stuttering. A series of t-tests were performed to determine whether the percentage of stuttering on content and function words differed between L1 and L2. In order to account for multiple t-test comparisons, the alpha level was adjusted using the Bonferroni procedure (.05/2 comparisons = $p < .025$). The t-test examining the percentage of words stuttered according to L1 and L2 content words was not significant, indicating that the amount of stuttering on content words did not differ in L1 and L2. A similar t-test was performed to examine if the percentage of function words stuttered differed between L1 and L2. The test was significant [$t(1,14) = 2.53$, $p = .024$], indicating a higher percentage of stuttering on function words in L2 compared to L1. A display of the overall percentages of content and function words stuttered in L1 and L2 is provided in Figure 7. A similar analysis was carried out according to the number of syllables stuttered. The t-test evaluating the amount of stuttering on content words in L1 and L2 was significant [$t(1,14) = 2.97$, $p = .01$], indicating a

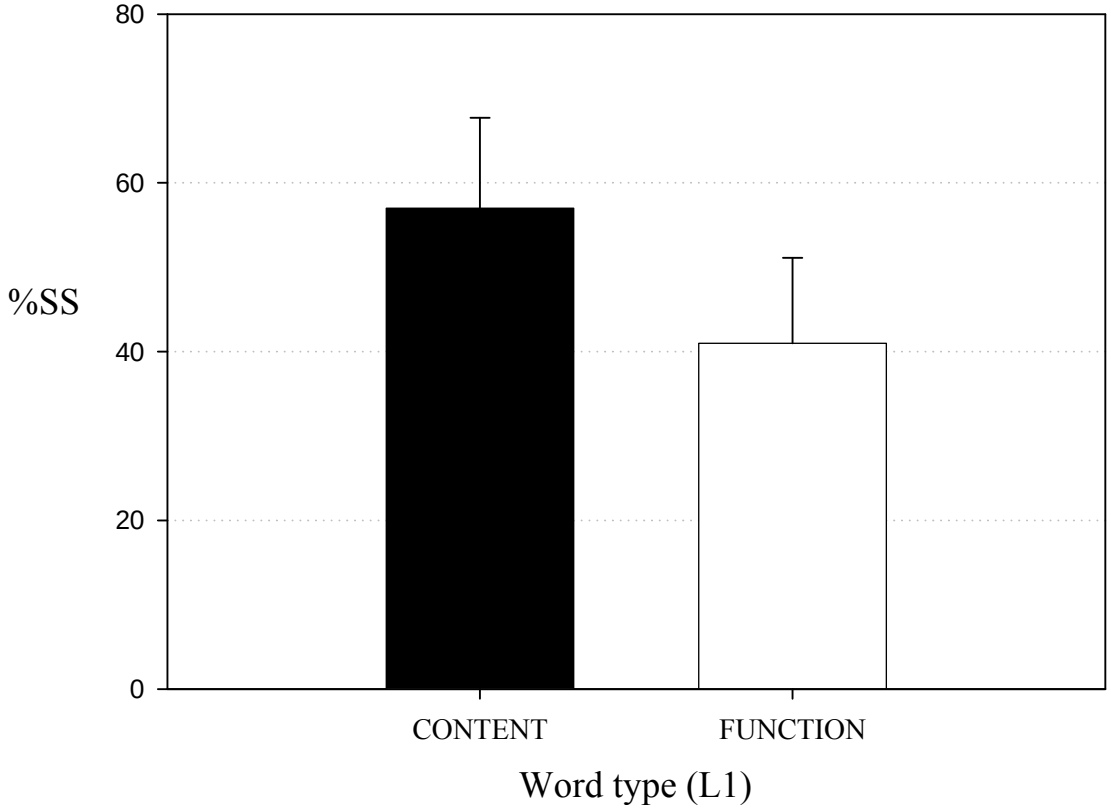

Figure 5: Histogram showing the mean percentage of syllables stuttered (%SS) on content and on function words in the group of participant's first language (L1). The upper limits of the corresponding standard deviations are also shown.

Table 10: The number (#) and percentage of words stuttered (%WS) according to function (F) and content (C) word status in each participant's second language (L2). The results are based on the total number of words stuttered within a 300-word conversational speech sample. The overall mean and standard deviation (SD) is provided.

	L2 Function Words		L2 Content words	
Participant	# F Words / Total # WS	% WS	# C Words / Total # WS	% WS
1	32/48	66.7	14/48	29.2
2	56/89	62.9	32/89	36
3	33/52	63.5	19/52	36.5
4	34/59	57.6	25/59	42.4
5	25/64	39,1	38/64	59.4
6	13/24	54.2	11/24	45.8
7	36/72	50	35/72	48.6
8	10/28	35.7	18/28	64.3
9	10/25	40	11/25	44
10	17/56	30.4	38/56	67.9
11	36/110	32.7	74/110	67.3
12	7/9	77.8	2/9	22.2
13	66/112	58.9	44/112	39.3
14	30/64	46.9	33/64	51.6
15	6/14	42.9	8/14	57.1
Mean		50.6		47.4
SD		13.5		13.4

Table 11: The number (#) and percentage of syllables stuttered (%SS) according to function (F) and content (C) word status in each participant's second language (L2). The results are based on the total number of syllables stuttered within a 300-word conversational speech sample. The overall mean and standard deviation (SD) is provided.

	L2 Function Words		L2 Content words	
Participant	# F Syllables / Total # SS	% SS	# C Syllables / Total # SS	% SS
1	33/49	67.3	14/49	28.6
2	57/90	63.3	32/90	35.6
3	35/56	62.5	21/56	37.5
4	34/59	57.6	25/59	42.4
5	25/65	38.5	39/65	60
6	13/24	54.2	11/24	45.8
7	36/75	48	38/75	50.7
8	10/28	35.7	18/28	64.3
9	11/26	42.3	11/26	42.3
10	17/61	27.9	43/61	70.5
11	37/126	29.4	89/126	70,6
12	7/9	77.8	2/9	22.2
13	66/113	58.4	45/113	39.8
14	30/64	46.9	33/64	51.6
15	6/14	42.9	8/14	57.1
Mean		50.2		47.9
SD		14		14.1

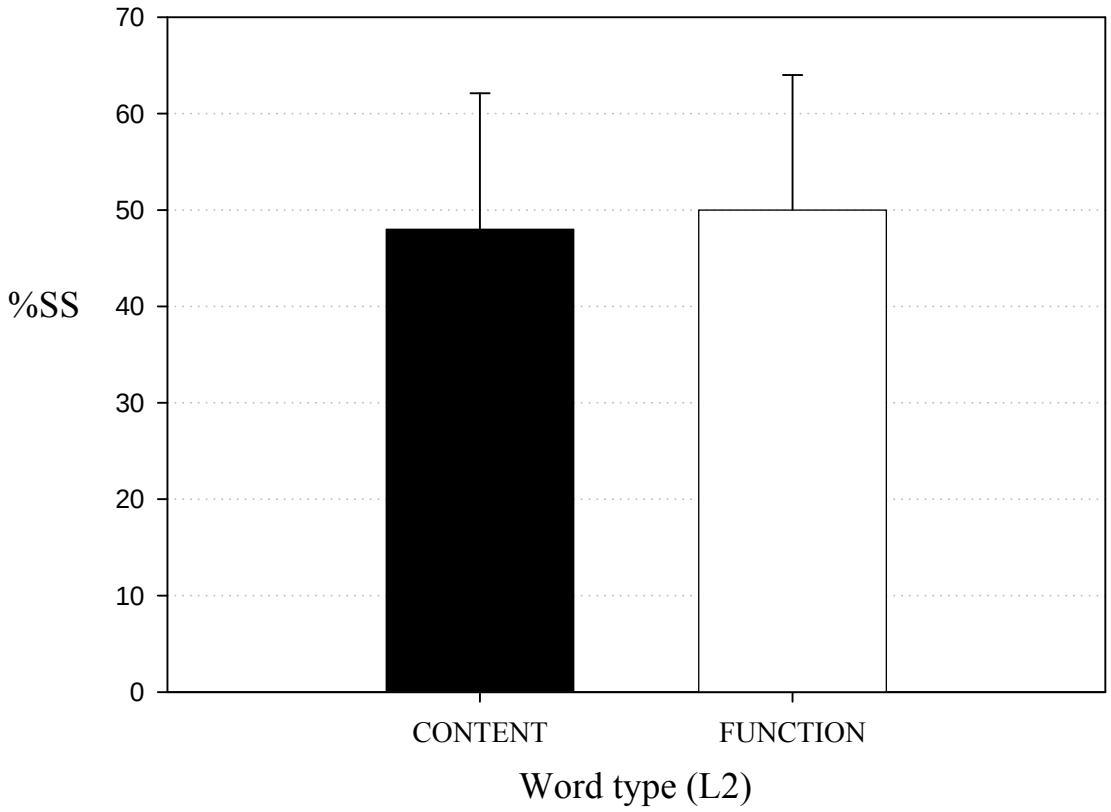

Figure 6: Histogram showing the mean percentage of syllables stuttered (%SS) on content and on function words in the group of participants' second language (L2). The upper limits of the corresponding standard deviations are also shown.

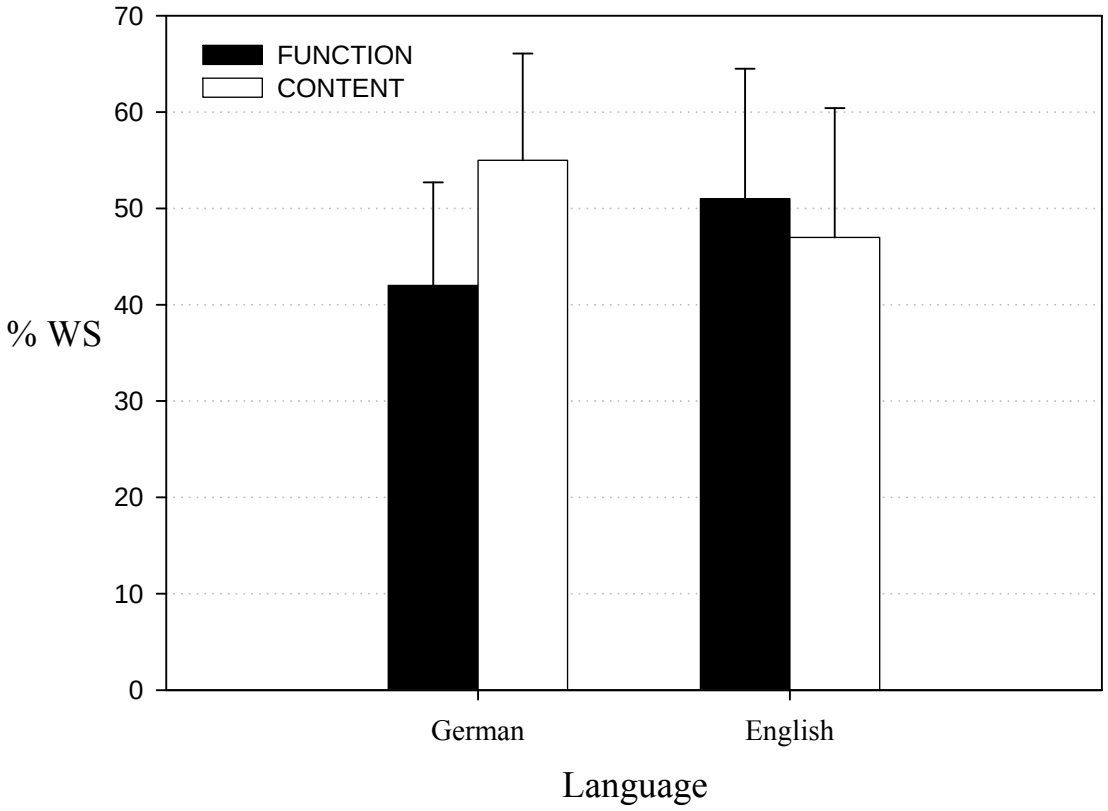

Figure 7: Histogram showing the mean percentage of words stuttered (%WS) in L1 (German) and L2 (English) with respect to content and function words. The upper limits of the corresponding standard deviations are also shown.

greater number of syllables comprising content words were stuttered upon in L1 compared to L2. The t-test for function words was also significant [t(1,14) = 2.76, p = .015], indicating a greater number of syllables comprising function words were stuttered upon in L2 compared to L1. A display of the overall percentages of syllables stuttered in content and function words in L1 and L2 is provided in Figure 8.

Word Length and Stuttering. Thee numbers of syllables comprising disfluently produced function and content words in the L1 and L2 samples for each participant and as a group are provided in Table 12. For comparison, the overall number of syllables comprising disfluently produced words for each participant and as group is also provided in Table 14. In L1, word lengths of function words stuttered ranged from 1.1 to 1.59 syllables and averaged 1.3 syllables (SD = .17) for the group. In L2, word lengths of function words stuttered ranged from 1 to 1.21 syllables and averaged 1.1 syllables (SD = .07) for the group. In order to determine whether the word length of stuttered function words differed across languages, a paired *t*-test was performed. The *t*-test was significant [$t(1,14) = 4.37$, $p < .001$], indicating that stuttered function words were longer in L1 compared to L2. Word lengths of stuttered content words in L1 ranged from 1.67 to 3.12 syllables and averaged 2.5 syllables (SD = .37) for the group. In L2, word lengths of stuttered content words ranged from 1.13 to 2.71 syllables and averaged 1.8 syllables (SD = .42) for the group. In order to determine whether the word length of stuttered content words differed across languages, a paired *t*-test was performed. The *t*-test was significant [$t(1,14) = 5.12$, $p < .001$], indicating that stuttered content words were longer in L1 compared to L2. A display of the word lengths of stuttered function and content words for L1 and L2 as a group is listed in Figure 9.

Questionnaire and Cloze Test.

