ABSTRACT

Thesis Title:

LINGUISTIC INFLUENCES ON DISFLUENCIES IN TYPICALLY-DEVELOPING FRENCH-ENGLISH BILINGUAL CHILDREN

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The connections among language proficiency, language complexity, and fluency have been well-researched in both typical and atypical monolingual populations. Though previous work indicates that bilingual individuals often demonstrate different patterns of disfluency in each of their languages, how or why this happens is largely unknown. Relationships among fluency, language proficiency, and language complexity were examined using the narrative and conversational speech samples of 9 French-English bilingual children. Mean length of utterance in words (MLUw) and percent grammatical utterances (PGU) were shown to strongly relate to rates of total disfluency. The proportion of disfluent function words across samples differed significantly from the proportion of disfluent content words, although rates of disfluency on individual parts of speech did not differ significantly between French and English. Further work is necessary in order to better understand the extent to which language proficiency and linguistic complexity interact and affect disfluency across bilingual populations.

LINGUISTIC INFLUENCES ON DISFLUENCIES IN TYPICALLY-
DEVELOPING FRENCH-ENGLISH BILINGUAL CHILDREN

By

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Thesis submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Master of Arts
2018

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Acknowledgements

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Introduction

Fluency is a phenomenon that seems inherently linked to language use, and different aspects of language have been shown to influence breakdowns in spoken fluency. Two such aspects are *language proficiency* and *linguistic complexity*. *Language proficiency* refers to the stability and mastery of linguistic skill in a language. By contrast, *linguistic complexity* refers to the encoding of demands from the language itself and can include a language's syntactic features. Together, the two terms help quantify how language exerts influences both within and external to the individual. While *language proficiency* captures the importance of an individual's own linguistic ability, *linguistic complexity* highlights the implications of the language encoding task itself. The influences of both language proficiency and linguistic complexity on fluency have been studied across several clinical populations, as described in the following sections. However, further research is needed in order to increase understanding of the intricacies of these two linguistic aspects, their relationship with fluency, and their effects across languages and linguistic experiences.

Fluency and Aspects of Language: Individuals Who Stutter

Connections between fluency and aspects of language have been well researched in one clinical population, children and adults who stutter (Weiss & Zebrowski, 1992; Logan & Conture, 1995; Yaruss, 1999; Maner, Smith, & Grayson, 2000; Kleinow & Smith, 2000; Weber-Fox, Spencer, Spruill, & Smith, 2004; Smith, Sadagopan, Walsh, & Weber-Fox, 2010; Hollister, Van Horne, & Zebrowski, 2017). In people who stutter, disfluency has been linked to language proficiency. Although

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some argue that the language skills of children who stutter are at or above those of their peers (Bernstein Ratner & Sih, 1987; Nippold, Schwarz, & Jescheniak, 1991; Watkins, Yairi, & Ambrose, 1999; Bonelli, Dixon, Bernstein Ratner, & Onslow, 2000), there is a notable amount of evidence to suggest that less stable language skills may be seen in individuals who stutter (Byrd & Cooper, 1989; Anderson & Conture, 2000; Silverman & Bernstein Ratner, 2002; Anderson, Pellowski, & Conture, 2005; Coulter et al., 2009). In a review of over twenty studies, Ntourou, Conture, and Lipsey (2011) showed that children who stutter differ significantly from typically-developing children on several different language measures. Across these studies, children who stutter were found to perform significantly lower on measures including general language test batteries, receptive and expressive vocabulary, and mean length of utterance in morphemes (MLU) and in words (MLUw) seen in spontaneous speech, relative to age-matched peers. Other evidence suggests differences between the language skills of children who stutter when they are categorized as either persistent or recovered (Ambrose, Yairi, Loucks, Seery, & Throneburg, 2015; Leech, Ratner, Brown, & Weber, 2017). Together, these findings suggest that the language skills of children who stutter may, on average, be noticeably weaker relative to the language skills of typically-developing peers and children who have recovered from stuttering. This suggests a relationship between an individual's language proficiency and relative degree of fluency.

Linguistic complexity, usually defined by syntactic complexity, has also been shown to affect the fluency of individuals who stutter, particularly children (Bernstein Ratner & Sih, 1987; Brundage & Bernstein Ratner, 1988; Gaines, Runyan, & Meyers,

1991; Weiss & Zebrowski, 1992; Logan & Conture, 1995; Silverman & Ratner, 1997; Yaruss, 1999; Buhr & Zebrowski, 2009; Watson, Byrd, & Carlo, 2011; Wagovich & Hall, 2017). Across these studies, utterances that contained later-acquired grammatical structures displayed more disfluencies than language structures acquired earlier in development (i.e., more morphologically and/or syntactically complex structures). As an example, Bernstein Ratner & Sih (1987) found a significant relationship between the occurrence of disfluencies and the production of more grammatically advanced constructions (e.g., right and center embedded relative clauses) in children who stutter as well as in typically fluent peers.

Furthermore, research suggests that more disfluencies tend to occur on function words than on content words in both children who stutter and fluent peers (Bloodstein & Gantwerk, 1967; Bloodstein & Grossman, 1981; Bernstein, 1981; Buhr & Zebrowski, 2009; Richels, Buhr, Conture, & Ntourou, 2010). This does not seem to be related to function words themselves, but it is argued that this phenomenon could be related to issues with planning more recently- acquired and more complex grammatical structures, since function words usually initiate sentence constituents (Richels et al., 2010). Evidence supporting a relationship between fluency and linguistic task complexity in children who stutter is compelling and suggests that, as children are taxed beyond their current language capacities, they may be more likely to produce utterances with notable disfluency; however, further investigation is warranted.

Fluency and Aspects of Language: Other Populations

As noted, studies examining other populations, such as typically-developing children (Gordon, Luper, & Peterson, 1986; Bernstein Ratner & Sih, 1987; Gordon & Luper, 1989; Yaruss, Newman, & Flora, 1999; Rispoli & Hadley, 2001; Rispoli, Hadley, & Holt, 2008; Buhr & Zebrowski, 2009), children with specific language impairment (SLI; Nettelbladt & Hansson, 1999; Boscolo, Ratner, & Rescorla, 2002; Guo, Tomblin, & Samelson, 2008; Finneran, Leonard, & Miller, 2009) and late talkers (Bernstein Ratner, 2013) have demonstrated that the connections between language and fluency are not uniquely found in stuttering. Like children who stutter, typically-developing children have been shown to have increased disfluency surrounding more recently acquired and more complex grammatical structures (Pearl & Bernthal, 1980; Colburn & Mysak, 1982; Rispoli & Hadley, 2001). As an example, Pearl and Bernthal (1980) found a significant relationship between the occurrence of disfluencies and the production of passive sentences in typically fluent children between the ages of 3 and 4;5.

Boscolo et al. (2002) found that children with SLI produced a significantly higher incidence of disfluencies, including stuttering-like disfluencies (SLDs), when compared with typically-developing children. Similarly, children classified as late talkers have been found to produce utterances with more disfluencies than their typically-developing peers, with late talkers who produced longer utterances being particularly disfluent (Bernstein Ratner, 2013). In these studies, the researchers reasoned that the higher numbers of breakdowns in fluency (as seen in the children with SLI and late talkers) may be due to their less proficient language skills,

especially when presented with linguistic demands that surpassed the abilities of their weaker language systems. This evidence, in conjunction with evidence from the stuttering literature, emphasizes the link between fluency and linguistic factors that are inherent to the individual as well as those that are dependent on the linguistic demands of a given speaking task.

