Disfluency Patterns in Four Bilingual Adults who Stutter

Disfluidités chez quatre adultes bilingues qui bégaient

Patricia M. Roberts

Abstract

This paper presents data on four bilingual adults who stutter, two balanced bilingual participants who reported equal abilities in French and English and two participants who identified French as their dominant language. Fluency (number of disfluencies per 100 syllables) and speaking rate (syllables per minute) were measured in both languages during two speaking tasks: monologue and reading aloud. Results were different for the two tasks. In the monologues, the two French-dominant participants were more disfluent and spoke more slowly in English than in French. Only one of the two balanced participants spoke with similar patterns in the two languages. For reading aloud, there were few between-language differences. The participants' self-evaluation of speech fluency in their two languages was a poor predictor of the observed disfluency levels on the two tasks. Methodological issues for future studies are discussed in relation to these results, and those of other studies of stuttering in bilingual adults. Until methodological issues are resolved, interpretation of bilingual results will remain problematic.

Abrégé

Le présent article divulgue des données sur quatre adultes bilingues qui bégaient, deux participants équilingues qui ont signalé être autant à l'aise en français qu'en anglais, et deux autres participants qui ont déclaré le français comme étant leur langue dominante. La fluidité (nombre de dysfluidités pour 100 syllabes) et le débit de parole (syllabes par minute) ont été mesurés dans les deux langues durant deux tâches : un monologue et une lecture à voix haute. Les résultats ont été différents pour les deux tâches. En effet, les deux participants pour qui le français était la langue dominante ont eu plus de dysfluidités dans les monologues et ont parlé plus lentement en anglais qu'en français. Seulement l'un des deux participants équilingues a parlé de la même façon dans les deux langues. Pour la lecture, il y a eu peu de différences reliées au niveau de bilinguisme. L'auto-évaluation des participants de leur niveau de fluidité dans les deux langues s'est révélée un piètre indicateur des niveaux de dysfluidité observés. Cet article aborde les questions d'ordre méthodologique utiles pour les prochaines études dans le contexte des résultats obtenus et de ceux d'autres études sur le bégaiement chez les adultes. Jusqu'à ce que les questions de méthodologie soient résolues, il sera difficile d'interpréter des résultats portant sur des adultes bègues bilingues.

Key words: stuttering, bilingualism, adult, speech rate, assessment

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Bilingualism is a common phenomenon in many areas of the world. By some estimates, over half the world's population speaks more than one language (Duncan, 1989). In Canada, 15.1 million people speak a language other than English as their native language. Of these, 14.6 million are bilingual (Statistics Canada, 1996). In the United States, Europe, and Africa bilingualism is also common (Grosjean, 1982; Harris & Nelson, 1992; Menn, O'Connor, Obler, & Holland, 1995; United States Census, 1990). Unfortunately, there are only scattered studies on stuttering in bilingual individuals. A number of authors have recently called for cross-cultural and cross-linguistic studies of stuttering (Bernstein Ratner, 1997; Bernstein Ratner & Benitez, 1985; Cooper &

Cooper, 1993; Finn & Cordes, 1997; Leahy & Wright, 1995; Leith, 1986; Stahl & Totten, 1995). The calls for investigation into this area nearly outnumber the studies done to date. There are a number of exploratory studies of stuttering in bilingual children (Agius, 1995; Dale, 1977; Druce, Debney, & Byrt, 1997; Karniol, 1992; Waheed-Khan, 1998; Weliky & Douglass, 1994). As is often the case for initial studies in a given area, these studies vary in quality.

To date, few published studies have examined stuttering in bilingual adults. Of these, several are by the same author, and focus on a group of 10 speakers of English and Kannada, a language spoken in southern India (see Jayaram, 1983, 1984). Participants read aloud sets of words or phonetically controlled sentences. Three studies of adults have a more clinical orientation. These are reviewed below.

The present study analyzed the connected speech of four bilingual adults who stutter to examine the level of bilingualism, the rate of speech, the number and the types of disfluencies produced in each language. Two tasks are used. Both are part of routine clinical assessments: a monologue and reading aloud. The data are interpreted descriptively. It is not possible to draw causal links between the above variables in individual cases.

Methodological Issues

Bilingualism and unilingualism are end points on a continuum, not a dichotomy (Bloomfield, 1935 quoted in Baetens-Beardsmore 1982, p.1). Individuals may be more or less proficient in each of their languages, and proficiency may vary over time and across expressive, receptive, oral, and written language modalities (Baetens-Beardsmore, 1982; Hakuta, 1986; Hyltenstam & Obler, 1989; Macnamara, 1967; Manuel-Dupont, Ardila, Rosselli, & Puente, 1992; Weltens & Grendel, 1993).

If bilingualism is a continuum, research participants must be described in sufficient detail to allow readers to place them along that continuum. Four aspects of bilingualism are particularly relevant: a) age of acquisition for each language, b) manner of acquisition (classroom instruction vs. informal acquisition through exposure to the language), c) language use (i.e., what activities are conducted in each language), and d) level of proficiency in each language. Each of these variables can influence performance on language tasks and each may interact with the others. We are far from understanding how these variables affect performance on clinical tasks. The interested reader is referred to reviews of these factors by Hamers and Blanc (1989), Harris (1992), and Schreuder and Weltens (1993).