L2 Proficiency. Questions 3, 7, and 9 from the questionnaire represent different estimates of language proficiency. The results obtained from the participants on these three

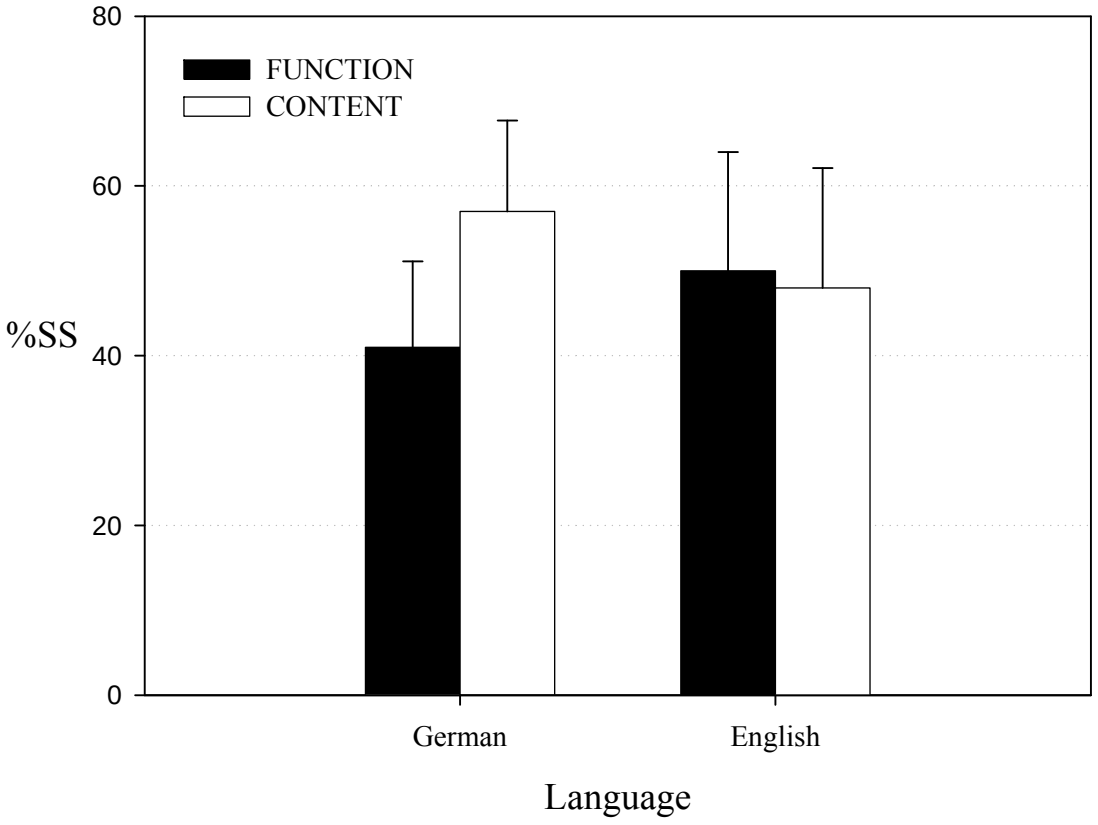

Figure 8: Histogram showing the mean percentage of syllables stuttered (%SS) in L1 (German) and L2 (English) with respect to content and function words. The upper limits of the corresponding standard deviations are also shown.

Table 12: The number (#) of syllables comprising disfluently produced function (F) and content (C) words in each participant's first language (L1) and second language (L2) in comparison to the overall number (#) of disfluently produced words. The results on word type are based on the total number of stuttered words within a 300-word conversational speech sample. The overall mean and standard deviation (SD) is provided.

Participant	Length of stuttered words in syllables L1			Length of stuttered words in syllables L2		
	overall	F	C	overall	F	C
1	1.62	1.19	2.2	1.26	1.09	1.64
2	1.99	1.44	2.51	1.11	1.07	1.19
3	1.6	1.21	2.06	1.44	1.21	1.84
4	2.18	1.59	2.76	1.54	1.09	2.16
5	2.19	1.08	2.63	1.62	1.2	1.89
6	2.25	1.1	2.79	1.58	1.15	2.09
7	2.52	1.5	3.12	1.42	1.03	1.83
8	2.07	1.6	2.33	1.71	1.1	2.06
9	1.62	1.57	1.67	1.14	1	1.27
10	2.24	1.29	2.55	2.22	1.12	2.71
11	1.95	1.36	2.42	1.85	1.11	2.22
12	1.96	1.3	2.43	1.22	1	2
13	1.97	1.19	3	1.32	1.06	1.70
14	1.95	1.23	2.27	1.56	1.1	1.97
15	1.83	1.3	2.5	1.07	1	1.13
Mean	2	1.3	2.5	1.5	1.1	1.8
SD	.26	.17	.37	.31	.07	.42

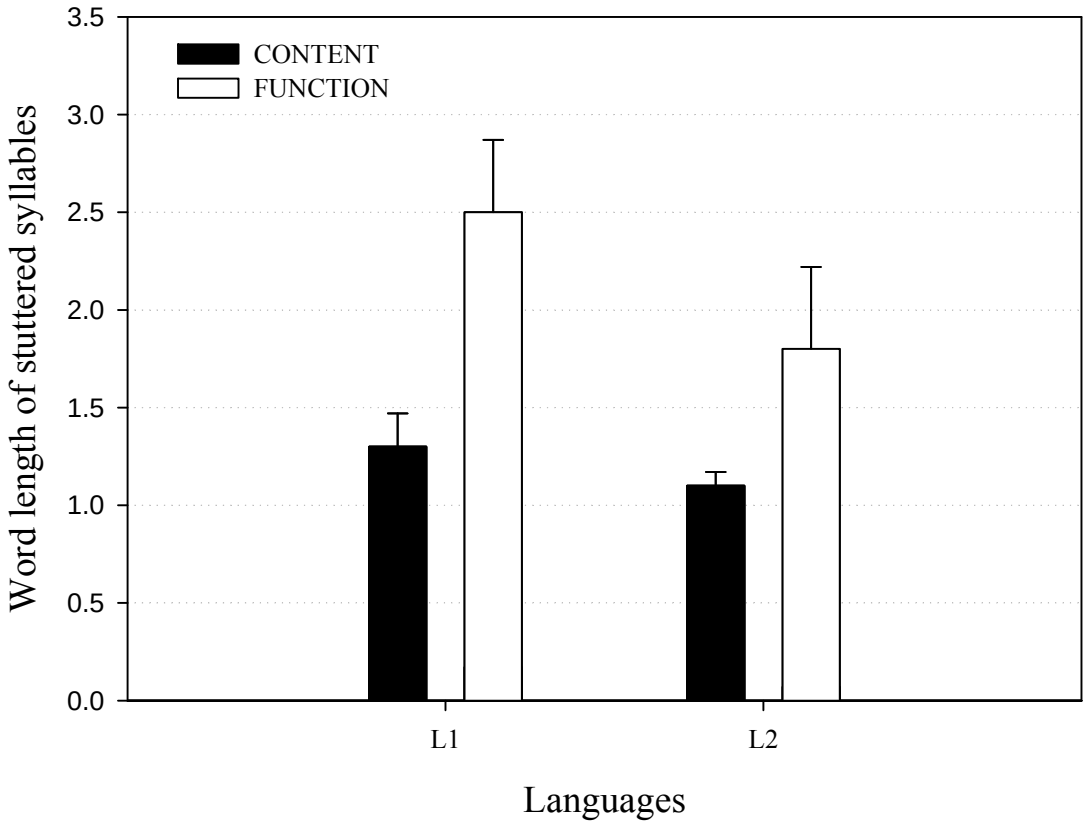

Figure 9: Histogram showing the mean length of syllables comprising stuttered content and function words in L1 and L2. The upper limits of the corresponding standard deviations are also shown.

questions are listed in Table 13. Years of L2 exposure ranged from 5 to 20 years and averaged 10 years (SD = 5.5) for the group. Percentages of daily L2 use ranged from 1% to 60% and averaged 12% (SD = 15.9) for the group. Percentages of estimated L2 proficiency by the participants ranged from 20% to 90% and averaged 60% (SD = 20.3) for the group. In addition to the three questions, estimates of language proficiency were also calculated on the basis of the researchers L2 proficiency estimates and results from the Cloze Test. The researcher's estimates of L2 proficiency ranged from 20% to 95% and averaged 65% (SD = 22.8) for the group. According to the Cloze Test, language proficiencies ranged from 60% to 100% and averaged 89% (SD = 12) for the group.

Motoric Complexity of L1 and L2. Questions 11 and 12 from the questionnaire were used to estimate the motor aspects of L1 and L2. Results are listed in Table 14. The calculated measures ranged from 0 to 4 and averaged 2.7 (SD = 1.4) for the group. Across the group, 67% of the participants judged their L2 to be more motorically complex than L1. The results obtained from the participants are summarised in Figure 10.

Linguistic Complexity of L1 and L2. In order to estimate the linguistic complexity of L1 and L2, questions 13 and 14 from the questionnaire were used. The results are provided in Table 14. The calculated measures ranged from 0 to 4 and averaged 2.9 (SD = 1.2) for the group. Across the group, 73% of the participants judged their L2 to be linguistically more complex than L1.

Correlational Analysis

In order to determine whether there were any relationships between stuttering behaviour and language proficiency, a number of Pearson Product-Moment correlations were computed. Major findings of the multiple correlational analyses are provided in a matrix format in Table 15. A complete matrix format of all the correlations analysed is provided in Appendix J. All correlations were performed as two-tailed tests. Correlations were considered to be significant at the .05 level if $r \geq .51$.

Table 13: The estimates of L2 proficiency, based on questions 3 (Years of L2 exposure), 7 (Percentage (%) of daily L2 use), and 9 (Percentage of estimated L2 proficiency) from the questionnaire, researcher's estimate of L2 proficiency, and Cloze Test performance for each participant. The overall mean and standard deviation (SD) are provided.

Participant	L2 proficiency measures				
	Years of L2 exposure	% Daily L2 use	% Estimated L2 proficiency by the participant	%Estimated L2 proficiency by the researcher	Cloze Test
1	5	10	30	30	86.7
2	6	38	60	60	96.7
3	7	20	90	90	100
4	> 20	12.5	40	80	100
5	5.5	10	40	20	66.7
6	8	1	80	80	93.3
7	11	5	80	75	93.3
8	7	1	50	75	93.3
9	5	2	70	30	80
10	>20	1	60	90	100
11	12	5	70	80	80
12	5	2	60	50	90
13	8	5	60	60	60
14	>20	5	20	60	96.7
15	5.5	60	90	95	100
Mean	9.7	11.8	60	65	89.1
SD	5.5	15.9	20.3	22.8	12

Table 14. The estimates of overall Motoric and Linguistic Complexity of each participant's second language (L2) (0 = no difficulty & 4 = maximum difficulty). The overall mean and standard deviation (SD) are provided.

Participant	Overall Linguistic Difficulty in L2	Overall Motoric Difficulty in L2
1	4	2
2	4	4
3	2	4
4	2	4
5	4	2
6	2	2
7	4	4
8	4	2
9	4	4
10	4	4
11	2	2
12	4	2
13	2	4
14	2	0
15	0	0
Mean	2.9	2.7
SD	1.2	1.3

Table 15: Correlation matrix showing the relationship between different language proficiency factors and stuttering characteristics for bilingual German (L1) – English (L2) PWS. Language proficiency factors are chronological age (A), Cloze Test performance (CT), estimated L2 proficiency from each participant (PP) and the researcher (PR), L2 use (U), L2 exposure (E), and estimated linguistic complexity. Stuttering characteristics include percentage (%) of syllables stuttered (SS), %SS on function (F) and content (C) words, percentage (%) of words stuttered (WS), %WS on F and C, and Severity Rating (SEV). Word length characteristics include number (#) of syllables (S) comprising the 300-word sample, word length of stuttered words (WL), and syllables (S) comprising stuttered function (F), and stuttered content (C) words. Correlations in bold refer to result section. Correlations exceeding $r = .51$ were significant at $p < .05$.

PWS																				
Estimated Proficiency Participant (PP)	**-.55**	.22	1.0																	
Estimated Proficiency Researcher (PR)	.18	**.70**	**.56**	1.0																
Years of L2 exposure (E)	**.91**	.42	-.36	.39	-.23	1.0														
Linguistic complexity	-.18	-.28	-.35	**-.59**	-.49	-.18														
% SS L2	.34	-.30	-.17	-.03	.06	.25	**.82**	1.0												
% WS L1	.22	-.46	-.23	-.17	.09	.04	**.99**	.80	1.0											
% WS L2	.42	-.30	-.21	-.02	.01	.33	.83	**.99**	**.81**	1.0										
# syllables L2 (SL2)	**.56**	.03	-.19	.17	**-.57**	**.58**	.04	.03	.26	.13	1.0									
SEV L1	.32	-.31	-.08	-.01	.05	.21	**.87**	.84	**.85**	.85	.15	1.0								
SEV L2	.42	-.16	-.04	.13	.04	.38	.65	**.80**	.63	**.90**	.18	**.85**								
%SS F L2	-.32	.04	-.05	-.23	.17	-.35	.18	-.16	.25	-.21	-.41	.09	**.55**	1.0						
%SS C L1	.47	.02	-.18	.12	-.45	.50	-.12	.10	-.10	.17	.65	.23	**-.97**	-.52	1.0					
%SS C L2	.37	.06	.07	.38	-.11	.42	-.12	.20	-.15	.25	.46	.02	-.63	**-.96**	**.62**	1.0				
%WS F L1	-.39	-.08	.24	-.04	.53	-.42	.37	.18	.32	.11	-.66	.08	**.98**	.48	-.93	-.54	1.0			
%WS F L2	-.30	.04	-.03	-.19	.17	-.33	.23	-.11	.25	-.15	-.38	.15	.54	**1.0**	.50	-.94	.48	1.0		
%WS C L1	.40	-.07	-.16	.07	-.62	.43	-.32	.24	-.35	-.16	.65	-.05	-.77	-.46	**.73**	.50	**-.74**	-.45		
%WS C L2	.36	.06	.05	.36	-.10	.40	-.17	.15	-.20	.20	.42	-.04	-.62	-.97	.60	**1.0**	-.54	**-.96**	1.0	
WL L2	**.59**	.12	-.18	.31	**-.53**	**.63**	-.01	.2	-.04	.27	**.83**	.15	-.75	**-.64**	.77	**.72**	-.7	**-.6**	**.69**	1.0
S of stuttered F L2	.2	.03	-.11	.06	-.12	.16	.2	.29	.16	.3	.26	.38	-.35	.17	.45	.28	-.31	-.16	.26	**.55**
S of stuttered C L1	.09	-.09	.06	.26	-.01	.24	.34	.33	.35	.37	.1	.48	-.24	.03	.37	.13	-.19	.07	.1	.17
S of stuttered C L2	**.59**	.13	-.23	.27	**-.66**	**.64**	-.02	.06	-.05	.14	**.84**	.14	-.69	-.31	.7	.42	-.65	-.27	.38	**.90**
	(A)	(CT)	(PP)	(PR)	(U)	(E)	%SS L1	%SS L2	%WS L1	%WS L2	(SL2)	SEV L1	%SS F L1	% SS F L2	% SS C L1	% SS C L2	%WS F L1	%WS F L2	%WS C L2	(WL L2)

Upon examination of the correlation matrix, a number of relationships were identified. These relationships can be organised into three general categories (1) stuttering behaviour, (2) L2 proficiency, (3) stuttering and L2 proficiency. The major relationships for each of these categories are presented below.

