Aleksandra Krawczyk iD

University of Central Florida, USA; College of Health Professions and Sciences, School of Communication Sciences and Disorders, 12805 Pegasus Drive, Orlando, FL 32816, e-mail: aleksandra.krawczyk@ucf.edu

Martine Vanryckeghem iD

University of Central Florida, USA; College of Health Professions and Sciences, School of Communication Sciences and Disorders, 12805 Pegasus Drive, Orlando, FL 32816, e-mail: martinev@ucf.edu

Katarzyna Węsierska iD

University of Silesia in Katowice, Faculty of Humanities, Institute of Linguistics, 4 Uniwersytecka St., 40–007 Katowice, Poland, e-mail: katarzyna.wesierska@us.edu.pl

Anthony Pak-Hin Kong iD

The University of Hong Kong, Hong Kong; Faculty of Education, Academic Unit of Human Communication, Development, and Information Sciences (CDIS) and Aphasia Research and Therapy (ART) Laboratory; Room 420, 4/F, Meng Wah Complex, University of Hong Kong, Pok Fu Lam Rd, Hong Kong, e-mail: akong@hku.hk

Peixin Xu iD

Takeda Pharmaceuticals, 650 East Kendall St., Cambridge, Massachusetts, 02142, USA, e-mail: peixin.xu@takeda.com

A preliminary investigation of stuttering and typical disfluencies in bilingual Polish-English adults who stutter: A multiple cases approach

Wstępne badanie jąkania i zwykłych niepłynności w mowie u dwujęzycznych polsko-angielskich dorosłych osób z jąkaniem – studia przypadków

Keywords: stuttering, fluency, bilingualism, dysfluency, language

Słowa kluczowe: jąkanie się, płynność mowy, dwujęzyczność, niepłynności w mowie, język

Abstract

This study analyzes the frequency of stuttering and typical disfluencies in Polish-English bilingual adults who stutter during cross-linguistic dialogue, monologue, and oral reading contexts. Additionally, the relationship between English proficiency and stuttering and typical disfluency frequencies was examined. The study aims to contribute to the body of research regarding differential considerations between monolingual and bilinguals who stutter. Data

collection took place via video conferencing. Participants first completed an English proficiency cloze test, where they entered missing words in a short English text. Following this, randomized dialogue, monologue, and oral reading speech samples in Polish and English were collected. The correlation between cloze test scores and frequency of stuttering and typical disfluency in the English samples was also examined. All participants experienced more stuttering in English (L2) than Polish (L1) during dialogue. Overall, participants had increased stuttering in L2 for at least one speaking task. Seventy one percent of participants had increased typical disfluencies in L2 for dialogue and monologue. Most participants evidenced an increase in stuttering and typical disfluencies in L2 compared to L1. The results suggest that language proficiency may share a relationship between frequency of stuttering and typical disfluencies, highlighting the importance of collecting cross-linguistic speech data during assessment to reach clinical decisions related to fluency disorders in bilingual populations.

Streszczenie

W artykule przeanalizowano częstotliwość występowania symptomów jąkania i tzw. zwykłych niepłynności u dwujęzycznych (polsko-angielskich) dorosłych osób z jąkaniem. Próbki zbierano podczas dialogu, monologu i czytania. Dokonano porównań pomiędzy obydwoma językami. Dodatkowo zbadano związek pomiędzy znajomością języka angielskiego a częstotliwością występowania symptomów jąkania i tzw. zwykłych niepłynności. Celem badania było pogłębienie wiedzy na temat różnic pomiędzy jedno- i dwujęzycznymi osobami, które się jąkają. Dane były pozyskiwane podczas sesji online. Uczestnicy najpierw wypełnili angielski test biegłości *Cloze*. Następnie zbierano randomizowane próbki mowy podczas dialogu, monologu i głośnego czytania w języku polskim i angielskim. Zbadano również korelację pomiędzy wynikami testu *Cloze* a częstotliwością jąkania i tzw. zwykłych niepłynności w próbkach angielskich. Wszyscy uczestnicy manifestowali więcej przejawów jąkania się w języku angielskim niż polskim podczas dialogu. Uczestnicy jąkali się bardziej w języku angielskim w co najmniej jednym zadaniu (dialog, monolog lub czytanie). Siedemdziesiąt jeden procent uczestników prezentowało podwyższony poziom tzw. zwykłych niepłynności w tym języku podczas dialogu i monologu. U większości uczestników objawy jąkania się i tzw. zwykłych niepłynności były bardziej nasilone w języku angielskim w porównaniu z polskim. Wyniki sugerują, że biegłość językowa może mieć związek z częstotliwością występowania objawów jąkania się i tzw. zwykłych niepłynności. W celu podejmowania decyzji klinicznych związanych z zaburzeniami płynności mowy w populacjach dwujęzycznych podczas diagnozy istotne jest dokonanie oceny w obu językach.

Introduction

In monolinguals, various linguistic features contribute to the presence of stuttering. Brown's [1945] seminal work in the field provided the basis for this type of research, with the following linguistic attributes described as leading to increased stuttering: initial sounds and words beginning with a consonant, words initiating a sentence or utterance, content rather than function words, and lengthier words. Additional

findings have shown that stressed syllables [Brown, 1938], increased syntactic complexity of a statement [Blood, Hood, 1978; Bloodstein, 1974] and unfamiliar words [Hubbard, Prins, 1994] contributed to increased stuttering.

