Stuttering in English–Mandarin Bilingual Speakers: The Influence of Language Dominance on Stuttering Severity

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Purpose: English and Mandarin are the 2 most spoken languages in the world, yet it is not known how stuttering manifests in English–Mandarin bilinguals. In this research, the authors investigated whether the severity and type of stuttering is different in English and Mandarin in English–Mandarin bilinguals, and whether this difference was influenced by language dominance.

Method: Thirty English–Mandarin bilinguals who stutter (BWS), ages 12–44 years, were categorized into 3 groups (15 English-dominant, 4 Mandarin-dominant, and 11 balanced bilinguals) using a self-report classification tool. Three 10-min conversations in English and Mandarin were assessed by 2 English–Mandarin bilingual clinicians for percent syllables stuttered (%SS), perceived stuttering severity (SEV), and types of stuttering behaviors using the Lidcombe Behavioral Data Language (LBDL; Packman & Onslow, 1998; Teesson, Packman, & Onslow, 2003).

Results: English-dominant and Mandarin-dominant BWS exhibited higher %SS and SEV scores in their less dominant language, whereas the scores for the balanced bilinguals were similar for both languages. The difference in the percentage of stutters per LBDL category between English and Mandarin was not markedly different for any bilingual group.

Conclusions: Language dominance appeared to influence the severity but not the types of stuttering behaviors in BWS. Clinicians working with BWS need to assess language dominance when diagnosing stuttering severity in bilingual clients.

KEY WORDS: bilingual, stuttering, language dominance

Stuttering occurs across cultures and languages and has been found to exist in both bilinguals and monolinguals (Finn & Cordes, 1997; Van Borsel, Maes, & Foulon, 2001). Although interest in bilinguals who stutter (BWS) has increased in recent years (e.g., Bernstein Ratner, 2004; Hall & Evans, 2004; Roberts & Shenker, in press; Shenker, 2006; Van Borsel et al., 2001), research has mainly focused on speakers of Indo-European languages (e.g., Bernstein Ratner & Benitez, 1985; Dale, 1977; Jankelowitz & Bortz, 1996; Nwokah, 1988). There are fewer studies of BWS who use languages of non-Indo-European origin (Jayaram, 1983; Karniol, 1992; Nwokah, 1988) and to date, no investigations have addressed stuttering in bilinguals who speak Sino-Tibetan languages such as Mandarin-Chinese. In this article, we report an investigation of stuttering in English–Mandarin bilinguals.

There are several reasons why it is important to examine stuttering in English–Mandarin bilinguals. Mandarin and English are the two
most spoken languages in the world (Gordon, 2005). There are more than 1 billion Mandarin speakers and more than 500 million English speakers worldwide. In the United States, there are currently more than 2 million people who speak a Chinese language, with Mandarin being the most common (Shin & Bruno, 2003). This figure is expected to rise with a predicted 5% of all elementary, secondary and college students enrolled in Mandarin studies by 2010 (Noerper, 2007). Multilingualism is already the norm at all levels of society in Southeast Asian countries such as Singapore (Gupta, 1994). Approximately 75% of the Singaporean resident population is ethnic Chinese (Singapore Department of Statistics, 2008), and more than half the Chinese population above the age of 15 years is literate in both languages (Singapore Department of Statistics, 2000). As such, this bilingual cohort is the largest ethnic group presenting to stuttering clinics in Singapore. Yet, speech-language pathologists (SLPs) have no empirical information on the presentation of stuttering in Mandarin bilingual individuals on which to base clinical decisions.

English and Mandarin are inherently different in their language structure. There is little or no overlap in their respective written forms, syntax, morphology, phonology, and syllable structure. Mandarin is a tonal language, whereas English is not. In Mandarin, lexical tones are used to minimally distinguish individual words undifferentiated by segmental (consonant or vowel phonemes) information (Baudoin-Chial, 1986; Gandour, 1987). Another reason why it may be worthwhile to compare stuttering behavior across English and Mandarin is that the two languages differ in terms of linguistic processing. Given that various theories and models of stuttering have postulated stuttering to be associated with a disruption at the level of either lexical retrieval (Newman & Bernstein Ratner, 2007), phonological encoding (Postma & Kolk, 1993; Saseisekaran, De Nil, Smyth, & Johnson, 2006), or phonetic encoding (Packman, Code, & Onslow, 2007), it is conceivable that the presentation of stuttering across English and Mandarin may be dissimilar.

The manifestation of stuttering in bilinguals who speak languages other than Mandarin has been described previously. In their review of the literature Van Borsel et al. (2001) concluded that bilingual persons commonly stutter in both languages. It is, however, unclear whether BWS stutter the same or differently in both languages. According to the “same-hypothesis” (Nwokah, 1988), individuals do not stutter differently across the two languages. Evidence for this hypothesis is weak, as only anecdotal reports are currently available in the literature (Lebrun, Bijleveld, & Rousseau, 1990; Van Riper, 1971). More evidence is available to substantiate the “different-hypothesis” (Nwokah, 1988). According to this hypothesis, BWS in both languages may show a difference in the frequency (counts of stuttering) but not the loci of stuttering (position of the stutter within an utterance; e.g., Jayaram, 1983). Alternatively, other authors propose that the frequency and the type of stuttering—which together affect stuttering severity—as well as the loci of stuttering may vary across the two languages (e.g., Bernstein Ratner & Benitez, 1985; Jankelowitz & Bortz, 1996; Nwokah, 1988).

One proposal that accounts for different degrees of stuttering in each language within an individual is that stuttering severity is affected by language proficiency (Van Borsel et al., 2001; Van Borsel, Sunaert, & Engelen, 2005). It has been suggested that BWS stutter more severely in their less proficient language. For example, Jankelowitz and Bortz (1996) and Scott Trautman and Keller (2000, cited in Van Borsel et al., 2001) both found that their bilingual participants stuttered less frequently in the “predominant” and “more proficient” language relative to their less proficient language. In addition, Jankelowitz and Bortz found that their participants produced fewer word, syllable, and sound repetitions in the more proficient language than the less proficient language. Moreover, sound prolongations were present in the less proficient language but not in the more proficient language. Thus, language proficiency appeared to influence the type of stutters observed.