To learn about language acquisition and use, one can interview participants to obtain a language history. Level of proficiency, however, is difficult to determine. There is no widely recognized test for level of bilingualism in most pairs of languages. There is support in the literature for the use of self-rating scales in which adults rate their level of proficiency in each language (e.g., Albanese, 1985; de Groot & Poot, 1997; Paivio, Clark, & Lambert, 1988; Roberts & Bois, 1999; Roberts & Le Dorze, 1997; Schwanenflugel & Rey, 1986; Segalowitz & Poulin-Dubois, 1990; Soares & Grosjean, 1984). All of these studies used lexical-semantic, language-based tasks. Flege and colleagues showed that self-ratings and age of acquisition are closely tied to performance on a range of speech tasks (e.g., Flege, Mackay, & Piske, in press). However, self-ratings do not always match objective test results (Delgado, Guerrero, Goggin, & Ellis, 1999). There are no published studies of whether or not self-ratings of bilingual proficiency correlate with fluency levels. (Note. Throughout this paper "fluency" refers to the flow of speech, an absence of disfluencies; "proficiency" refers to knowledge of a language.)

Test-retest stability. In bilingual clients, fluency/stuttering must be measured in each language. This is a type of test-retest situation. In order to know how to do this testing and how to interpret the results, we need studies of test-retest variability on the tasks typically used for clinical assessments. Andrews and Ingham (1971) cite a number of studies which report high test-retest correlation coefficients for severity ratings and disfluencies (e.g., Cullinan & Prather, 1968; Rousey, 1958), but none of the studies cited conducted the detailed analysis of transcripts currently used.

In a study of aphasia, Brookshire and Nicholas (1994) examined the test-retest stability of words per minute on a number of language tasks, including picture description[1] (four different pictures), and a brief monologue. When 10 nonbrain damaged adults performed these tasks in two visits, 7 to 10 days apart, the correlations between words per minute for Test 1 and Test 2 were high (.90 to .82) but individual scores changed by as much as 27% for the description of a single picture. For "Tell me what you do on Sundays" or "Tell me about where you live," the number of words per minute varied by up to 20% on retesting. When performance across several tasks was combined, test-retest variability in speech rate declined.

Brookshire and Nicholas' results demonstrate that within-language variability exists for the measure words per minute. It is important to keep this in mind when interpreting differences between languages (Roberts & Le Dorze, 1994; Roberts & Le Dorze, 1997; Roberts,

1998). For spontaneous speech, one could measure the dependent variables in two samples in each language to assess the within-language variability. The between-language differences, if any, can then be interpreted in the context of the within-language test-retest variability.

Types of disfluencies. In bilinguals, there may be many disfluencies related to word finding in the weaker language (Lw), or to uncertainty in planning syntax. Distinguishing normal speech disfluencies (NSDs) from stuttered disfluencies is difficult enough with unilingual participants. Some authors classify one-syllable word repetitions, part word repetitions, blocks and prolongations as stuttering-like disfluencies (SLDs; following Yairi & Ambrose, 1992) or as less typical (of normal speakers; Campbell & Hill, as reported in Yaruss, 1997), recognizing that these disfluencies are not always actual instances of stuttering. However, there is no consensus in the literature or in clinical practice about how to classify disfluencies. In the embryonic literature on bilingual stuttering, there are no guidelines on how to classify disfluencies in adults who stutter, how to determine which are due to language proficiency, which are normal speech disfluencies and which are instances of stuttering. Thus, measuring stuttering severity, as opposed to overall disfluency level, will be particularly difficult.

Previous Studies of Stuttering in Bilingual Adults

Three studies analyzed spontaneous speech and/or reading aloud in bilingual adults who stutter. Jankelowitz and Bortz (1996; see also Bortz & Jankelowitz, 1995) compared "the frequency and dynamics of stuttering in the participants' two languages" in order to "investigate the relation between bilingualism and stuttering" (p. 225). Although their single participant spoke English and Afrikaans from early childhood, he was more proficient in English than in Afrikaans on selected subtests from a test of bilingualism used in the school system in South Africa. He was "more aware" of stuttering in Afrikaans (his weaker language in formal testing) than in English and he, in fact, stuttered more in Afrikaans. However, the small speech samples (229 and 267 syllables in English and Afrikaans, respectively), low intrarater reliability (.62 in English and .45 in Afrikaans), and small number of actual disfluencies in each language all cast doubt on this finding.

Bernstein Ratner and Benitez (1985) also studied a single bilingual adult: a 50-year-old Spanish/English speaking man. He had spoken both languages since early childhood. He reported that he did not "feel himself to be more, or less fluent in either language"(p. 212). It is unclear whether "fluent," in this case, refers to bilingual proficiency or to number of disfluencies. Testing was conducted in English by one author and two weeks later in Spanish by the other author. Although the participant and both clinicians subjectively felt he stuttered equally in both languages, the data showed that he stuttered almost twice as much in English (95 instances) as in Spanish (50 instances). The samples were 50 utterances long in each language. However, since the authors do not state how many words or syllables were in each sample, it is difficult to interpret the raw number of disfluencies in each language. Also, because Bernstein Ratner and Benitez did not state what types of disfluencies they counted, the reader cannot judge whether the difference is in the overall rate of disfluencies, reflecting word-finding problems and language formulation delays in one language, or in actual instances of stuttering. No interrater or intrarater agreement data are reported.