However, because these linguistic features differ across languages, there may be some variability when comparing languages [Dworzynski, Howell, Natke, 2003; Dworzynski, Howell, 2004]. Stuttering frequency may also present differently depending on the speaking tasks, with increased stuttering typically presenting during dialogue compared to monologue [Johnson et al., 2009]. Cross-linguistic and cross-task comparisons contribute to a greater understanding of stuttering and its triggering factors, but more research is needed to understand whether these linguistic factors affect stuttering across different languages in bilinguals who stutter. Studying stuttering frequencies cross-linguistically helps parse out any differences due to language and provides more accurate and informed assessment, diagnostic, and treatment options. As bilingualism continues to increase, so will the need for cross-linguistic research to provide a knowledge base for the similarities and differences found between languages, contributing to evidence-based, linguistically sensitive practice. In addition, research into bilingualism could contribute to the understanding that bilingualism itself does not pose a significant risk for stuttering, despite previous research findings that said otherwise [e.g., Travis, Johnson, Shover, 1937]. Even though these findings have been dismissed due to unsupported data and methodological issues, the idea that there is a causal link between stuttering and bilingualism continues to prevail [Gahl, 2020].

Stuttering and bilingualism

It is known that stuttering will typically manifest in all languages spoken by people who stutters (PWS) [Kohnert, Medina, 2009]. The current research on bilingual PWS encompasses Indo-European languages, such as Spanish [Bernstein Ratner, Benitez, 1985; Ardila, Ramos, Barrocas, 2011; Hernández-Jaramillo, Velásquez-Gómez, 2015], French [Roberts, 2002], German [Schäfer, Robb, 2012], and Afrikaans [Jankelowitz, Bortz, 1996; Morrish, Nesbitt, Zsilavecz, 2017]. Non-Indo-European languages, such as Kannada [Maruthy et al., 2015; Kashyap, Maruthy, 2020], Omani-Arabic [Al'Amri, Robb, 2020], and Mandarin [Lim et al., 2008] have also been studied.

According to Schäfer and Robb [2012], two stuttering patterns have been identified for bilingual PWS: varying frequencies of stuttering in both languages and similar frequencies of stuttering in both languages. Some evidence points to the fact that bilingual PWS typically demonstrate different frequencies of stuttering cross-linguistically [Bernstein Ratner, Benitez, 1985; Jankelowitz, Bortz, 1996; Lim et al., 2008]. However, it is not yet certain whether the similarities and differences between the languages spoken by bilingual PWS impact the prevalence of their stuttering.

The task, too, can impact the frequency of stuttering. In general, stuttering frequency differs between monologue versus dialogue tasks, specifically with typically more stuttering occurring during conversation than monologue [Johnson et al., 2009]. In addition, many bilinguals take additional time to plan their statements in their non-native language. Levels of language proficiency in bilingual PWS can also correlate with stuttering severity [Van Borsel, Maes, Foulon, 2001; Van Borsel, Sunaert, Engelen, 2005]. Some investigators have found increased stuttering in participants' dominant language (usually their first language, or L1) [Jayaram, 1983; Al'Amri, Robb, 2020; Howell et al., 2004], while others noted a higher incidence of stuttering in the non-dominant language (usually their second language, or L2) [Jankelowitz, Bortz, 1996; Roberts, 2002; Lim et al., 2008; Ardila, Ramos, Barrocas, 2011; Schäfer, Robb, 2012; Maruthy et al., 2015; Kashyap, Maruthy, 2020]. In Roberts [2002], out of two self-reported balanced bilingual PWS (English and French) only one participant experienced a similar frequency of stuttering in both languages.

Typical disfluencies and bilingualism

Many bilinguals experience an increased number of typical disfluencies, compared to monolinguals [Roberts, 2002], which may also be seen in bilingual PWS. These typical disfluencies often result from word-finding and/or syntax planning difficulties in the second language [Roberts, 2002]. According to Schäfer and Robb [2012], if an individual presents with disfluencies in a non-dominant language without showing any behaviors traditionally recognized as stuttering (e.g., part-word repetitions), these disfluencies may be due to language processing, rather than stuttering. Speech-language pathologists (SLPs), then, have the added challenge of distinguishing between stuttering and typical disfluencies. It has also been pointed out that bilingual individuals, overall, may have an increased number of mazes in their speech, which present as typical disfluencies (e.g., interjections, revisions, and multi-syllabic word repetitions) that, while not meaningful, may serve as a way to process moments of linguistic uncertainty and complexity in the non-dominant language [Eggers, Van Eerdenbrugh, Byrd, 2020]. For example, Eggers, Van Eerdenbrugh, and Byrd [2020] found that bilingual Yiddish-Dutch speaking children experienced significantly more typical disfluencies than monolinguals in Dutch, the non-dominant language. Thus, SLPs should consider differences in monolinguals and bilinguals when considering stuttering and typical disfluencies.

Three known studies have also examined the frequency of typical disfluencies in PWS across genres (i.e., speech tasks). Specifically, Hollebeke and Neyt [2013] found significantly more typical disfluencies during monologue and oral reading tasks in English or French – participants' second language (L2) – compared to Dutch – their native, dominant language (L1). Similarly, Roberts [2002] found significantly

more typical disfluencies in speakers of English (L2) compared to French (L1) during monologue and oral reading tasks. Recently, Al'Amri and Robb [2020] studied the typical disfluencies of Omani-Arabic (L1) and English-speaking (L2) bilingual PWS during oral reading and dialogue tasks. The researchers found no significant difference in the number of typical disfluencies between the languages in either task [Al'Amri, Robb, 2020]. Clinicians working with bilingual populations, then, must be sensitive to this knowledge and be able to separate typical disfluencies (which may be higher in frequency depending on language proficiency) from stuttering [Byrd et al., 2015].

Considerations for determining language proficiency

One important aspect to consider when assessing bilingual individuals is degree of language proficiency. As shown in previous research, language proficiency can impact stuttering and typical disfluency levels. However, due to the varied definitions and cases of bilingualism, language proficiency can be difficult to measure. Bilingualism is an evolving skill that manifests itself in various forms (e.g., speaking, reading, writing, listening, as well as social, vocational, versus academic use). To gather evidence about participants' linguistic history, experiences, and proficiency, a self--report questionnaire can be used. According to Grosjean [2004], the following criteria provide important details about participants' language experience and abilities: language history (e.g., when and how language skills were first acquired), function (e.g., frequency, purposes, and environment of language use), proficiency (across the four domains of listening, speaking, reading, and writing), stability (e.g., whether a language is currently or no longer being acquired), and mode (e.g., code-switching).