However, the findings of several other studies contradict the language proficiency argument. Both Jayaram (1983) and Howell et al. (2004) found that their bilingual participants stuttered more frequently in their “primary” or “more fluent” language. In addition, Howell and colleagues found that their adult Spanish–English BWS produced a higher proportion of disfluencies on content than function words in the first language (L1) than in the second language (L2). These authors claimed that this was consistent with the hypothesis that their speaker showed more nonstalling disfluencies (prolongations, part-word repetitions, and complete stops) than stalling disfluencies (or phrase repetitions, and filled or silent pauses) in L1 than in L2. In contrast, Bernstein Ratner and Benitez (1985) and Nwokah (1988) examined balanced bilinguals who were either “theoretically equally competent in both languages” (Nwokah, 1988, p. 360) or had “spoken both languages at home, school, and work since birth” (Bernstein Ratner & Benitez, 1985, p. 212). These investigators concluded that their participants stuttered more frequently in one language than the other, hence language proficiency seemingly did not influence stuttering. Nwokah found during a reading task no significant difference in the number of repetitions produced across languages but a significantly higher number of blocks in one language. However, there was no significant difference in the number of blocks produced across languages during spontaneous speech. Due to the inconsistent findings across the available extant studies, the influence of
language proficiency on the frequency and type of stuttering in bilingual speakers remains inconclusive.

The influence of language proficiency on severity and type of stuttering across languages in BWS cannot be discounted as yet because of a number of shortcomings in the existing literature. First, different terms have been used to describe the relationship between languages in BWS. These terms include “primary language” (Jayaram, 1983), “predominant language,” “more proficient language” (Jankelowitz & Bortz, 1996), “native language” (Scott Trautman and Keller, 2000, cited in Van Borsel et al., 2001), and “equally competent languages” (Nwokah, 1988). Not all of the terms are defined, and consequently, it is unclear whether language dominance or language proficiency was measured. Language dominance and language proficiency are two “overlapping and confusable” yet functionally different constructs (Birdsong, 2006, p. 47). A bilingual may have native-like proficiency in two languages but still consider one language to be better than the other. In this case, the bilingual has one language that dominates the other. Unlike language proficiency, which measures a person’s command of grammar, vocabulary, and pronunciation and varies between bilinguals, language dominance reflects the differences in processing each of the two languages (Birdsong, 2006) and indicates the relative ability levels of the two languages within the same individual. Indeed, bilinguals have been found to have reduced accuracy, automaticity, and speed when identifying and retrieving lexical items in their less dominant language than in their dominant language; this difference in performance was found to be statistically significant (for details, see Chen & Leung, 1989; Kotz & Elston-Guttler, 2004; McElree, Jia, & Litvak, 2000). Thus, in investigating whether BWS stutter differently in their two languages, we propose that it is more relevant to assess language dominance rather than absolute levels of language proficiency in each language.

A second possible reason for the incongruent findings regarding the influence of language dominance on stuttering severity is that previous research has used different methods for measuring and describing stuttering. Jankelowitz and Bortz (1996), for example, analyzed the number of sound prolongations and word, sound, and syllable repetitions but not blocks. Alternatively, Nwokah (1988) calculated the number of blocks and repetitions but not sound prolongations. Packman and Onslow (1998) argued that these traditional terms are not behavioral and that they lack operationalism and specificity. Accordingly, they developed the Lidcombe Behavioral Data Language (LBDL; Packman & Onslow, 1998; Teesson, Packman, & Onslow, 2003), which describes the behaviors of stuttering in terms of repeated movements (RM), fixed postures (FP), and superfluous behaviors (SB). Packman and Onslow claim that this taxonomy of stuttering better reflects the kinematics of the speech mechanism and hence can be used reliably to describe stuttering behaviors across all ages and languages. The LBDL taxonomy may indeed be useful for comparing the types of stutters across languages. This is especially the case when word and syllable boundaries are less distinct in one language (e.g., Mandarin) than in the other (i.e., English).

A third limitation with the existing body of research is that many of the foregoing studies did not perform systematic and comprehensive evaluation of the languages spoken by their bilingual participants. A bilingual can range from someone who can function in each language according to given needs to someone who has native-like and equal competence in two languages (Grosjean, 1982). Grosjean (1982, 1998) recommends classifying a language as the predominant or native language only after consideration of language histories and backgrounds and thorough assessment of language abilities across the four modalities of understanding, speaking, reading, and writing. Differences in the mode, frequency, and domain of language use across the two languages should also be considered (Grosjean, 1982, 1985, 1989, 1998).

Fourth, studies in this area have mainly comprised case studies (e.g., Bernstein Ratner & Benitez, 1985; Jankelowitz & Bortz, 1996) with minimal speech sampling, limiting the generalization of the findings to other BWS. In several cases, stuttering analysis was based on fewer than 100 syllables (e.g., Bernstein Ratner & Benitez, 1985; Jayaram, 1983) or fewer than 300 syllables (e.g., Jankelowitz & Bortz, 1996). Finally, methodological problems arise in studies where speech samples are analyzed by the authors themselves (e.g., Jayaram, 1983) or where reliability measures were low (e.g., Jankelowitz & Bortz, 1996).

An investigation of stuttering behavior in English–Mandarin bilinguals is of clinical importance. Specifically, it will help to improve the accuracy of assessing and diagnosing the severity of the disorder in BWS. If language dominance is found to influence stuttering frequency and type, clinicians worldwide who work with BWS may either underestimate or overestimate the overall severity of the disorder if they assess stuttering in one language only.

The aim of this research was to examine stuttering behavior in English–Mandarin bilinguals who stutter. Specifically, we compared the severity and type of stuttering in two structurally different languages to see if stuttering was evident to the same degree in both languages and whether there was a relationship between stuttering and language dominance. In order to accomplish these aims, the severity and type of stuttering was examined in English–Mandarin BWS with three different language dominance profiles: English-dominant, Mandarin-dominant, and balanced bilinguals. A criteria-based, self-report classification tool was used to categorize
BWS into one of the three language dominance subgroups. This tool is described in the following section and in greater detail in Lim, Rickard Liow, Lincoln, Chan, and Onslow (2008). The specific research questions were as follows:

1. Do English–Mandarin BWS stutter more frequently in one language compared to the other?
2. Do English–Mandarin BWS stutter more severely in one language compared to the other?
3. Is the type of stuttering different across languages?
4. Are the severity and type of stuttering influenced by language dominance?

Method
Participants

Participants were 30 BWS who were referred to the Singapore General Hospital Stuttering Clinic. Inclusion criteria for the participants were as follows: (a) Chinese descent, (b) Singaporean or Singapore permanent resident, (c) bilingual in Mandarin and English, (d) 12 years or older, (e) diagnosis of developmental stuttering, (f) stuttering rate of more than 2% syllables stuttered (%SS) as determined by the assessing SLP from a 10-min within-clinic conversational sample, and (g) no treatment involving a speech pattern change during the previous 2 years. All participants consented to participate in a study of bilingual stuttering but were unaware of the specific research aims. There were 28 men and 2 women, ranging in age from 12 to 44 years.