In a third study, 16 adult speakers of Igbo and English were assessed in both languages in reading aloud and in conversation (Nwokah, 1988). All were considered balanced bilinguals, that is, equally proficient in their two languages: Igbo, learned at home, and English, learned in school. However, Nwokah did not test participants' bilingual proficiency and did not ask them to rate their own abilities. All participants read in English, then Igbo and then conversed in English, then in Igbo. Testing occurred in a single session. The types of disfluencies counted as stuttering were "repetitions, blocks, insertions, and prolongations". Interrater reliability for overall number of stuttered words was good: 88.9% for spontaneous speech and 92.5% for reading.

The group results showed no significant differences in percent of disfluent words or in speaking rates in the two languages, in conversation. Nwokah attributed the significantly slower rate in reading aloud (104 wpm in Igbo vs. 133 wpm in English) to weaker reading ability in Igbo. Since the participants were presented as balanced bilinguals, it is surprising that one language was stronger than the other for the reading task. Perhaps the term "balanced" applied only to oral expression.

Before performing the language tasks, participants were asked whether they stuttered equally in their two languages. The individual data show that 11 of the 16 participants accurately stated the language in which they stuttered more frequently. The interpretation of these results, however, is problematic. According to Nwokah, "all but one participant stuttered more in one language than the other" (p. 36). But six other participants had rates of disfluency that were within 3% in the two languages. The data on the variability of stuttering (see Bloodstein, 1995 for a review) and on the difficulty measuring disfluency rates reliably (Cordes & Ingham, 1994; Kully & Boberg, 1988) suggest that a difference of some size must exist before one can say that a person is

more disfluent in one language than in the other. Given the reported interjudge reliability of 89% for spontaneous speech in this study, one could suggest that a difference of approximately 10% between languages would be needed to demonstrate a real difference in the severity of stuttering. By this criterion, only two participants stuttered more severely in one language than in the other, and only one of them accurately identified (prior to taping) which language this was.

One additional problem with the Nwokah study is that not all types of disfluency were counted. Prolongations were counted, but it is not clear whether or not interjections were. "Insertions" were counted but not defined. Does this type of disfluency include interjections? Nwokah states that Igbo speakers tend to produce prolongations in places where English speakers would use interjections. Unless both types of disfluencies were counted, it is difficult to compare disfluency rates in the two languages. This issue is important for the classification of disfluencies into more/less typical or stuttering-like. Grosjean and Deschamps (1975) report that French speakers sometimes use prolongations where English speakers might use interjections.

These three studies provide contradictory answers to the question of how bilingual ability affects fluency in bilingual adults who stutter. They also show that asking "Do you stutter more in one language than the other?" does not allow us to predict speech fluency levels reliably.

The strong tendency for stuttering to occur on the initial words of sentences or clauses has been attributed to the higher linguistic planning load at these points compared to others in the sentence (Bernstein Ratner & Benitez, 1985; Jayaram, 1983, 1984; Kleinow & Smith, 2000; Koopmans, Slis, & Rietveld, 1991; Maner, Smith, & Grayson, 2000; Starkweather, 1987). One would expect that using their Lw places greater linguistic demands on bilingual speakers than using their stronger language (Ls). A number of studies of lexical decision and single word translation provide support for this view, showing more errors and/or slower response times in Lw (e.g., see de Groot & Poot, 1997; Potter, So, VonEckhardt, & Feldman, 1984; Snodgrass, 1993). Therefore, we could expect that bilingual adults who stutter and who have unequal proficiency in their two languages will stutter more in their Lw than in their Ls and that those who are balanced bilinguals should have similar disfluency levels in both languages.

However, language planning is not the only factor that affects fluency. It is also possible that adults who stutter are more fluent in their Lw when this is not their native language. Speaking a second language could have the same fluency enhancing effects as speaking with an accent or acting a role. These effects are well known (Bloodstein, 1995), but have not been studied in the context of bilinguals' second language use. Stuttering may also be less frequent in a second language if the person who stutters does not have a history of unpleasant speaking experiences in this language.

A recent study of 11 French-English bilingual adults confirms that stutterers report both greater fluency and greater stuttering in the second language (L2; Maillet & Roberts, 1998), and cite the factors discussed in the previous paragraphs as reasons. Self-assessed proficiency in L2 was linked to self-perceived fluency in that language for some adults but not for others.

Only the Nwokah study examined rate of speech. There are studies outside the clinical literature showing that adults who do not stutter speak more slowly in Lw than in Ls (Black, Tossi, Singh, & Takefuta, 1966; Raupach, 1980). A corollary of this finding is that balanced bilinguals should speak at similar rates in their two languages. Whether or not the same is true of bilingual adults who stutter has not been determined. It may be that for some languages, a normal speaking rate is slower or faster than in English. We must evaluate speaking rate in bilingual adults who stutter in light of the normal range for each language. Although rate of speech is routinely measured in clinical assessments, there is little published literature on speech rate to guide the assessment of bilingual speakers.

