Beyond stuttering:

Speech disfluencies in normally fluent French-speaking children at age four

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ABSTRACT

The aim of this study is to establish normative data on the speech disfluencies of normally fluent French-speaking children at age four, an age at which stuttering has begun in 95% of children who stutter (Yairi & Ambrose, 2013). Fifty monolingual French-speaking children who do not stutter participated in the study. Analyses of a conversational speech sample comprising 250 to 550 words revealed an average of 10% total disfluencies, 2% stuttering-like disfluencies, and around 8% non-stuttered disfluencies. Possible explanations for these high speech disfluency frequencies are discussed, including explanations linked to French in particular. The results shed light on the importance of normative data specific to each language.

Key words: stuttering, speech disfluencies, preschool, norms, French-speaking

INTRODUCTION

The interest in describing speech disfluencies in normally fluent children is not new (e.g. Carlo & Watson, 2003; Yairi, 1982; Yaruss, Newman, & Flora, 1999). Johnson (1961) categorizes speech disfluencies as interjections, phrase repetitions, revisions, incomplete phrases, part-word repetitions, word repetitions, broken words, or prolonged sounds. Although these categories may vary slightly from one author to another (for a review, see Yaruss, 1997b), some disfluencies are generally considered by the listener to be 'normal', such as interjections, revisions, multisyllabic word repetitions, and phrase repetitions, which we refer to as non-stuttered disfluencies (NSD). Stuttering-like disfluencies (SLD) include part-word repetitions, monosyllabic word repetitions, sound prolongations, broken words, and blocks (Conture, 2001; Yaruss, 1997b).

Previous studies show that normally fluent preschool children typically produce less than three per cent SLD in a conversational speech sample (Ambrose & Yairi, 1999; Boey, Wuyts, Van de Heyning, De Bodt, & Heylen, 2007; Natke, Sandrieser, Pietrowsky, & Kalveram, 2006; Pellowski & Conture, 2002; Tumanova, Conture, Lambert, & Walden, 2014). Most studies have examined English-speaking children. Ambrose and Yairi (1999) analysed the speech samples of 54 normally fluent children aged two to five based on open-ended questions from an examiner or parent. The children produced a mean of 4.32 NSD and 1.33 SLD per 100 syllables. Using a conversational speech task between children and their mothers, Pellowski and Conture (2002) observed averages of 2.6 total disfluencies per 100 words in 36 children aged three and four years old. Among these, 1.5 were NSD while 1.1 were SLD. More recently, Tumanova et al. (2014) observed a mean of 4.28 total disfluencies per 100 words with 3.05 NSD and 1.2 SLD in 244 children between three and six years old during a free play interaction task between the children and the examiner. There was some variability between children, with 90% of them producing between 1 and 8 total disfluencies (0.42 to 6.9 NSD and 0.00 to 2.7 SLD).

Some studies have also been conducted in other languages. Carlo and Watson (2003) analysed speech samples from free play with the examiner in Spanish-speaking children aged three to five. They observed a mean of 5.36 total disfluencies per 100 syllables (ranging from 1.6 to 8.93) at age three and a mean of 6.65 total disfluencies (ranging from 2.98 to 18.88) at age five. Around 80% of the children produced between 3.00 and 8.99 total disfluencies per 100 syllables with higher proportions of NSD than SLD: 2.9% NSD vs. 1.92% SLD in three-year-olds, and 3.42% vs. 2.66% in five-year-olds. Boey et al. (2007) observed a mean of 0.42 SLD per 100 words in Dutch-speaking preschool children (mean age: 69 months) within free play and conversational interaction with the examiner. Other disfluencies were not described. Finally, during the same interactional situation, Natke et al. (2006) observed a mean of 3.75 total disfluencies per 100 syllables with 2.59 NSD and 1.16 SLD in German-speaking children aged five or younger. Table 1 shows the means and standard deviations for the percentages of NSD, SLD, and total disfluencies for these studies.

Insert table 1 about here

The status of monosyllabic word repetition

Describing the speech disfluencies in preschool children may help in understanding the expected behaviours and better identify early stuttering at an age when the speech could be highly disfluent. Most of the studies mentioned mainly focused on qualitative and quantitative variations that could help differentiate between children who stutter and those who do not stutter. Applying a criterion of 3% SLD resulted in high degrees of sensitivity and specificity in young English-speaking children (Ambrose & Yairi, 1999; Pellowski & Conture, 2002; Tumanova et al., 2014), Dutch-Speaking children (Boey et al., 2007), and German-speaking children (Natke et al., 2006). This criterion is also in line with parental concern about their children's stuttering (Tumanova et al., 2014).