Materials

The self-report classification tool described by Lim et al. (2008) was used to divide participants into one of three language dominance groups: balanced bilinguals, English-dominant, and Mandarin-dominant. The tool is a questionnaire that incorporates items from the History of Bilingualism questionnaire (Paradis, 1987) and the Language Background Questionnaire (Rickard Liow & Poon, 1998). Participants reported on all languages in their repertoire across the four language modalities: understanding, speaking, reading, and writing. Specifically, they were asked to (a) provide demographic information including the number of years of language exposure and formal instruction in both languages; (b) state the age of acquisition for each modality; (c) rank their languages from best to worst for each modality; (d) quantify their current proficiency for each modality using a 7-point self-rating scale (Kohnert, Hernandez, & Bates, 1998) where 1 = very few words and 7 = native speaker; (e) rank the language they use most often at home, work, and socially; (f) quantify how frequently they use each language; and (g) provide information about school examination grades for each language.

The criteria used to determine language dominance were based on the participants’ self-ratings of language proficiency, frequency of language use, and domains of language use. For each variable, measures were taken across the four language modalities—understanding, speaking, reading, and writing. Briefly, a language was considered dominant if it consistently received a higher language proficiency rating across the language modalities, was spoken and heard daily, was used for either reading or writing at least weekly, and was used in at least two of the three possible language environments: home, work/school, and social. The classification as Mandarin-dominant or English-dominant required all three self-report criteria to be met. Failure to satisfy all three criteria was taken to imply balanced bilingualism. The rationale and description of these criteria is described in detail in Lim et al. (2008).

Lim et al. (2008) validated the classification tool with 168 English–Mandarin bilingual undergraduates from the National University of Singapore. A discriminant analysis performed on the self-report data revealed an overall correct classification rate of 88%. Based on the large sample size of 168 participants in that study, this accuracy rate was high and significant when compared with the random probability of 33% (p < .001). The categorization of bilingual groups was also validated against an objective test (see details that follow). Together, these results indicate a reliable three-way classification into English-dominant, Mandarin-dominant, and balanced bilinguals. Although other criterion-based methods of establishing bilingual dominance have been suggested (e.g., Gutiérrez-Clellen, Restrepo, & Simón-Cereijido, 2006), this tool was preferred because it was found to be reliable for establishing the dominant language in English–Mandarin bilingual Singaporeans (Lim et al., 2008).

Lim et al.’s (2008) participants also completed the English and Mandarin versions of the Multilingual British Picture Vocabulary Scale (MBPVS; Rickard Liow, Hong, & Tng, 1992). The MBPVS is an adapted version (with publisher’s permission) of the standard long form of the BPVS (Dunn, Dunn, Whetton, & Pintillie, 1982). The original BPVS is a 150-item receptive vocabulary test that is the British equivalent to the Peabody Picture Vocabulary Test (Dunn & Dunn, 2007). The test is presented as an auditory word–picture matching task with three distractors per target. The targets were arranged in order of difficulty and were originally normed for monolingual British children. The 150-item test was adapted by Rickard Liow et al. (1992) and was normed for Singaporean children. Only the English and Mandarin versions of the adapted test were used for this study. Each language version of the test contained 75 of the original 150 items, which were rank-ordered for difficulty.
Even-numbered items remained in the English version, and odd-numbered word stimuli were translated into suitable counterparts in Mandarin. This procedure ensured that vocabulary was tested across a range of difficulty and that the same items were not reassessed within English–Mandarin bilinguals. The two versions are not equivalent in terms of difficulty, and there are no normative data for adult Singaporeans; hence, the raw scores were used to validate language dominance classification results as determined by self-report.

**Speech Sampling**

To obtain a representative sample of stuttering behavior, 10-min conversational speech samples in both English and Mandarin were collected in three different speaking situations within and beyond the clinic. These included speaking face to face with the SLP, speaking with a family member or friend at home, and having a telephone conversation with an unfamiliar person. The within-clinic speech samples were video recorded, and the two beyond-clinic speech samples were audio recorded. A total of six speech samples was collected per participant, one for each language across the three assessment conditions.

It has been proposed that where a bilingual sits on the monolingual–bilingual mode continuum determines the state of activation of their languages and language processing mechanism and subsequently affects language production or perception (Grosjean, 1998). During speech sampling, all BWS remained along the bilingual language mode continuum—that is, participants knew that their conversational partners were also bilingual and were allowed to code-switch temporarily between the two languages despite speaking either English or Mandarin as their base language. This was done to ensure that any normal speech disfluencies and/or difficulties in lexical retrieval that may be associated with reduced language ability (Roberts & Shenker, in press) would not confound stuttering measurements.

**Study Procedure**

The procedure for the study is summarized in Figure 1. All participants underwent a standardized initial assessment protocol. Case history taking and the initial interviews were conducted in English by a bilingual SLP. Video recordings of participants’ conversational speech in English and Mandarin were conducted during the first clinic visit by a bilingual English–Mandarin SLP. The assessing SLP conversed with the participant about a familiar topic. Video recordings were front-on headshots recorded in a well-lit clinic room, using a Panasonic WV-CS320 ¼-in. CDD-COL PTZ Dome Camera and a Panasonic ES-945 omnidirectional condenser boundary microphone.

The two beyond-clinic audio recordings in English and Mandarin were conducted during the following week. Participants recorded their conversations with a family member or friend of their choice using either a digital or analog audio recording device. The telephone conversations in English and Mandarin between the participant and the unfamiliar person were initiated by a clinic volunteer. These occurred at unexpected times during the week following the initial assessment and served to remove participant bias in selecting a recording situation that could elicit a more fluent speech sample (Packman, Onslow, O’Brian, & Huber, 2004). The telephone conversations were recorded using a recording jack attached to the telephone. These speech samples were recorded on cassette audio tapes.

The order of administration for the video and telephone speech assessments in English and Mandarin was counterbalanced such that half the speech samples were collected in English followed by Mandarin. The remaining half was conducted in the reverse order. This was done to minimize, as much as possible, any differential carry-over or adaptation effects that can influence stuttering behavior during assessment (Hall & Evans, 2004). Audio recordings of speech in the home environment were not counterbalanced, as the recordings depended on the availability of the participants’ speaking partners.