Stuttering Behaviour. (1) A positive correlation has been found between numbers of syllables stuttered in L1 and L2 (r = .82), as well as between numbers of words stuttered in L1 and L2 (r = .81), indicating that if stuttering was high (or low) in L1 it was similarly high (or low) in L2. This significant relationship was also confirmed for L1 and L2 stuttering severity ratings (r = .85). (2) According to the percentage of syllables stuttered, a positive correlation was found between percentages of stuttered function words in L1 and L2 (r = .55), indicating that if stuttering on function words was high (or low) in L1 it was also high (or low) in L2. A similar relationship was found for stuttered content words according to percentages of syllables stuttered (r = .62). (3) The percentage of stuttered function words in both L1 and L2 was negatively correlated with stuttered content words in L1 and L2, respectively (L1 %WS r = -.74 & %SS r = -.97; L2 %WS & %SS r = -.96), indicating that as the amount of stuttering on content words increased there was a corresponding decrease in stuttering on function words (see Figure 10). (4) Numbers of syllables, as well as numbers of words, stuttered in both L1 and L2 were positively correlated with severity ratings in L1 and L2, respectively (L1 r = .87 & r = .85; L2 r = .80 & r = .90), indicating that the quantitative and qualitative measurements of stuttering severity were in agreement. This significant relationship was also confirmed for percentages of words stuttered and percentages of syllables stuttered for both L1 and L2 (L1 & L2 r = .99).

L2 Proficiency. (1) A negative relationship between participants' estimated L2 proficiencies and their chronological ages was found (r = -.55), indicating that younger participants estimated their L2 proficiency higher than older participants. (2) There was a positive relationship between participants' estimated L2 proficiencies and proficiency ratings

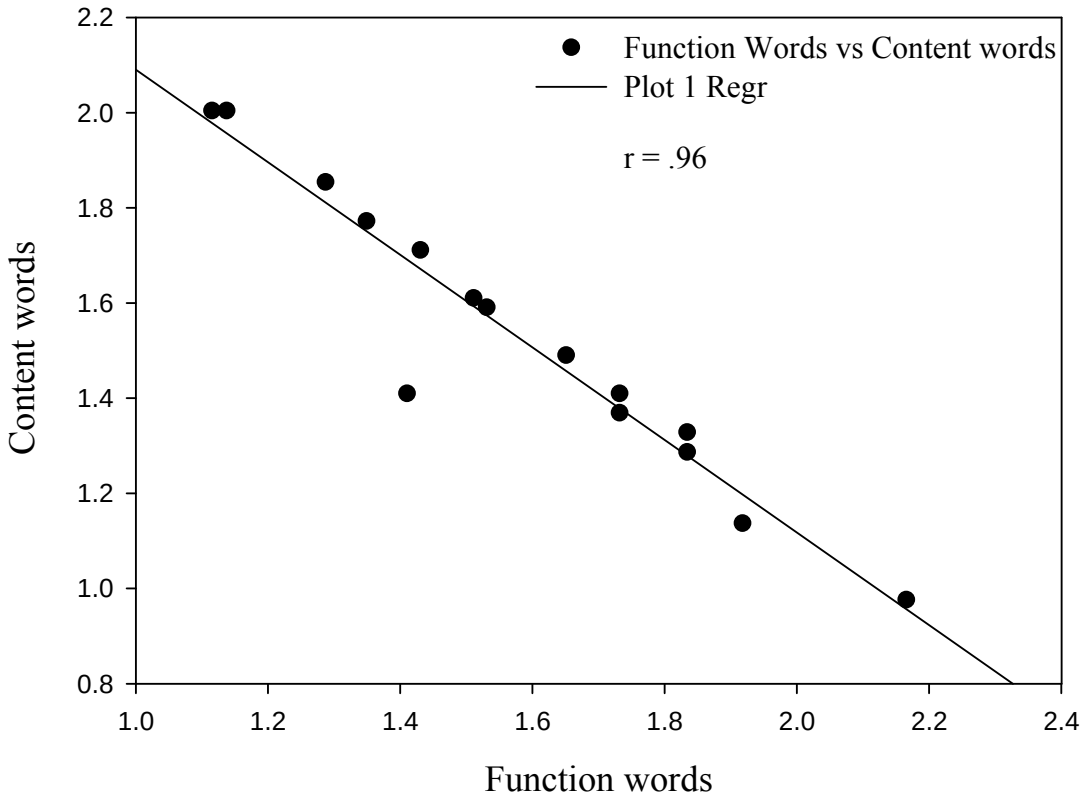

Figure 10: Negative correlation between the amount of stuttering on content words and function words in a participant's second language (L2).

assigned by the researcher (r = .56), indicating that when the participant rated himself/ herself high (or low), the researcher showed the same trend. (3) The researcher's estimates of participants' L2 proficiency were also positively correlated with results obtained from the Cloze Test (r = .70), indicating that the researcher's L2 proficiency ratings and the results of the Cloze Test showed agreement (see Figure 111). (4) Finally, years of L2 exposure were positively correlated with numbers of syllables spoken in a 300-word sample (r = .58), indicating that when the participants were exposed to L2 for a longer period, they also used longer words.

Stuttering and L2 Proficiency. positive relationship was found between years of L2 exposure and numbers of syllables comprising stuttered words in L2 (r = .63), as well as syllables comprising stuttered content words in L2 (r = .64), indicating that the word length of stuttered words in general, as well as the word length of stuttered content words, was longer in participants who had been exposed to L2 for a longer amount of time (see Figure 12).

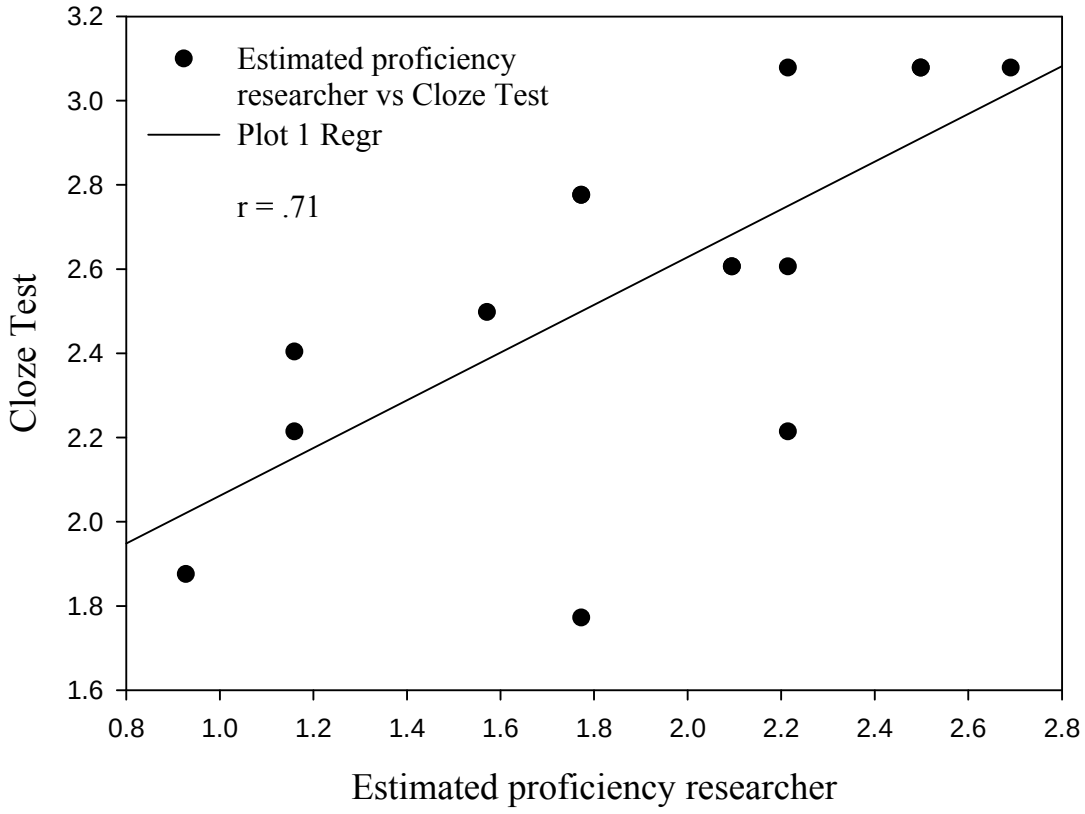

Figure 11: Positive correlation between a participant's performance on the Cloze Test and the estimated second language (L2) proficiency of the participant from the researcher.

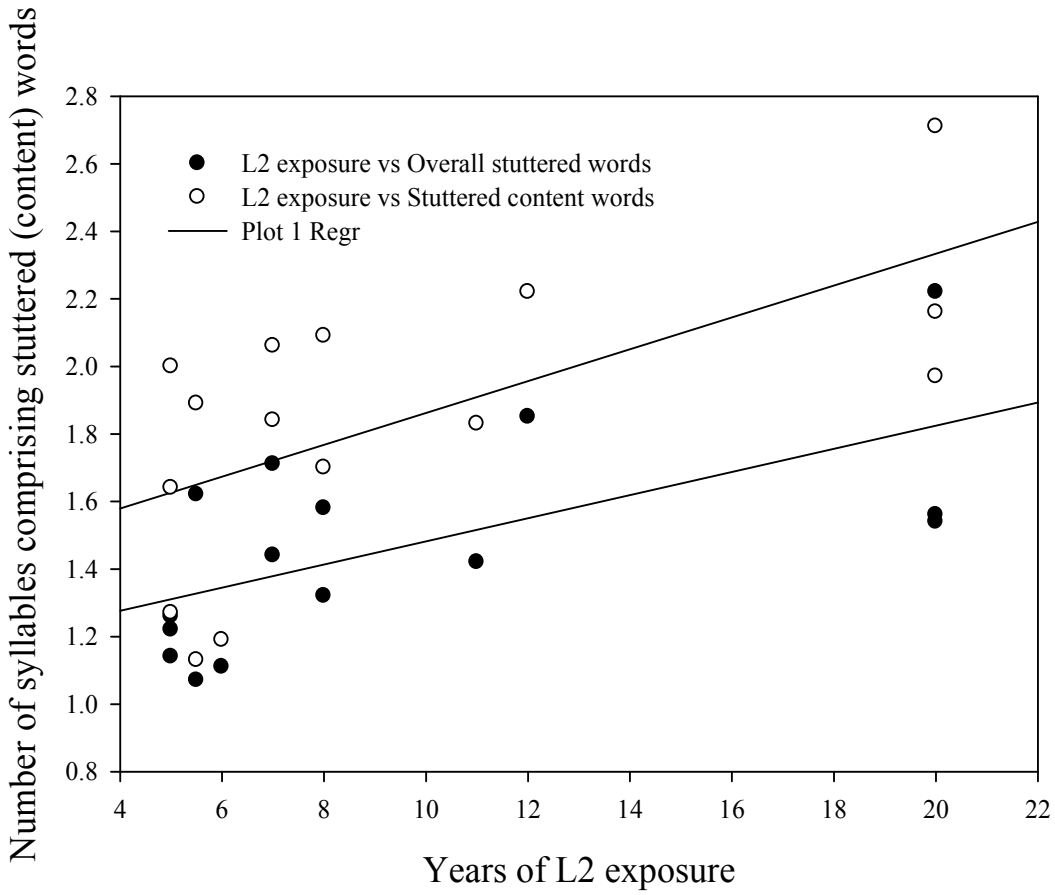

Figure 12: Positive correlation between L2 exposures and numbers of syllables comprising stuttered words and stuttered content words in the 300-word samples in L2.

Summary of Results

The primary results of the present study were as follows:

(1) The percentage of stuttering was significantly higher in L2 compared to L1 for %SS, and %WS.

(2) A significantly higher percentage of stuttering occurred on content words compared to function words for both %SS and %WS in L1.

(3) No difference was found between the percentage of stuttering on content and function words in L2.

(4) According to %SS, stuttering on content words was significantly higher in L1 compared to L2.

(5) According to both %WS and %SS, stuttering on function words was significantly higher in L2 compared to L1.

(6) The word length of all word classes (overall, stuttered, stuttered function, and stuttered content) was significantly longer in L1 compared to L2.

(7) There were no strong correlations between measures of stuttering and L2 proficiency.