Given the above, the present study compared self-assessments of proficiency in each language, self-assessments of the level of stuttering in each language, and observed levels of disfluency in 4 adults in spontaneous speech and in reading aloud. The specific research questions were: (a) Are level of bilingualism and level of disfluencies linked in any pattern? (b) Can the participants accurately predict their more fluent language? (c) Do the various types of disfluency occur in the same proportions in the two languages and is their rank order of frequency of occurrence the same? and (d) When one language is stronger than the other, is the speech rate (in syllables per minute) faster in Ls than Lw?

Method

Participants

Four bilingual adults who stutter (two male, two female) participated in this study. Since they are analyzed as single cases, the selection criteria were broad, and the four cases differ in a number of ways (see Table 1). All four had stuttered since childhood. Three had received no treatment for their stuttering. One participant had received three to four months of treatment

Table 1
Demographic and language history of participants

	EQ1	EQ2	FR1	FR2
Age	27	19	52	26
Sex	male	male	female	female
Education (years)	16	12	14	15
Occupation	student	student	health care	health care
Handedness	right	right	right	left
Family history of stuttering	yes	yes	no	yes
Language of home: childhood	F	80%F	F	F
Language of elementary school	F	F	F	F
Language of high school	F	F	F	F
Language of college/university	70%E	80%F	90%F	90%F
Language of home: adult	Both	F	F	F
Language of work	E	80%F	90%F	80%F
Language of social life	60%E	85%E	90%F	90%F
Age began learning English	6-10	6-10	11-15	11-15
Formal English classes	yes	yes	yes	yes
Informal acquisition of English	yes	yes	limited	limited
Age began to read/write English	6-10	6-10	11-15	11-15
Previous therapy for stuttering	yes (<6 months)	no	no	no
Age therapy completed	10	NA	NA	NA
Proficiency (self-rating)				
Understand	EQ	EQ	F+	F
Speak	EQ	EQ	F+	F+
Read	EQ	E	F+	F
Write	E	E	F+	F+

Note. EQ = approximately equal abilities in French and English; F = somewhat better in French; F+ = much better in French; E = somewhat better in English; E+ = much better in English.

Table 2
Linguistic Features of Texts Read Aloud

	Text Length		Mean Sentence Length		Mean Clauses/sentence
	words	syllables	words	syllables	
L'ours brun	425	571	17	22.5	1.7
Golf ball	189	245	17.2	22.3	1.5
Wild horses	188	275	17.1	25	1.5
Strokes	260	420	23.6	38.2	2.2

approximately 17 years prior to this study. He reported little improvement and did not complete the treatment program. All four participants reported no history of neurological disease, head injury, drug or alcohol abuse, and no hearing or communication disorders other than stuttering. All learned French in their home as children (L1). At least one parent was French-speaking.

Level of bilingual proficiency and the history of language acquisition and use were assessed using a revised version of a questionnaire developed for previous research on bilingual adults (Lafaury & Roberts, 1998; Roberts & Le Dorze, 1997). There is considerable support for the use of self-rating in the literature. The self-ratings of proficiency show that the two men claimed roughly equal abilities in their two languages. They are designated EQ1 and EQ2. The two women, designated FR1 and FR2, judged themselves to have more knowledge of French than English.

EQ1 was the mildest in overall stuttering severity, followed by FR1. FR2 (mild to moderate severity) reported successfully avoiding many disfluencies through revisions and word substitutions. EQ2 showed a severe stuttering/cluttering pattern. Three of the four participants were tested pretreatment, using standard clinical assessment tasks. The fourth, EQ1, was not seeking treatment for his stuttering.

Procedures

Self-assessment of fluency. As part of the preassessment interview, participants were asked whether they stuttered more in one language than the other. Of the two balanced bilinguals, only EQ1 felt his stuttering was consistent across languages. EQ2 reported stuttering more in French, especially "struggling" more. He attributed this to the fact that he prefers to speak English and uses mainly English with his friends. The two French-dominant participants made different self-assessments of their stuttering. FR2 felt she stuttered more in English, her weaker language. She attributed this to lack of practice in English and less mastery of "vocabulary". FR1, on the other hand, felt it was easier to speak in English, because she believed it contains fewer of her feared sounds (t and d) and because she was "not as aware of the words".

Tasks. All participants performed two tasks in each language as part of a routine clinical assessment. The first was a monologue about their hobbies, their work, or a recent vacation. When the sample size was below 250 syllables (EQ2 in the English and French monologues, FR1 in the French and FR2 in the English monologue), a monologue summarizing the reading passage was also included. The examiner spoke only when necessary to elicit more speech.

The second task involved reading aloud a brief passage. In French, a long text on brown bears was used. In English, two less lengthy texts were read: one on how golf balls are made, the other on wild horses in the American mid-west (both adapted from *Reader's Digest*). EQ1 also read an English magazine article on the causes of strokes (from *Macleans* magazine). French was tested first and English second for all participants.

Three of the four reading passages were of roughly equal difficulty and all four were of similar type (expository). None contained spoken dialogue, humour, or technical vocabulary. Table 2 displays the sentence length and number of clauses per sentence for the reading passages. The article on strokes was somewhat more complex than the other reading passages. The speaking tasks and reading passages were not chosen specifically for this research; they were used at the clinic where three of the four participants sought treatment for their stuttering.