Using Grosjean's recommendations, Coalson, Peña, and Byrd [2013] completed a systematic review of existing research on bilingual and multilingual PWS to evaluate how many studies included these recommendations. Their findings show that the description used for multilingual PWS participants was both inadequate and inconsistent. Coalson, Peña, and Byrd (2013) recommended that future research consider Grosjean's [2004] recommendations, including degree of accent (e.g., how pronounced an accent is, which may negatively correlate with age of acquisition and language use), language of covert speech (e.g., what language an individual thinks in), and affective variables (e.g., the individual's overall comfort and willingness to speak a language).

One issue noted in Coalson, Peña, and Byrd [2013] and Werle, Byrd, and Coalson [2019] reviews was that various language factors were not included or adequately described in previous questionnaires involving multilingual participants who stutter, which may have impacted the interpretation of a particular study's findings [Werle, Byrd, Coalson, 2019]. There are primary factors that influence language knowledge (including language history, proficiency, and function) as well as secondary factors

(e.g., stability, mode, accent, affect, and covert speech) [Coalson, Peña, Byrd, 2013]. Both primary and secondary factors can be considered in language proficiency questionnaires, as there is multilingual, non-stuttering research that shows that all these factors can influence language processing [Coalson, Peña, Byrd, 2013]. The questionnaire used in this study asked participants questions relative to the recommended primary and secondary factors.

Another difficulty when assessing language proficiency in bilingual participants is the lack of standardized measures. Specifically, there is no standardized assessment that would allow for testing participants' second language proficiency in a free, timely, online, and feasible manner. One option that can be used to provide a more objective measure of non-native language proficiency is the cloze test. Cloze tests have been a commonly used means of measuring language proficiency [Oller Jr., 1972] and have also been adopted in studies involving bilingual PWS [Jankelowitz, Bortz, 1996; Evans, 2002; Schäfer, Robb, 2012]. A cloze test typically involves a body of text where certain letters or words are removed, and participants need to fill in the blank with a syntactically and semantically appropriate letter or word. To score a cloze test, participants are typically given one point for every correct response, if contextually appropriate. A percentage of language proficiency is then calculated by dividing the total of correct responses by the total answers possible and multiplying by 100 [Kobayashi, 2002]. A specific score criterion for proficiency has not been established so far [Evans, 2002]. In Jankelowitz and Bortz's [1996] study, cloze test scores of 90% and 94% were respectively obtained for the balanced bilingual (Afrikaans-English) participant and subsequently interpreted as "highly proficient" in both languages. Schäfer and Robb [2012] designated proficiency with higher percentages being interpreted as "better language proficiency."

While there is no standardized criterion for cloze test interpretation, it does provide insight into the ability to listen, read, speak, and write, which, according to Grosjean [1998], are necessary areas to assess language proficiency. The basis of the cloze test rests on participants' exposure and understanding of a non-native language's semantics and syntax, which is a key component of second language acquisition [Barcroft, 2004]. In addition, according to Tremblay and Garrison [2010], standardized language proficiency scores have been found to correlate with cloze test scores, have high reliability and internal consistency, and have been shown to discriminate between proficiency levels. Furthermore, based on the results of Chae and Shin [2015], timed cloze tests correlated with higher standardized English proficiency test scores, given that time constraints allow for more spontaneous answers that indicate proficiency levels.

Present study aims

At present, there are limited studies examining stuttering and typical disfluencies in the speech of Polish-English bilingual PWS. This study, a continuation of the findings from Krawczyk [2018], examines whether levels of language proficiency correlate with the type and frequency of stuttering as well as typical disfluencies. The purpose of this investigation is to contribute to the existing body of research on bilingual PWS, especially in the Slavic branch of languages, and to build upon previous studies by analyzing not only stuttering types and frequency, but also typical disfluencies across three different speech tasks: monologue, dialogue, and oral reading. The following questions guided this study: 1) does the frequency of stuttering and typical disfluencies differ between Polish and English during monologue, dialogue and reading tasks; 2) does second language proficiency correlate with the frequency of stuttering, and 3) does second language proficiency correlate with the frequency of typical disfluencies? It was hypothesized that English, as the second language, would incur more stuttering and typical disfluencies than Polish and that there would be a correlation between English proficiency and the frequency of stuttering and typical disfluencies.

Methodology

Participants

This study was approved by the University of Central Florida Institutional Review Board (IRB number: SBE–17–13558). Participants included seven adults (five males and two females); their age ranged from 20 to 31 years with an average age of 25 years and 8 months. They all received and signed a consent form to participate. All participants were native Polish speakers and spoke English as a second language. More specifically, L1 in this study refers to Polish, which is the native and more proficient language spoken by all participants; L2 refers to English as the second, less proficient language. The average age at which participants started to learn English, acquired via school, private lessons, or self-teaching, was 8 years old. To be included, each of the participants must have a diagnosis of child onset stuttering, present with at least 3% words stuttered as determined by means of 200-word conversational samples in Polish and English, have no additional speech and/or language disorders, have no educational background in English, psychology, translation, or speech-language pathology, and speak English at an intermediate level or higher, as defined by a score of at least 50% on the cloze test.

All participants live in Poland, representing six of the sixteen provinces: Greater Poland, Holy Cross, Lesser Poland, Lublin, Masovia, and Silesian. Participants were notified that data collection would occur via video conference call (Skype). The first

author is a native English and proficient Polish speaker and, therefore, communication prior to and during data collection occurred in both Polish and English.