Applying this criterion requires agreement on which disfluencies should be considered as SLD. There is general agreement on the SLD status of part-word repetitions, sound prolongations, broken words,

and blocks, but there is a long-standing debate about the relevance of considering monosyllabic word repetitions as SLD (Brocklehurst, 2013; Howell, 2013; Wingate, 2001; Yairi, Watkins, Ambrose, & Paden, 2001). Given that these repetitions are frequent in both children and adults who do not stutter, Wingate (2001) suggests that these disfluencies should not be considered as stuttering, even if such repetitions occur more frequently in the speech of people who stutter. In contrast, Yairi et al. (2001) argue that monosyllabic word repetitions are frequent contributors to the disfluency and stuttering of preschool children.

Some empirical studies corroborate their opinion. Ambrose and Yairi (1999) have shown that the frequency of monosyllabic word repetitions is significantly higher in English-speaking preschool children who stutter than in their peers who do not stutter. From age two to age four, the percentage of monosyllabic word repetitions was around 3% of the syllables produced, while this percentage was lower than 1% in the control group. Natke and colleagues (Natke et al., 2006) have also shown significantly higher percentages of monosyllabic word repetitions in German-speaking preschool children who stutter (around 2%) than in normally fluent children (less than 1%).

One factor that could be relevant to the status of monosyllabic word repetitions and bring some piece of evidence to the debate is the number of iterations per instance. Various studies have indeed shown that the mean number of repeated units in normally fluent children is less than two, while children who stutter repeat more times per disfluent event (Ambrose & Yairi, 1999; Natke et al., 2006; Pellowsky & Conture, 2002). According to Pellowsky and Conture (2002), 'the mean number of repetition units appears to be a significant factor to consider when determining the presence and severity of a stuttering problem, as well as when differentiating between children who do and do not stutter' (p. 30). Boey suggests considering monosyllabic words that are repeated three times or more to be stuttered (R. Boey, personal communication, June 8, 2015). Monosyllabic word repetitions currently remain a major element in the diagnosis of stuttering. The status of this type of disfluency

could be of particular interest given that monosyllabic word repetitions are prime characteristics that prompt identification of early stuttering by parents (Yairi & Ambrose, 2013).

Other studies have suggested that all disfluencies matter, regardless of their status as SLD or NSD. Tumanova et al. (2014) have shown a very strong discriminatory ability at the threshold of eight disfluencies per 100 words, while Guitar (2013) uses a criterion of no more than 10 disfluencies per 100 words for a normally fluent child. Describing all the disfluencies observed in the speech of young French-speaking children could help improve understanding of the disfluencies to expect in children who do not stutter.

Cross-language differences

As mentioned, most studies have focused on speech disfluencies in English. While some data exist for Dutch, German, and Spanish, none are available for French speakers. However, the frequency and types of speech disfluencies can differ from one language to another. Eklund and Shriberg (1998) have shown a larger amount of within-word disfluencies in Swedish than in English. They attributed this result to the word-compounding nature of Swedish as compared to English. Ardila, Ramos, and Barrocas (2011) showed that stuttering occurred less often with pronouns in Spanish than in English (pronouns are frequently omitted in Spanish).

Concerning French, Crible et al. (2017) showed that filled pauses (which we call interjections, such as '*euh*' ['uh']) display a higher frequency in French than in English among adults. Based on the fact that filled pauses occur more often in French, even in very formal situations, the authors suggest that they could be less stigmatized than in English. Moreover, the speech rate could also impact the speech disfluencies produced. The impact of speech rate on disfluencies is unclear in children who stutter (Chon, Sawyer, & Ambrose, 2012; Sawyer, Chon, & Ambrose, 2008; Tumanova, Zebrowski, Throneburg, Kayikci, 2011). However, a previous study shows that an increase in speech rate is significantly correlated with an increase in speech disfluencies in children and adults who do not

stutter (Oliveira, Broglio, Bernardes, & Capellini, 2013). Thus, studying the speech disfluencies in French in particular is relevant given that speech rate is generally higher among French speakers than English speakers, at least in adults (Pellegrino, Coupé, & Marsico, 2011).

Gender impact

Stuttering exhibits strong differences in incidence between genders, with a larger amount of males who stutter and larger male-to-female ratios in adults than in young children (for a review, see Yairi & Ambrose, 2013). However, less is known about the characteristics of the speech disfluencies in regard to gender. A previous study found no statistical difference in the type and amount of disfluencies among children according to gender in Spanish (Carlo & Watson, 2003). The picture was almost the same for English speakers (Ambrose & Yairi, 1999), except that interjections were more frequent among girls than boys. Nevertheless, differences in the type of disfluencies produced have been found in Swedish-speaking children at age six. Using an event picture description task in normally fluent children at age six, Hedenqvist et al. (2015) showed that girls produced more prolongations, sound repetitions, and unfilled pauses than boys, while boys produced more word repetitions. In English-speaking adults, men have been shown to produce more fillers and repetitions in a referential communication task than women (Bortfeld, Leon, Bloom, Schober, & Brennan, 2001). Once more, French data are not available.

Aim

The purpose of the present study is to establish normative data on the various types of speech disfluencies of normally fluent French-speaking children at age four, an age when stuttering has begun in 95% of children who stutter (Yairi & Ambrose, 2013). If the characteristics of the speech disfluencies observed in other languages are similar in French, we should observe less than 3% SLD, a larger proportion of NSD than SLD, and a mean proportion of total disfluencies lower than 10%.