Analysis

All speech samples were videotaped. The first 250 to 300 syllables in each language were analyzed from each monologue. When possible, two 300-syllable samples

were selected for analysis, to measure variability within a given language.

The rate of speech was calculated as the number of intended syllables in a 60-second interval (syllables per minute or spm). That is, the number of syllables was calculated based on the number of syllables that would have been produced if the sample had contained no disfluencies (Guitar, 1998; Hillis & McHugh, 1998). The only exception to this was for the category Revisions. These were included in the syllable count, since these were often lengthy and eliminating them would have artificially lowered the number of syllables produced.

When more than one disfluency occurred in successive attempts to say a given syllable, all disfluencies were counted (e.g., "the the uh the one the one ..." counted as one single word repetition, one interjection, and one repetition of more than one word). In the few instances where participants produced two disfluent behaviours on a single syllable (e.g., p-p-p-pro:), only one disfluency, the one perceived to have taken longer, was counted.

The following disfluencies were calculated (Bernstein Ratner, Rooney, & MacWhinney, 1996):

1. pauses of one second or longer, excluding pausing to laugh, cough or wait for feedback from the interviewer;

2. filled pauses or interjections: sounds or words used to gain time prior to speaking. These included, for example, "um, uh, well, like, you know" in English and "euh, puis, b'en, là" in French. If the same interjection occurred twice with no intervening words, it was counted as a single disfluency. If two different interjections were produced with no intervening words, they counted as two disfluencies;

3. repetitions of more than one word;

4. revisions and incomplete sentences;

5. repetitions of multi-syllabic words;

6. repetitions of single syllable words;

7. repetitions of sounds or syllables;

8. prolongations (for nonplosive sounds);

9. blocks (attempts to speak accompanied by visible and/or audible tension, may or may not be accompanied by phonation); three instances of broken words (a pause or interruption in the production of a word) were included in this category. Incomplete words immediately before a revision were not counted as broken words since they were part of the revision.

A native French speaker verified the accuracy of all French transcriptions and a native English speaker verified all English transcripts (50% of each sample). Both were graduate students in speech-language pathology who had completed a series of exercises in transcription and fluency analysis during the course in fluency disorders given by the author. Both students were very proficient bilinguals (French/English). Interrater agreement (between the students and author) for the transcription was 97% (i.e., the two judges agreed on 97% of all syllables) in French and 95% in English. Agreement on the number of disfluencies per 100 intended syllables (%DS) was 94% in French and 91% in English. Agreement on how to classify types of disfluencies was lower: 87% in both French and English. The most frequently occurring disagreements were for interjections (the students tended to identify fewer), prolongations, and prolongations versus sound repetitions.

To assess intrarater agreement, the author transcribed and analyzed half of each sample approximately 18 months after the initial transcriptions. The intrarater agreement was within two percent for %DS for all samples. In identifying the type of disfluency, 154 of the 198 were identical to the first scoring (22 samples x nine disfluency types = 198 cells), and 27 were within plus or minus 1. The remaining 17 reratings were within plus or minus 2. Intrarater agreement for spm was high: reratings were within five spm in all cases.

Results

Results are presented for each participant, first for the monologue task then for the reading aloud task. Note that in all four cases, the author agreed with the participants' self-rating of bilingual proficiency. EQ1 and EQ2 spoke with native-like accents in English and French, and made only rare grammatical errors in English. FR1 and FR2 had moderate to strong accents in English, and made frequent grammatical and lexical errors. FR1 made fewer errors and had less of an accent than FR2.

Monologue

Rate of disfluency. EQ1's %DS were within four percent for all four monologue samples (see Table 3). This confirms his perception of equal fluency levels in the two languages. FR2, who believed she was more disfluent in English, had an English %DS more than twice her French %DS. Although EQ2 believed he spoke English more fluently, his %DS were nearly identical in French and English (48% vs. 49%). Although FR1 also believed her level of fluency was better in English, her English %DS was more than double her French %DS (26% vs. 12%).

Interjections and revisions were the most frequent types of disfluency for all participants, and these are generally considered to be normal speech disfluencies (NSDs). Therefore, the % of SLDs for each monologue was calculated (see Table 3). Since there is no consensus

Table 3
Disfluencies and Rate of Speech Across Tasks and Languages

Participants	English Monologue		English Reading		French Monologue		French Reading	
EQ1	1st	2nd	stroke	golf	1st	2nd	Bear 1	Bear 2
	Childhood				Studies	Travel		
syllables	330	272	333	245	274	290	290	278
disfluencies	52	43	15	10	33	43	7	16
% disfluent	16	16	5	4	12	15	2	5
syllables per min.	213	204	248	237	195	200	255	252
%SLD incl 1 syll	8	4	4	3	4	7	7	3
%SLD excl 1 syll	6	2	3	3	4	6	6	3
EQ2								
syllables	259+			245	236+		252	
disfluencies	125			29	115		17	
% disfluent	48			12	49		6	
syllables per min.	71			168	90		182	
%SLD incl 1 syll	23				13			
%SLD excl 1 syll	12				4			
FR1	Travel		Horse		Job		Bear 1	Bear 2
syllables	297		275		287+		297	281
disfluencies	78		3		35		5	8
% disfluent	26		1		12		2	3
syllables per min.	132		182		154		195	190
%SLD incl 1 syll	9				5			
%SLD excl 1 syll	6				3			
FR2	Hobby		Horse		1st Job	2nd Job	Bear	
syllables	300+		275		304	302	234	
disfluencies	77		24		37	28	35	
% disfluent	26		9		12	9	11	
syllables per min.	102		133		208	274	133	
%SLD incl 1 syll	7		7		1	1	20	
%SLD excl 1 syll	5		4		1	1	15	