The Influences of Bilingualism

Despite the substantial body of literature surrounding these connections in different monolingual populations, the relationships among fluency, language proficiency, and linguistic demand has not been extensively explored in bilingual individuals. Investigating these questions in bilinguals, rather than monolinguals, is valuable for better understanding possible relationships for a number of reasons. Although bilingual children reach the same developmental milestones as do their monolingual peers (Paradis & Genesee, 1996; Petitto, Katerelos, Levy, Gauna, Tétreault, & Ferraro, 2001), the rate and overall process of learning two languages is in many ways incomparable to the process of learning a single language. The acquisition of two distinct phonological, semantic, morphologic, syntactic, and pragmatic systems is a complicated process, with room for individual variation based on a number of factors (e.g., age of exposure, amount of exposure, type of exposure, etc.) (Hammer & Rodriguez, 2004; Hoff, 2003; Hoff & Core, 2013). In light of this, bilinguals present particularly interesting cases for examining links between language and fluency. Studying disfluency in bilingual individuals allows for a direct comparison of fluency in two different languages within the same individual.

Consequently, more insight can be gained concerning how linguistic abilities and task demand interact and affect fluency across languages.

Language proficiency, linguistic complexity, and their effects on fluency have been explored in bilingual children; however, few studies have investigated all of these components within the same investigation. Additionally, most of the literature on fluency and bilingualism has focused on disfluency in children and adults *who stutter* across several different languages (Jayaram, 1983; Bernstein Ratner & Benitez, 1985; Carias & Ingram, 2006; Lim, Lincoln, Chan, & Onslow, 2008; Schäfer & Robb, 2012), with few studies investigating disfluencies in typically fluent bilinguals (Byrd, Bedore, & Ramos, 2015). Additionally, studies examining language proficiency and fluency in bilinguals often focus on their relative language proficiency in the two languages, which can also be thought of as language dominance (Bedore, Peña, Summers, Boerger, Resendiz, Greene, Bohman, & Gillam, 2012). With the potential for unequal exposure to each language, bilingual individuals may perform differently than their monolingual peers and differently in each language (Pearson, Fernandez, Lewedeg, & Oller, 1997; Thordardottir, Rothenberg, Rivard, & Naves, 2006; Thordardottir, 2011). Additionally, input in each of a bilingual's languages is, at best, half of that of a monolingual, since it is divided across two signals. Evidence regarding the relationship between relative language proficiency and disfluency in bilinguals is largely contradictory. For example. bilingual adults who stutter have been found to have more disfluencies in their less dominant language (Jankelowitz & Bortz, 1996; Lim et al., 2008; Ardila et al., 2011). Conversely, more disfluencies have been found in the more dominant language of

both bilingual adults who stutter (Jayaram, 1983) and bilingual children who had been identified with fluency concerns (Carias & Ingram, 2006). More research is needed to fully understand the discrepancy in the literature, as this conflicting evidence may be due to other factors, including how proficiency is measured and biases in participants' self-reported amounts of language input.

Differences between a bilingual's degree of disfluency in her two languages may also be in part affected by each language's inherent characteristics and "complexity" (Bedore, Fiestas, Pena, & Nagy, 2006; Ardila, Ramos, & Barrocas, 2011; Byrd et al., 2015). Byrd et al. (2015) looked at the type and incidence of disfluencies in Spanish-English bilingual children. Although the children in this study were typically developing, their rates of disfluency met criteria for a diagnosis of stuttering when compared to normative data for English monolingual peers (Byrd et al., 2015). The relationship between linguistic demand and fluency was not explicitly investigated. However, the researchers noted a higher occurrence of disfluencies when the children spoke Spanish. This effect was seen irrespective of language dominance.

Byrd et al. (2015) offered the explanation that Spanish, relative to English, requires the speaker to consider more syntactic elements when forming certain grammatical constructions (Byrd et al., 2015). As an example, Spanish requires that certain parts of speech (e.g., adjectives, articles) match the nouns they modify in terms of gender, number, and--when appropriate--definiteness. This lies in contrast to English, which only requires that the parts of speech agree in terms of number and/or definiteness. This is not to say that one language is easier or more difficult to learn

(i.e., the concept of learnability). Rather, the increased syntactic complexity is due to the higher number of elements that must be reviewed and coordinated and may differ between the speaker's two languages. Studies of both monolingual and bilingual Spanish-speaking children support the hypothesis that the increased syntactic complexity of certain constructions in Spanish (as contrasted with English) may contribute to increased disfluency in Spanish in comparison to English in Spanish-English bilinguals (Bedore et al., 2006; Watson et al., 2011).

Within bilinguals, the influence of one language's linguistic demands on the other has been well-researched, especially in terms of syntactic complexity (Bland-Stewart & Fitzgerald, 2001; Müller & Hulk, 2001; Nicoladis, 2002, 2012). In a study by Bland-Stewart and Fitzgerald (2001), the level of mastery and order of acquisition of Brown's 14 morphemes in English was examined in Spanish-English bilingual children. Despite acknowledging certain limitations to their findings, the authors noted several interesting points in the data. Certain morphemes acquired earlier in monolingual English-speaking children (i.e., present progressive, the plural ending "-s", possessives) were some of the earliest mastered morphological endings in the bilingual participants; however, they were still mastered later in comparison to monolingual English speakers (Bland-Stewart & Fitzgerald, 2001). The children's comparatively later acquisition of these morphemes could be attributed to a number of factors; one of these was that the children may not have been exposed to those morphemes as much as in a monolingual's input. An alternate explanation, as the authors postulated, is that this effect may in part have been due to more complex and

restrictive rules in Spanish dictating the formation of these syntactic constructions (e.g., pluralization is reflected in both the noun and the article in Spanish).

Difficulties with consistent and correct productions of later acquired morphemes seemed to further highlight the effects of two language systems interacting. The children's irregular and imprecise use of morphemes such as the prepositions "in" and "on", the regular past tense ending "-ed", and contractible copula and auxiliary were thought to be due to grammatical and phonological differences between English and Spanish. As an example, the authors reasoned that the children's difficulty with the use of contractible copula and auxiliary may have been because the rules for expressing states of being in Spanish are more restrictive and nuanced than they are in English (Bland-Stewart & Fitzgerald, 2001). Differences between a bilingual child's two languages and their interactions do not appear to have been investigated in conjunction with disfluency. However, exploring these possible relationships could help identify linguistic demands specific to the bilingual experience, how they interact, and whether or not they affect fluency.

Bilingualism: Possible Confounding Variables

Research concerning bilingual development in the United States has often focused on Spanish-English bilinguals (see Kohnert & Medina, 2009 and Hammer, Hoff, Uchikoshi, Gillanders, Castro, & Sandilos, 2014 for reviews of the literature). However, studying this specific group of bilinguals comes with certain limitations, as teasing apart the effects of bilingualism and other related factors can be difficult. In the United States, Spanish is considered to be a minority language, meaning that Spanish-English bilingual children may only be exposed to it at home. Indeed,

bilingual children have been shown to have unequal rates of proficiency between their home and community languages (Pearson, 2007; Gathercole & Thomas, 2009). Additionally, many Spanish-English bilinguals tend to have a lower socioeconomic status (SES) compared to their monolingual counterparts, and the negative effects of low SES on language development are well-documented (Hart & Risley, 1995; Hoff, 2003; Hoff & Core, 2013).

Bilingualism in the United States lies in stark contrast to bilingualism in other parts of the world. In parts of Canada, such as Montreal, French and English have a relatively equal sociocultural status, and the association between bilingualism and SES is not as robust (see Thordardottir, 2011). Because the effects of SES and majority/minority language are not as strongly connected to bilingualism in Montreal, further research on bilingualism using this particular population could allow for a clearer understanding of bilingualism as it relates to various aspects of language development.