All participants reported that their stuttering began during childhood and was not due to a psychological or neurological event. Types of self-reported stutters that occurred the most included monosyllabic word repetitions, sound prolongations, blocks, and broken words. All participants indicated having received treatment for stuttering, conducted in Polish, in the past (at least a year prior to the study), but none were receiving speech therapy at the time of the study. Per self-report, treatment included Fluency Shaping, Stuttering Modification and Cognitive-Behavioral approaches. Three participants were attending self-help groups, three had attended in the past, and one participant never joined. Participants were recruited through a call for participants sent to self-help groups throughout Poland, either by e-mail, Facebook, or the group's webpage. Table 1 details the participant demographics.

Table 1. Participant Demographics

Participant	Age	Gender	Highest Ed.	Occupation	Age of Stuttering Onset
1	31	M	Bachelor's	Software Manager	6
2	23	M	High School	Student	8
3	26	F	Master's	Accountant	5
4	26	M	Master's	Student	7
5	28	M	Master's	Software Engineer	9
6	27	M	Master's	Student	4
7	20	F	High School	Student	13

Source: own study

Materials and procedure

Questionnaire

All participants first completed a digital "Language History and Stuttering Experience" Questionnaire in English (Appendix A). The self-report questions were created based on Coalson, Peña, and Byrd (2013) and Werle, Byrd, and Coalson (2019) recommendations for primary and secondary factors impacting language proficiency. Four areas of information were collected from this questionnaire: participant demographics (e.g., voivodeship and occupation), language history (e.g., languages spoken, for how long, frequency and situational use, self-rating of language ability and level of comfort, etc.), stuttering treatment experiences (e.g., diagnosis, previous therapy, other speech and/or language disorders, age of stuttering onset, types of stuttering experienced by participants, etc.), and bilingualism and stuttering (e.g., which language the participant thinks they stutter more in, level of stuttering severity in English and Polish, etc.). Not only did this questionnaire provide confirmation that participants met the inclusionary criteria, but also gave the researchers additional insight

into participants' linguistic history as individuals who stutter. Table 2 provides more information on participant responses.

Table 2. Participants' English Language Frequency[1]* ("How Often Do You…") and Setting of Use

Participant #	Hear	Speak	Read	Write	Setting(s)
1	Daily	Weekly	Daily	Daily	Social and Work
2	Weekly	Monthly	Weekly	Monthly	Social and Work
3	Weekly	Monthly	Weekly	Daily	Social and Work
4	Daily	Daily	Daily	Daily	Social and Work
5	Monthly	Monthly	Daily	Monthly	Work
6	Daily	Weekly	Daily	Daily	Work and Social
7	Daily	Weekly	Daily	Weekly	Social

Source: own study

Cloze test

The text "Sensible Driving Can Save Fuel" (n.d.) was used for this study (Appendix B). Every 8th word was removed – sometimes the entire word and other times the first letter remained. Prior to utilizing the cloze test in the study, the researcher piloted the test by sharing the link on social media to Polish-English bilinguals (who were not participants or friends of the participants in the study) asking for feedback relative to the cloze test design, readability, and understanding of the task. Following their review, the researcher revised the test instructions for clarity. Participants were then sent this revised cloze test link during the Skype data collection session. The cloze test had 30 blanks; thus, if a participant got 24 of those 30 blanks correct, their cloze test score was 80%. Overall, cloze test scores for this study ranged from 60–100%, with an average score of 81.4%. Participants had 30 minutes to complete the cloze test and, upon receiving a 50% score or higher, were able to continue with the study. Table 3 details participants' cloze test scores relative to the amount of time they have spoken English.

Table 3. Participants' Self-Reported Rating[2] of Proficiency Based on the Four Language Domains ("How Well Do You…English?"), Year Speaking English, and Cloze Test Score

Participant	Understand	Speak	Read	Write	Years	Cloze Test Score
1	4	4	4	5	23	80%
2	3	3	4	3	15	60%
3	3	3	4	4	19	70%
4	5	5	5	5	21	97%

---

1 Frequency is reported as a range, as participants were asked to state the frequency that they hear, speak, read, and write English.

2 Rating based on a 0–5 scale, with 0 = Not at all; 5 = near native language proficiency.

Table 3 (cont.)

Participant	Understand	Speak	Read	Write	Years	Cloze Test Score
5	4	2	4	2	18	80%
6	4	3	4	3	14	83%
7	5	4	5	3	14	100%

Source: own study

Speech tasks

The speech tasks were recorded using a video camera, which was zoomed in to the laptop screen to provide a clear image, but still out of the frame so as not to distract the participant. The researcher informed participants beforehand via the consent form that they would be filmed for the purpose of this study.

The three speech tasks were dialogue, monologue, and oral reading. The dialogue task consisted of a semi-structured conversation with the researcher (Appendix C). The questions related to common events, such as "If you could have any job in the world, what would you choose?" and "What is a favorite memory that you have of your family?" Two sets of questions were randomized per language, per participant. The monologue portion was a picture description task, where participants were sent a series of images from the National Geographic magazine and asked to discuss the images (e.g., anything that came to mind). There were ten images per set and two sets of images total so that each set could be randomized per participant per language (Appendix D). For oral reading, participants read a 200-word passage aloud in each language. Each passage was at a beginner level for the corresponding language. The Polish language text (Appendix E), "Co było pierwsze, imię czy nazwisko?" was chosen from an elementary-level Polish textbook for Polish-language learners [Pawlusiewicz, 2001]. The English text, "Sunbathing" [Sunbathing, n.d.], is for first-year students learning English as a second language (Appendix F).

Taken together, each participant provided six speech samples (dialogue, monologue, and oral reading in both Polish and English). Instructions presented prior to each task stressed that participants were not to switch between languages during a task to avoid any linguistic differences that may skew the data. All tasks were randomized for every participant in terms of language, sequence of administration, and set of dialogue topics and monologue images to minimize the possibility of an order effect.