Specific attention will be drawn to the characteristics of monosyllabic word repetitions that have generally been found to contain only one iteration in normally fluent children. Our study also examines the influence of gender on speech disfluencies, given that qualitative differences have been found in some languages (Swedish) but not in others (English and Spanish).

METHOD

Participants

Fifty children participated in the study (23 girls; mean age = 54 months; *SD* = 3.38 months; range = 49-59 months), and informed consent was obtained from the parents. Parent reports on a medical history questionnaire ensured that all children were monolingual French speakers and that they had no history of psychiatric or neurological disorders, neurodevelopmental delay, sensory impairment, or parental or teacher concern about fluency disorders. A specialised speech-language pathologist confirmed the assessment of normally fluent children. All children scored 10 or less on the SSI-4 (Riley, 2009), and no physical concomitance was observed during speech. Moreover, using standard clinical tests, we ensured that all of the children scored within the normal range on language tests. Their productive phonological abilities were assessed using the word repetition task of the *Evaluation du Langage Oral* (Khomsi, 2001), and their receptive phonological abilities were assessed using the discrimination task of *EVALO 2-6* (Coquet, Ferrand, & Roustit, 2009). Their lexical abilities were measured by productive and receptive vocabulary tests from the *Nouvelles Epreuves pour l'Examen du Langage* (Chevrie-Muller & Plaza, 2001). Their receptive grammatical abilities and productive grammatical abilities were measured by the sentence comprehension task and the sentence production task of the *Evaluation du Langage Oral,* respectively (Khomsi, 2001).

Procedure

The speech fluency of the participants was measured based on a 250 to 550-word conversational speech sample between the child and an examiner using sentences longer than two words. The examiner was a speech-language pathologist. The examiner asked the child to speak about his or her family, home, school, free-time activities, or any topic, and followed the child's lead after the topic was introduced. The conversational pressure was low, and the adult used a slow speaking rate, sat at the child's eye level, kept eye contact, and did not interrupt the child. Elicited samples were video recorded and transcribed verbatim by the first and third authors. Only the intended words were taken into account in the total amount of words produced, but not interjections and initial words that were revised in revised sentences.

The stuttering-like disfluencies included part-word/sound-syllable repetitions (*pu-pu-pudding or p-p-pudding*), sound prolongations (*pu:dding*), blocks (#*pudding*), broken words (*pu#dding*), and monosyllabic word repetitions (*and and and*), although some of the following analyses exclude these from SLD given their specific status. The non-stuttered disfluencies included multisyllabic word repetitions (*pudding - pudding*), phrase repetitions (*I wanted to [/] I wanted to*), revisions (*I wanted to [//] I tried to*), and interjections ('*hum*'). Moreover, monosyllabic word repetitions were divided into those with fewer than three iterations and those with three iterations or more.

To determine inter-observer reliability, 11 samples were randomly selected and analysed by both judges. Reliability was calculated for each disfluency subtype. Wilcoxon signed-rank tests revealed that the differences between the mean frequencies of all disfluencies were not significant, except for part-word repetitions ($p = 0.018$). Spearman's correlation coefficients between the scores of both judges were high for words repeated fewer than three times ($r_s = 0.93$), words repeated three times or more ($r_s = 0.90$), multisyllabic word repetitions ($r_s = 1.00$), phrase repetitions ($r_s = 0.96$), revisions ($r_s = 0.96$), and interjections ($r_s = 0.99$). Given the low frequency of part-word repetitions, sound prolongations, blocks, and broken words, the respective correlation coefficients were not good.

Consequently, both judges reanalysed these disfluencies together to come to an agreement. After this agreement, the previously observed significant Wilcoxon signed-rank test for the part-word repetitions was obviously no longer significant. To determine intra-observer reliability, 10 samples were randomly selected and reanalysed by the same judge. Wilcoxon signed-rank tests revealed that the differences between the mean frequencies of all disfluencies were not significant. Spearman's correlation coefficients between the first and the second counts ranged from $r_s = 0.93$ to $r_s = 1.00$.

RESULTS

The percentages of all disfluency types related to the number of words were calculated for each participant. Mean percentages, standard deviations, and ranges of the disfluency types for boys and girls are presented in table 2. The percentages of total disfluencies were around 10% in both groups and ranged from 3.98 to 23.74%. As shown in the table, there was high variability among the children, especially for the most frequent disfluencies.