Comparing Aspects of English and French

Although limited data exist, differences between average rates of disfluency in monolingual French and English-speaking typically-developing children have been found (Leclercq, Suaire, & Moyse, 2017). A rate of stuttering-like disfluencies that is less than 3% of syllables and a rate of total disfluencies that is less than 10% of syllables is considered typical in English-speaking monolingual preschool-aged children (Ambrose & Yairi, 1999; Tumanova, Conture, Lambert, & Walden, 2014). By contrast, French-speaking monolingual children at age 4 have been found to produce an average rate of 10% total disfluencies (Leclercq et al., 2017). This is

notable, as these rates would be considered atypical by English monolingual standards. Furthermore, because normative data for stuttering has almost entirely been based on English monolingual children, these rates, if seen during an evaluation, could lead to a misdiagnosis of stuttering.

Although this study appears to be the only study at this time that has reported differences between French and English, the notion that different languages may have different "permissible" or "acceptable" rates of disfluency is not novel (Eklund & Shriberg, 1998; Zhao & Jurafsky, 2005; Moniz, Mata, & Viana, 2007; Bedore et al., 2006; Ardila et al., 2011; Byrd et al., 2015). These disparities have often been attributed to various cross-linguistic differences, such as the degree of syntactic complexity of the language and sociolinguistic attitudes towards disfluency (Bedore et al., 2006; Byrd et al., 2015; Crible, Degand, & Gilquin, 2017). Thus, cross-linguistic differences between French and English must be taken into consideration when exploring the relationship between language proficiency, linguistic demands, and fluency in this population.

When comparing English and French, there are several differences regarding syntactic rules that govern certain parts of speech. For one, different parts of speech cause changes in word order, and the changes they cause do not translate well in the other language. As an example, SVO word order is predominantly used in both languages. However, changing the direct and indirect objects to pronouns changes the word order to SOV in French. Examples of permissible word order in French with direct and indirect objects follow, showing the stark differences between the direct translation of the French and the equivalent sentence in English:

(1) a. Élisabeth montre la robe à Rose.
     'Elizabeth shows the dress to Rose.'

    b. Élisabeth   lui   montre   la robe.
       Elizabeth   to:her   shows   the dress
       'Elizabeth shows the dress to her.'

    c. Élisabeth   la   lui   montre.
       Elizabeth   it   to:her   shows
       'Elizabeth shows it to her.'

Other notable dissimilarities in the rules governing parts of speech in French versus English include, but are not limited to, adjective and article agreement (i.e., French denotes gender in addition to number), certain adjective-noun constructions, possessor-possessed constructions, and negation (Clark, 1986; Salkoff, 1999; Prévost, 2009). Studies examining the effects of these grammatical differences have primarily investigated their patterns of acquisition in French bilingual children, with most participant groups consisting of typically-developing children and/or those with SLI (Paradis & Genesee, 1996; Paradis, Nicoladis, & Genesee, 2000; Müller & Hulk, 2001; Paradis, Crago, Genesee, Beachley, Brown, & Conlin, 2003; Nicoladis, 2012). As an example, Paradis et al. (2003) showed that the complex nature of object clitics in French is likely the source of grammatical difficulties for both typically-developing French-English bilinguals and those with SLI, as both groups demonstrated delays in comparison to monolingual French peers. Little research to date has examined parts of speech with regards to fluency in French-English bilingual children, and almost none have explicitly focused on parts of speech whose syntactic rules differ between their languages. Investigations of these parts of speech in relation to disfluency could

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offer further insight into the link between complex linguistic demands and fluency in bilingual populations.

Summary

When considering the literature, it is apparent that different aspects of language demand affect fluency in both typical and atypical populations. Although language proficiency, linguistic complexity, fluency, and the connections between them have been extensively explored in monolingual individuals (Pearl & Bernthal, 1980; Bernstein Ratner & Sih, 1987; Gordon & Luper, 1989; Yaruss et al., 1999, Boscolo, et al., 2002, Bernstein Ratner, 2013), comparatively less research has been conducted investigating this in bilingual individuals. Both relative language proficiency (Jayaram, 1983; Jankelowitz & Bortz, 1996; Carias & Ingram, 2006; Lim et al., 2008; Ardila et al., 2011) and the linguistic demands of a bilingual's two languages (Bedore et al., 2006; Watson et al., 2011; Byrd et al., 2015) appear to affect fluency. The majority of the studies that have examined these connections have done so using bilinguals who stutter. Investigating how these relationships manifest themselves in typically-developing bilinguals would help us gain further insight into language's multi-faceted role in fluency breakdowns within typical populations and could allow for greater understanding regarding the nature of fluency as it relates to language.

Furthermore, specifically looking at this relationship in French-English bilingual children offers unique benefits. Because French-English bilingualism in Montreal is not as affected by SES and the differences between majority/minority cultures as bilingualism elsewhere, such as Spanish-English bilingualism in the

United States, connections between different aspects of language and fluency could be more directly evaluated, as fewer extraneous variables would need to be controlled for.

Research Questions and Hypotheses

The purpose of this study was to examine the relationships among language proficiency, linguistic demands, and fluency in typically fluent French-English bilingual children. This was accomplished through the use of conversational and narrative audio samples of typically-developing bilingual children in Canada. Specifically, this study aimed to answer the following research questions:

1. Do rates of disfluency differ across French and English in the speech of typically-developing bilingual children?

2. Does language proficiency relate to an individual's rate of disfluency in both French and English?

3. Does an individual's profile of disfluency relate to increased syntactic complexity in both French and English?

4. Are breakdowns in fluency more likely to occur at or before different linguistic structures in one language versus the other?

The first research question aimed to further investigate what "typical" rates of disfluency look like for typically-developing children in different languages. As mentioned previously, little research has been done to establish normative data for fluency in French monolingual children (Leclercq et al., 2017), and almost no data seem to exist regarding disfluencies in bilingual children who speak French. Based on Leclercq and colleagues' work (2017), it seems that rates of disfluency in

monolingual French children do not match those for monolingual English children; however, we do not know how these rates may manifest themselves if the child speaks both French and English. If rates of disfluency differ between French and English, then we hypothesized that, similar to the findings by Leclercq and colleagues (2017), French would have a higher average rate of total disfluencies and a higher average rate of SLDs compared to English.

The second research question addressed the inconsistent findings regarding relative language proficiency and its tie to disfluency. Conflicting evidence exists regarding relative language proficiency and fluency in bilingual individuals who stutter (Jayaram, 1983; Jankelowitz & Bortz, 1996; Carias & Ingram, 2006; Lim et al., 2008; Ardila et al., 2011). Although Byrd and colleagues (2015) did not find that language dominance related to disfluency in typically-developing Spanish-English children, dominance was treated as a categorical variable and not examined quantitatively. It is possible that, when examined in more detail, relative language proficiency may relate to disfluency in typically-developing bilingual children. If relative language proficiency relates to disfluency in both French and English, then we hypothesized that higher rates of disfluency would be related to lower scores on measures of relative proficiency in both languages.

The third research question focused on disfluency and linguistic complexity in the form of syntactic complexity. Currently, little research on bilingual populations has discussed syntactic complexity in terms of its possible connection to disfluency (e.g., Byrd et al., 2015). However, ample past research on monolingual populations has shown that more disfluency often coincides with increased syntactic complexity

(Pearl & Bernthal, 1980; Bernstein Ratner & Sih, 1987; Rispoli & Hadley, 2001; Burh & Zebrowski, 2009). The evidence from several different monolingual populations makes it likely that the same could be seen in bilingual speakers, though a more focused look at this relationship in bilingual speakers is necessary. If rates of disfluency relate to increased syntactic complexity of spoken targets, then we hypothesized that higher rates of disfluency would be seen in utterances characterized as more complex in both languages.