Data analysis

To analyze the frequency of stuttering and typical disfluencies, the first 200 words of the dialogue and monologue tasks were transcribed for both the Polish and English samples. Stuttering behaviors were operationally defined as: sound, syllable and monosyllabic word repetitions, oral and silent prolongations, and broken words [Ambrose,

Yairi, 1999; Bloodstein, Bernstein Ratner, 2008; Byrd, Bedore, Ramos, 2015]. Typical disfluencies were based on the types defined by Ambrose and Yairi [1999]: interjections, revisions, incomplete phrases and multisyllabic word and phrase repetitions. Each sample (dialogue, monologue, oral reading) was then analyzed and coded for stuttering and typical disfluencies using a coding key based on the stuttering and typical disfluency features mentioned above.

To calculate the overall frequency (percentage) of words stuttered, the total number of words stuttered was divided by 200 for the dialogue, monologue, and oral reading tasks in both languages. This process was repeated to obtain the frequency (percentage) of typical disfluencies. Descriptive statistics relative to the overall percentage of words stuttered and typical disfluencies in L1 and L2 during each of the three tasks were presented. In addition, an individual analysis of each participant's frequency of stuttering and typical disfluencies in L1 and L2 within each task was conducted and a sign test table depicted the increase and decrease in frequency of stuttering and disfluency. Cloze test scores were compared to the overall frequency of stuttering and typical disfluencies.

Reliability

Intra-rater and inter-rater reliability measures were computed using a point-by-point fluency count. To measure intra-rater reliability, fifty percent (50%) of the samples were chosen at random for re-analysis by the first author. The intra-rater reliability agreement was 98%. For inter-rater reliability, all Polish speech samples were re-analyzed by a Polish-speaking speech-language pathologist who completed the European Clinical Specialization in Fluency Disorders (ECSF) certification. All English samples were re-analyzed by an English-speaking speech-language pathologist, who holds an ECSF certification as well as an American Speech-Language Hearing Association (ASHA) Board Certification in Fluency Disorders. The inter-rater reliability was 96% for Polish and 91% for English.

Results

Frequency of stuttering during speaking tasks

During dialogue, the mean percentage of words stuttered in L1 (Polish) was 10.6% (SD = 11.2), with a minimum of 2 and maximum of 31.5. For L2 (English), the average was 14.7% (SD – 11.6, min = 5, max = 34). For the monologue samples, stuttering averaged 12.4% (SD = 14.1, min = 1, max = 39) in L1. For L2, the mean was 14% (SD = 11, min = 1.5, max = 39). In oral reading, the mean percentage of stuttering in L1 was 6.43% (SD = 6.11, min = 1.5, max = 18). The mean percentage of stuttering in L2 during oral reading was 9.21% (SD = 13.7, min = 1, max = 40).

When looking at each individual participant's frequency of stuttering during each task, it can be observed in Table 4 that all participants displayed an increase

in stuttering in L2 compared to L1 during dialogue. For all participants, the mean increase in stuttering was 4.1%. For the monologue samples, 5 out of 7 (71%) of participants had increased stuttering in L2, with a mean increase of 5.4% and mean decrease of 7.8%. During the oral reading task, four participants stuttered more in L2, while three participants had more stuttering in L1. The mean increase between L1 and L2 was 6.9% and the mean decrease was 3%. Overall, all participants increased stuttering in L2 in at least one condition or speaking task.

Table 4. Percentage of Words Stuttered in L1 (Polish) and L2 (English) during Dialogue, Monologue, and Oral Reading Tasks and the Difference in Frequency

Participant	Dialogue		Diff.	Monologue		Diff.	Oral Reading		Diff.
	L1	L2		L1	L2		L1	L2	
1	2	7	+5	1	7.5	+6.5	2	5	+3
2	6	8	+2	6	10	+4	3.5	4	+0.5
3	31.5	34	+2.5	39	26	−13	18	40	+22
4	21	28.5	+7.5	24.5	32	+7.5	10.5	4	−6.5
5	4	9.5	+5.5	4	7.5	+3.5	1.5	3.5	+2
6	6.5	11	+4.5	8	13.5	+5.5	7.5	7	−0.5
7	3.5	5	+1.5	4	1.5	−2.5	2	0	−2

Source: own study

Frequency of typical disfluencies during speaking tasks

During dialogue, the mean percentage of typical disfluencies present in L1 for all participants was 8.5% (SD = 5.78, min = 1, max = 16.5). The mean percentage of typical disfluencies in L2 was 13.9% (SD = 7.94, min = 4.5, max = 26.5). During monologue, participants presented with an average percentage of 10.6% (SD = 4.26, min = 4.5, max = 16.5) in L1. In L2, there were an average of 15.8% (SD = 8.44, min = 4, max = 27) typical disfluencies. For oral reading, in L1 participants had an average of 1.36% (SD = 1.89, min = 0, max = 5.5) typical disfluencies and, for L2, 4.57% (SD = 5.93, min = 0, max = 16).

As evident from Table 5, when scrutinizing each participant's data, 5/7 (71%) experienced an increase in typical disfluencies in L2 compared to L1 during dialogue and monologue. During dialogue, there was a mean increase from L1 to L2 of 8.8%; the mean decrease was 3%. For monologue, 5/7 (71%) of participants evidenced increased typical disfluencies from L1 to L2. The mean increase of typical disfluencies in L2 was 8% and the average decrease was 1.8%. For oral reading, three participants had a slight decrease (each 0.5%) in typical disfluencies in L2 and for one participant, the number of disfluencies in both languages were equal. The remaining three participants experienced an increase in typical disfluencies in L2 (mean increase of 7.7%; mean decrease of 0.5%). Overall, only Participant 7 evidenced decreases in typical disfluencies across all three speaking tasks.