Notes: FR2 found the French reading task extremely difficult. In attempting to say the three-syllable title of the text, she produced three attempts, each one accompanied by comments on her anticipated disfluencies. She produced the three-syllable title and 50 additional syllables, and 8 disfluencies. These were excluded from the analysis, since the 50 syllables were not part of the text. Because of her reaction to the reading task, she did not read the entire passage.
% = number of __ produced in 100 intended syllables. + = this monologue also includes summarizing reading passage.
SLDs (stuttering-like disfluencies) include repetitions of sounds or syllables, prolongations, blocks, and may include repetitions of one-syllable words.

Table 4
Percentage Distribution of Types of Disfluencies (part a)

Participants	English Monologue		English Reading		French Monologue		French Reading	
EQ1	1st	2nd	stroke	golf	1st	2nd	Bear 1	Bear 2
Interjections	40	60	13	20	49	35	0	32
Revisions	9	5	0	0	3	12	0	20
Repetitions:								
>one word	2	9	0	0	3	7	0	0
multisyllabic wd	0	0	7	0	0	0	0	0
one-syllable word	15	7	13	0	0	7	14	0
sound or syllable	0	5	13	20	9	7	14	0
Prolongation	13	0	20	20	12	16	26	6
Block	17	14	33	40	15	16	43	50
Pause	2	0	0	0	6	0	0	0
EQ2			golf					
Interjections	43	NA	0	NA	41	NA	0	
Revisions	5		7		5		25	
Repetitions:								
>one word	1		55		2		40	
multisyllabic wd	3		7		4		0	
one-syllable word	21		19		23		10	
sound or syllable	25		10		22		20	
Prolongation	0		0		0		0	
Block	3		3		2		5	
Pause	0		0		0		0	
FR1								
Interjections	58	NA	0	NA	51	NA	0	0
Revisions	12		0		14		15	19
Repetitions:								
>one word	0		0		0		0	38
multisyllabic wd	0		0		0		0	0
one-syllable word	9		3		14		0	6
sound or syllable	5		0		3		15	25
Prolongation	3		0		6		0	0
Block	14		0		14		69	6
Pause	0		0		0		0	0

Table continues - see part b.

Table 4
Percentage Distribution of Types of Disfluencies (part b)

Participants	English Monologue		English Reading		French Monologue		French Reading	
FR2	1st	2nd	stroke	horse	1st	2nd	Bear 1	Bear 2
Interjections	44	NA	NA	8	54	32	14	NA
Revisions	22			17	30	39	8	
Repetitions:								
>one word	8			0	8	14	8	
multisyllabic wd	0			0	0	0	0	
one-syllable word	19			29	5	4	14	
sound or syllable	3			29	0	4	17	
Prolongation	1			4	0	4	18	
Block	3			4	0	0	20	
Pause	1			8	3	4	3	

Note. Totals are not all 100% due to rounding. All figures are percentages. Thus, Interjections: 44 means that 44% of all disfluencies produced during this task were interjections.

on whether or not one-syllable words are NSDs in English, Table 3 presents two figures, one including and one excluding one-syllable words.

Using this metric, FR1 and FR2 remain more disfluent in English than in French. EQ1 could be seen as equally disfluent or as slightly more fluent in English, depending upon which samples are used and how large a difference one considers clinically significant. If the only samples had been the first monologue in each language, EQ1 would appear more fluent in English. However, if one considers all four samples in each language, his percentages of SLDs are very similar in the two languages. EQ2 is much more disfluent in English than in French when SLDs are examined. This result is different from the %DS pattern of roughly equal disfluency levels in the two languages.

Frequency of types of disfluencies. Table 4 shows that interjections occurred more than other types of disfluencies for both FR1 and FR2. Blocks and revisions were the next most frequent for FR1 in English while in French, blocks, revisions, and repetitions of one-syllable words occurred with relatively equal frequency. For FR2, interjections and revisions were the most frequently occurring disfluencies in both languages.

The rank order of disfluency types was identical across languages for EQ1. EQ2 also showed consistency across languages. Interjections were by far the most frequent disfluency in both English and French followed by sound/syllable repetitions and single syllable word repetitions.

Within-language variability was assessed for EQ1 using two different samples from his monologues in each language. Interjections were the most frequently occurring type of disfluency in each sample, followed by blocks. The rank ordering of other types of disfluencies was more variable within each language.

Reading Aloud

For EQ1, FR1, and FR2, the %DS in reading aloud was very similar across languages, varying by 3% or less (Table 3). In contrast, EQ2 produced 12%DS in English reading, but only six percent in French. For all participants, the %DS was much lower in reading aloud than for the monologue task.