Discussion

The purpose of the present study was to investigate in relationships between language behaviour and stuttering behaviour in German-English speaking PWS. Based on examination of the fluency behaviour of consecutive German-English bilingual PWS, three research questions were posed. The first research question was, *Does severity of stuttering differ between L1 and L2*? The second research question was, *Does stuttering occur more often on content words in L1 and more often on function words in L2?* The third research question was, "*Is language proficiency related to stuttering behaviour?"* The discussion pertaining to each of these questions is presented below.

Research Question 1: Does Severity of Stuttering Differ between L1 and L2?

In the present study, the severity of stuttering was primarily determined according to the percentages of syllables and words stuttered. Based on these measures, stuttering was found to be significantly more severe in L2 samples compared to L1 samples. This was the case in the majority of the participants. In 12 participants, the percentages of syllables and words stuttered in L2 were higher compared to L1. The opposite pattern was found for 1 participant (according to %SS) and 3 participants (according to %WS) respectively. Two participants were found to have a similar pattern of syllables and words stuttered across languages. The results obtained for stuttering at both syllable and word levels confirm that severity of stuttering differs between L1 and L2, lending support for the Difference-Hypothesis (Bernstein Ratner & Benitez, 1985; Jankelowitz & Bortz, 1966; Jayaram, 1983; Nwokah, 1988).

Results of past studies have been mixed in regard to the amount of stuttering observed in L1 and L2 samples. Studies that have found more stuttering in L2 (or the less proficient language) include Dale (1977), Jankelowitz and Bortz (1996), and Roberts (2002). On the other hand, Jayaram (1983), Howell et al. (2004), and Meline et al. (2006) found more

stuttering in L1 (or the more proficient language). Finally, Nwokah (1988) and Roberts (2002) reported no significant differences between stuttering in L1 and L2.

Those studies that have found a higher occurrence of stuttering in L2, have attributed this finding to cultural and socio-psychological factors (Dale, 1977), language proficiency (Dale, 1977; Jankelowitz & Bortz, 1996; Roberts, 2002), or possibly gender effects (Roberts, 2002). Upon comparison of the present findings to those of Dale (1977), Jankelowitz and Bortz (1996), and Roberts (2002), the stuttering behaviour demonstrated in the group of German (L1) – English (L2) PWS appears to be associated with language proficiency. All of the participants reported that they were less proficient in English compared to German. The fact that word length in general, as well as word length of stuttered words, was significantly shorter in L2 further supports this conclusion. However, it is also possible that the results were associated with socio-psychological factors. This inference is drawn on the basis of results obtained from the questionnaire, which revealed that a majority of the participants felt as though they would stutter more often in L2 compared to L1. A majority of the participants also felt that L2 was more linguistically complex than L1. Since the questionnaire was undertaken after the collection of conversational speech samples, results cannot be directly associated with pre-conceived notions about stuttering. However, the views of the participants do shed light on how socio-psychological factors may impact stuttering. The influence of gender on stuttering severity in L1 and L2 was not specifically examined in the present study. However, upon examination of the results reported in Table 4 and Table 5, there did not appear to be a clear difference in stuttering severity between females and males. Therefore, it is unlikely that a gender difference was responsible for the obtained results.

A last comment concerns the measurement of stuttering severity in bilingual PWS. Stuttering severity differed across languages when different measurement types were investigated. According to percentages of syllables stuttered only one participant stuttered more in L1, whereas according to percentages of words stuttered three participants stuttered

more in L1. Since word length analyses showed significantly longer words in L1 compared to L2, the present findings support Bernstein Ratner's suggestion (2004) that severity measures may be influenced by language based differences in syllable length. However, for most parts, the statistical significance was not affected by the application of different measurement types.

Research Question 2: Does Stuttering Occur more often on Content Words in L1 and more often on Function Words in L2?

Stuttering occurred significantly more often on content words compared to function words in L1 (German). This pattern was found according to the numbers of syllables and words stuttered. No statistically significant difference was observed between stuttering on content and function words in L2 (English), although there was a tendency for more stuttering to occur on function words. Results of statistical testing also confirmed that significantly more stuttering occurred on content words in L1 compared to L2 and significantly more stuttering occurred on function words in L2 compared to L1. The overall results were judged to provide support for Research Question 2.

Past studies for monolingual PWS reported that in both English and German languages, children stutter more on function words and adults stutter more on content words (Au-Yeung et al., 1998; Bernstein Ratner, 1997; Bloodstein & Grossman, 1981; Brown, 1945; Dayalu et al., 2002; Dworzynski et al., 2003; Dworzynski & Howell, 2004a, 2004b; Dworzynski et al., 2004; Graham et al., 2004; Howell, 2007; Howell et al., 1999; Nakte et al., 2004). Howell et al. (2004) have interpreted the content-function word "dichotomy" based on the EXPLAN Theory of Fluency Control (Howell & Dworzynski, 2005; Howell, 2002; Howell & Akande, 2005; Howell & Au-Yeung, 2002). According to this theory, content words are considered to be more phonetically complex than function words, and therefore, the speech planning for the eventual production of content words takes longer compared to function words. Although content words are more phonetically complex, children tend to stutter more often on function

words. Stuttering on function words then reflects a coping strategy used by children to delay the production of more difficulty (content) words until the phonetic plan is ready. In other words, stuttering on function words is used to prevent stuttering on the following content word. However, there is an age-related shift in this pattern of stuttering. As children get older (i.e., beyond 8-years of age), there is a resultant decrease of disfluencies on function words and an increase of disfluencies on the subsequent content word. Therefore, the original coping strategy is abandoned as older children (and adults) directly attempt the content word, which then results in stuttering on the first part of a content word until the phonetic plan for the rest of the word is available.

Au-Yeung et al. (2003) have framed the EXPLAN Theory of Fluency Control in the "Demand and Capacity Model" of Starkweather (1987). That is, a relationship was drawn between phonological encoding capacity and the speech execution demand. According to the theory of Au-Yeung et al., disfluencies are predicted to occur more frequently if the execution demand exceeds the capacity of phonetic planning. As the phonological encoding capacity improves with age and language development, disfluencies will no longer occur on function words, which results in recovery from stuttering. If the child continues to stutter, s/he is most likely employing unusual coping strategies, such as attempting the content word within a phonological word (PW) before the phonetic plan is ready (Au-Yeung et al., 2003). Another suggestion is that there might be a general deficit in the phonological encoding process. Both unusual coping strategies and phonological encoding deficits make recovery from stuttering more difficult.

In contrast to the EXPLAN Theory of Fluency Control, Dayalu et al. (2002) considered the adaptation effect to be a possible explanation of the age-related change in monolingual stuttering on function and content words. Dayalu et al. (2002) found that regardless of word type, more frequently used words were stuttered less than infrequently used words. Thus, the assumption was made that adults stutter less on function words because

these words represent a close set of highly frequent and highly practiced words. In contrast, children do not have the same amount of practice as adults, which is why they stutter more on function words. Bernstein Ratner (1981), Rispoli and Hadley (2001) and Rispoli (2003) have suggested that stuttering on function words (certain sentence constituents) in children is caused by an incompletely developed syntactic system. Thus, children cannot assemble certain sentence components at the same speed that adults. Accordingly, with experience and practice, children will stutter less on function words as their syntactic system develops.

Research examining stuttering on function and content words in bilingual PWS has only been reported by Howell et al. (2004) who examined one 11-year-old Spanish (more proficient) - English (less proficient) PWS. The results of that study showed more stuttering on content words in the more proficient language (Spanish) and more stuttering on function words in the less proficient language (English). Howell et al. suggested that the child demonstrated a typical form of stuttering in the more proficient language (i.e., most stuttering occurring on content words), while the opposite pattern was found for the less proficient language (i.e., most stuttering occurring on function words). This opposite pattern of stuttering in the less proficient language (English) was judged to reflect a more immature pattern of stuttering in L2.

The results of the present study tend to agree with the findings of Howell et al. (2004) and can be extended to German-English PWS. Moreover, the findings of this study support a strong linguistic component to stuttering as proposed by Au-Yeung et al. (2003), Bernstein (1981), Rispoli and Hadley (2001), and Rispoli (2003). These researchers attribute the change in disfluency pattern to developmental stages in phonological encoding and syntax development. Research for English, as well as German, suggests that stuttering on content and function words is age-related. However, the results of the present study have found higher percentages of disfluencies on function words in L2 regardless of age. Furthermore, the majority of participants judged themselves to be less proficient in L2. Thus, the assumption

that stuttering on content and function words is closely related to overall language abilities is supported (Au-Yeung et al., 2003; Bernstein 1981).

The results of the present study also tend to agree with the adaptation theory proposed by Dayalu et al. (2002). As a whole, the present group of participants used L2 less often than L1. That is, participants had less experience (practice) producing L2 compared to L1. Therefore, one could argue that the lower amount of stuttering in L1 compared to L2 was indicative of a pratice (adaptation) effect on their overall speaking behaviour. Furthermore, Segalowitz and Lange (2000) researched differences in lexical access rates according to content and function words. Findings suggested that lexical access for function words was only faster compared to lower frequency content words. Due to less experience speaking L2, L2-words are generally lower frequency words compared to L1-words; thus, slower phonological process (word retrieval) in L2 might make adaptation more difficult, causing more stuttering in L2.

Finally, the present findings further support the assumption made by Dworzynski and Howell (2004b) that due to longer words in German, more stuttering occurs on content words in German. This is word length was significantly longer in L1 compared to L2 for all word types. Thus, it is likely that significantly more stuttering on content words compared to function words in L1 can be related to word length differences across languages.

Research Question 3: Is Language Proficiency Related to Stuttering Behaviour?

In the present study, language proficiency was essentially defined in two ways, the Cloze Test and the questionnaire. Based on several Pearson-Product-Moment correlations there were significant correlations among the various language proficiency measures. However, there were no strong correlations directly linking stuttering behaviour to language proficiency. Although more stuttering was observed in L2 and L2 was clearly the less

proficient language, the various proficiency measures were not highly correlated with stuttering behaviour.

The reason for the lack of a strong correlation between language proficiency and stuttering behaviour is surprising. One possibility is to consider the manner in which L2 proficiency was estimated. Past studies have varied in their methodology concerning language proficiency. Although most studies provides some indication of L2 proficiency, Jankelowitz and Bortz (1996) and Roberts (2002) appear to be the only studies that formally tested language proficiency in both languages using a Cloze Test and/or a questionnaire. Both studies reported more stuttering in the less proficient language. A similar pattern was found in the present study. However, apart from the studies of Jankelowitz and Bortz (1996) and Roberts (2002), the language proficiency levels of participants in past studies have not been described in detail. Thus, it is difficult to compare the present results with past research.

As previously mentioned, Au-Yeung et al. (2003), Bernstein (1981) suggested a linkage between language development (i.e., language proficiency) in regard to morpho-syntactical complexity and the age-related shift from stuttering on function and content words in monolingual PWS. Accordingly, more stuttering on function words would be expected in the less proficient language of a bilingual PWS. This pattern of stuttering was clearly observed in the present group of German (L1) – English (L2) bilingual PWS when examining stuttering in L1 compared to L2. The assumption that stuttering shifts from function to content words as language skills develop also tends to be supported by the present study. However, a reason why a strong correlation between L2 proficiency and stuttereing behaviour was not observed may be that the present study did not specifically evaluate the syntactic abilities of the participants. That is, it is possible that the measures of L2 proficiency used in the present study were not sensitive to the specific language behaviours that may be linked to stuttering, namely syntactic abilities. Since Berman Hakim and Bernstein Ratner (2004), Bernstein Ratner and Benitez (1985), Bloodstein and Grossman (1981), and Boscolo et al.

(2002) suggested that syntactical and grammatical differences in the languages, as well as proficiency related difficulties in retrieval of key words in the syntax unit, might impact on stuttering patterns across languages, the assessment of syntactic abilities might be essential for the analysis of stuttering behaviour across languages.

In conclusion, although L2 proficiency was independently found to be lower compared to L1 proficiency, and greater stuttering was found in L2 compared to L1, the various correlations performed did not provide clear evidence of a significant relationship between language proficiency and stuttering. Therefore, the results obtained in the present study do not provide strong support for Research Question 3.

Brain Differences

Past research has investigated differences in brain organisation, language representation, and language processing in bilinguals according to the time frame of L2 acquisition. Bilinguals who acquire L2 early appear to use the same brain structures for each language, whereas late L2 learners use different brain structures. In addition, results presented by Halsband (2006) refer to overlapping, as well as distinct components, in the representation of language in the cortex; however, no distinctions between early and late L2 learners were made. These findings suggest that language proficiency, as well as learning strategies, might have a bigger impact on the cortical representation of a language than the time of acquisition (Halsband, 2006; Perani et al., 1998). This theory is supported by Reiterer (2002) who investigated in the effects of different language proficiency levels on brain activity (EEG) patterns in 38 German-English bilingual speakers. Two groups were observed. Group 1 represented university students of English Language and Literature, and thus, were considered to be more advanced learners of English. Group 2 represented university students of different departments who had English until their final examination (i.e., the “Abitur”), and consequently, were considered to be less proficient in English compared to the control group.

Results of the study failed to support the suggestion of distinct brain activity according to language spoken. Rather, EEG patterns were indicative of different cognitive and neuro-biological language processing strategies according to language proficiency levels. Findings of Reiterer suggest that the intensity of language studies - and thus language proficiency - seems to alter the neuronal network, allowing for more efficient comprehension and processing strategies.

Differences in the cortical representation of a language and processing of language, might relate to differences in the observed pattern of stuttering. For example, Roberts (2002) examined 4 consecutive bilingual PWS and specifically considered the time of L2 acquisition. The results showed that those 2 participants who acquired L2 from the age of 6 were considered balanced bilingual speakers, whereas the 2 participants who acquired L2 from the age of 11 were considered unbalanced bilingual speakers. In regard to stuttering, the balanced speakers exhibited equal amounts of stuttering in both languages, whereas the unbalanced speakers exhibited more stuttering in L2. Framed within the context of brain organisation, the differences observed by Roberts might reflect differences in cortical activation between the speakers. For example, if a late L2 learner (less proficient) uses different brain structures than an early L2 learner (more proficient), it is possible that accessing information for the speech plan from two different parts of the brain is more difficult for the individual. Consequently, a late L2 learner might be expected to show more stuttering in L2 compared to and early (or balanced) bilingual speaker.