Table 5. Percentage of Typical Disfluencies in L1 (Polish) and L2 (English) during Dialogue, Monologue, and Oral Reading and the Difference in Frequency

Participant	Dialogue		Diff.	Monologue		Diff.	Oral Reading		Diff.
	L1	L2		L1	L2		L1	L2	
1	3.5	12	+8.5	10.5	18	+7.5	1	6	+5
2	16.5	26.5	+10	16.5	27	+10.5	5.5	8	+2.5
3	9.5	22.5	+13	14.5	24.5	+10	0.5	16	+15.5
4	1	4.5	+3.5	4.5	4	− 0.5	0.5	0	− 0.5
5	4.5	13.5	+9	6	17.5	+11.5	0.5	0.5	0
6	14.5	11.5	−3	11	11.5	+0.5	1.5	1	− 0.5
7	10	7	−3	11	8	−3	1	0.5	− 0.5

Source: own study

English proficiency cloze test

A Spearman correlation was computed to analyze the correlation coefficient between cloze test scores and percentage of stuttering in English. The analysis revealed a moderate correlation between the cloze test score and frequency of stuttering in L2 during dialogue, $\rho(5) = .49$, and monologue, $\rho(5) = .49$, and a low correlation for oral reading, $\rho(5) = .24$.

A Spearman correlation analysis revealed a moderate correlation between cloze test scores and percentage of typical disfluencies in L2 during dialogue, $\rho(5) = -.63$, monologue, $\rho(5) = .63$, and oral reading, $\rho(5) = .55$.

Discussion

To our knowledge, this study is the first report that explored the frequency of stuttering and typical disfluencies in Polish-English bilingual participants' native (i.e., Polish) and second (English) language. Most participants experienced an increase in the number of stutters in English during all three speaking tasks. Similarly, most participants had a greater number of typical disfluencies in English compared to Polish in all tasks. This research study also tested the relationship between participants' language proficiency and fluency level via cloze test score, revealing a moderate correlation between cloze test scores and frequency of stuttering in L2 during dialogue and monologue tasks. For typical disfluencies, there was a moderate correlation across all three speaking tasks.

Concerning the differences of stuttering behaviors across genres identified in this study, it is possible that the frequency of stuttering was higher in participants' L2 during dialogue because a conversation is much less structured than monologue or oral reading and relies on a communication partner to provide verbal and non--verbal feedback. Our findings are consistent with Lim et al. [2008] who revealed

that English-Mandarin bilingual PWS had significantly more stutters in their second language during conversation.

The current study's results echo what previous studies have found, namely that some participants experienced increased stuttering in their second language, such as the research by Jankelowitz and Bortz [1996], Roberts [2002], Lim et al. [2008], Schäfer and Robb [2012], Hollebeke and Neyt [2013], and Maruthy et al. [2015]. When scrutinizing participants' cloze test scores in light of the difference in percentage stuttering in English, there seemed to be various patterns of manifestations. All participants scored above 50% on the cloze test, with 5/7 participants scoring 80% or higher, indicating very good proficiency in English. Of these five participants, all experienced an increase in stuttering in L2 compared to L1 during dialogue, and 80% had increased stuttering in L2 during monologue and 2/5 (40%) during oral reading. Participants two and three, with a cloze test score of 60% and 70%, both experienced an increase in stuttering in L2 during dialogue and oral reading, but only one had increased stuttering during monologue. Important to note, however, is the difficulty to fully compare or draw conclusions from the published studies, as some data were based on single cases [Coalson, Peña, Byrd, 2013]. In general, multilingual stuttering research typically comprises of case studies and small-scale studies because large groups of bilingual individuals who stutter are difficult to recruit [Coalson, Peña, Byrd, 2013]. The current investigation used a multiple case study approach with an individual analysis for all seven participants in an effort to explore diverse patterns of stuttering and typical disfluency manifestation in bilingual PWS.

In terms of typical disfluencies, it was hypothesized that English, as the second language, would lead to more typical disfluencies due to word finding and language planning difficulties. Participants with high cloze test scores (80% or higher) evidenced a lower number of typical disfluencies in L2. For example, Participants 4 and 7, whose cloze test scores were 97% and 100% respectively, evidenced a decrease in disfluencies between L1 and L2 across all tasks and the lowest percentage increase on one occasion (dialogue) compared to the other participants. The two participants with the lowest cloze test scores (Participants 2 and 3) experienced the highest increase in typical disfluencies in L2 across all three speaking tasks. Participant 3, who scored 70% on the cloze test, had the largest difference in typical disfluencies from L1 to L2 during dialogue and oral reading compared to all other participants. In previous research, Roberts [2002] and Hollebeke and Neyt [2013] showed significantly more typical disfluencies in participants' non-native languages. The researchers attributed this to the fact that participants may use increased avoidance behaviors in L2, such as circumlocution.

While Jankelowitz and Bortz [1996] and Lim et al. [2008], both proposed that language dominance impacts stuttering severity, no study – to the best of the researchers' knowledge – has explored the correlation between cloze test scores

and frequency of stuttering and typical disfluencies. Testing such a relationship could provide clinical insight and lead to assessment and treatment implications specific to foreign languages spoken by the client. Previous studies have shown that the less dominant language evoked significantly more stuttering than the native language [Jankelowitz, Bortz, 1996; Roberts, 2002; Lim et al., 2008; Schäfer, Robb, 2012; Hollebeke, Neyt, 2013; Maruthy et al., 2015]. As mentioned before, not only is it difficult to define bilingualism, it is even more difficult to measure it [Schäfer, Robb, 2012]. Cloze tests have been used in other studies that measured language proficiency and stuttering [e.g., Jankelowitz, Bortz, 1996; Evans, 2002; Schäfer, Robb, 2012] in the absence of a more objective, standardized and norm-referenced option. Therefore, although the researchers recognize the limitation of using a cloze test in combination with a questionnaire to define language proficiency, specifically because the lack of standardization of this method, this method was still adopted in an attempt to gauge expressive language proficiency rather than assuming it.