The English and Mandarin MBPVS were administered during the second clinic visit. Both tests were administered on the same day as different target items and

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**Figure 1.** Flow chart for study procedure. SLP = speech-language pathologist; CD = compact disc; LBQ = Language Background Questionnaire; HOB = History of Bilingualism questionnaire; MBPVS = Multilingual British Picture Vocabulary Scale.
picture stimuli were assessed for each test. The sequence of administration of the English and Mandarin MBPVS was also counterbalanced so that half the participants received testing in Mandarin first followed by English, and vice versa. However, the order of presentation of test stimuli within the Mandarin and English tests was the same for all participants. Participants received the standardized instruction “please point to the picture that best corresponds to the given word” prior to commencement of the assessment. The assessing SLP read out the target words to participants, who then recorded their responses using a separate response sheet for each language.

Data collection was completed in two clinic visits. Each session was approximately 1 hr in duration.

### Dependent Variables

#### Stuttering Severity

Percent syllables stuttered (%SS) and severity rating (SEV) were used to provide measures of stuttering frequency and severity (O’Brian, Packman, & Onslow, 2004). The 9-point severity rating scale described by O’Brian et al. (2004) was applied (1 = no stuttering, 9 = extremely severe stuttering). This scale has been shown to be a valid and reliable tool for evaluating stuttering severity by both experienced and inexperienced listeners (O’Brian, Packman, Onslow, & O’Brian, 2004).

**Judges.** Judges were two English–Mandarin bilingual SLPs from Singapore who were independent of the study and masked to the aims of the study. They were trained and experienced in the assessment and treatment of stuttering. Bilingual English–Mandarin Singaporean clinicians were engaged so that they would be able to make accurate judgments about stuttering behavior in both languages spoken by the participants (Finn & Cordes, 1997; Van Borsel & Medeiros de Britto Pereira, 2005). The first judge rated the entire set of speech samples in English and Mandarin, whereas the second judge rated a subset of the speech samples.

**Speech samples and reliability analyses.** There were a total of 180 speech samples collected in English and in Mandarin. Due to recording failure, two speech samples were deemed missing data. One was a telephone recording in Mandarin; the other was a home recording in English. The final dataset consisted of 178 speech samples, with 89 samples per language. Of these 89 speech samples, 30 were digital video recordings and 59 were audio recordings. No video and audio samples contained any identifying information, and they were presented to the judges in random order on readable compact discs (CD-Rs). The judges observed or listened to each speech sample and counted %SS in real time using a button-press timing and counting device. The judges also provided a SEV score for each speech sample at the end of each recording. Because %SS scores and SEV ratings may be potentially confounded by normal speech disfluencies that result from reduced language proficiency (Andrade, Sassi, & Zackiewicz, 2004; Roberts & Meltzer, 2004), judges were told to base their assessment on unambiguous stuttering only.

Thirty-nine speech samples (22%) were randomly chosen for the purposes of establishing inter- and intrajudge reliability of %SS and SEV. This constituted an additional 19 recordings in English and 20 recordings in Mandarin. Of the 19 recordings in English, 9 were video recordings and 10 were audio recordings. In addition to the total 178 speech samples, the first judge re-rated these 39 speech samples for intrarater reliability assessment. The same set of speech samples was rated by the second judge for %SS and SEV as a measure of inter-judge reliability.

The Pearson correlation between the initial scoring and rescoring of %SS by the first judge was .97. Twenty-two of the 39 samples (56.4%) differed by 0–1%SS, 37 samples (94.9%) differed by 0–2%SS, and all 39 samples differed by 0–3.4%SS. The correlation between the %SS scores of the first and second judge was 0.91. Twelve of the 39 samples (30.8%) differed by 0–1.0%SS, 27 samples (71.8%) differed by 0–2.0%SS, 32 samples (82.1%) differed by 0–3.0%SS, 35 samples (89.7%) differed by 0–4.0%SS, and all 39 samples (100%) differed by 0–6.4%SS.

For SEV scores, the Spearman correlation between the initial scoring and rescoring by the first judge was 0.91. Twenty-two of the 39 samples (56.4%) achieved identical ratings, 35 samples (89.7%) differed by 0–1 rating points, and all samples (100%) were within a 2-rating-point difference. Interjudge reliability analyses for SEV ratings yielded a correlation score of 0.85. Twelve of the 39 samples (30.8%) had identical ratings between the two judges, 28 samples (71.8%) differed by 0–1 rating point, 37 samples (94.9%) differed by 0–2 rating points, 1 sample (97.4%) differed by 0–3 rating points, and all 39 samples (100%) differed by 0–4 rating points.

#### Type of Stuttering

The Lidcombe Behavioral Data Language (LBDL; Packman & Onslow, 1998; Teesson, Packman, & Onslow, 2003) taxonomy was used to describe the types of stuttering behaviors in English and in Mandarin. As discussed in the introduction, this system classifies stuttering behaviors according to three categories and seven descriptors (for details, see Packman & Onslow, 1998; Teesson et al., 2003).

**Training.** The same pair of judges received training in the use of the LBDL. The instruction package described by Teesson et al. (2003) was modified so that judges were trained to perform LBDL analyses for both English
and Mandarin speech samples. The package comprised two LBDL training videos, one for English and one for Mandarin. Each video contained 23 examples of different types of stuttering behaviors taken from different speakers. Each example was presented five times. The English training video consisted of 18 examples of stuttering behaviors from speakers of Australian English and 5 examples of stuttering behaviors from speakers of Singaporean English. All 23 exemplars from the Mandarin training video were taken from Singaporean Mandarin speakers. Judges also received the three-page instruction pamphlet written in English, which explained and presented written examples of the LBDL and provided LBDL descriptors for the stuttering behaviors in both the English and Mandarin videos. Judges were asked to read the instruction pamphlet and watch the videos of the Mandarin and English samples. They were told to spend as much time as they needed and to replay sections of the instruction video, if required, to better understand how the LBDL was used to describe the stuttering behavior of both English and Mandarin speakers.

**Stimulus videos.** Only the video recordings of each participant’s speech in English and Mandarin were used for LBDL analyses. Each original 10-min video conversation was edited such that only the first 3 min of participants’ speech samples was analyzed. Care was taken to ensure that the interval started and ended with complete words. There were 60 videos in total, 30 in each language. The videos were presented in random order on 13 video CD-Rs.