On the other hand, the assumption has been made that early L2 learners may experience a cognitive overload because the same brain structures are being used for processing two (or more) languages (Au-Yeung et al., 2001; Kim et al., 1997; Shenker, 2004a). At present, it is unclear whether there are differences in the stuttering behaviour of early versus late L2 learners. Therefore, it is intriguing to consider the possibility of

differences in cortical representation or processing of language in bilingual speakers and the subsequent impact on stuttering behaviour.

Clinical Implications – Assessment and Treatment of Stuttering in Bilingual PWS

Assessment. In regard to diagnostic implications in bilingual PWS, it is important to recognise that speech-language therapists (SLTs) are faced with a range of doubts. In most cases the situation will be one, where the SLT and client share a similar language, the one being spoken by the client as L2. The most obvious clinical questions which arise are: Can I diagnose stuttering in a foreign language? How do I assess a bilingual PWS? How can I differentiate between disfluencies due to limited language proficiency and disfluencies due to stuttering? What advice can I give to the parents and/ or the client? Roberts and Shenker (2007) noted that there are possibly more people in the world who are bilingual (or multilingual) compared to monolingual speakers. Therefore, the likelihood of a SLT encountering a bilingual client at some point in their career is high. Unfortunately, standard protocols for the assessment of bilingual PWS do not exist.

Despite the importance of an SLT recognising his/ her limitations, having little or no knowledge of a language does not mean that one cannot assess the disfluencies of a bilingual client. However, stuttering has been found to be easier to detect if the language under investigation and the SLT's native language belong to the same family tree; e.g., the West Germanic family tree (Van Borsel et al., 2008). Thus, some familiarity with the languages being spoken by the client would be beneficial if they do not belong to the family tree of the SLT's native language. One of the main guidelines for the assessment of bilingual PWS is that a client must exhibit SLDs in the more proficient language (usually L1) in order to be diagnosed as a PWS (Van Borsel et al., 2001). If a client only exhibits disfluencies (SLDs and ODs) in the less proficient language, these disfluencies are more likely related to language difficulties, e.g., difficulties in expressing oneself (Bernstein Ratner, 2004). Thus, special care needs to be taken if L1 is a language unknown to the SLT. Since the difference between SLDs and ODs is usually noticeable by normal speakers, SLTs should be able to perceive these apparent characteristics of stuttering even if they do not speak the language (Bernstein Ratner,

2005a). However, it is very likely that subtle aspects of the client's stuttering moment or coping strategies in an unknown language will remain undetected. Therefore, focusing on secondary behaviours, such as tension and physical concomitants, would be useful in differentiating true stuttering behaviour from language-based disfluencies. Besides assessing stuttering severity across languages, it is essential to assess language skills. That is, remission in bilingual PWS might be positively affected by supporting language skills (Bernstein Ratner, 2005a). In any case, it is important to compare stuttering patterns and language proficiency levels in L1 and L2 in order to be able to holistically assess stuttering and create a treatment programme based on the individual needs of the client.

Treatment. Based on the present finding that stuttering is more severe in L2, it is important to consider both languages of a bilingual PWS in the management plan. Unfortunately, similar to issues regarding the diagnosis of stuttering in a bilingual PWS, there are no formal guidelines available to the SLT in matters concerning treatment of a bilingual PWS. One of the main issues confronting the SLT in regards to the treatment of a bilingual PWS is, *"Which language should be treated?"* Roberts and Shenker (2007) state that ideally a bilingual PWS should be treated in both languages, with the treatment occurring "seamlessly" between languages. However, it is unlikely that a bilingual PWS will be seen by a SLT who is also fluent in all of the languages spoken by the client. Therefore, a prevailing guideline for the treatment of bilingual PWS is that therapy should be presented in the language which is used most often by the client.

There is an absence of direct research examining treatment efficacy in bilingual PWS. However it is important to note that several treatments that have proven to be successful in monolingual English-speaking PWS (e.g., fluency-shaping principles, stuttering modification methods, blended methods) have also been successfully used in other languages (Roberts & Shenker, 2007). Therefore, it seems plausible to use the same treatment approach in both

languages spoken by a bilingual PWS. However, in terms of treatment choice, SLTs have to be prepared that, due to cultural differences, culturally diverse populations might not approve of certain treatment programmes (Bernstein Ratner, 2004; Kathard, 1998). The limited possibility of the SLT being able to treat both languages can be addressed by helping parents to develop a home porgramme for the native language. While implementing the basic treatment components, culturally suitable stimulus materials can be integrated to allow for successful treatment outcomes (Roberts & Shenker, 2007; Shenker, 2004a). Thus, recruiting family members or friends who are familiar with the L1 spoken by the client could be a useful approach to addressing the treatment needs of the client in both languages. As far as treatment duration is concerned, it has been reported that treatment times for monolingual PWS and bilingual PWS, who have spoken both languages from birth, do not differ (Gutmann & Shenker, 2006; Shenker, 2004a). The role of generalisation in the treatment of a bilingual PWS is also an important consideration. Conflicting results have been reported on whether or not treatment effects in one language generalise to another language without incorporating both languages in treatment (Gutmann & Shenker, 2006; Roberts & Shenker, 2007; Shenker, 2004a). If the SLT is able to detect that a reduction of stuttering is not only occurring in L2 but also in the (untreated) L1, than justification for pursuing the current line of treatment would be provided. However, if no noticeable improvement in fluency of L1 can be identified, it is important for the SLT to modify the existing treatment programme (e.g., creating a home programme for L1 or altering the treatment method).

Finally, given that the present study found more stuttering in the less proficient language, language skills are important to consider in the treatment of stuttering. Sieff and Hooyman (2006) have reported that stuttering severity was reduced by improving the syntactical skills of the less proficient language in a bilingual Chinese (L1) – English (L2) PWS. Furthermore, language competency is reported to support remission (Bernstein Ratner, 2005a). Consequently, integrating the improvement of basic language skills in the

intervention plan could serve to accelerate treatment times and enhance treatment outcomes. Detailed information on what to consider in the assessment and treatment of bilingual PWS is provided by Bernstein Ratner (2004), Finn and Cordes (1997), Gonzalez et al. (2004), Lattermann and Shenker (2005), Roberts and Shenker (2007), Shames (1989), Watson and Kayser (1994) and Watson (2005).

Limitations

Although the present study identified clear differences in the type and severity of stuttering that occurred in L1 compared to L2, there are a number of limitations to the present study that need to be considered. One of the major drawbacks of this study is the limited chance to compare the present results with previous findings. Despite the existing number of studies examining bilingualism and stuttering, it appears that few studies have focused on the same aspects of stuttering behaviour. Subsequently, there are limited data available in which to compare the results of the present study. Another drawback relates to data analysis. Although SLDs were determined for L1 and L2 samples, they were not further specified in type of SLD. Thus, comparison to monolingual studies of the distribution of stuttering in English and German (Ambrose & Yairi, 1999; Natke et al., 2006) cannot be made. Furthermore, ODs were not taken into consideration in the present study, which is why relationships of frequency of ODs and language proficiency cannot be drawn.

Perhaps the major drawback of the present study is related to insufficient measurement of L2 proficiency. The Cloze Test was the only formal measure used to assess language proficiency. Consequently, participants' bilingual skills on the "bilingualism continuum" were not fully known. Aside from the Cloze Test, most of the proficiency estimates were subjective, and thus possibly affected by socio-psychological factors. For example, the finding that younger participants, who were still in school, estimated their proficiency higher compared to older participants might relate to different understandings of proficiency. On the other hand, older participants, who had been away from any English speaking education for a longer period of time, might have felt less self-confident in speaking English. Furthermore, although English was clearly the most proficient language besides German, most of the participants were exposed to more than two languages (see Table 2). This is common practice in the education system of German "Gymnasium" students. Consequently, it is arguable that

bilingualism might have different effects on the stuttering pattern compared to multilingualism.

Further detailed examination of various linguistic aspects of stuttering may have provided additional insight into stuttering and bilingualism. The present study only examined stuttering associated with function and content words and the impact of word length on stuttering. Furthermore, data analysis was confined to words that were stuttered. In order to allow for a more thorough interpretation of the data, analyses of the overall amount of fluent content and function words and related relationships with stuttered content and function words would need to be taken into consideration. In addition, stuttering on early or late segments in phonological words has not been taken into account. Thus, comparison to monolingual studies (e.g., Howell et al., 1999; Dworzynski et al., 2004), is limited. Clearly, it is important to look at a wider range of linguistic characteristics in order to make stronger statements about the effects of linguistic factors on stuttering in bilingual PWS. For example, Bernstein Ratner (1981, 1997), as well as Bernstein Ratner and Benitez (1985) suggested that the formulation and production of sentences, including morpho-syntactical rules, is likely to be at the core of moments of stuttering in both children and adults. Therefore, examination of sentence-level aspects of stuttering in bilinguals may be beneficial to the overall understanding of stuttering in bilingual PWS.

Another caveat of the present study is that the participants recruited were German-English bilinguals. Thus, comparing the results of German-English bilingual PWS (i.e., who produced German as L1 and English as L2) to English-German bilingual PWS (i.e., who produced English as L1 and German as L2) was not possible. However, such a comparison is important, as it assists to determine whether the type and severity of stuttering noted in the present group of German-English speakers is language specific. Indeed, this is an issue with all past research examining stuttering and bilingualism, where there is no control group of participants who speak the same two languages but in opposite order of dominance.

Finally, most of the participants examined in the present study were adults. Upon a general look at the results, it was found that participants 36 and 40, and 59 years of age stuttered more on content words in L2 (i.e., the opposite pattern than the younger participants). The L2 exposure in these participants was also above average and their Cloze Test performances were 80%, 100%, and 97%, respectively. Thus, chronological age, L2 exposure, and language proficiency might have impacted stuttering patterns across languages. Analysis of group differences according to age, L2 exposure and L2 proficiency might have assisted in finding clearer relationships between stuttering behaviours and the different factors presented above. Furthermore, the data were not evaluated in regard to individual case studies. Rather, the results for all participants were summarised as group values. Detailed examination of individuals may provide additional detail regarding stuttering and bilingualism that is not revealed when summarised according to a group.

Directions for Future Research

One of the greatest drawbacks in research on stuttering and bilingualism is the lack of a unifying terminology to accurately refer to language proficiency levels in participants. The diversity of meanings in past research regarding language proficiency makes it very difficult to support or refute past results. In particular, there is a strong case for considering that terminologies referring to L2 acquisition (e.g., consecutive and simultaneous bilingualism) have been confused with language proficiency measures. That is, consecutive bilinguals are thought to be more proficient in L1, whereas simultaneous bilinguals are thought to be equally proficient across languages. However, bilingualism is a continuum (Roberts & Shenker, 2007) and therefore, language acquisition does not necessarily refer to the proficiency levels of languages spoken by an individual (Evans, 2002; Halsband, 2006; Van Borsel et al., 2001). Similarly, subjective suggestions by researchers (e.g., balanced bilingual, more/ less proficient in L1/ L2) or reporting which language the participant feels more proficient in, is an inadequate and surely inaccurate determination of language proficiency. An overview of the different types of language proficiency references in past research concerning bilingualism and stuttering is listed in Table 19.

In order to allow for clinically relevant, as well as reproducible studies, future investigations will need to incorporate valid, reliable, and efficient language proficiency tests. Importantly, Evans (2002) argued that language proficiency impacts on any results related to stuttering. Furthermore, findings of Anderson and Conture (2000) and Logan (2001), suggested a link between stuttering and language development. Because bilingual speaker are likely to present differing levels of language proficiency across languages spoken, this finding supports Evans' emphasis on the necessity of administering language proficiency tests. Marian et al. (2007) found "The Language experience and proficiency questionnaire" (LEAP-Q) to be an efficient tool for the assessment of language profiles in bilingual and

Table 19. Differences in language proficiency classifications in past studies examining stuttering behaviour in bilingual speakers. The table includes the languages investigated, sequence of language acquisition (L1 & L2), the type of bilingualism, the severity of stuttering across languages, language assumed or tested to be less proficient, and the proficiency measurement used in the study.

Study	Languages spoken	Type of bilingualism	More stuttering in	Less Proficient language	Proficiency measurement
Dale, 1977	Spanish – English	simultaneous	Spanish	Spanish	Perception of researcher
Jayaram, 1983	Kannada (L1) – English (L2)	consecutive	Kannada	English	English Test to ensure proficiency of some extent
Bernstein Ratner & Benitez, 1985	Spanish – English[3]	simultaneous	English	-	Perception of client
Nwokah, 1988	Igbo (L1) – English (L2)	consecutive, balanced	For some Igbo, for others English; no significant difference	Data suggests maybe English[4]	Assumption due to length of L2 exposure
Jankelowitz & Bortz, 1996	Afrikaans – English	simultaneous	Afrikaans	Afrikaans	Modification of the Bilingual Aphasia Test (Paradis, 1987), Cloze Test, language background questionnaire
Roberts, 2002	French (L1) – English (L2)	consecutive	English	English	Questionnaire developed for research on bilingual adults (Lafaury & Roberts, 1998; Roberts & Le Dorze, 1997)
Roberts, 2002	French (L1) – English (L2)	consecutive, balanced	No significant difference between stuttering across language groups	-	
Howell et al., 2004	Spanish – English	simultaneous	Spanish	English	Perception of researcher
Meline et al., 2006	Chinese (L1) – English (L2)	consecutive	Chinese	English	L2 at CALP level

[3] The participant perceived himself to be equally proficient. However, proficiency levels have not been tested in this study.
[4] Suggestion made by researcher due to participants report that they needed more planning and anticipation in English

multilingual individuals. Investigating proficiency analysis software, such as the Systematic Analysis of Language Transcripts (applicable for English and Spanish) would be another way of administering cross-linguistically applicable language proficiency tests.