Overall, this research may prove useful to clinicians working with bilingual PWS in terms of recognizing that dysfluencies may differentially occur in the native versus foreign language in certain speaking conditions. Based on our current finding, it is argued that stuttering and typical disfluencies may be more prevalent in the lesser proficient language; therefore, it is beneficial to assess and possibly treat stuttering in all languages spoken by the client. Clinicians may also pay particular attention to the frequency and type of stuttering and typical disfluencies. Being aware of any cross-linguistic differences may also guide clinicians towards a more nuanced diagnosis and treatment approach, one that involves all languages spoken by the client, not just the shared language between a client and clinician.

Study limitations

It is possible that completing the study via Skype may have impacted the results, as participants might have various comfort levels with online versus in-person communication. As mentioned above, the use of cloze tests might pose as a limitation as well. In addition, asking participants not to code switch during language tasks might have unknowingly influenced the presence of stuttering or typical disfluencies. The authors also recognize the sample size limitation in light of generalization of the results. Follow-up research may also elaborate on demographic information including previous treatment type and its duration.

Conclusion

The current study adds to the body of existing literature regarding stuttering and bilingualism, uncovering both similarities and differences compared to previous studies. Because all study participants had received speech therapy in the past, these results might not directly generalize to untreated individuals. By collecting data on different speech tasks, operationally defining stuttering, and including typical disfluencies – which may not have been analyzed in most studies so far – the aim was to expand the scope of existing knowledge on the topic. The results indicate that many (though not all) participants evidenced an increase in stuttering and typical disfluencies in L2 compared to L1. These results would suggest the importance for clinicians to collect cross-linguistic speech data during assessment, as the occurrence and manifestations of stuttering behaviors may differ depending on language and task. This information would, in turn, allow for more specific treatment targets that involve languages frequently spoken. Mostly, this study invites further research into understanding exactly how bilingualism differentially impacts stuttering. Other factors to be explored might include specific linguistic correlates between languages (e.g., phonetic and morpho-syntactic components), sub-types of bilinguals, type and number of languages spoken, etc., and may shed further light on stuttering and bilingualism.

Future research, with a larger sample, could explore the linguistic features of Polish versus English morphosyntax or phonology to determine if these factors influence stuttering in any way. In addition, prospective studies could contribute to what constitutes efficacious, best practice assessment, and treatment of the bilingual PWS.

References

Al'Amri F., Robb M.P., 2020, *Disfluency characteristics of Omani Arabic-English bilingual speakers*, "Clinical Linguistics & Phonetics", Vol. 35(7), pp. 593–609, https://doi.org/10.1080/02699206.2020.1806931

Ambrose N., Yairi E., 1995, *The role of repetition units in the differential diagnosis of early childhood incipient stuttering*, "American Journal of Speech-Language Pathology", Vol. 4(3), pp. 82–88.

Ardila A., Ramos E., Barrocas R., 2011, *Patterns of stuttering in a Spanish/English Bilingual: A case report*, "Clinical Linguistics & Phonetics", Vol. 25(1), pp. 23–26.

Barcroft J., 2004, *Effects of sentence writing in second language lexical acquisition*, "Second Language Research", Vol. 20(4), pp. 303–334.

Bernstein Ratner N., Benitez M., 1985, *Linguistic analysis of a bilingual stutterer*, "Journal of Fluency Disorders", Vol. 10, pp. 211–219.

Blood G.W., Hood S.B., 1978, *Elementary school-aged stutterers disfluencies during oral reading and spontaneous speech*, "Journal of Fluency Disorders", Vol. 3, pp. 155–165.

Bloodstein O., 1974, *The rules of early stuttering*, "Journal of Speech and Hearing Disorders", Vol. 39, pp. 379–394.

Bloodstein O., Bernstein Ratner N., 2008, *A handbook on stuttering*, New York: Thomson-Delmar.

Brown S.F., 1938, *Stuttering with relation to word accent and word position*, "Journal of Abnormal and Social Psychology", Vol. 33, pp. 112–120.

Brown S.F., 1945, *The loci of stutterings in the speech sequence*, "Journal of Speech Disorders", Vol. 10, pp. 181–192.

Byrd C.T, Bedore L.M., Ramos D., 2015, *The disfluent speech of bilingual Spanish-English children: Considerations for differential diagnosis of stuttering*, "Language, Speech, and Hearing Services in Schools", Vol. 46, pp. 30–43.

Byrd C.T., Watson J., Bedore L., Mullis A., 2015, *Identification of stuttering in bilingual Spanish-English speaking children*, "Contemporary Issues in Communication Science and Disorders", No. 42, pp. 72–87.

Chae E.-Y., Shin J.-A., 2015, *A study of a timed cloze test for evaluating L2 proficiency*, "English Teaching", Vol. 70(3), pp. 117–135.

Coalson G.A., Peña D.E., Byrd C.T., 2013, *Description of multilingual participants who stutter*, "Journal of Fluency Disorders", Vol. 38, pp. 141–156.

Dworzynski K., Howell P., 2004, *Cross-linguistic factors in the prediction of stuttering across age groups – The case of German*, [in:] A. Packman, A. Meltzer, H. Peters (eds.), *Theory, research and therapy in fluency disorders. Proceedings of the 4 World Congress on Fluency Disorders*, Montreal: International Fluency Association, pp. 382–388.

Dworzynski K., Howell P., Natke U., 2003, *Predicting stuttering from linguistic factors for German speakers in two age groups*, "Journal of Fluency Disorders", Vol. 28(2), pp. 95–112.

Eggers K., Van Eerdenbrugh S., Byrd C., 2020, *Speech disfluencies in bilingual Yiddish-Dutch speaking children*, "Clinical Linguistics & Phonetics", Vol. 34(6), pp. 576–592, https://doi.org/10.1080/02699206.2019.1678670

Evans D.L., 2002, *The adaptation effect in bilingual people who stutter: An examination of the oral-motor rehearsal theory*, Master thesis, Maine: University of Maine, https://digitalcommons.library.umaine.edu/cgi/viewcontent.cgi?article=1292&context=etd (accessed: 15.08.2022).