The self-ratings of fluency do not apply to reading aloud. Thus, one cannot compare the self-ratings to the results on the reading task. For all participants, the %DS and the most frequently occurring disfluency type in reading aloud were different for reading than in the monologue. FR2 produced more blocks and prolongations in French but more repetitions of sounds, syllables and one syllable words in English (see Table 4). FR1 produced too few disfluencies to analyze frequencies by subtype. EQ1 produced blocks more often than any

other type in both languages, but the frequency of other types of disfluencies varied too greatly within each language (see below) to allow comparisons between languages. For EQ2, repetitions of more than one word were the most frequent type of disfluency in both languages. There was no consistent ranking for other types.

The within-language variability was assessed in French for FR1 using the first and second halves of the Bear passage and in English for EQ1 using the Stroke and the Golf passages. The %DS was within three percent in both cases. The distribution of types of disfluencies varied across readings for EQ1, with no Interjections or Revisions in the first half of the passage, but a high proportion of both in the second half of the passage. For FR1, blocks were the most frequent disfluency type in both French samples. With few other disfluencies, little can be said about their distribution.

Rate of Speech

EQ2 spoke slightly faster in French than in English (19 spm faster in the monologue and 14 spm faster in reading aloud). EQ1 spoke at similar rates in the two languages for both the monologue and reading aloud. FR1 and FR2 both spoke faster in their stronger language, by 22 spm and by 106 spm respectively (see Table 3). For the reading task, the rate of speech was nearly identical in the two languages for both women.

Discussion

The purpose of the present study was to explore issues in assessing bilingual stuttering as they relate to four research questions. The results provide tentative answers to the research questions for each participant. However, given the individual variability which is the hallmark of stuttering and of bilingualism, the present results should be viewed as preliminary. The results serve primarily to illustrate a number of methodological issues that need to be resolved in the study of bilingual stuttering before we can accurately interpret these findings.

Fluency Levels and Proficiency in Each Language

The rate of speech, %DS, and %SLD data for the monologue task confirm that the two participants who claimed roughly equal abilities in French and English spoke at similar rates and with similar %DS in the two languages. The rank order of the two most frequent types of disfluency was the same in French and English (EQ1) or very similar (EQ2).

The two participants who claimed better knowledge of French than English spoke more fluently in French in the monologue task. They also spoke faster in French, confirming Raupach's finding (1980) of slower speech in the Lw. However, for FR1 the between-language difference in rate was only 22 spm, very close to the 19 spm difference of EQ1. Thus, one could also interpret these results as showing that FR1 spoke at a similar speed in French and English.

It is possible to conclude that for the monologue task, the EQ men were, in fact, equally disfluent in French and English and that they were disfluent in a manner that was much more similar across languages than were the FR women. The differences between the EQ and the FR participants could be due to their respective levels of bilingualism. However, a gender effect or a gender/bilingualism interaction cannot be ruled out because both EQs were men and both FRs were women. Also, EQ2's combined stuttering/cluttering pattern may have affected his results. Cluttering in bilingual adults is an unexplored area.

Frequency of Disfluency Types

Although the overall %DS was higher in Lw for both FR participants, they were not disfluent in the same way in their Lw. The ratios of NSDs and SLDs were quite consistent across languages for FR1. For FR2, the NSDs were lower in Lw than in Ls. One syllable word repetitions were higher in Lw. NSDs are often linked to language planning difficulties. Given this, one could expect NSDs to be more frequent in the weaker language than in the stronger one. The present results run counter to that expectation for both FR participants. The relevance of the stuttered/nonstuttered disfluencies dichotomy for cross-language studies requires investigation, particularly in light of Nwokah's (1988) and Grosjean and Deschamps' (1975) findings that an SLD in English may be an NSD in another language.

The participants' self-evaluation of their level of bilingualism was accurate. The two balanced bilinguals were more similar to each other than they were to the two French-dominant participants. Used in conjunction with selection criteria based on age of acquisition and language use, self-rating scales in which adults compare their two languages may allow researchers to place them in groups that are reasonably homogeneous in terms of their bilingualism. However, more work is needed in assessing language proficiency.

The self-evaluation used in the present study is based on language and not speech abilities. It is, therefore, encouraging that self-rated language ability mirrors, at least roughly, speech fluency and rate of speech. This finding is, perhaps, not surprising for at least two reasons. First, stuttering is influenced by both language and motor factors (Bernstein Ratner, 1997; Kleinow & Smith, 2000; Maner et al., 2000; Watson et al., 1994). To the

extent that high language planning loads cause disfluencies, a lower level of proficiency in a language should be associated with a lower level of fluency. Second, there are fairly high correlations between self-ratings of proficiency in adult bilinguals and speaking rate, and other motor-based tasks (e.g., Flege et al., in press). Larger studies are needed to explore how language ability interacts with normal speech disfluencies and with stuttering frequency. These will provide yardsticks for clinicians to use in assessing disfluencies in bilingual adults.

Participants were better judges of their bilingualism than of their disfluency. In the monologue task, only the results of EQ1 and FR1 matched their description of their relative fluency in each language. In the reading task, only EQ1 did so. This means that clinicians and researchers cannot assume that bilingual adults can accurately identify the language in which their stuttering is more severe. The participants in two of the three studies reviewed in the introduction showed a similar discrepancy between perceived and actual %DS (Bernstein Ratner, & Benitez, 1985; Nwokah, 1988). In light of these findings, clinicians should assess both languages in bilingual speakers.