Moreover, it cannot be assumed that data reported for English speaking PWS is applicable cross-linguistically. For example, the 3% SLD cut-off measure for the assessment of stuttering reported for English and recently also for German and Dutch (Amborse & Yairi, 1999; Boey et al., 2007; Natke et al., 2006) may not necessarily be the same cross-linguistically. Also the question remains whether to use %SS or %WS as a measurement of stuttering in bilingual PWS. Research on the distribution of SLDs and/ or ODs in English, German, Spanish and French suggests that there might be cross-linguistic differences in the distribution of SLDs and ODs (Ambrose & Yairi, 1999; Carias & Ingram, 2006; Carlo & Watson, 2003; Natke et al., 2006; Roberts & Meltzer, 2004). In addotopm, distinct disfluency types have been reported to be used as a coping strategy for low language proficiency bilingual PWS (Roberts & Shenker, 2007; Walters, 2005). Consequently, it is essential to conduct investigations across multiple languages in order to find out whether data reported for English stuttering characteristics can be generalised to other languages, and more importantly, whether generalisations can be made for bilingual PWS.

Increased standardisation in the use and administration of language proficiency assessment tools, acceptance of defining characteristics of language proficiency in the international SLT community, and reliable scales for stuttering severity measurement in bilingual PWS, will facilitation the advanced of a number of significant research areas in stuttering and bilingualism. First of all, it is important to acknowledge the significance of studies in bilingual PWS as they possibly allow for clarifications about the nature of stuttering. Analysing two language systems spoken by one individual and comparing these language systems to the stuttering patterns observed in each language might allow for in depth analysis of what is causal to stuttering. As Dayalu et al. (2003) have pointed out, the

dichotomy of stuttering on content and function words is not fundamental to stuttering. In that respect, it is important to look at more possible causal factors in order to holistically understand what is at the root of stuttering.

Relationships between morpho-syntactic complexity and stuttering in bilingual PWS have been drawn by many researchers (Bernstein Ratner & Benitez, 1985; Jankelowitz & Bortz, 1996; Gonzalez et al., 2004). Thus, examining grammatical and syntactical differences (e.g., length and complexity of proposed utterances and their influence on stuttering or stuttering on noun and verb phrases) in the language involved, as well as their impact on stuttering patterns, would be an intriguing topic for future research. Merino and Rumberger (1999) reported for that due to the language system of L1, the order of acquisition of grammatical structures differs in L2 learners, and consequently, slows down the process and pace of language acquisition. This finding has recently been supported by Jia and Fuse (2007), who examined the acquisition of English morphology in Mandarin (L1) – English (L2) speaking children and adolescents. In contrast, Howell et al. (2003) have investigated syntactical aspects in PWS and speak English as L2, and found that syntax was developing normally in L2 learners. Consequently, Howell et al. suggested that if syntactical systems differ between L1 and L2, processing, monitoring, and word retrieval deficiencies are more likely to be at the core of the problem than syntactic dissociations.

Further support of this theory is provided by monolingual studies. First, Anderson and Conture (2004) suggested that stuttering might be influenced by difficulties in rapid, efficient planning and/ or retrieval of sentence-structure units. Second, Berman Hakim and Bernstein Ratner (2004) suggested that deficiencies in remembering and/ or producing novel phonological sequences might impact on stuttering. Similarly, Bajaj (2007) noted that phonological memory might impact on stuttering. Third, Sasisekaran & De Nil (2006) and Sasisekaran et al. (2006) noted that stuttering is possibly related to phonological encoding, monitoring, and processing deficits. In addition to language proficiency, it therefore seems

essential to incorporate phonological encoding, monitoring, and processing skills into the analysis of morpho-syntactical complexity in bilingual PWS.

In any case, combined analysis of phonetic and linguistic aspects in bilingual PWS is necessary to allow for a more holistic picture of stuttering and bilingualism, and thus understand the phenomenon more thoroughly. Howell and Dworzynski (2005) emphasised the importance to investigate the phonetic aspect of stuttering. In particular, the fact has been emphasised that execution is the end product of language planning, meaning that other levels within the speech plan already had their impact. As a consequence, phonetic aspects of speech production can be analysed separately from speech planning aspects. In light of existing data of the phonetic complexity of English (Howell et al., 2006), German (Dworzynski & Howell, 2004a, 2004b), and Spanish (Howell & Au-Yeung, 2007), bilingual studies comprising these languages would be extremely valuable in allowing comparisons between monolingual and bilingual data could be made.

Conclusions

Stuttering severity significantly differed between L1 and L2. Furthermore, stuttering occurred significantly more often on content words than function words in L1. In contrast, stuttering was similarly distributed on content and function words in L2, although the amount of stuttering on content and function words in L1 was significantly different compared to L2. The results of the present study suggest that stuttering in bilingual speakers is closely related to language dominance. The less dominant language is likely to show more stuttering than the dominant language. Further, the less dominant language is likely to show a pattern stuttering that is indicative of a less developed language system. Future bilingual research evaluating language proficiency effects on stuttering using sensitive language proficiency tests is a likely "next step" in unravelling the relationships betweens stuttering and language.

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Appendices

Appendix A

English Advertisement used to recruit participants

Department of Communication Disorders

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

ADVERTISEMENT

Are you a person who stutters and do you speak both English and German? Or do you know of someone for whom this who this applies – children or adults?

I am a postgraduate student, completing my Masters of Speech and Language Therapy at the University of Canterbury. My research project is concerned with *Stuttering Characteristics of German-English Bilingual Speakers.*

The aim of this project is to analyse stuttering behaviour in two different languages spoken by one individual. Presently, little is known about stuttering in bilingual speakers. In order to develop effective treatment approaches for people who stutter and are bilingual, it is important to understand the nature of stuttering in bilingual speakers. Therefore, the aim of this project is to examine stuttering in bilingual speakers as it occurs in a natural speaking context.

Participants in this study will be video-recorded as they speak with a researcher for approximately 15 minutes in each language. A variety of topics of conversation will be covered (e.g., interests, hobbies) so as to obtain a representative sample of speech. Participants will also be asked to fill out a questionnaire about their speaking behaviour. The entire procedure will take no longer than one hour. As a sign of gratitude, participants will receive 2 movie tickets. In addition, free consultation regarding the participant's speech will be provided by the University of Canterbury Speech and Hearing Clinic.

If you are interested in participating in the research project, please contact either me, Martina Schaefer, under 021 2424324 or my supervisor, who is Professor Michael Robb at the University of Canterbury under 364-2987. We will be pleased to give you further information and discuss any concerns you may have about participation in the project.

Thank you very much!

Martina Schaefer
Speech and Language Therapist

Michael Robb
Professor

Appendix B

German Advertisement used to recruit participants

Department of Communication Disorders

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Suchanzeige

Stottern Sie und sprechen Sie sowohl Deutsch als auch Englisch? Oder kennen Sie jemanden auf den diese Suchanzeige zutrifft – Erwachsene oder Kinder?

Ich bin Studentin und mache gerade meinen "Masters of Speech and Language Therapy" an der "University of Canterbury" in Neuseeland. Meine Studie beschäftigt sich mit *"Stottercharakteristika bei Deutsch-Englisch bilingualen Sprechern"*. Bilingual definieren wir in dieser Studie als Sprachkenntnisse, die mindestens auf 2 Jahren Schulunterricht beruhen.

Das Ziel der Studie ist es, Stotterverhalten in zwei verschiedenen Sprachen zu analysieren, die beide von einem Individuum gesprochen werden. Zum jetzigen Zeitpunkt wissen wir noch sehr wenig über Stottern bei bilingualen Sprechern. Um effektive Behandlungsansätze für Stotterer zu entwickeln, die mehr als eine Sprache sprechen, ist es wichtig, die Eigenschaften von Stottern bei mehrsprachigen Sprechern zu verstehen. Deshalb ist das Ziel dieser Studie, Stottern bei mehrsprachigen Stotterern zu untersuchen, wie es in natürlichen Gesprächssituationen auftritt.

Alle Teilnehmer dieser Studie werden während des -in beiden Sprachen geführten- jeweils etwa 15minütigen Gesprächs mit der Logopädin auf Video aufgenommen. Eine Vielzahl von Themen wird in diesem Gespräch abgedeckt werden, (z.B. Interessen, Hobbies), so dass eine repräsentative Spontansprachanalyse gemacht werden kann. Weiterhin werden alle Teilnehmer darum gebeten, einen Fragebogen über ihr Sprechverhalten auszufüllen. Das gesamte Verfahren wird im Zeitraum von Anfang Juni bis Anfang Juli 2007 stattfinden und nicht länger als eine Stunde in Anspruch nehmen. Als Dankeschön wird jeder Teilnehmer im Anschluss an das Gespräch 2 Kinokarten erhalten.

Falls Sie Interesse haben, an der Studie teilzunehmen, würde ich mich sehr freuen, wenn Sie sich bei mir unter der unten aufgeführten Emailadresse melden. Gerne gebe ich Ihnen dann weitere Informationen oder beantworte Fragen über die Teilnahme an der Studie.

Emailadresse:
Martina_schaefer@gmx.net

Gerne können Sie auch Professor Michael Robb kontaktieren, jedoch versteht Professor Michael Robb nur englisch.

Emailadresse:
michael.robb@canterbury.ac.nz

Vielen Dank!

Martina Schäfer
Staatlich anerkannte Logopädin

Michael Robb
Professor

Appendix C

Human Ethics Committee approval letter, English parent information letter, English child participant information letter, English adult participant information letter, English consent forms.

HEC Ref: 2007/41

23 June 2008

Martina Schaefer
Communication Disorders
UNIVERSITY OF CANTERBURY

Dear Martina

The Human Ethics Committee advises that your research proposal "Stuttering Characteristics of German-English Bilingual Speakers" has been considered and approved. However this approval is subject to the amended documents you provided with your email of 16 May 2007.

Yours sincerely

Dr Michael Grimshaw
Chair, Human Ethics Committee

Department of Communication Disorders

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Project Information Sheet-Parents

Your child is invited to participate in the research project, *Stuttering Characteristics of German-English Bilingual Speakers.*

The aim of this project is to analyse stuttering behaviour in two different languages spoken by one individual. Presently, little is known about stuttering in bilingual speakers. In order to develop effective treatment approaches for people who stutter and are bilingual, it is important to understand the nature of stuttering in bilingual speakers. Therefore, the aim of this project is to examine stuttering in bilingual speakers as it occurs in a natural speaking context.

Your child will be video-recorded as he or she speaks with a researcher for approximately 15 minutes in each language. A variety of topics of conversation will be covered (e.g., interests, games) so as to obtain a representative sample of your child's speech. This speech sample will later be analysed in regard to the amount and type of stuttering produced by your child in each of the languages. Depending on the age of your child, either the child or you will also be asked to fill out a questionnaire about his/her speaking behaviour. This information will be included in the overall analysis of your child's speech. The entire procedure will take no longer than one hour. As a sign of gratitude, your child will receive 2 movie tickets.

The results of the project may be published, but your child may be assured of the complete confidentiality of data gathered in this investigation: the identity of participants will not be made public without their consent. To ensure anonymity and confidentiality, the information gathered will be assigned a number and all identifiable information will be removed. Data will be kept in a locked filing cabinet within a lockable room in the Department of Communication Disorders.

The project is being carried out as a requirement for a Masters of Speech-Language Therapy by Martina Schaefer under the supervision of Professor Michael Robb. Martina Schaefer can be contacted at 021 242-4324 and Professor Michael Robb can be contacted at the University of Canterbury at 364-2987 (x7077). They will be pleased to discuss any concerns you may have about participation in the project.

The project has been reviewed ***and approved*** by the University of Canterbury Human Ethics Committee.

Martina Schaefer
Speech and Language Therapist

Michael Robb
Professor

Department of Communication Disorders

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Project Information Sheet-Children

You are invited to take part in a research project that is called *Stuttering Characteristics of German-English Bilingual Speakers.*

Have you ever asked yourself why you stutter and where stuttering comes from? We hope to answer this question and help children who have a stutter.

This project will involve you speaking for about 15 minutes in German and 15 minutes in English. You will be videorecorded while you are speaking with an adult. You will also be asked to answer some questions about your speech. The entire procedure will take no longer than one hour. The information we collect will be kept private and will not be shared with other children or adults.

The project is being carried out by Martina Schaefer and Prof Michael Robb at the University of Canterbury. Martina can be contacted 021 242-4324. Prof Robb can be contacted at 364-2987 (extension 7077).

We hope you will consider taking part in this project. As a sign of thanks, you will receive 2 movie tickets after our 1-hour meeting.

Thank you!

Martina Schaefer
Speech-Language Therapist

Michael Robb
Professor

Department of Communication Disorders

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Project Information Sheet-Adults

You are invited to participate in the research project, *Stuttering Characteristics of German-English Bilingual Speakers.*

The aim of this project is to analyse stuttering behaviour in two different languages spoken by one individual. Presently, little is known about stuttering in bilingual speakers. In order to develop effective treatment approaches for people who stutter and are bilingual, it is important to understand the nature of stuttering in bilingual speakers. Therefore, the aim of this project is to examine stuttering in bilingual speakers as it occurs in a natural speaking context.

You will be video-recorded as you speak with a researcher for approximately 15 minutes in each language. A variety of topics of conversation will be covered (e.g., interests, hobbies) so as to obtain a representative sample of your speech. This speech sample will later be analysed in regard to the amount and type of stuttering you produced in each of the languages. You will also be asked to fill out a questionnaire about your speaking behaviour. This information will be included in the overall analysis of your speech. The entire procedure will take no longer than one hour. As a sign of gratitude, you will receive 2 movie tickets.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: the identity of participants will not be made public without their consent. To ensure anonymity and confidentiality, the information gathered will be assigned a number and all identifiable information will be removed. Data will be kept in a locked filing cabinet within a lockable room in the Department of Communication Disorders.