Gahl S., 2020, *Bilingualism as a purported risk factor for stuttering: A close look at a seminal study (Travis et al., 1937)*, "Journal of Speech, Language, and Hearing Research", Vol. 63, pp. 3680–3684.

Grosjean F., 1998, *Studying bilinguals: Methodological and conceptual issues*, "Bilingualism: Language and Cognition", Vol. 1, pp. 131–149.

Grosjean F., 2004, *Studying bilinguals: Methodological and conceptual issues*, [in:] T. Bhatia, W. Ritchie (eds.), *The Handbook on Bilingualism*, Oxford: Blackwell Publishing Company, pp. 32–63, http://doi.org/10.1002/9780470756997

Hernández-Jaramillo J., Velásquez-Gómez K., 2015, *Patterns of stuttering comparing two languages: A case report*, "Revista Ciencias de la Salud", Vol. 13(3), pp. 493–504, https://doi.org/10.12804/revsalud13.03.2015.09

Hollebeke L., Neyt J., 2013, *Stotteren en tweetaligheid. Een onderzoek naar het verschil in type en frequentie van stottergedrag en andere niet-Vloeiendheden*, Unpublished Master Thesis, Gent: Universiteit Gent.

Howell P., Ruffle L., Fernandez-Zuniga A., Gutierrez R., Fernandez A.H., O'Brien M.L., Tarasco M., Vallejo Gomez I., Au-Yeung J., 2004, *Comparison of exchange patterns of stuttering in Spanish and English monolingual speakers and a bilingual Spanish-English speaker*, [in:] A. Packman, A. Meltzer, H. Peters (eds.), *Theory, Research and Therapy in Fluency Disorders. Proceedings of the 4 World Congress on Fluency Disorders*, Montreal: International Fluency Association, pp. 415–422.

Hubbard C.P., Prins D., 1994, *Word familiarity, syllabic stress pattern, and stuttering*, "Journal of Speech and Hearing Research", Vol. 37, pp. 564–57.

Jankelowitz D.L., Bortz M.A., 1996, *The interaction of bilingualism and stuttering in an adult*, "Journal of Communication Sciences and Disorders", Vol. 29, pp. 223–234.

Jayaram M., 1983, *Phonetic influences on stuttering in monolingual and bilingual Stutterers*, "Journal of Communication Disorders", Vol. 16, pp. 287–297.

Johnson K.N., Karrass J, Conture E.G., Walden T., 2008, *Influence of stuttering variation on talker group classification in preschool children: Preliminary findings*, "Journal of Communication Disorders", Vol. 42(3), pp. 195–210.

Kashyap P., Maruthy S., 2020, *Stuttering frequency in Kannada-English balanced bilingual adults*, "Clinical Linguistics & Phonetics", Vol. 34(3), pp. 271–289.

Kobayashi M., 2002, *Cloze tests revisited: Exploring item characteristics with special attention to scoring methods*, "The Modern Language Journal", Vol. 86(4), pp. 571–586.

Kohnert K., Medina A., 2009, *Bilingual Children and Communication Disorders: A 30 Year Research Retrospective*, "Seminars in Speech and Language", No. 30, pp. 219–233.

Krawczyk A., 2018, *A Crosslinguistic Analysis of Stuttering and Typical Disfluencies in Polish-English Bilinguals Who Stutter*, Master's thesis, Orlando: University of Central Florida.

Lim V .P.C., Lincoln M., Chan Y.H., Onslow M., 2008, *Stuttering in English-Mandarin bilingual speakers: The influence of language dominance on stuttering severity*, "Journal of Speech, Language, and Hearing Research", Vol. 51, pp. 1522–1537.

Maruthy S., Raj N., Geetha M.P., Priya C.S., 2015, *Disfluency characteristics of Kannada-English bilingual adults who stutter*, "Journal of Communication Disorders", Vol. 56, pp. 19–28.

Morrish T., Nesbitt A., Zsilavecz U., 2017, *Sounds affecting moments of stuttering in multilingualism: A case study*, "Communication Disorders Quarterly", Vol. 38(3), pp. 154–160.

Oller J.W. Jr., 1972, *Scoring methods and difficulty levels for cloze tests of proficiency in English as a second language*, "The Modern Language Journal", Vol. 56(15), pp. 1–158.

Pawlusiewicz M., 2001, *Piękna nasza Polska cała*, Warszawa: Wisdom Publishers Corporation.

Roberts P.M., 2002, *Disfluency patterns in four bilingual adults who stutter*, "Journal of Speech Language Pathology", Vol. 26(1), pp. 5–19.

Schäfer M., Robb P., 2012, *Stuttering characteristics of German-English bilingual speakers*, "Clinical Linguistics & Phonetics", Vol. 26(7), pp. 597–612.

Sunbathing (n.d.), In Actual press magazine 486, Cover story, Mag & Fl@sh. Centre d'animation en langue.

Travis L.E., Johnson W., Shover J., 1937, *The relation of bilingualism to stuttering: A survey of the East Chicago, Indiana, schools*, "Journal of Speech Disorders", Vol. 2(3), pp. 185–189.

Tremblay A., Garrison M., 2010, *Cloze tests: A tool for proficiency assessment in research on L2 French*, [in:] M.T. Prior (ed.), *Proceedings of the 2008 second language research forum*, Somerville: Cascadilla Proceedings Project, pp. 73–88.

Van Borsel J., Maes E., Foulon S., 2001, *Stuttering and bilingualism: A review*, "Journal of Fluency Disorders", Vol. 26, pp. 179–205.

Van Borsel J., Sunaert R., Engelen S., 2005, *Speech disruption under delayed auditory feedback in multilingual speakers*, "Journal of Fluency Disorders", Vol. 30(3), pp. 201–217.

Werle D.R., Byrd C., Coalson G., 2019, *Description of multilingual participants who stutter: An update 2011–2018*, "Communication Disorders Quarterly", Vol. 41(1), pp. 50–57.