The fourth and final research question was more exploratory in nature and aimed to explore the loci of disfluencies across different languages. As such, this research question was examined in two different ways. First, disfluency as it relates to content and function words was analyzed. Monolingual English children who do and do not stutter have been shown to be more disfluent on function words than on content words. This may be connected to the fact that function words are acquired later and, consequently, present as more challenging words at earlier stages of development. They also form the "building blocks" that introduce major sentence constituents, such as noun phrases, verb phrases, prepositional phrases, etc. Disproportionate rates of disfluency on function words has been seen in young, monolingual Spanish speakers who stutter (Au-Yeung, Gomez, & Howell, 2003), native German speakers who stutter (Dworzynski, Howell, Au-Yeung, & Rommel, 2004), and native Brazilian Portuguese speakers who do and do not stutter (Juste, Sassi, & de Andrade, 2012) as well as in Spanish-English bilingual children who stutter (Gkalitsiou, Byrd, Bedore, & Taliancich-Klinger, 2017). Although this profile does not appear to have been examined specifically in typically-developing fluent

French-English bilingual children, we may expect similar results. If later acquired and more complex parts of speech relate to disfluency, then higher rates of disfluency will be observed at function words in both French and English.

Second, in order to investigate this research question in even greater detail, rates of disfluency were observed at specific parts of speech in both languages. Because the rules that govern parts of speech can differ in complexity between the two languages (e.g., rules for article use in French are arguably more complex than in English), we may expect different linguistic structures to have higher mean instances of disfluency in French versus English and vice versa.

Method
Participants

This study was completed in coordination with the Montreal Fluency Centre in Quebec, Canada and used a protocol that incorporated elements used in previous studies on bilingualism and fluency (Lim et al., 2008; Byrd et al. 2015). French-English bilingual children (4;3 – 7;11) were recruited from nurseries, kindergarten classes, and daycares in Montreal, Quebec and Quebec City, Quebec. All participants were considered to be typically-developing with no history or diagnosis of stuttering. In order to be classified as a French-English bilingual for the purposes of this study, the children had to be exposed to their second language at least 20% of the time on a daily basis. Prior to testing, parents completed a case history form and two parent questionnaires regarding each child's language exposure and intelligibility. This information, along with information from the case history form, was used to determine each child's language dominance. A collaborative agreement was signed between the Montreal Research Team and the University of Maryland to transfer data

for transcription and thesis use. A cohort of approximately 30 children was anticipated for use in this thesis. Due to recruitment issues in Canada, the availability of data was significantly reduced from originally planned, and 9 participants (5 female, 4 male) were used for the purposes of this study. Of the 9 participants, 7 were classified as English dominant, 1 was classified as French dominant, and 1 was classified as a balanced bilingual.

Materials and Procedures

Data collection was completed in the Quebec area under the direction of Dr. Rosalee Shenker. Sessions were conducted at the Montreal Fluency Centre and at participants' homes. Testing for each child occurred over the course of two sessions (i.e., one for testing in English and one for testing in French). No more than one week separated each participant's two test sessions. Testing was counterbalanced so that approximately half of the children underwent testing in English first and approximately half of the children underwent testing in French first. Speech samples of structured conversation and narration in both languages were audio recorded using a Zoom H4nPro Digital Recorder.

Receptive and expressive vocabulary skills were assessed in both languages. The Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 2007) and the Expressive One Word Picture Vocabulary Test (EOWPVT-4; Martin & Brownell, 2011) were used to assess receptive and expressive vocabulary skills in English. Receptive and expressive vocabulary skills in French were tested using the French equivalents of both tests, the Échelle de vocabulaire en images Peabody (EVIP; Dunn et al., 1993) and the French adaptation of the Expressive One Word Picture

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Vocabulary Test (Groupe coopératif en orthophonie – Région Laval, Laurentides, Lanaudière, 1995). Though standardized language tests were administered to the participants, the complete data set was not available and thus the results were not used for the purposes of this study.

Samples of structured conversations centered on searching for and talking about familiar and unfamiliar objects hidden in a sensory table. Familiar objects included toy animals and vehicles. With familiar objects, the experimenter prompted the child to explain which one was their favorite and why. Children were also prompted to either recall a real-life experience with the objects or to create a story about the objects. Unfamiliar objects predominantly consisted of unusual kitchen tools (e.g., an egg poacher). If the child found one of the unfamiliar objects, the experimenter prompted the child to explain what they thought the object was and what they thought a person could do with it. Narrative samples were gathered through the use of two wordless books: *Frog, Where Are You?* (Mayer, 1969) and *Frog Goes to Dinner* (Mayer, 1974). First, the experimenter conducting the test sessions modeled a story using one of the wordless books. Then, children were prompted to retell the story in their own words.

For each participant, a structured conversational sample and a narrative sample were collected in both languages, resulting in a total of four speech samples for every participant. Prior to being shared with the author, all audio files and standardized test scores were de-identified. The only other information shared with the author included the participants' identification number, date of birth, gender,

language dominance classification as calculated from the parent questionnaires, and language test scores.

Transcription Protocol

All audio files were transcribed using the Computerised Language Analysis (CLAN; https://childes.talkbank.org/) program and Codes for the Human Analysis of transcripts (CHAT) transcription codes. Disfluencies were coded based on the type and number of iterations in the sample. Both stuttering-like disfluencies (SLDs)— which include part-word repetitions, audible prolongations, blocks, and monosyllabic word repetitions—as well as typical disfluencies—which include filled pauses, silent pauses (i.e., hesitations), multisyllabic word repetitions, phrase repetitions, and revisions—were coded. Grammatical errors and instances of code-switching were also coded via CHAT coding conventions.

Transcription was completed collaboratively with the Montreal research team. Student members of Dr. Shenker's research team transcribed the French audio files, while the author of this paper transcribed the English audio files. To ensure that CHAT coding and formatting conventions were as consistent as possible across transcribers, the author of this paper reviewed all transcripts. Minor inconsistencies were found throughout samples, and coding was adjusted to align with formatting as outlined in the current CHAT manual (https://childes.talkbank.org/) Inconsistencies in the use of disfluency codes were discussed with Dr. Shenker, and modifications were made across all transcripts to reflect the agreed-upon conventions.

Each child's narrative and conversation samples were combined into a single transcript for each language. Although pragmatically appropriate, some of the

children demonstrated a tendency to use one-word utterances during the conversation sample (e.g., "yes", "no", "turtle"). Thus, combining the two samples allowed for a more representative example of the children's language abilities to be examined.

Reliability

A reliability check was completed by a member of the Montreal research team who was not directly involved in the transcription process. Reliability was completed by listening to and tallying instances of disfluency in 10% of the transcripts (i.e., one French and one English transcript). Counts on audible prolongations, part-word repetitions (PWR), whole-word repetitions (WWR), phrase repetitions, and revisions (at the word and phrase level) were compared to the originally transcribed disfluencies using Spearman's rank-order correlation. Results of Spearman's correlation indicated good agreement between the original transcribers and the rater, $r_s = 0.8$. The first coder's fluency annotations were used for all analyses.

Analysis
CLAN Programs

Transcripts were processed using four of CLAN's programs. Disfluencies were analyzed using the FLUCALC program. FLUCALC uses a formula based on the one outlined by Ambrose and Yairi (1999) and reports values that are word-based for French (English samples also permit a syllable-based option; only word-based computations can currently compare French and English). Measures commonly used for language sample analysis (e.g., MLU, MLUw, DSS, etc.) were computed using the KIDEVAL program. EVAL, a program similar to KIDEVAL that can be used for both adult and child samples, was used to identify other linguistic elements such as parts of speech seen in samples. Finally, the program KWAL, which can be used to

identify utterances that contain codes or words that are specified by the user, was

used to tabulate utterances that were post-coded as grammatical or ungrammatical.

These programs and their output are described in greater detail in following sections.