The project is being carried out as a requirement for a Masters of Speech-Language Therapy by Martina Schaefer under the supervision of Professor Michael Robb. Martina Schaefer can be contacted at 021 2424324 and Professor Michael Robb can be contacted at the University of Canterbury at 364-2987 (x7077). They will be pleased to discuss any concerns you may have about participation in the project.

The project has been reviewed ***and approved*** by the University of Canterbury Human Ethics Committee.

Martina Schaefer
Speech and Language Therapist

Michael Robb
Professor

Department of Communication Disorders

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Martina Schaefer
Department of Communication Disorders
University of Canterbury
Creyke Road
Ilam
5 April 2007

Consent Form

"Stuttering Characteristics of German-English Bilingual Speakers"

I have read and understood the description of the above-named project. On this basis, I agree to my child participating and being video-taped in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved.

I understand that my child may at any time withdraw from the project, including withdrawal of any information my child or I have provided.

NAME (please print): ……..

CHILD'S NAME: …….

Parent's Signature:

Date:

Department of Communication Disorders

Martina Schaefer
Department of Communication Disorders
University of Canterbury
Creyke Road
Ilam
5 April 2007

Consent Form

"Stuttering Characteristics of German-English Bilingual Speakers"

I have read and understood the description of the above-named project. On this basis, I agree to participate and be video-taped in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved.

I understand that I may withdraw from the project at any time, including withdrawal of any information I have provided.

NAME (please print): ……..

Signature:

Date:

Appendix D

German parent information letter, German child participant information letter, German adult participant information letter, German consent forms.

Department of Communication Disorders

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Informationsblatt - Eltern

Ihr Kind ist eingeladen, an der Studie *"Stottercharakteristika bei Deutsch-Englisch bilingualen Sprechern"* teilzunehmen. Bilingual definieren wir in dieser Studie als Sprachkenntnisse, die mindestens auf 2 Jahren Schulunterricht beruhen.

Das Ziel der Studie ist es, Stotterverhalten in zwei verschiedenen Sprachen zu analysieren, die beide von einem Individuum gesprochen werden. Zum jetzigen Zeitpunkt wissen wir noch sehr wenig über Stottern bei bilingualen Sprechern. Um effektive Behandlungsansätze für Stotterer zu entwickeln, die mehr als eine Sprache sprechen, ist es wichtig, die Eigenschaften von Stottern bei mehrsprachigen Sprechern zu verstehen. Deshalb ist das Ziel dieser Studie, Stottern bei mehrsprachigen Stotterern zu untersuchen, wie es in natürlichen Gesprächssituationen auftritt.

Ihr Kind wird während des -in beiden Sprachen geführten- jeweils etwa 15minütigen Gesprächs mit der Logopädin auf Video aufgenommen. Eine Vielzahl von Themen wird in diesem Gespräch abgedeckt werden (z.B. Interessen, Hobbies), so dass eine repräsentative Spontansprachanalyse gemacht werden kann. Diese Spontansprachanalyse beinhaltet sowohl die Stotterhäufigkeit als auch die Stottersymptome in beiden Sprachen. Je nach Alter Ihres Kindes werden wir im Anschluss an das Gespräch entweder Sie oder Ihr Kind darum bitten, einen Fragebogen über das Sprechverhalten Ihres Kindes auszufüllen. Das gesamte Verfahren wird nicht länger als eine Stunde in Anspruch nehmen. Als Dankeschön wird Ihr Kind im Anschluss an das Gespräch 2 Kinokarten erhalten.

Möglicherweise werden die Ergebnisse der Studie publiziert werden. Wir versichern Ihnen, dass wir die gesamten Informationen vertraulich behandeln und die Identität der Teilnehmer nicht ohne ihr Einverständnis veröffentlicht wird. Um Anonymität und Diskretion zu garantieren, werden wir den erfassten Daten Zahlen zuordnen und jegliche identifizierende Information entfernen. Die Daten werden in einem verschlossenen Aktenschrank innerhalb eines abschließbaren Raumes im Fachbereich Logopädie an der "University of Canterbury" aufbewahrt.

Die Studie wird als Voraussetzung für einen "Masters of Speech-Language Therapy" von Martina Schäfer unter der Supervision von Professor Michael Robb durchgeführt. Martina Schäfer kann unter Martina_schaefer@gmx.net und Professor Michael Robb unter michael.robb@canterbury.ac.nz kontaktiert werden. Gerne geben wir weitere Informationen oder beantworten Fragen über die Teilnahme an der Studie. Professor Robb kann jedoch nur in Englisch kontaktiert werden.

Die Studie wurde vom "Human Ethics Committee" der "University of Canterbury" geprüft und genehmigt.

Martina Schäfer
Staatlich anerkannte Logopädin

Michael Robb
Professor

Department of Communication Disorders

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Informationsblatt - Kinder

Du bist eingeladen, an der Studie *"Stottercharakteristika bei Deutsch-Englisch bilingualen Sprechern"* teilzunehmen.

Hast Du Dich jemals gefragt, warum Du stotterst und wo das Stottern herkommt? Wir hoffen, dass wir diese Frage mit unserer Studie beantworten und somit Kindern, die stottern, helfen können.

Wenn Du an dieser Studie teilnimmst, wirst Du darum gebeten werden, mit einer Logopädin 15 Minuten in Deutsch und 15 Minuten in Englisch zu sprechen. Dabei werden wir Dich auf Video aufnehmen. Zudem wird die Logopädin Dir einige Fragen zu Deinem Sprechen stellen. Das gesamte Verfahren wird nicht länger als eine Stunde dauern. Die Informationen und das Video werden geschützt aufbewahrt und nicht an andere Kinder oder Erwachsene weitergegeben werden.

Die Studie wird von Martina Schäfer und Professor Michael Robb durchgeführt. Je nach Vereinbahrung wird sich Martina Schäfer mit Dir entweder bei Dir zu Hause, in einer logopädischen Praxis, der Lehranstalt für Logopäden in Mainz oder im Rahmen der "Stotterintensivtherapie Susanne Rosenberger" treffen. Falls Du noch Fragen hast, kannst Du Dich gerne unter folgender Emailadresse bei Martina melden:

Martina_schaefer@gmx.net

Gerne kannst Du Dich auch bei Professor Michael Robb melden, aber dann musst Du die Email in Englisch schreiben. Die Emailadresse lautet:

michael.robb@canterbury.ac.nz

Wir würden uns sehr freuen, wenn Du an unserer Studie teilnehmen kannst. Als Dankeschön bekommst Du nach dem einstündigen Gespräch 2 Kinokarten geschenkt.

Vielen Dank!

Martina Schäfer
Staatlich anerkannte Logopädin

Michael Robb
Professor

Department of Communication Disorders

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Informationsblatt - Erwachsene

Sie sind eingeladen, an der Studie *"Stottercharakteristika bei Deutsch-Englisch bilingualen Sprechern"* teilzunehmen. Bilingual definieren wir in dieser Studie als Sprachkenntnisse, die mindestens auf 2 Jahren Schulunterricht beruhen.

Das Ziel der Studie ist es, Stotterverhalten in zwei verschiedenen Sprachen zu analysieren, die beide von einem Individuum gesprochen werden. Zum jetzigen Zeitpunkt wissen wir noch sehr wenig über Stottern bei bilingualen Sprechern. Um effektive Behandlungsansätze für Stotterer zu entwickeln, die mehr als eine Sprache sprechen, ist es wichtig, die Eigenschaften von Stottern bei mehrsprachigen Sprechern zu verstehen. Deshalb ist das Ziel dieser Studie, Stottern bei mehrsprachigen Stotterern zu untersuchen, wie es in natürlichen Gesprächssituationen auftritt.

Sie werden während des -in jeder der beiden Sprachen- jeweils etwa 15minüigen Gesprächs mit der Logopädin auf Video aufgenommen. Eine Vielzahl von Themen wird in diesem Gespräch abgedeckt werden (z.B. Interessen, Hobbies), so dass eine repräsentative Spontansprachanalyse gemacht werden kann. Diese Spontansprachanalyse beinhaltet sowohl die Stotterhäufigkeit als auch die Stottersymptome in beiden Sprachen. Im Anschluss an das Gespräch werden wir Sie weiterhin darum bitten, einen Fragebogen über ihr Sprechverhalten auszufüllen. Das gesamte Verfahren wird nicht länger als eine Stunde in Anspruch nehmen. Als Dankschön werden Sie im Anschluss an das Gespräch 2 Kinokarten erhalten.

Möglicherweise werden die Ergebnisse der Studie publiziert werden. Aber wir versichern Ihnen, dass wir Ihre gesamten Informationen vertraulich behandeln und die Identität der Teilnehmer nicht ohne ihr Einverständnis veröffentlicht wird. Um Anonymität und Diskretion zu garantieren, werden wir den erfassten Daten Zahlen zuordnen und jegliche identifizierende Information entfernen. Die Daten werden in einem verschlossenen Aktenschrank innerhalb eines abschließbaren Raumes im Fachbereich Logopädie an der "University of Canterbury" aufbewahrt.

Die Studie wird als Voraussetzung für einen "Masters of Speech-Language Therapy" von Martina Schäfer unter der Supervision von Professor Michael Robb durchgeführt. Martina Schäfer kann unter Martina_schaefer@gmx.net und Professor Michael Robb unter michael.robb@canterbury.ac.nz kontaktiert werden. Gerne geben wir weitere Informationen oder beantworten Fragen über die Teilnahme an der Studie. Professor Robb kann jedoch nur in Englisch kontaktiert werden.

Die Studie wurde vom "Human Ethics Committee" der "University of Canterbury" geprüft und genehmigt.

Martina Schäfer
Staatlich anerkannte Logopädin

Michael Robb
Professor

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CHRISTCHURCH NEW ZEALAND

Martina Schäfer
Department of Communication Disorders
University of Canterbury
Creyke Road
Ilam
5 April 2007

Einverständniserklärung

"Stottercharakteristika bei Deutsch-Englisch bilingualen Sprechern"

Ich habe die Beschreibung der oben aufgeführten Studie gelesen und verstanden. Auf dieser Grundlage stimme ich der Teilnahme meines Kindes an dem Projekt sowie der Videoaufnahme des Gesprächs meines Kindes mit der Logopädin zu. Weiterhin gebe ich mein Einverständnis für die Veröffentlichung der Ergebnisse dieser Studie unter der Voraussetzung, dass die Anonymität meines Kindes gewahrt wird.

Ich verstehe, dass mein Kind jeder Zeit von der Studie zurücktreten kann. Das beinhaltet auch die Zurücknahme aller Informationen, die ich oder mein Kind gegeben haben.

NAME (in Druckschrift bitte):

……..

NAME IHRES KINDES:

……..

Unterschrift des Erziehungsberechtigten:

……..

Datum:

……..

Department of Communication Disorders

UNIVERSITY OF CANTERBURY
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CHRISTCHURCH NEW ZEALAND

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Ich verstehe, dass ich zu jedem Zeitpunkt von der Studie zurücktreten kann. Das beinhaltet auch die Zurücknahme aller Informationen, die ich gegeben habe.

NAME (in Druckschrift bitte):

……..

Unterschrift:

……..

Datum:

……..

Appendix E

Cloze Test used for the present study (Evans, 2002)

Cloze Test

In the following passage, the blank spaces indicate that words are incomplete. Please fill in the necessary letters in order to make the words, as well as the passage, linguistically correct.

Example: *In order to bake a cake you need fl___r, e__s, m__k, bak__ so_a, and su__r.*

The house I live in is not very big, but it is comfortable. There i___ a gard___ in fr___t of t___ house. Wh___ you o___ the fr___ door, y___ are in___ the li___ room.
Wh___ you wa___ through t___ living r___, you en___ t___ kitchen. T___ backyard i___ through t___ kitchen do___.

Th___ are thr___ bedrooms a___ one ba___ in t___ house. Y___ reach th___m through t___ door nea___ the ki___.

---------- ----------

Name Date

Appendix F

English Post-Conversational Questionnaire

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CHRISTCHURCH NEW ZEALAND

Questionnaire/ Case History

Please respond to the questions posed and note that the questions pertain to both German and English languages.

General Language Behaviour	
1. What languages do you speak?	
2. Which language did you learn first?	
German:	English:
3. When did you learn your second language?	
4. How often do you use your first language? (In percentage)	
5. When (where and with whom) do you use your first language?	
6. How proficient do you feel in your first language? (scale from 1-10, 1=low proficiency and 10=high proficiency)	
7. How often do you use your second language? (In percentage)	
8. When (where and with whom) do you use your second language?	
9. How proficient do you feel in your second language? (scale from 1-10, 1=low proficiency and 10=high proficiency)	
10. Is there a language you feel more comfortable speaking in?	
Yes:	No:
If so, which one?	
German:	English:
Information on Language Pronunciation & Formulation	
11. Do you notice a difference in the degree of difficulty concerning the motoric aspects of the two languages?	
Yes:	No:
If so, which language do you consider easier to speak in regards to motor skills?	
German:	English:
12. Do you find a difference in the ease of pronunciation of the languages?	
Yes:	No:
Which one is easier to pronounce?	
German:	English:
13. Do you notice a difference in the degree of difficulty creating sentences in the two languages?	

Yes:	No:
If so, which language do you consider easier to speak in regards of creating sentences?	
German:	English:
14. Do you find formulating your thoughts more difficult in one language than in the other?	
Yes:	No:
If so, which language do you consider easier to formulate your thoughts in?	
German:	English:
Stuttering behaviour	
15. Do you consider your stuttering the same in both languages?	
Yes:	No:
If not	
a) Which language do you feel you stutter more?	
German:	English:
b) Do your stuttering symptoms vary in the two languages?	
Yes:	No:
How?	
16. Do you use coping strategies to overcome your stuttering?	
Yes:	No:
a) Do these coping strategies differ in both languages?	
Yes:	No:
17. Does the stuttering bother you more in one language than the other?	
Yes:	No:
Which one?	
German:	English:
18. Have you ever noticed any reactions to your stuttering from other people?	
Yes:	No:
Which one?	
German:	English:
Cultural information	
19. In both languages: Is there a difference in who you talk to in terms of how concerned you are about speaking that language?	
Yes:	No:
If so, can you give examples?	
20. Does your family or do you regard the importance of language and speaking skills differently in both languages?	
Yes:	No:
If so, how would you describe the difference?	