Insert table 2 about here

Disfluency types and gender

A series of Mann-Whitney tests were used to compare the differences between boys and girls for each disfluency type. Non-parametric statistical analyses were performed given that speech disfluencies are not normally distributed (Tumanova et al., 2014). As shown in table 2, no statistical difference regarding gender was found for any of the disfluency types. A series of Wilcoxon-signed-rank-tests revealed that the most frequent disfluencies were interjections (due to multiple comparisons, the significance level was adjusted to $p = 0.0045$ using the Bonferroni correction). These occurred significantly more often than monosyllabic word repetitions ($T = 153$, $p < 0.001$),

while the difference did not reach significance with revisions (T = 350, p = 0.009). Revisions and monosyllabic word repetitions had similar frequencies (T = 451, p = 0.23). Phrase repetitions occurred significantly less often than revisions (T = 166, p < 0.001) and monosyllabic word repetitions (T = 235, p < 0.001), but significantly more than multisyllabic word repetitions (T = 0.00, p < 0.001). The frequency of part-word repetitions did not differ significantly from that of multisyllabic word repetitions (T = 218, p = 0.07), but it was significantly higher than that of broken words (T = 94, p < 0.001). Broken words were significantly more common than blocks (T = 0.00, p < 0.001), while the difference did not reach significance with sound prolongations (T = 33, p = 0.01). Sound prolongations and blocks had no significant differences in frequencies (T = 8, p = 0.16). In sum, the most frequent speech disfluencies were interjections, followed by revisions, monosyllabic word repetitions, and phrase repetitions. The least frequent were multisyllabic word repetitions and part-word repetitions, followed by broken word, sound prolongations, and part-word repetitions.

SLD, NSD and variability among children

Table 3 shows the distribution of children across the range of total disfluencies, NSD (multisyllabic word repetitions, phrase repetitions, revisions, and interjections), SLD (sound prolongations, blocks, broken words, monosyllabic word repetitions, and part-word repetitions), and monosyllabic word repetitions only. The first observation is that NSD is frequent, with most of the children (94 %) producing them as 3 to 15% of the intended words. As expected, the frequency of NSD was significantly higher than that of SLD (T = 0.00, p < 0.001).

Insert table 3 about here

Only 50% of the children produced less than 10% disfluencies, regardless of the disfluency type. When monosyllabic words repeated fewer than three times are not considered in the SLD count, 100% of the children produce less than 3% SLD. When including all monosyllabic word repetitions in

the SLD, 40% the children produced more than 3% SLD, and individual frequency reached 7.91% in some children. As shown in Table 3, two children (one boy and one girl) produced more than 20% total disfluencies (20.20% and 23.74 % total disfluencies, respectively). These two children were the most disfluent, but their total SLD (excluding monosyllabic word repetitions with less than 3 iterations) was not higher than that in the rest of the group (1.02 % and 1.44% SLD, respectively). Although we cannot exclude that their disfluencies will evolve into early stuttering, these children only exhibit non-stuttered disfluencies in higher frequencies. When looking more closely at their speech disfluencies, they produced especially high percentages of monosyllabic word repetitions (less than three iterations, 5.31% and 6.47% respectively) and interjections (8.78% and 10.07% respectively). To explore the extent to which their results influenced the calculated means, we performed descriptive analyses without these two children on total disfluencies (M=10.08, SD=2.87; initial mean = 10.55), NSD (M= 7.59, SD=2.79; initial mean = 7.89), monosyllabic word repetitions (less than three iterations, M= 1.91, SD=1.36; initial mean = 2.07), and interjections (M=3.44, SD=1.86; initial mean = 3.68). The corrected means do not distinctly contrast with the initial means.

To explain the high variability in the sample, we performed Spearman correlations between the number of words in the speech sample and the number of disfluencies produced by each child. A previous study has shown that the number of disfluencies generally increases as the sample size increases (at least for SLD, Sawyer & Yairi, 2006). However, Spearman correlations between the number of produced words and the number of total disfluencies (r_s= - .09), SLD (r_s= - .09), and NSD (r_s= - .04) were not significant.

Monosyllabic word repetitions

The mean frequency of monosyllabic word repetitions is 2.22%. However, most of these repetitions (2.07%) have fewer than three iterations. As shown in table 2, the percentages of monosyllabic words with three iterations or more are very low. Like in other SLD (sound prolongations, blocks,

broken words, and part-word repetitions), the mean frequency is under 1%, and the maximum observed is under or just above one per cent (1.08%) for monosyllabic word repetitions with three iterations or more. The mean frequency of monosyllabic words with fewer than three iterations is above 1%, such as in phrase repetitions, revisions, and interjections, and the maximum observed frequency is above 1%.

DISCUSSION

The aim of the present study was to describe the speech disfluencies of normally fluent French-speaking children at age four. We wondered whether the mean percentage of SLD would be lower than 3% and whether the mean percentage of total disfluencies would be lower than 10%, as previously observed in other languages. We draw specific attention to the status of monosyllabic word repetitions that elicits debate among scholars and to the number of iterations observed. Our study also examined the differences between girls and boys relative to the type and amount of disfluencies produced.