Rates of Disfluency

Using FLUCALC, values for percent SLDs, percent typical disfluencies,

percent total disfluencies, and weighted SLD values within each transcript were

calculated. As outlined by Yairi and Ambrose (1999), weighted SLD values quantify

the severity of observed SLDs by placing greater numeric value on SLDs that are

rarely seen in typically fluent children and by considering the average number of

repetitions for PWRs and WWRs. Percent SLDs, percent typical disfluencies, percent

total disfluencies, and weighted SLD values were compared in French and English

through the use of paired t-tests.

Language Proficiency and Disfluency

In this study, relative language proficiency was defined as the extent to which

an individual was more or less skilled in one language versus the other. Percent

grammatical utterances (PGU) was our operational definition of this construct, and

was computed for both the French and English transcripts in order to measure relative

grammatical accuracy in each language. Only a subset of the utterances within each

sample was eligible to be used for calculating PGU. As outlined by Eisenberg and

Guo (2016), grammatical utterances were those that were error-free and included a

subject and a verb. Ungrammatical utterances were those that contained grammatical

errors (e.g., verb form errors, argument errors, pronoun errors, etc.) or were fragments

used where an utterance with a subject and a verb was pragmatically required (e.g.,

"Why is he laughing?" "The restaurant."). Utterances with omitted subjects and fragments were excluded from the PGU count when they were pragmatically appropriate within the context of the transcript (e.g., "What do you have?" "A boat."). Disfluent utterances with no grammatical errors were operationally defined as grammatical, and utterances that contained unintelligible words or code-switching were excluded for the PGU count. Additionally, though not explicitly addressed by Eisenberg and Guo, utterances including errors that were self-corrected (i.e., in the case of a word or phrase revision) were counted as grammatical utterances.

Within each CHAT transcript, utterances that met the aforementioned criteria were given a postcode to denote whether they were grammatical or ungrammatical. Then, using the KWAL program in CLAN, utterances that contained these postcodes were identified and counted. PGU was then calculated by dividing the number of grammatical utterances from the total number of PGU utterances. Comparisons of PGU values and percent total disfluency in each language were completed using Pearson's correlations.

Furthermore, in order to better conceptualize each child's skill in one language compared to the other, relative proficiency values were generated for each participant. Relative proficiency values were derived by subtracting each child's PGU value in French from their PGU value in English. This resulted in a value that quantified the degree to which a child's sample appeared more or less proficient in one language than the other. Positive values were interpreted as reflecting higher proficiency in English, while negative values were interpreted as reflecting higher proficiency in French. Relative proficiency values were then compared to the percent

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total disfluency using Pearson's correlations. Separate correlations were run for percent total disfluency in each of the two languages.

Linguistic Complexity and Disfluency

For the purposes of this study, linguistic complexity was investigated in several different ways. First, linguistic complexity was defined as mean length of utterance in words (MLUw). MLUw was calculated using the KIDEVAL program in CLAN. MLU in words was used, rather than morphemes, to make developmental complexity in French and English more comparable, as is often done when examining grammatical development in languages more highly inflected than English (Gutiérrez-Clellen, Restrepo, Bedore, Peña, & Anderson, 2000; Parker & Brorson, 2005). In order to better compare MLUw values across ages, MLUw values in both languages were converted to z-scores. Normative data for MLUw in English were derived from a study of 3 to 9 year-old typically-developing monolingual English children (Rice, Smolik, Perpich, Thompson, Rytting, & Blossom, 2010). Determining normative data for MLUw in French that fit the ages of the children included in the present study was more challenging. Comparative data were taken from a study of 2 to 6 year old typically-developing monolingual Quebec French children by Thordardottir (2016). Because the children in the present study extended past the oldest age used by Thordardottir (2016), children 6 years and older were combined into a category labeled "6/+ years old". The z-scores for these children's French MLUw values were then computed using the mean and standard deviation reported for 6 year olds in Thordardottir's study (2016). Through the use of Pearson's correlation, MLUw values and percent total disfluency were compared in each

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language for 8 participants. One participant was excluded from MLUw correlations, as her French sample was too short for MLUw to properly be calculated.

Second, linguistic complexity was defined as differences in the complexity of the rules that govern shared parts of speech across the two languages. This was accomplished by identifying the loci of disfluency at different parts of speech. In order to investigate the loci of disfluency in French and English, PWRs, WWRs, prolongations, silent pauses, and filled pauses were examined (Bernstein, 1981; Richels et al., 2010). Though they infrequently appeared throughout the samples, broken words were also included. Both silent pauses and filled pauses were attributed to the part of speech immediately following (Bernstein, 1981). Although multiple disfluencies occasionally occurred in conjunction with a single part of speech, the part of speech was only marked as disfluent once. Disfluencies that occurred at the phrase-level (i.e., phrase repetitions and phrase revisions) and word revisions were excluded from this count, as connecting these disfluencies to a single part of speech proved to be difficult.

Additionally, the French words "au" (a combination of the preposition "a" and the article "le") and "du" (i.e., a combination of the preposition "de" and the article "le") were excluded from this analysis. This was because, unlike other contractions in French and contractions in English, the beginning and ends of the two composite words could not be separated. Consequently, disfluencies that occurred before or within these words could not be transparently attributed to one word (and, subsequently, one part of speech) versus the other. By contrast, "parce que" in French was coded such that it counted as one part of speech, as the two word construction is

considered a single unit that serves as a conjunction. As such, repetitions of "parce que" were considered to be WWRs for this analysis.

Transcripts were analyzed line-by-line to locate each disfluency and the part of speech it occurred within or before. In all of the English transcripts, disfluencies were attributed to one of nine parts of speech: nouns, verbs, pronouns, adjectives, adverbs, conjunctions, auxiliary verbs, prepositions, and determiners (e.g., numbers, articles, etc.). EVAL was then used to generate the total number of each part of speech for every sample. Together, these part of speech disfluency counts and total counts were used to calculate the percent of disfluent words for all nine identified parts of speech. Then, for each part of speech, percent disfluent words was averaged across all participants. In order to compare which parts of speech were the most and least disfluent across samples, parts of speech in English were ranked from 1 to 9, with 1 being the most disfluent part of speech and 9 being the least disfluent. This process was repeated for all of the French transcripts using the same nine parts of speech. A Spearman's rank order correlation was used to compare average percent disfluent words for each part of speech across the two languages.

A historically active question is comparing the so-called "shift" from predominance of stuttering on or before function words in children to more typical profiles of dysfluency impacting content words in the speech of adults who stutter. As such, the third and final investigation of linguistic complexity was concerned with the developmental complexity of different word classes. To compare disfluency at content versus function words, disfluency counts for each of the nine parts of speech were grouped using the definitions for content and function words as outlined by Au-

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Yeung and colleagues (1998). Using EVAL, the total number of content and function words within each transcript was tabulated. Then, for each language, the proportion of content words within the sample, the proportion of function words within the sample, the proportion of disfluent content words, and the proportion of disfluent function words were averaged across participants and compared using a chi-square statistic.

Results
Disfluency Rates in Different Languages

Descriptive statistics for percent SLDs, percent typical disfluency (written as TD), percent total disfluencies, and weighted SLD values in French and English are included below in Table 1. In both languages, mean rates of SLDs fell below 3%, with similar average rates in both English and French. Similarly, average weighted SLD values were under 4% in the two languages. Within subjects, percent typical disfluencies fell below 10% in English and French, although some participants demonstrated typical disfluency rates well above 10% in both languages. When percent SLDs and percent typical disfluencies were combined, average percent total disfluencies in both French and English were at or above 10%.