Name:
Age:
Gender:
Nationality:
Country of birth:
What is the native language of your parents?
As a child, what language did you speak most at home?
When did you first notice your stuttering? Do you know of any neurological injury?
Do you know of any other cases of stuttering in your family?
Do you have any other communication disorder other then stuttering?
Have you had treatment before? When? Where? How long? What type of treatment?

Thank you!

Martina Schaefer
Speech Language Therapist

Michael Robb
Professor

Appendix G

German Post-Conversational Questionnaire

UNIVERSITY OF CANTERBURY
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CHRISTCHURCH NEW ZEALAND

Fragebogen/ Anamnese

Bitte beantworten Sie die unten aufgeführten Fragen und beachten Sie dabei, dass die Fragen sich sowohl auf Deutsch als auch auf Englisch beziehen.

Allgemeines Sprachverhalten	
1. Welche Sprachen sprechen Sie?	
2. Welche Sprache haben Sie zuerst gelernt?	
Deutsch:	Englisch:
3. Wann haben Sie Ihre zweite Sprache gelernt?	
4. Wie oft benutzen Sie Ihre erste Sprache? (In Prozent)	
5. Wann (wo und mit wem) benutzen Sie Ihre erste Sprache?	
6. Wie gut glauben Sie sind Ihre Sprachkenntnisse in Ihrer ersten Sprache? (Skala von 1-10, 1 = schlechte Sprachkenntnisse und 10 = sehr gute Sprachkenntnisse)	
7. Wie oft gebrauchen Sie Ihre zweite Sprache? (In Prozent)	
8. Wann (wo und mit wem) benutzen Sie Ihre zweite Sprache?	
9. Wie gut glauben Sie sind Ihre Sprachkenntnisse in Ihrer zweiten Sprache? (Skala von 1-10, 1 = schlechte Sprachkenntnisse und 10 = sehr gute Sprachkenntnisse)	
10. Gibt es eine Sprache in der Sie sich wohler fühlen, zu kommunizieren?	
Ja:	Nein:
Falls ja, welche?	
Deutsch:	Englisch:
Informationen über Aussprache und Formulierung	
11. Haben Sie das Gefühl, dass beide Sprachen unterschiedlich schwer sind im Hinblick auf die motorischen Eigenschaften beider Sprachen?	
Ja:	Nein:
Falls ja, welche Sprache empfinden Sie als die motorisch einfachere?	
Deutsch:	Englisch:
12. Empfinden Sie einen Unterschied in der Leichtigkeit der Aussprache beider Sprachen?	
Ja:	Nein:
In welcher Sprache ist die Aussprache Ihrer Meinung nach einfacher?	
Deutsch:	Englisch:
13. Haben Sie das Gefühl, dass beide Sprachen unterschiedlich schwer sind im Hinblick darauf, Sätze zu bilden?	

Ja:	Nein:
Falls ja, in welcher Sprache empfinden Sie es einfacher, Sätze zu bilden?	
Deutsch:	Englisch:
14. Gibt es eine Sprache, in der es Ihnen schwieriger fällt, ihre Gedanken zu formulieren?	
Ja:	Nein:
Falls ja, in welcher Sprache fällt es Ihnen leichter, Ihre Gedanken zu formulieren?	
Deutsch:	Englisch:
Stotterverhalten	
15. Empfinden Sie Ihr Stottern als gleich in beiden Sprachen?	
Ja:	Nein:
Falls nicht,	
a) In welcher Sprache haben Sie das Gefühl mehr zu stottern?	
Deutsch:	Englisch:
b) Unterscheiden sich die Stottersymptome in beiden Sprachen?	
Ja:	Nein:
Wie?	
16. Benutzen Sie Strategien, um Ihr Stottern zu überwinden oder zu vermeiden?	
Ja:	Nein:
a) Benutzen Sie unterschiedliche Strategien in beiden Sprachen?	
Ja:	Nein:
17. Stört Sie das Stottern mehr in einer Sprache als in der anderen?	
Ja:	Nein:
In welcher Sprache stört Sie das Stottern mehr?	
Deutsch:	Englisch:
18. Haben Sie jemals Reaktionen von anderen Menschen auf Ihr Stottern bemerkt?	
Ja:	Nein:
Falls ja, in welcher Sprache haben Sie Reaktionen auf Ihr Stottern bemerkt?	
Deutsch:	Englisch:
Kulturelle Informationen	
19. In beiden Sprachen: gibt es Menschen, bei denen Sie größere Angst haben, zu sprechen im Vergleich zu anderen Menschen?	
Ja:	Nein:
Falls ja, können Sie Beispiele dafür geben (ebenfalls für beide Sprachen)?	
20. Bewertet Ihre Familie oder bewerten Sie die Wichtigkeit von Sprache im Allgemeinen sowie sprachliche Fähigkeiten unterschiedlich in beiden Sprachen?	
Ja:	Nein:
Falls ja, können Sie die Unterschiede beschreiben?	

Name:
Alter:
Geschlecht:
Nationalität:
Geburtsort:
Was ist die Muttersprache Ihrer Eltern?
Welche Sprache haben Sie als Kind am meisten zu Hause gesprochen?
Wann haben Sie zuerst Ihr Stottern bemerkt? Wissen Sie, ob Sie jemals neurologische Verletzungen hatten?
Wissen Sie, ob noch mehr Personen in Ihrer Familie stottern oder gestottert haben?
Haben Sie außer dem Stottern noch andere Kommunikationsstörungen?
Waren Sie schon einmal in logopädischer Behandlung? Wann? Wo? Wie lange? Welcher Behandlungsansatz war das?

Vielen Dank!

Martina Schäfer
Staatlich anerkannte Logopädin

Michael Robb
Professor

Appendix H

Applied disfluency count rules

Disfluency Count Rules

Block:

- Silent block was counted if
    - Sign of tension in lips, nose, throat, thyroid/ larynx, eyes, mouth, tongue accompanied the silent block
    - It is obvious that an articulation place was attempted
    - If an unnatural pause was the result and/ or the natural flow of articulation was interrupted
    - If a glottal stop that did not fit in the phonemic context or showed additional unnatural features, such as extended tension or acoustic features (e.g., vocal fry), could be identified.

- If additional phonemes were produced due to tension, the phonemes were considered to be part of the main stuttering moment and not counted separately.

Monosyllabic Word Repetitions:

- One word repetitions with a rate of 1 repetition (I I) were only counted as an SLD if clearly distinguishable from thought processes, i.e. the rate of repetition was high and the prosody stayed the same or the pitch clearly increased due to additional laryngeal tension.

Interjections:

- If the same Interjection was repeated, it was only counted as one word
    - "ahm, ahm, ahm the road…" (3 words)
    - "ahm so yes…" (3 words)
- If stuttering was identified on an interjection preceding another moment of stuttering, the interjection was counted as belonging to that latter moment of stuttering.
    - "**ah**m **a**pple…" (1 word, 1 moment of stuttering)
- If between two moments of stuttering, it belongs to that moment of stuttering, regardless of whether or not it is stuttered upon or not.
    - "**s**un ah **sh**ines…" (2 words, 2 moments of stuttering)
    - "**t**o ah **t**o ah **t**o the…" (2 words, one moment of stuttering)

Repetitions:

- If words were abandoned and then newly attempted, they were only counted as one word. Fluent words that were repeated in order to overcome stuttering on another word (Stop-and-go mechanisms) werre also not counted as new words. However, if new words were introduced, they were counted.
    - "in the restau in the restaurant" (3 words, one moment of stuttering)
    - " in the restau in the new restaurant" (4 words, one moment of stuttering)

Examples:

[past **() past]** one word, 1 SLD
[he **() he]**
[**f**ive **()** five]

He [**k he killed]** 2 words 1 SLD

[**(th)** killed the] (articulation place and manner were indicated: 2 words, 1 SLD)

[**()** be **()** äh before] (one word, 2 SLD)
[**()** äh **l l**ived] (one word, 1 SLD)
[() ahm **a**] (one word, 1 SLD)

[**()** and **w a**nd was] (2 words, 2 SLDs)
[**l a**h **tl I** like] (2 words, 2 SLDs)
[**f** nineteen eigh**t**y **f ä**h **f** nineteen eigh**t**y **f**our] (3 words, 2 SLDs)

Kick it like (3 words) [B**() [**al-so] [ähm] [in] [school] kick it like Back-ham] (5 words, 1 SLD)

Appendix I

Categorisation of word type rules

Categorisation of Word Type Rules

- If a participant did not say the full attempted word and the context did not allow to clearly determine which word he or she attempted, the stuttering moment did **NOT** qualify for word type analysis.
- If the context allowed for clear prediction of the following word, the stuttering moment qualified for word type analysis.

Examples:

- **()** refers to a silent block
- **Bold face** refers to moment of stuttering on that sound or syllable

→[**ah w s** ah **w** ah **w**e] Function

→ac**()** *accent* Content

→ [lo**()** have a lot] Content

→ [**k the** king] Content

→**Kk** *kick* Content … it like [B**()** al-so ähm [in] [school] kick it like Back-ham] Content (Wants to say the movie title "Kick it like Backham")

→And **I me**et friends **f**rom [**()** äh **f** äh I meet friends] Word type unknown.

Examples of categorisation of word type in German:

Function words:

- Einfach, nicht(s), so, eigentlich, nicht, hier, darüber hinaus, erst, viel, mehrere, halt, auch, andere, vielleicht (i.S. v. kaum zu fassen, wie sehr), manche, Zahlenwörter (z.B. eins, vierzig, etc.), äh.

Content words:

- Anders, nur, immer, überhaupt, jetzt, mehr, sehr, inzwischen, sofort, noch, abend, wieder, selber, werden, ganzen, vielleicht, wirklich, eher, natürlich.

Examples of categorisation of word type in English:

Function words:

- Not, used to, first (first, next...), lots, some, many, all, several, few, other, about, numbers (e.g., one, forty, etc.), everything, yes, okay.

Content words:

- Sometimes, first, most, very, infinitives, totally, all (not at all), out, middle, main, just, almost, always.

Appendix J

Multi-correlational matrix

Cloze Test (CT)	.18	1.0																					
Estimated Proficiency Participant (PP)	-.55	.22	1.0																				
Estimated Proficiency Researcher (PR)	.18	.70	.56	1.0																			
L2 used (U)	-.32	.37	.30	.26	1.0																		
Years of L2 expo (E)	.91	.42	-.36	.39	-.23	1.0																	
Motorcomplexity (MC)	-.13	-.04	.21	.001	-.19	.04	1.0																
Ling complexity (LC)	-.18	-.28	-.35	-.59	-.49	-.18	.41	1.0															
Language tested first (1^{st})	.20	-.19	-.08	-.04	-.63	-.01	-.07	.08	1.0														
% SS L1	.18	-.46	-.16	-.12	.10	.02	.23	-.14	.05	1.0													
% SS L2	.34	-.30	-.17	-.03	.06	.25	.39	.01	-.16	.82	1.0												
% SW L1	.22	-.46	-.23	-.17	.09	.04	.21	-.11	.05	.99	.80	1.0											
% SW L2	.42	-.30	-.21	-.02	.01	.33	.37	-.01	-.13	.83	.99	.81	1.0										
# syllables L1 (SL1)	.46	.06	-.30	.08	-.11	.45	-.12	.04	-.27	.17	.24	.03	.29	1.0									
# syllables L2 (SL2)	.56	.03	-.19	.17	-.57	.58	.03	.16	.44	.04	.03	.26	.13	.14	1.0								
SR L1	.32	-.31	-.08	-.01	.05	.21	.20	-.16	-.08	.87	.84	.85	.85	.36	.15	1.0							
SR L2	.42	-.16	-.04	.13	.04	.38	.33	-.05	-.21	.65	.80	.63	.90	.32	.18	.85	1.0						
Stuttering severity perception (per)	-.13	.11	.21	.37	.39	.03	.32	-.04	-.47	.32	.44	.25	.42	-.07	-.01	.30	.48	1.0					
%SS F L1	-.43	-.04	.17	-.11	.51	-.44	.22	-.24	-.09	.28	.08	.32	.01	-.39	-.69	-.03	-.20	.07	1.0				
%SS F L2	-.32	.04	-.05	-.23	.17	-.35	.12	.06	.001	.18	-.16	.25	-.21	.09	-.41	.09	-.28	-.18	.55	1.0			
%SS C L1	.47	.02	-.18	.12	-.45	.50	-.16	.19	-.0004	-.12	.10	-.10	.17	.46	.65	.23	.36	-.004	-.97	-.52	1.0		
%SS C L2	.37	.06	.07	.38	-.11	.42	-.19	-.15	-.06	-.12	.20	-.15	.25	.02	.46	.02	.36	.31	-.63	-.96	.62	1.0	
%WS F L1	-.39	-.08	.24	-.04	.53	-.42	.21	-.33	-.09	.37	.18	.32	.11	-.39	-.66	.08	-.08	.14	.98	.48	-.93	-.54	1.0
%WS F L2	-.30	.04	-.03	-.19	.17	-.33	.13	.04	.01	.23	-.11	.25	-.15	.11	-.38	.15	-.23	-.13	.54	1.0	.50	-.94	.48
	(A)	(CT)	(PP)	(PR)	(U)	(E)	(MC)	(LC)	(1^{st})	%SS L1	%SS L2	%WS L1	%WS L2	(S L1)	(SL2)	SR L1	SR L2	(per)	%SS F L1	% SS L2	% SS L1	% SS L2	%WS F L1	%WS F L2