**Procedure.** Following LBDL training, the judges were told to view the video recordings of the participants in the study. They were allowed to refer to the instruction pamphlet to review the LBDL taxonomy wherever necessary and were also allowed to replay the video at any time. Each stuttering moment and the time it occurred on the video was then transcribed onto a response sheet and identified accordingly using the LBDL taxonomy. Each stimulus video required between 30 and 60 min to analyze.

**Reliability analyses.** Six video recordings (10%) were randomly chosen for the purposes of inter- and intrajudge reliability analyses. In addition to analyzing all 60 stimulus videos according to the LBDL taxonomy, the first judge re-measured the six speech samples to establish intrajudge reliability. The same six speech samples were analyzed by a second judge, and the results were compared with those of the first judge as a measure of interjudge reliability. Judges were told that each stuttering moment could be associated with more than one type of stuttering behavior. Reliability analyses were only performed on the stutters identified by both judges. For each speech sample, the number of stutters out of the total number of stutters that were identified as repeated movements, fixed postures, and secondary behaviors were calculated. The Pearson correlation coefficient was used to analyze intra- and interjudge reliability. Intrajudge reliability for the number of repeated movements, fixed postures, and superfluous behaviors identified by the first judge across the two ratings was .98, .96, and .96, respectively. Interjudge reliability for the total number of stutters that were identified as repeated movements, fixed postures, and superfluous behaviors between the first and second judge was .91, .74, and .79, respectively.

**Results**

**Participants and Language Dominance Classification**

Using the self-report classification tool described by Lim et al. (2008), 11 BWS were categorized as balanced bilinguals, 15 were grouped as English-dominant, and four were classified Mandarin-dominant. A discriminant analysis (Garson, 2006) was run on the data to see if the prediction of group membership was accurate. In this analysis, the grouping variable was language dominance (English-dominant, Mandarin-dominant, balanced) and the independent variables were the raw scores for language proficiency, frequency of language use, and domain of language use in both languages. The discriminant analysis yielded a 100% (95% CI: 90.5%–100%) accuracy rate for group membership, which was found to be significant when compared with the random probability of 33% (p < .001).

Participant characteristics also supported their language dominance classification. Although the balanced bilinguals were exposed to Mandarin earlier than English, they were found to have equivalent proficiency self-ratings and MBPVS scores across the two languages (see Table 1). Conversely, the English-dominant bilingual group reported an earlier exposure to English and produced higher scores for both the English MBPVS and self-reported English proficiency compared with Mandarin. Likewise, Mandarin-dominant bilinguals showed trends that were consistent with their language grouping. They acquired Mandarin earlier than English and obtained higher scores for the Mandarin MBPVS compared with English. With the exception of the ability to write Mandarin, these bilinguals also self-reported higher proficiency for understanding, speaking, and reading Mandarin than for understanding, speaking, and reading English. The exception for written proficiency was not unexpected, since English is the official written language used at school and at the workplace. In fact, all bilingual groups reported higher proficiency for writing English than for writing Mandarin. The higher mean age of exposure to English for the Mandarin-dominant group was also notably higher than that for the English-dominant and balanced bilingual groups. This was because two of the
four Mandarin-dominant participants were from China and Malaysia originally and were only exposed to English at 12 and 13 years, respectively, after immigrating to Singapore. As anticipated, years of formal instruction did not fluctuate across the bilingual groups, as all Singaporeans undergo uniform education in both languages.

### Stuttering Frequency and Severity Across Languages

To determine whether BWS stuttered more severely in one language compared to the other, two types of analyses were performed. In the first analysis, the number of individuals in each bilingual group who obtained higher %SS and SEV scores in English or Mandarin was tabulated. Notably, all BWS stuttered in both languages and had higher %SS scores in one language than the other. Six of the 11 (54%) balanced bilinguals had higher %SS in English compared with Mandarin, whereas 5 (46%) had higher %SS in Mandarin compared with English. Of the 15 BWS in the English-dominant group, 12 (80%) were found to have higher %SS scores in Mandarin, whereas only 3 BWS (20%) were found to have higher %SS scores in English. Three of the 4 Mandarin-dominant bilinguals (75%) had a higher %SS in English compared with Mandarin, whereas an inverse result was found for the remaining participant.

The results were slightly different in the analysis of SEV ratings. Five (46%) balanced bilinguals had higher scores in English, 3 (27%) had a higher score in Mandarin, and 3 (27%) had identical SEV scores. For the English-dominant bilinguals, 11 (74%) had higher ratings for Mandarin, 2 (13%) had higher ratings for English, and 2 (13%) had the same ratings for both languages. Finally, three (75%) Mandarin-dominant BWS had higher SEV ratings in English than in Mandarin, and 1 (25%) participant received a higher SEV rating in Mandarin than in English.

The second analysis involved the comparison of the overall group mean %SS and SEV scores ($N = 30$) across English and Mandarin. Before doing so, we first examined whether %SS and SEV scores differed across the three speaking situations: within clinic, home, and telephone conversations. Separate one-way analyses of variance