Comparison with previous results from other languages should be made with caution. The main reason is that the speaking situation used differs from that of some previous studies. Like Ambrose and Yairi (1999), we based our speech samples on conversations between the child and the examiner, while other studies used a free-play interaction task between the child and the examiner (Boey et al., 2007; Carlo & Watson, 2003; Natke et al., 2006; Tumanova et al., 2014) or between the child and a parent (Pellowski & Conture, 200). Disfluencies may vary depending on the speaking situation or the speaking partner (Yaruss, 1997a). Our adult-child interaction was designed to elicit a very low level of pressure: the adult sat at the child's level, used a slow speaking rate, gave the child the time to answer, and followed the child's lead after the topic had been introduced. However, it is possible that the speech disfluencies would have been different in a free-play situation or if the child

conversed with a parent. With this caveat in mind, our results show some similarities with previous studies, but also some differences.

Stuttering-like disfluencies

The main finding of previous studies on speech disfluencies in young children is the fact that these children generally exhibit less than 3% SLD in English, Spanish, Dutch, and German (Ambrose & Yairi, 1999; Boey et al., 2007; Carlo & Watson, 2003; Natke et al., 2006; Pellowski & Conture, 2002; Tumanova et al., 2014). The data from our French-speaking sample are in line with these previous results, with 100 % of the normally fluent preschool children exhibiting less than 3% SLD, as long as monosyllabic word repetitions with fewer than three iterations are not taken into account. In other languages, the 3% SLD criterion has been proven as a sensitive and specific diagnostic criterion (Ambrose & Yairi, 1999; Boey et al., 2007; Natke et al., 2006; Pellowski & Conture, 2002; Tumanova et al., 2014). Even if this is beyond the scope of the present study, our results provide a first glimpse at the potential specificity of this criterion in French. Future studies should investigate this criterion in larger samples including children who stutter in order to assess both its sensitivity and specificity. Given that our inclusion criteria excluded children whose parents were concerned with their stuttering, our results are also consistent with previous data showing that producing less than three per cent SLD is in line with an absence of parental concern (Tumanova et al., 2014).

Types and frequency of the disfluencies produced and the impact of gender

No difference was observed between boys and girls in the type or frequency of the disfluencies produced. This is in line with previous data for young English and Spanish speakers (Ambrose & Yairi, 1999; Carlo & Watson, 2003), but it contrasts with previous data for Swedish speakers showing qualitative differences in the types of disfluencies produced (Hedenqvist et al., 2015). It seems that in

French, the speech behaviours are quite similar between girls and boys in the types and frequency of speech disfluencies produced.

As expected, NSD was significantly more frequent than SLD. Interjections were the most frequent disfluencies, followed by revisions and monosyllabic word repetitions. These results are very close to those previously observed in other languages. Interjections and revisions were also the most frequent disfluencies in preschool English-speaking children, followed by monosyllabic word repetitions (Ambrose & Yairi, 1999). Revisions were the most frequent disfluencies in German-speaking children, followed by interjections and monosyllabic word repetitions (Natke et al., 2006). Monosyllabic word repetitions were the most frequent in Spanish-speaking children, followed by revisions and interjections (Carlo & Watson, 2003).

The most notable difference from previous studies is the mean percentage of 10% total disfluencies. A cut-off score of 8% or 10% total disfluencies was suggested to diagnose stuttering in young English-speaking children (Guitar, 2013; Tumanova et al., 2014). Only 50% of our French-speaking preschool children produced less than 10% total disfluencies. This high percentage of total disfluencies is driven by a high percentage of NSD and monosyllabic word repetitions with fewer than three iterations. We have explored the possibility that some outliers could have explained this result. However, the results of the two children who produced higher rates of total disfluencies (more than 20%) did not really affect the observed means to a large extent. Moreover, there is a continuum in the distribution of children across the range of disfluencies from children producing 3% total disfluencies to children producing 20% or more total disfluencies, with 14% of the children producing between 15% and 20% total disfluencies. The high rate of total disfluencies (NSD) produced in our French speaking sample is thus not simply explained by the outliers. Carlo and Watson (2003) also observed high variability among children with up to 18.9% total disfluencies. Unfortunately, the range of speech disfluencies was not provided in other studies.

Another possible explanation for the high percentage of speech disfluencies observed in a speech sample could reside in the speech sample size. A previous study showed that the number of SLD generally increases as the speech sample size increases (Sawyer & Yairi, 2006). To assess whether the speech sample size had an impact on the number of disfluencies produced from one child to another in our sample, we performed Spearman correlations between the number of produced words and the number of total disfluencies, SLD, and NSD. There results were not significant. Nevertheless, it remains possible that the large number of speech disfluencies produced in the present study can be explained by the larger speech sample as compared to previous studies. On one hand, our speech samples were longer than those used by Boey et al. (2007, 100 words), Pellowski and Conture (2002, 300 words), and Tumanova et al. (2014, 300 words), who performed their analyses on a word-basis count. It is thus possible that the speech sample size partially explains the high frequency of speech disfluencies observed. Future studies should specifically address this question, given that Sawyer and Yairi (2006) only studied SLD, while the differences in our sample mainly concerned NSD. On the other hand, our speech samples were not longer than those in previous studies that performed analyses based on a syllable count (Ambrose & Yairi, 1999: 750-1500 syllables; Natke et al., 2006: 600 syllables; Carlo & Watson, 2003: 500-800 syllables). However, it is likely that the results cannot be directly compared given that young French-speaking children produce more disyllabic words than young English-speaking children (Vihman, 1993).