Results of the paired t-tests revealed no significant differences regarding percent SLDs in English ($M = 2.42$) and in French ($M = 2.84$), $t(8) = -0.82$, $p = 0.44$ (see Figure 1); percent typical disfluency in English ($M = 8.96$) and in French ($M = 7.84$), $t(8) = 0.79$, $p = 0.45$ (see Figure 2); percent total disfluency in English ($M = 11.38$) and in French ($M = 10.68$), $t(8) = 0.38$, $p = 0.71$ (see Figure 3); and weighted SLD values in English ($M = 3.12$) and in French ($M = 3.89$), $t(8) = -1.17$, $p = 0.28$ (see Figure 4). Although it was noted that one participant demonstrated far higher

rates disfluency in English relative to the other participants, with percent typical

disfluencies at 20% and a percent total disfluency nearing 26%, all 9 participants

were included for all of the paired t-tests.

Table 1: Descriptive Statistics for
Disfluency Rates in English

	M	SD	Minimum	Maximum
% SLDs	2.42	1.57	0.88	5.58
% TDs	8.96	4.68	4.57	20.05
% Total Disfluencies	11.38	6.12	6.43	25.64
Weighted SLD Values	3.12	2.12	1.1	7.61

Table 2: Descriptive Statistics for
Disfluency Rates in French

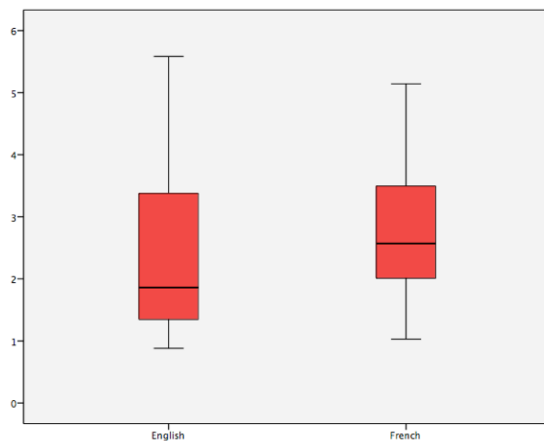|	M	SD	Minimum	Maximum
% SLDs	2.84	1.27	1.03	5.14
% TDs	7.84	3.86	2.83	14.18
% Total Disfluencies	10.68	5.05	3.86	19.33
Weighted SLD Values	3.89	1.57	1.29	6.38

Figure 1: Percent SLDs by Language

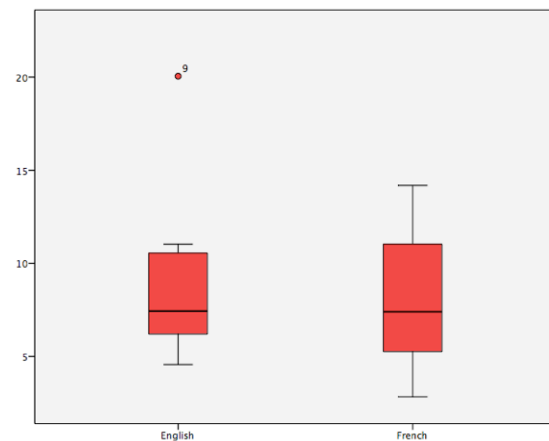Figure 2: Percent Typical Disfluencies by Language
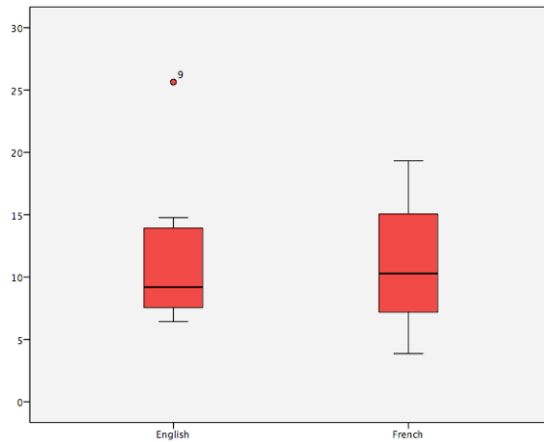

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Figure 3: Percent Total Disfluencies
by Language

Figure 4: Weighted SLD Values by
Language
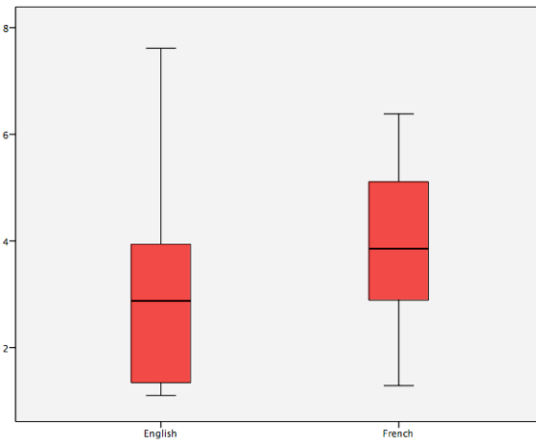
Disfluency and Language Proficiency

Pearson's correlations were computed between PGU and percent total disfluency and PGU proficiency values and percent total disfluency in each language. A strong negative correlation was observed between PGU and percent total disfluency in French, $r = -0.75$, $p = 0.03$ (see Figure 5). One participant, QC005, was excluded from the correlation PGU in English, as her rate for total disfluency alone appeared to be driving the results towards significance. After excluding this participant, a weak relationship was observed between PGU and total disfluency in English, $r = -0.27$, $p = 0.51$ (see Figure 6). When comparing the PGU proficiency values to percent total disfluency, a weak positive relationship was seen in French, $r = 0.41$, $p = 0.27$ (see Figure 7). However, a much weaker positive relationship was seen when the two were compared in English, $r = 0.11$, $p = 0.8$ (see Figure 8).

Figure 5: Percent Total Disfluencies and PGU in English

% Total Disfluency - English vs. PGU - English
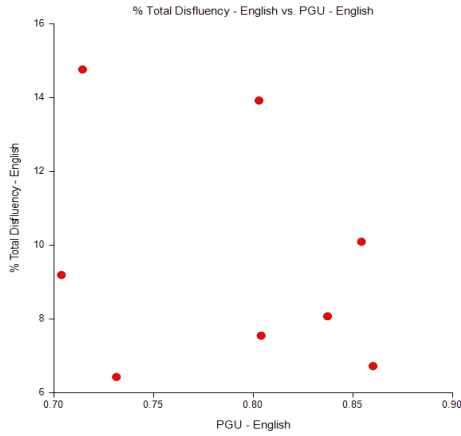
Figure 6: Percent Total Disfluencies and PGU in French

% Total Disfluency - French vs. PGU - French

Figure 7: PGU Proficiency Values and Percent Total Disfluencies in English

% Total Disfluency - English vs. PGU Proficiency Value
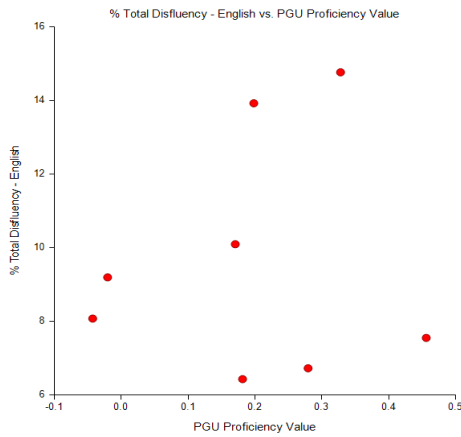
Figure 8: PGU Proficiency Values and Percent Total Disfluencies in French

% Total Disfluency - French vs. PGU Proficiency Value
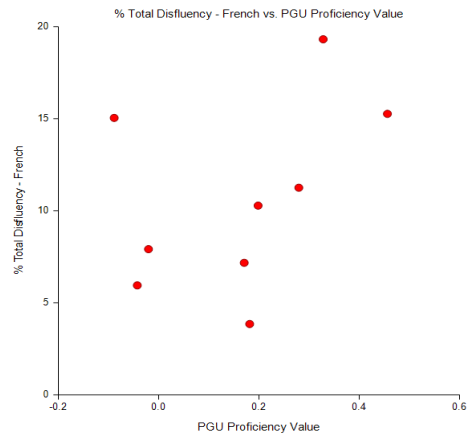
Disfluency and Linguistic Complexity

Pearson's correlations were computed between MLUw and percent total disfluency. In French, results of the Pearson correlation suggested no relationship between MLUw and percent total disfluency, $r = -0.021$, $p = 0.96$ (see Figure 9). As

previously mentioned, one participant (QC005) demonstrated notably higher disfluency in English. Thus, she was excluded from the MLUw analysis in English. After excluding this participant, results indicated a weak relationship between MLUw and percent total disfluency, $r = -0.23$, $p = 0.62$ (see Figure 10).