### Table 1. Profile of BWS according to language dominance group.

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<tr>
<th>Variable</th>
<th>Balanced bilinguals ($n = 11$)</th>
<th>English dominant ($n = 15$)</th>
<th>Mandarin dominant ($n = 4$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$ (SD)</td>
<td>$M$ (SD)</td>
<td>$M$ (SD)</td>
</tr>
<tr>
<td>Age</td>
<td>22.27 (5.42)</td>
<td>20.07 (6.78)</td>
<td>26.75 (12.50)</td>
</tr>
<tr>
<td>Age of first exposure (AoE)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>4.55 (1.44)</td>
<td>2.00 (1.25)</td>
<td>9.25 (3.78)</td>
</tr>
<tr>
<td>Mandarin</td>
<td>2.82 (1.60)</td>
<td>3.47 (1.73)</td>
<td>2.00 (0.82)</td>
</tr>
<tr>
<td>Years of formal instruction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>13.00 (2.79)</td>
<td>12.00 (3.89)</td>
<td>12.00 (2.16)</td>
</tr>
<tr>
<td>Mandarin</td>
<td>11.09 (1.14)</td>
<td>10.06 (2.02)</td>
<td>10.25 (1.26)</td>
</tr>
<tr>
<td>Years of language exposure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>17.73 (4.51)</td>
<td>18.07 (6.33)</td>
<td>17.50 (10.63)</td>
</tr>
<tr>
<td>Mandarin</td>
<td>19.45 (5.09)</td>
<td>16.60 (6.58)</td>
<td>24.75 (11.73)</td>
</tr>
<tr>
<td>MBPVS score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>85.69 (5.07)</td>
<td>86.75 (5.12)</td>
<td>76.98 (12.21)</td>
</tr>
<tr>
<td>Mandarin</td>
<td>83.88 (4.93)</td>
<td>67.12 (13.47)</td>
<td>86.33 (4.53)</td>
</tr>
<tr>
<td>English proficiency (1–7 scale)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding</td>
<td>5.00 (0.63)</td>
<td>5.73 (0.96)</td>
<td>4.25 (0.50)</td>
</tr>
<tr>
<td>Speaking</td>
<td>5.00 (0.63)</td>
<td>5.73 (0.96)</td>
<td>4.25 (0.50)</td>
</tr>
<tr>
<td>Reading</td>
<td>5.27 (0.79)</td>
<td>6.20 (0.78)</td>
<td>5.25 (1.26)</td>
</tr>
<tr>
<td>Writing</td>
<td>5.27 (0.79)</td>
<td>6.07 (0.88)</td>
<td>6.25 (0.50)</td>
</tr>
<tr>
<td>Mandarin proficiency (1–7 scale)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understanding</td>
<td>5.64 (0.81)</td>
<td>3.93 (0.88)</td>
<td>6.50 (0.58)</td>
</tr>
<tr>
<td>Speaking</td>
<td>5.09 (0.70)</td>
<td>3.40 (1.06)</td>
<td>6.00 (0.82)</td>
</tr>
<tr>
<td>Reading</td>
<td>5.18 (1.08)</td>
<td>3.33 (0.82)</td>
<td>6.25 (0.96)</td>
</tr>
<tr>
<td>Writing</td>
<td>4.91 (1.04)</td>
<td>3.20 (1.01)</td>
<td>5.75 (0.96)</td>
</tr>
</tbody>
</table>

Note. MBPVS = Multilingual British Picture Vocabulary Scale.
(ANOVAs) with repeated measures were performed for %SS and SEV for both English and Mandarin. In each analysis, the repeated measure was speaking situation. There were no significant differences in %SS between speaking situations for either English, $F(2, 86) = 0.325, p = .723$, or Mandarin, $F(2, 86) = 0.512, p = .512$. The SEV ratings were also not significantly different across the three speaking situations: English, $F(2, 86) = 0.512, p = .512$. Thus, the mean %SS and SEV scores for each language were pooled together for further analyses. The overall group mean %SS scores for English and Mandarin were 7.40 ($SD = 5.00$) and 8.07 ($SD = 5.06$), respectively, and were not found to be significantly different, $t(29) = –1.36$, $p = .184$ (two-tailed). Similarly, the overall mean SEV scores between English ($M = 5.08, SD = 1.65$) and Mandarin ($M = 5.17, SD = 1.59$) did not reach significance, $t(29) = –0.49$, $p = .62$ (two-tailed). A Spearman rank-order correlation analyses also revealed a significant positive correlation between %SS and SEV ratings for both English ($r_s = .974, p < .001$) and Mandarin ($r_s = .949, p < .001$).

**Stuttering Frequency and Severity as a Function of Language Dominance**

The findings were different when %SS and SEV scores were analyzed separately for each bilingual group. Figure 2 shows the mean %SS and SEV scores for English and Mandarin for the English-dominant, Mandarin-dominant, and balanced bilinguals. Descriptive statistics provided in Table 2 augment the graph. The difference in scores for %SS and SEV were not analyzed statistically because of the small sample size in each group. Balanced bilinguals were found to exhibit almost identical mean %SS scores for both English ($M = 6.51$) and Mandarin ($M = 6.55$). Likewise, their mean SEV ratings were not markedly different across the two languages: $M = 4.85$ for English and $M = 4.53$ for Mandarin. In contrast, the English-dominant group produced a higher mean %SS score for Mandarin ($M = 9.01$) than for English ($M = 6.99$). A similar pattern was observed for their mean SEV scores ($M = 5.44$ for Mandarin, $M = 4.91$ for English). The data also showed that stuttering was greater in English ($M = 11.37$ for %SS, $M = 6.42$ for SEV) compared with Mandarin ($M = 8.57$ for %SS, $M = 5.92$ for SEV) for the Mandarin-dominant group.

**Type of Stutters Across Languages**

The mean percentage of stutters for each LBDL descriptor in English and Mandarin is tabulated in Table 3 and illustrated in Figure 3. As the data for each LBDL descriptor was found to be skewed, a nonparametric test was used to determine whether the types of stutters differed between languages. A Wilcoxon signed rank test revealed that the mean percentage of stutters between English and Mandarin was not significantly different for all seven LBDL descriptors: syllable repetition ($–.40, p = .69$), incomplete syllable repetition ($–.86, p = .39$), multisyllable unit repetition ($–1.02, p = .31$), fixed posture with audible airflow ($–.86, p = .39$), fixed posture without audible airflow ($–1.04, p = .30$), verbal superfluous behavior ($–.16, p = .87$), and verbal superfluous behavior ($–.62, p = .62$).

**Type of Stutters as a Function of Language and Bilingual Group**

To ascertain whether the types of stutters varied as a function of language dominance, the different stutter types were examined within each bilingual group: Mandarin-dominant, English-dominant, and balanced. As there were no significant differences for each LBDL descriptor across languages, the type of stutters according to bilingual groups were analyzed in terms of their broader categories: repeated movements, fixed postures, and superfluous behaviors. Again, the small sample size within each group precluded the use of statistical analyses. Nonetheless, the difference in percentage of stutters per LBDL category did not appear to be markedly

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Figure 2. Mean percent syllables stuttered (%SS) and severity rating (SEV) scores for English and Mandarin according to bilingual group.
different between English and Mandarin for English-dominant, Mandarin-dominant, or balanced bilinguals (see Figure 4).

**Discussion**

The aim of this research was to investigate whether the severity and type of stuttering were differentially affected in English–Mandarin BWS and whether this difference was influenced by language dominance. Stuttering behavior was examined in English–Mandarin BWS who were assigned to one of three language dominance groups—English-dominant, Mandarin-dominant, and balanced bilinguals—and using a large corpus of speech samples in each language ($M = 1,018$ syllables per speech sample). To ensure that the BWS were appropriately categorized, bilingual classification was achieved using a previously validated self-report classification tool. A discriminant analysis showed that BWS were classified at an accuracy rate of 100%. Participant profiles also complemented their group membership.