The speaking situation used in the present study may also have elicited more disfluencies than the free-play situation that is usually used. Asking a child to talk about his or her family, school, house, or free-time activities may have led to longer and more complex sentences than if they had been asked to describe toys while playing. Longer sentences also tend to elicit more disfluencies (Yaruss et al., 1999). However, as previously stated, our adult-child interaction was designed to elicit a very low level of pressure. Even if no speech situation is perfect, the present interaction should be a fair reflection of an everyday-life situation when the child talks to an adult without specific time pressure.

Other possible explanations may be related to specific characteristics of the French language. Previous studies have shown that the mean speech rate is higher in French-speaking than in English-speaking adults (Pellegrino et al., 2011). Furthermore, an increase in speech rate is associated with an increase in speech disfluencies in non-stuttering children and adults (Oliveira et al., 2013). In the same vain, it is also possible that the high variability observed between children could be explained by the high variability in their speech rate. However, this question is beyond the scope of the present study, in which the speech rate has not been analysed. Future studies should further investigate the speech rate and its influence on disfluencies in normally fluent preschool children in French and other languages.

Finally, when looking at the specific disfluency types described in English (from 4-year-olds by Ambrose & Yairi, 1999), German (Natke et al., 2006), and Spanish (from 5-year-olds in Carlo & Watson, 2003), our French percentages are especially high for monosyllabic word repetitions (M=2.22, SD=1.7; English Mean=0.52, SD=0.45; German Mean=0.54, SD=0.48; Spanish Mean=1.5, SD=1.3), interjections (M=3.68, SD=2.18; English Mean=2.04, SD=1.69; German Mean=0.74, SD=0.58; Spanish Mean=0.89, SD=0.55), and phrase repetitions (M=1.48, SD=0.98; English Mean also including multisyllabic word repetitions=0.36, SD=0.18; German Mean=0.32, SD=0.29; Spanish Mean=0.44, SD=0.42). A previous study in English showed a larger proportion of interjections in adult French speakers compared to English-speaking adults (Crible et al., 2017). The authors gave a cultural interpretation to this result: interjections are more frequent in French, even in formal situations, and are thus probably less stigmatized than in English. Second, there is a larger co-occurrence of interjections with discourse markers (such as '*donc*' ['so']) in French than in English, revealing a larger use as a discourse-functional device in French. It is thus possible that the high proportions of NSD observed in French can be explained by cultural and linguistic differences in the use of French itself, at least in this particular Belgian subgroup.

The status of monosyllabic word repetitions

The frequency of monosyllabic word repetitions is around 2% (2.22%), but most (2.07%) contain fewer than three iterations. This corroborates previous results showing that repetitive disfluency usually involves one iteration in non-stuttering children (e.g. Natke et al., 2006; Pellowski & Conture, 2002). In our speech sample, the monosyllabic word repetitions with three iterations or more seem to behave like the other types of SLD (part-word repetitions, sound prolongations, blocks, and broken words), appearing less frequently than 1%. In contrast, the frequency of monosyllabic words repeated fewer than three times is closer to that of other NSD (phrase repetitions, revisions, and interjections). The current data add some information to the long-standing debate about the inclusion of monosyllabic word repetitions in the SLD count in French-speaking preschool children (Brockelhurst, 2013; Howell, 2013; Wingate, 2001; Yairi et al., 2001). While the monosyllabic words repeated fewer than three times are frequent in their speech, those repeated three times or more seem to be less typical and could more easily be considered as SLD.

Clinical implications

This study sheds light on the necessity of using normative data that are specific to each language. Speech-language pathologists have to be cautious when comparing the frequencies of speech disfluencies of French-speaking patients to normative data from other languages. The alert criterion for stuttering that has been established for English, such as 10% or 8% total disfluencies (Guitar, 2013, Tumanova et al., 2014), is not directly applicable to French-speaking children. It is possible that cultural or linguistic variations lead to a larger acceptance of some types of NSD in French, at least in this Belgian subgroup.

Our data should also support speech-language pathologists in making clinical decisions about the types of disfluencies that must be considered as SLD. Our French data show very low frequencies for

part-word repetitions, sound prolongations, blocks, broken words, and monosyllabic word repetitions with three iterations or more. These disfluencies are less than 3% of the spoken words and are thus not typical of normally fluent French-speaking preschool children. However, the present results emphasize '*the need as clinicians to take caution when interpreting the production of monosyllabic word repetitions*' (Byrd, Bedore, & Ramos, 2013, pp. 41-42), given that monosyllabic word repetitions with fewer than three iterations are rather frequent in French-speaking preschool children. Finally, our data draw attention to the high developmental variability in the frequency of speech disfluencies in normally fluent children, without differences between boys and girls, which speech-language pathologists will have to take into account in their clinical decisions.