Figure 9: Percent Total Disfluencies and MLUw in English
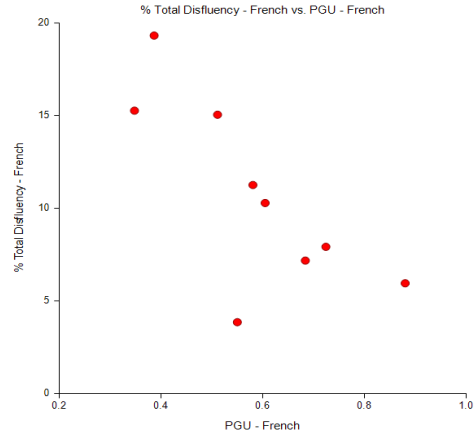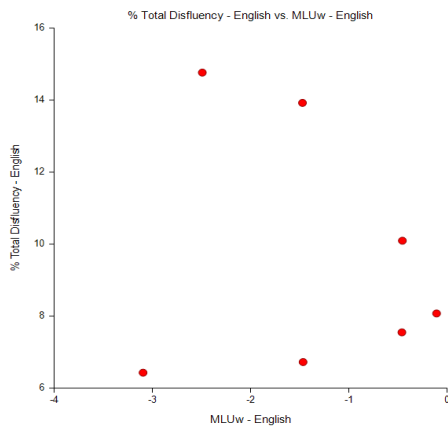
Figure 10: Percent Total Disfluencies and MLUw in French

% Total Disfluency - English vs. MLUw - English

% Total Disfluency - French vs. MLUw - French
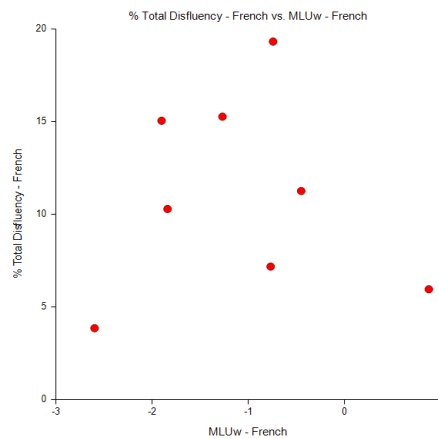
In order to further investigate the relationship between MLUw and disfluency, *post-hoc* analyses were conducted. Following the protocol outlined by Gaines, Runyan, and Meyers (1991), each transcript was divided into fluent and disfluent utterances. Separate MLUw values were then calculated across each transcript's fluent and disfluent utterances. Paired t-tests were run to compare MLUw values across fluent and disfluent utterances for each language. In English, fluent utterances ($M = 3.22$) had, on average, significantly lower MLUw values (that is, they were shorter and simpler) than disfluent utterances ($M = 5.88$), $t(8) = -7.91$, $p < 0.01$ (see Figure 11). Similar results were seen in French, with MLUw values across fluent

utterances ($M = 3.22$) significantly lower than MLUw values across disfluent

utterances ($M = 5.26$), $t(8) = -4.85$, $p < 0.01$ (see Figure 12).

Figure 11: MLUw for Fluent and
Disfluent Utterances in English
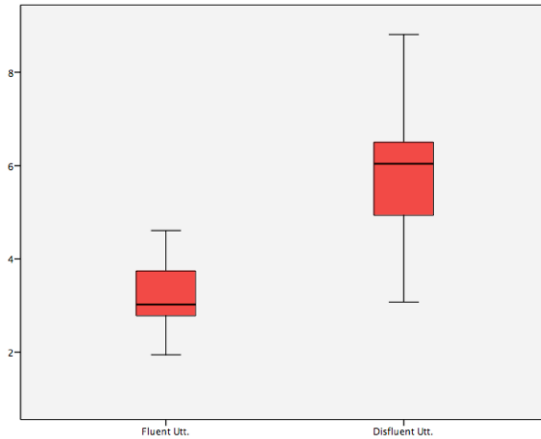
Figure 12: MLUw for Fluent and
Disfluent Utterances in French
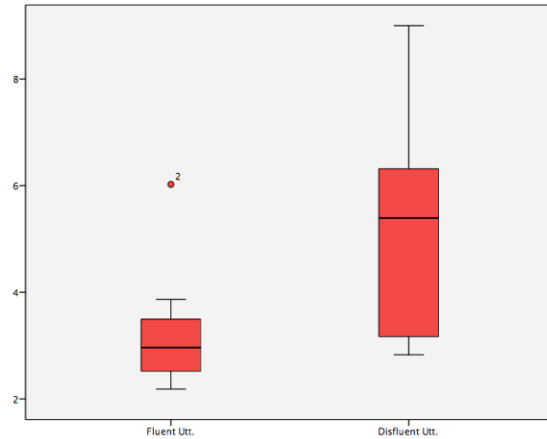
Although ranked in slightly different orders, conjunctions, determiners, and

prepositions were all ranked as the three most disfluent parts of speech in both French

and English. Any differences between the two languages emerged with the parts of

speech that were ranked to be less disfluent. For example, adverbs were the least

disfluent part of speech across all samples in English. By contrast, no auxiliary verbs

were marked as being disfluent in French. A Spearman's rank-order correlation

showed a significant result, with disfluent parts of speech in French and in English

relating strongly, $r_s = 0.77$, $p < 0.05$. Results from the chi-square statistic comparing

the proportions of disfluent content and function words to the proportion of total

content and function words within samples revealed significant results in both French,

χ^2 (1, $N = 9$) = 6.49, $p = 0.01$, and English, χ^2 (1, $N = 9$) = 4.08, $p = 0.04$. In order to better understand whether the relationship between disfluency and word class was seen at the level of individual parts of speech, *post-hoc* analyses were conducted using the three most disfluent parts of speech in both languages. The proportion of conjunctions in the sample, the proportion of prepositions in the sample, the proportion of determiners in the sample, the proportion of disfluent conjunctions, the proportion of disfluent prepositions, and the proportion of disfluent determiners were averaged across participants and compared using chi-square statistics for each language. Non-significant relationships were found in French, χ^2 (2, $N = 9$) = 2.74, $p = 0.25$, as well as in English, χ^2 (2, $N = 9$) = 1.08, $p = 0.58$.

Table 3: Parts of Speech Ranked From Most to Least Disfluent

POS	Average Disfluent POS - English	Rank - English	Average Disfluent POS - French	Rank - French
noun	5.84%	8	2.44%	8
pronoun	9.25%	4	10.44%	6
verb	7.34%	5	11.34%	4
adjective	6.72%	7	10.54%	5
adverb	4.80%	9	4.96%	7
conjunction	27.60%	1	12.01%	3
preposition	10.66%	3	12.01%	2
aux verb	6.74%	6	0.00%	9
determiner	17.66%	2	23.55%	1

Discussion

A small pilot study such as this can not offer absolute clarification regarding the relationship between aspects of language and fluency in bilingual individuals, and

this study is not without its limits. However, the present findings do offer possible insight into the complex nature of these issues, using a population that, within this context, has not been extensively studied. Contrary to what was hypothesized, bilingual participants were not significantly more disfluent in one language versus the other. Average rates across disfluency categories and average weighted SLDs were similar between the two groups, with mean percent SLDs below 3% and mean percent total disfluency rates between 10.5 and 12% in both languages. This finding is interesting, as it lies in contrast to Byrd and colleagues' (2015) report that typically-developing bilingual children were significantly more disfluent in one language versus the other.