The finding that English–Mandarin BWS evidenced stuttering in English as well as in Mandarin is consistent with the studies that examined BWS in two languages and found stuttering to occur in both (for a review, see Roberts & Shenker, in press; Van Borsel et al., 2001). With respect to whether bilinguals stutter the same or differently across languages, the results of this study seem to support the “difference hypothesis” postulated by Nwokah (1988). Similar to the findings by Nwokah, all BWS in the present study were found to exhibit disproportionate mean %SS scores across English and Mandarin. Notably, for SEV ratings, 25 BWS had different mean SEV scores between English and Mandarin, whereas 5 BWS had identical ratings between languages. Thus, although %SS and SEV ratings were found to be highly correlated, our results indicated that %SS was a more sensitive measure for detecting differences in stuttering severity across languages.

However, a closer inspection of individual data showed that one third (10) of the BWS had a difference in mean

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**Table 2.** Descriptive statistics of percent syllables stuttered (%SS) and severity rating (SEV) according to language and bilingual groups.

<table>
<thead>
<tr>
<th>Variable</th>
<th>%SS</th>
<th>SEV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>English</td>
<td>Mandarin</td>
</tr>
<tr>
<td><strong>Balanced bilinguals (n = 11)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>6.51</td>
<td>6.55</td>
</tr>
<tr>
<td>$SD$</td>
<td>5.09</td>
<td>6.16</td>
</tr>
<tr>
<td>Median</td>
<td>4.63</td>
<td>5.13</td>
</tr>
<tr>
<td>Minimum</td>
<td>2.43</td>
<td>1.43</td>
</tr>
<tr>
<td>Maximum</td>
<td>20.27</td>
<td>24.2</td>
</tr>
<tr>
<td><strong>English dominant (n = 15)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>6.99</td>
<td>9.01</td>
</tr>
<tr>
<td>$SD$</td>
<td>4.86</td>
<td>4.76</td>
</tr>
<tr>
<td>Median</td>
<td>5.80</td>
<td>8.10</td>
</tr>
<tr>
<td>Minimum</td>
<td>1.17</td>
<td>2.03</td>
</tr>
<tr>
<td>Maximum</td>
<td>19.43</td>
<td>20.00</td>
</tr>
<tr>
<td><strong>Mandarin dominant (n = 4)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>11.37</td>
<td>8.57</td>
</tr>
<tr>
<td>$SD$</td>
<td>4.50</td>
<td>2.06</td>
</tr>
<tr>
<td>Median</td>
<td>13.11</td>
<td>8.37</td>
</tr>
<tr>
<td>Minimum</td>
<td>4.70</td>
<td>6.47</td>
</tr>
<tr>
<td>Maximum</td>
<td>14.53</td>
<td>11.07</td>
</tr>
</tbody>
</table>

**Table 3.** Mean percentage of stutters for each Lidcombe Behavioral Data Language (LBDL) descriptor in English and Mandarin ($N = 30$).

<table>
<thead>
<tr>
<th>LBDL descriptor</th>
<th>English</th>
<th>Mandarin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeated movements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syllable repetitions</td>
<td>40.37</td>
<td>40.69</td>
</tr>
<tr>
<td>Incomplete syllable repetitions</td>
<td>17.78</td>
<td>21.61</td>
</tr>
<tr>
<td>Multisyllable unit repetitions</td>
<td>12.13</td>
<td>9.02</td>
</tr>
<tr>
<td>Fixed postures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With audible airflow</td>
<td>13.60</td>
<td>12.77</td>
</tr>
<tr>
<td>Without audible airflow</td>
<td>5.44</td>
<td>6.39</td>
</tr>
<tr>
<td>Superfluous behaviors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal</td>
<td>6.54</td>
<td>5.79</td>
</tr>
<tr>
<td>Nonverbal</td>
<td>4.15</td>
<td>3.74</td>
</tr>
</tbody>
</table>
%SS score of less than 1 percentage point between English and Mandarin. Further, the mean SEV rating scores for 16 (53%) BWS were either identical or were marginally different (i.e., <1) between the two languages. These results raise the question of how dissimilar %SS scores and SEV ratings need to be before a difference in stuttering severity between two languages is considered significant. In addition, although stuttering severity may vary across time and speaking situations, as a whole, the difference in the degree of stuttering between the languages may not be easily perceptible. This may account for some of the inconsistencies reported by SLPs between %SS measures and their clients’ self-evaluation of stuttering severity across the languages. Therefore, the question remains as to what the actual level of differentiation in %SS and SEV scores needs to be before Nwokah’s (1988) difference hypothesis is substantiated. This is an interesting research topic that could be evaluated in future investigations.

One important outcome of this study was that although the overall group mean %SS and SEV scores were not found to be significantly different across languages, stuttering severity was, in fact, influenced by language dominance. This was clearly illustrated by the finding that both the English-dominant and the Mandarin-dominant BWS experienced a greater degree of stuttering in their less dominant language, whereas the balanced bilinguals had almost equivalent mean %SS and SEV scores for both languages. In concert with the results of Jankelowitz and Bortz (1996), Scott Trautman and Keller (2000, cited in Van Borsel et al., 2001), and Van Borsel, Sunaert, and Engelen (2005), our data contribute further evidence to strengthen the language dominance argument in explaining why stuttering severity may be uneven across languages in bilinguals.

The studies in the literature that did not find stuttering to be more severe in the less dominant language (Bernstein Ratner & Benitez, 1985; Howell et al., 2004; Jayaram, 1983; Nwokah, 1988) did not systematically assess language dominance in their bilingual participants. It is possible, therefore, that the participants in the group studies by Jayaram (1983) and Nwokah (1988) were not entirely homogeneous. For example, all but one of Nwokah’s balanced bilinguals stuttered more in one language than the other, but there was no consistent pattern as to which language was more affected. As observed in this study, a clearer result may have transpired if the author had assessed language dominance and evaluated the results as a function of language dominance. In the single case study by Bernstein Ratner and Benitez (1985), the balanced bilingual was reportedly not equally dysfluent in both languages, even though both the clinician and the participant believed that fluency in both languages was equally compromised. Likewise, this may be attributable to a lack of clarity about the participants’ bilingualism or to the limited speech sample on which the analysis of stuttering was based. Their perception of stuttering across the two languages may very well have been accurate, especially if it was based on the participants’ overall stuttering behavior.