Methodological Challenges

The interpretation of the results of this study, however, is somewhat problematic. Among the many questions we cannot yet answer is "How big a difference between languages is needed to conclude that speech is faster or more fluent in one language than in the other?" The within-language variability in SLDs for EQ1 demonstrates the need for guidelines about how to sample speech reliably. Issues such as "What sample size is adequate? Which disfluencies should we count?" need to be resolved before much progress can be made in understanding stuttering in bilinguals.

In order to interpret between-language differences in rate and fluency, we need information about the effect of the monologue topic on both fluency and rate. Should the same topic be used for both languages? If it is, will there be an adaptation or practice effect in the second language tested? How does having the same clinician test both languages influence the results? In group studies, one can counterbalance the order of testing across participants and can have different examiners for each language. For most clinical assessments, however, a single speech-language pathologist usually tests one language, then the other, as in the present study, not knowing how this affects the results. Should clinicians sample each language twice, in order to control for the effect of order of testing? For example, one could test English - French - French- English and only use the second sample from each language. A related question is how to handle patients who use only one language at work, and do not possess work-related vocabulary in the other language? Asking these patients to do "the job task" in both languages may be inappropriate. On the other hand, changing topics may bias the between-language comparison by introducing a confounding variable.

The samples used in the present study were approximately 300 syllables. This is consistent with recommendations by many authors (e.g., Gregory & Hill, 1999; Riley & Riley, 1994; Venkatagiri, 1999). The relative percentage of occurrence of the types of disfluency, and the rank ordering of the types of disfluency was more variable within a given language than was the %DS. It may be that a speech sample of 250 to 300 syllables is adequate to estimate the %DS, but not to reliably measure the patterns of disfluency, particularly for samples where the total number of disfluencies is low, as was the case for EQ1. Brookshire and Nicholas (1994) recommend using more than one sample/topic to measure speaking rate. Following their recommendation would yield longer samples, and would require more clinical time for each assessment. At the University of Ottawa, studies of unilingual English speakers (Roberts, Meltzer, & Wilding, 2001) and bilingual French/English speakers (in progress) have found no effect for sample length on the number of disfluencies in nonstuttering adults. However, we need studies of bilingual adults who stutter to determine the appropriate sample length.

Comparison With Other Studies

Bernstein Ratner and Benitez (1985) found a much higher rate of disfluency in English than in Spanish in the speech of an ostensibly balanced bilingual man. This contrasts with the results of the present study, in which the two balanced participants produced very similar %DS and types of disfluencies in their two languages. By testing the two languages two weeks apart and using two different examiners, Bernstein Ratner and Benitez may have increased the apparent between-language differences. By testing in a single session, and using the same examiner for both languages, the present study may have minimized them. Further research is needed to determine if this is the case.

The present results for the two balanced bilinguals are similar to those obtained by Nwokah (1988), although our interpretation of her results is different from that of Nwokah and of others who cite her study (Culatta & Goldberg, 1995). In reading aloud, the between-language difference was less than eight percent for all participants. There are many methodological differences between Nwokah's study and the present one. Also, the pairs of languages tested are very disparate (Igbo is from

the Congo-Niger family of languages and is completely unrelated to English, while French and English are both Indo-European languages, and share many features). Yet, both studies show balanced bilinguals to be relatively balanced stutterers, for spontaneous speech.

Variability Within and Between Languages

The present study is unique in that it compared disfluencies both within and across languages. Not all participants were tested twice in each language on each task. However, the within-language data obtained for some tasks illustrate the usefulness of comparing within-language and between-language variability. The %DS varied by one to three percent on the same task within a given language. This was true, even for the reading passages that were different in topic and in reading level (Stroke passage versus Golf ball passage for EQ1) and for monologues that were on different topics (EQ1) or on the same topic (FR2). Future studies will determine whether this is a typical range of within-language variability for adults who stutter and determine what factors influence this variability (same session, sample length, speaking task, level of bilingualism). We will then have a benchmark against which to compare between-language variability.

Conclusion

The results of the present study and those of the few other studies of bilingual stuttering to date raise more questions than they answer. In the present study, the two participants who claimed equal ability in their two languages showed similar overall disfluency rates across languages in their monologues. The two participants who claimed greater proficiency in French than in English had lower disfluency rates in French monologues than in English. However, the %SLDs did not always follow the same pattern as the %DS.

Among the questions which the present study raises are the following: Are speech fluency and bilingual proficiency related? Are stuttering frequency and bilingual proficiency related? To answer these questions, we need to learn more about how to classify disfluencies in languages other than English. We also need to determine what an adequate sample length is for bilingual speakers. It may or may not be the same as that for unilingual speakers. To assess between-language differences we need data on within-language variability and on order of testing effects and how to control for them in a clinical assessment. Until we have answers to these and other questions concerning the assessment of disfluency in bilingual speakers, results should be interpreted cautiously, in both clinical and research contexts.

Endnote

1. Included the Cookie Theft (Goodglass & Kaplan, 1983) and the Picnic (Kertesz, 1982) pictures, a birthday party scene, and a picture of a cat being rescued from a tree.

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