These findings also do not align with the literature on bilingual individuals who stutter, as the majority of studies have found differences between disfluency rates in bilinguals' dominant and non-dominant languages (Jayaram, 1983; Jankelowitz & Bortz, 1996; Carias & Ingram, 2006; Lim et al., 2008; Ardila et al., 2011). If we are to assume that different languages have different "inherent" rates of disfluency, then the present findings could suggest otherwise. Alternatively, the present study's findings could also be interpreted as evidence for cross-linguistic influences on fluency within bilinguals. This seems more likely considering the other results of this study, although it is unclear exactly why disfluency rates in both languages more closely resembled those of typically-developing French monolinguals.

This is not to say that language proficiency does not have a notable role in contributing to fluency. Rather, the results of this study suggest that an individual's

fluency and relative language proficiency may be related. Robust results were seen when PGU values were compared to the total disfluency rates in French, especially when considering the sample size of the present study. The difference between the strength of this relationship in French versus English is striking, and several explanations are possible. For one, most of the children in this study were initially classified as being English-dominant. Because the relationship between PGU and percent total disfluency was strongest in French, it is possible that the relationship between relative proficiency and disfluency is most robust when looking at the less proficient language. Increased disfluency in a bilingual's less dominant language has been shown in bilinguals who stutter (Jankelowitz & Bortz, 1996; Lim et al., 2008; Ardila et al., 2011), and the same could be true for typically-developing bilingual children. Relative proficiency and disfluency's moderate relationship in French and weak relationship in English could also be explained by this observation, though more research is needed to better understand this finding.

The connection between relative language proficiency and disfluency is further strengthened by analyzing the outlier in this data set. As previously stated, one participant notably differed from the other participants in percent typical disfluency and percent total disfluency in English so much so that she was excluded from both relative proficiency analyses in English. Interestingly, this participant was the only child to be categorized as French-dominant. As such, her marked disfluency in English could be explained by her status as a less proficient speaker of English. Future research investigating the extent to which age, relative language proficiency,

and interactions between the two influence fluency in bilingual children is warranted for both academic purposes and clinical applications.

Despite this, the results of this study cannot fully describe proficiency's effects on fluency in bilingual populations. Though not directly addressed in this study, comparing relative language proficiency and absolute language proficiency, or overall language skill, as well as their contributions to disfluency in bilinguals would provide more information regarding language proficiency's connection to fluency. This kind of investigation would require a larger sample as well as more in-depth language testing of multiple aspects of language knowledge, as PGU only quantifies language proficiency in one particular way. However, it would be a worthwhile investigation, as it would help clarify which operational definitions of language proficiency are better predictors of disfluency in bilinguals.

This study's findings also provide evidence for a relationship between linguistic complexity, in the form of developmental complexity, and disfluency. When looking utterance-by-utterance, MLUw related strongly with disfluency in both languages. That higher rates of disfluency were seen in conjunction with longer utterances is suggestive of a relationship between disfluency and syntactic complexity, as longer utterances tend to include later acquired grammatical structures (e.g., embedded clauses). This reflects the findings of other studies on MLU and disfluency in monolingual English children (Gaines et al.,1991). However, this relationship was not seen when MLUw was calculated across entire samples. This relationship is further supported by the findings of the content and function word analyses. As hypothesized, function words were significantly more disfluent than

content words when averaged across participants in both English and French. When parts of speech were ordered from most to least disfluent, surprising similarities were seen across French and English. In both languages, conjunction, prepositions, and determiners--all of which are classified as function words—were, on average, the three most disfluent parts of speech. These findings also provide further support for the connection between disfluency and function words across languages, as increased disfluency on function words relative to content words is in line with cross-linguistic literature on word class and disfluency (Au-Yeung et al., 2003; Dworzynski et al., 2004; Juste et al., 2012; Gkalitsiou et al., 2017).

In this study, linguistic complexity as it pertains to cross-linguistic differences in use of specific parts of speech did not relate to disfluency. The similarity between the most and least disfluent parts of speech in French and English may suggest that the higher rate of disfluencies on function words relative to content words could have little to do with the individual parts of speech themselves. Other factors, such as sentence position, could be responsible for disfluency on certain parts of speech as opposed to others (Bernstein, 1981; Buhr & Zebrowski, 2009; Richels et al., 2010). It could also be that investigating disfluency and linguistic complexity at the phrase-level is more informative than at the level of individual parts of speech. This would ascertain whether linguistic planning, rather than generation of individual linguistic units, plays a role in typical childhood disfluency. Doing so could also provide a more in-depth look at cross-linguistic effects on sentence production and their possible connections to disfluency in bilingual individuals.

This study is not without its limitations. In particular, the size of the sample presents possible issues when interpreting the results and when drawing conclusions about bilingualism and fluency on a larger scale. With a larger sample, results would be more representative and could potentially have greater value for use in clinical practice. Additionally, MLUw is not a perfect measure of developmental linguistic complexity. By virtue of being longer, utterances with higher MLUw values also provide more opportunities for speakers to be disfluent, although few disfluencies tend to appear in the last few words of utterances. Conducting our analyses with a larger sample size would help remediate this problem. This would allow for the use of partial correlations so that relationships between MLUw and disfluency could be seen while controlling for utterance length.

Conclusions

Despite ample research on the intersection between aspects of language and fluency across monolingual populations, relatively little research has been conducted with bilingual individuals. Even fewer studies have examined this in typically-developing bilinguals. This study aimed to investigate these possible connections, using a little-researched bilingual population. The results of the present study indicate connections among relative language proficiency, developmental language complexity, and disfluency within typically-developing French-English bilingual children. Nuanced differences in the complexity of linguistic structures and their effects on disfluency profiles across languages were not as clear, warranting further research on cross-linguistic differences in a bilingual's two languages as they relate to disfluency. Furthermore, future studies should focus on the individual contributions of absolute and relative language proficiency to disfluency in bilingual speakers. This

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would not only allow for better understanding of the multifaceted role that proficiency plays in the disfluency but would also aid researchers in better appraising disfluency in bilingual populations.

These findings also provide insight for clinicians who are often faced with the task of determining if the higher disfluency rates that are often seen in bilingual children are stuttering or typical disfluency stemming from encoding demands. For the children in this study, higher rates of total disfluencies appeared to be driven by rates of typical disfluencies, while rates of SLDs were more similar to those typically seen in English monolingual speakers. Although the results of this study cannot be used directly for diagnostic purposes, they do show the importance of using both quantitative and qualitative appraisals of disfluency when working with bilingual populations. For example, comparing rates of different types of disfluency may provide useful information when differentiating between disorder and language difference. Ultimately, more normative data is necessary for better identification of bilingual children with fluency disorders. However, with or without normative data, it is still of the utmost importance that clinicians considers a bilingual child's pattern of disfluency from multiple angles to inform clinical decision-making.

Finally, this study provides preliminary information on disfluency as it relates to different aspects of language in French-English bilinguals, a bilingual population with very little normative data and research concerning language development and fluency. It is evident from the results of the present study and the body of literature on disfluency and bilingualism that monolingual normative data for disfluency cannot be used to diagnose stuttering in bilingual speakers. However, the lack of data on this

specific bilingual population, compounded with scarce data on monolingual French

speakers, is a notable gap in the literature. It also adversely impacts the practice of

speech-language pathology, as it makes it even more difficult to distinguish between

typically-fluent individuals and individuals who stutter in this population. This study

serves both as an initial look at these issues in French-English bilinguals as well as a

call for more studies to be conducted in this area.

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