STATEMENT OF INTEREST

The authors report no declarations of interest.

REFERENCES

Ambrose, N.G., & Yairi, E. (1999). Normative disfluency data for early childhood stuttering. *Journal of Speech, Language, and Hearing Research*, 42, *895-909.*

Ardila, A., Ramos, E., & Barrocas, R. (2011). Patterns of stuttering in a Spanish/English bilingual: A case report. *Clinical Linguistics and Phonetics, 25,* 23-36.

Boey, R., Wuyts, F., Van de Heyning, P., De Bodt, M. & Heylen, L. (2007). Characteristics of stuttering-like disfluencies in Dutch-speaking children. *Journal of Fluency Disorders,* 32, 310-329.

Bortfeld, H., Leon, S. D., Bloom, J. E., Schober, M. F., & Brennan, S. E. (2001). Disfluency rates in conversation: Effects of age, relationship, topic, role, and gender. *Language and Speech, 44(2),* 123–147. https://doi.org/10.1177/00238309010440020101

Brocklehurst, P. (2013). Stuttering prevalence, incidence and recovery rates depend on how we define it: Comment on Yairi & Ambrose' article Epidemiology of stuttering: 21st century advances. *Journal of Fluency Disorders,* 38, 290-293.

Byrd, C., Bedore, L., & Ramos, D. (2015). The disfluent speech of bilingual Spanish-English children: Considerations for differential diagnosis of stuttering. *Language, Speech, and Hearing Services in Schools,* 46*,* 30-43.

Carlo, E., & Watson, J. (2003). Disfluencies of 3- and 5-year old Spanish-speaking children. *Journal of Fluency Disorders,* 28*,* 37-53.

Chevrie-Muller, C., & Plaza, C. (2001). *Nouvelles épreuves pour l'examen du langage.* Paris: Editions du Centre de Psychologie Appliquée.

Chon, H., Sawyer, J., & Ambrose, N. G. (2012). Differences of articulation rate and utterance length in fluent and disfluent utterances of preschool children who stutter. *Journal of Communication Disorders*, *45*(6), 455–467. https://doi.org/10.1016/j.jcomdis.2012.08.003

Conture, E. (2001). *Stuttering, its nature, diagnosis, and treatment*. Boston: Allyn & Bacon.

Coquet, F., Ferrand, P., & Roustit, J. (2009). *Batterie EVALO 2-6.* Isbergues: Ortho Edition.

Crible, L., Degand, L., & Gilquin, G. (2017). The clustering of discourse markers and filled pauses. *Languages in Contrast*, *17*(1), 69–95. https://doi.org/10.1075/lic.17.1.04cri

Eklund, R., & Shriberg, E. (1998). Crosslinguistic Disfluency Modeling: A Comparative Analysis of Swedish and American English Human-Human and Human-Machine Dialogs. *Fifth International Conference on Spoken Language Processing*, *6*(March 2016), 1–4.

Guitar, B. (2013). *Stuttering: An integrated approach to its nature and treatment (4th ed.).* Baltimore, MD: Lippincott-Williams & Wilkins.

Hedenqvist, C., Persson, F., & Eklund, R. (2015, August). *Disfluency incidence in 6-year old Swedish boys and girls with typical language development.* Paper presented at the 7th Workshop on Disfluency in Spontaneous Speech, Edinburgh, Scoltand.

Howell, P. (2013). Screening school-aged children for risk of stuttering. *Journal of Fluency Disorders,* 38*,* 102-123

Johnson, W. (1961). Measurements of oral reading and speaking rate and disfluency of adult male and female stutterers and nonstutterers. *Journal of Speech and Hearing Disorders, Monograph Supplement, No.7,* 1-20.

Khomsi, A. (2001). *Evaluation du langage oral (ELO)* [Oral language assessment]. Paris: ECPA.

Natke, U., Sandrieser, P., Pietrowsky, R., & Kalveram, K. (2006). Dislfuency data of German preschool children who stutter and comparison children. *Journal of Fluency Disorders,* 31, 165-176.

Oliveira, C. M., Broglio, G. A., Bernardes, A. P., & Capellini, S. A. (2013). Relationship between speech rate and speech disruption in cluttering. *Codas*, *25*(1), 59–63. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/24408172

Pellegrino, F., Coupé, C., & Marsico, E. (2011). A cross-language perspective on speech information rate. *Language*, *87*(3), 539–558.

Pellowski, M., & Conture, E. (2002). Characteristics of speech disfluency and stuttering behaviors in 3- and 4-year-old children. *Journal of Speech, Language, and Hearing Research,* 45, 20-34.

Riley, G. D. (2009). *SSI-4: Stuttering Severity Instrument – Fourth Edition*. Austin, TX: Pro-Ed.