Although we found stuttering severity to be influenced by language dominance, the type of stuttering
was not. For all three bilingual groups in this study, the proportion of stutters that constituted either repeated movements, fixed postures, or superfluous behaviors did not differ markedly across the two languages. It appeared, therefore, that the frequency rather than the type of stuttering had influenced overall stuttering severity in the two languages. This finding contrasts with that of Jankelowitz and Bortz (1996), who reported that language ability had influenced not only the frequency but also the distribution and nature of their participants' dysfluencies. Our findings also contradict Howell et al. (2004), who proposed that nonstalling disfluencies (e.g., fixed postures, incomplete syllable repetitions) occur in the first and more developed language, whereas stalling disfluencies (e.g., syllable or multisyllabic unit repetitions) occur in the second language. On the contrary, we found that the different types of stutters manifested in both languages, irrespective of language dominance. In addition, when the data were pooled across bilingual groups, there were no noticeable differences in the frequency or the range of stutter types between English and Mandarin. All LBDL descriptors were fairly equally represented in both these languages. Even though there are some limitations (e.g., a stuttering moment can reflect two or more LBDL descriptors, the LBDL does not take into consideration the length of the stutter) in using the LBDL to measure types of stutters, overall the LBDL taxonomy is still preferred for comparing types of stutters across languages where there is ambiguity regarding word and syllable boundaries.

Because developmental stuttering may evolve from repeated movements to fixed postures, this may suggest that the disorder progresses in roughly the same way in the two languages. Furthermore, given the established relationship among stuttering, genetics, and motor processing, and because stuttering occurs in both languages, the results of this study may also imply that stuttering in English and in Mandarin reflects a similar manner of breakdown during the process of speech production. This issue could be addressed further by performing a linguistic analysis of loci of stuttering moments in English and Mandarin. In a future study, we plan to assess the relationships of phonological and syntactic structure to the frequency, type, and location of fluency breakdown in BWS.

The observed differences in the frequency but not the type of stuttering may not be justified by cross-linguistic differences. English and Mandarin are structurally different languages. Specifically, Mandarin is a tonal language and differs from English in terms of orthography, phonology, and morphology. Recent imaging studies provide evidence to show that the cognitive processes and neural substrates for Mandarin and English representation may be distinct (Tham et al., 2005). Yet, in our study, we did not find stuttering to be consistently more severe in either language. Therefore, it seems unlikely that the nature of the language, per se, influenced the differences in stuttering severity in our bilingual individuals. This view makes sense, as stuttering has been found to manifest differently in bilinguals whose two languages are structurally similar as well as dissimilar.

More stuttering in the less dominant language, however, might be explained by interference from the dominant language to the nondominant language. As discussed in the introduction, bilinguals experience greater processing demands in their less dominant language and, as such, are slower and less accurate when performing tasks in this language (e.g., Chen & Leung, 1989; de Groot & Poot, 1997; Kotz & Elston-Guttler, 2004; Kroll & Stewart, 1994; McElree, Jia, & Litvak, 2000). Research has consistently shown that increased linguistic demands on the speech planning and production system can result in increased stuttering (Bernstein Ratner & Benitez,
The vulnerability of the speech motor system to higher processing demands has also been demonstrated in people who stutter who are subjected to dual task experiments (Bosshardt, 1997, 1999, 2002; Bosshardt, Ballmer, & De Nil, 2002; Bosshardt & Fransen, 1996). Such increased sensitivity to interference between speaking and concurrent cognitive processing in people who stutter is supported by functional magnetic resonance imaging (fMRI) data (see Bosshardt, 2006; De Nil & Bosshardt, 2000).

Bosshardt (1997) proposed that “speech dysfluencies can be the result of an interference between the execution of speech movements and concurrently performed cognitive processes” (p. 503). Bilinguals may stutter more in their less dominant language because of the need to perform concurrent attention-demanding processes in that language (Bosshardt, 1999, 2002, 2006; Bosshardt et al., 2002). To speak in the less dominant language, bilinguals need to formulate and integrate the semantic, syntactic, phonological, and phonetic features of a word both simultaneously and incrementally; the accuracy, speed, and automaticity of such processing is affected by language dominance (e.g., Chen & Leung, 1989; de Groot & Poot, 1997; Kotz & Elston-Guttler, 2004; Kroll & Stewart, 1994; McElree et al., 2000). While this is occurring, they also need to suppress activation and interference from competing signals from the dominant language (Green, 1986, 1993). These processes may impose overlapping demands on an assumed deficient motor speech system. This drains the system’s resources (Green, 1986, 1993), reduces the level of speech control, and thus stuttering results. This may account for findings that BWS stutter in both languages but more so in the language that is less dominant and that requires greater control.

The proposal that stuttering severity (specifically, the frequency of stutters) in BWS is linked to language dominance and not factors that are inherent in the languages needs to be accounted for in the various models and theories of stuttering. However, none of the models to date seem to specifically and sufficiently explain why the frequency but not the type of stutters was affected by language dominance. Although it is not within the scope of this article to answer this question, in our future work we will endeavor to link our findings with other theories and models of stuttering. Because bilinguals outnumber monolinguals worldwide, researchers in this field could test the existing models of stuttering—which have been based almost entirely on monolingual populations—with BWS to obtain better insight into why and how the disorder manifests in bilinguals. Research that extends the theories and models of stuttering to bilinguals should consider not only the influence of language dominance on differential stuttering behavior in BWS but also the sociopsychological issues associated with speaking in the less dominant language.

Even though we may understand why bilinguals stutter differently across languages, further information needs to be sought about the language dominance effect. One future consideration would be to study groups of BWS with varying levels of language proficiency in their less dominant languages. Another area where research is lacking is the interrelationship between language dominance, code switching, and stuttering in bilinguals. Whether code switching occurs as a strategy to overcome stuttering (Karniol, 1992) or whether stuttering occurs because of code switching (Bernstein Ratner, 2004) is not yet clear. As code switching relates to language processing, an investigation on code switching in BWS in different language dominance groups may serve to extend our existing knowledge on the language dominance effect.

To summarize, our study of English–Mandarin BWS showed that stuttering occurred in both languages but was found to be more affected in one language relative to the other. Specifically, BWS were found to stutter more frequently in the language that was less dominant. The type of stuttering, however, did not appear to be influenced by language dominance. Cross-linguistic differences do not seem to account for the findings, as stuttering was not found to be more severe in either English or Mandarin.

Our findings are clinically important and suggest that SLPs working in Singapore need to assess the language dominance in BWS in addition to conducting routine evaluation of stuttering in both languages. A self-report classification tool for clinical use has been described here and also in Lim et al. (2008), which may assist SLPs in determining the dominant language. It is possible that SLPs may risk a misjudgment of stuttering severity in their bilingual clients if they do not consider language dominance or if they continue to assess stuttering only in one language. The results of this study provide evidence to support a change in current clinical assessment protocols for BWS in Singapore and elsewhere.

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