Sawyer, J., Chon, H., & Ambrose, N.G. (2008). Influences of rate, length, and complexity on speech disfluency in a single speech sample in preschool children who stutter. *Journal of Fluency Disorders, 33,* 220–240.

Sawyer, J., & Yairi, E. (2006). The effect of sample size on the assessement of Stuttering Severity. *American Journal of Speech-Language Pathology*, *15*(February 2006), 36–44. https://doi.org/10.1044/1058-0360(2006/005)

Tumanova, V., Conture, E., Lambert, E., & Walden, T. (2014). Speech disfluencies of preschool-age children who do and do not stutter. *Journal of Communication Disorders,* 49*,* 25-41.

Tumanova, V., Zebrowski, P. M., Throneburg, R. N., & Kulak Kayikci, M. E. (2011). Articulation rate and its relationship to disfluency type, duration, and temperament in preschool children who stutter. *Journal of Communication Disorders*, *44*(1), 116–129. https://doi.org/10.1016/j.jcomdis.2010.09.001

Vihman, M. (1993). Variable paths to early word production. *Journal of Phonetics,* 21, 61-82.

Wingate, M. (2001). SLD is not stuttering. *Journal of Speech, Language and Hearing Research,* 44*,* 381-383.

Yairi, E. (1982). Longitudinal study of disfluencies in two-year-old children. *Journal of Speech and Hearing Research, 25,* 155-160.

Yairi, E., & Ambrose, N. (2013). Epidemiology of stuttering: 21st century advances. *Journal of Fluency Disorders,* 28*,* 66-87.

Yairi, E., Watkins, R., Ambrose, N., & Paden, E. (2001). What is stuttering? *Journal of Speech, Language, and Hearing Research,* 44, 585-597.

Yaruss, J. S. (1997a). Clinical implications of situational variability in preschool children who stutter. *Journal of Fluency Disorders*, *22*(3), 187–203. https://doi.org/10.1016/S0094-730X(97)00009-0

Yaruss, J. (1997b). Clinical measurement of stuttering behaviors*. Contemporary Issues in Communication Science and Disorders,* 24, 33-44.

Yaruss, J. S., Newman, R. M., & Flora, T. (1999). Language and Disfluency in Nonstuttering Children ' S Conversational Speech. *Journal of Fluency Disorders*, *24*, 185–207.

Table 1

Mean percentages of non-stuttered disfluencies (NSD), stuttering-like disfluencies (SLD), and total disfluencies (TD) in preschool children speaking various languages.

Study	Language	N	Mean Age (months)	Word or syllable basis	NSD (SD)	SLD (SD)	TD (SD)
Ambrose & Yairi (1999)	English	54	38.87	syllable	4.32% (2.28%)	1.33% (0.83%)	5.65% [a]
Pellowski & Conture (2002)	English	36	46.1	word	1.5 % (1.6%)	1.1 % (0.8%)	2.6 % (1.8%)
Tumanova et al. (2014)	English	244	50	word	3.05%	1.2%	4.28 %
Boey et al. (2007)	Dutch	79	69	word	/	0.42 % (0.98%)	/
Carlo & Watson (2003)	Spanish	15	43	syllable	2.90 %	1.92 %	5.36%[b]
		17	61		3.42 %	2.66%	6.65%
Natke et al. (2006)	German	24	43	syllable	2.59% (1.14%)	1.16% (0.68%)	3.75%[a]
Present study	French	50	54	words	7.89 % (3.09%)	2.67 % (1.71%)	10.55 % (4.48%)

[a] The means were not given in the original articles but were calculated by the authors of the present article by adding up the stuttered and non-stuttering-like disfluencies.

[b] The total percentage of disfluencies does not exactly correspond to the sum of the percentages of the stuttered and non-stuttering-like disfluencies, since Carlo and colleagues have analysed other sorts of disfluencies, such as unfinished words and grammatical pauses.

Table 2

Mean percentages of all disfluency types for boys, girls, and both groups.

	Both groups	Girls	Boys	
	M (SD)	*M (SD)*	*M (SD)*	*U (p)*
	Range	Range	Range	
Sound prolongations	0.04 (0.10)	0.02 (0.07)	0.05 (0.12)	266.5 (.39)
	0 – 0.38	0 – 0.29	0 – 0.38	
Blocks	0.01 (0.09)	0.00 (0.00)	0.02 (0.12)	299 (.83)
	0 – 0.63	0 – 0.00	0 – 0.63	
Broken words	0.11 (0.15)	0.09 (0.12)	0.12 (0.17)	290 (.66)
	0 – 0.63	0 – 0.3	0 – 0.63	
Part-word repetitions	0.29 (0.32)	0.27 (0.27)	0.31 (0.36)	305 (.92)
	0 – 1.13	0 – 1.13	0 – 1.12	
Monosyllabic word repetitions	2.22 (1.70)	2.31 (1.65)	2.13 (1.77)	277 (.52)
	0.21 – 7.55	0.21 – 7.55	0.22 – 5.31	
< 3 Iterations	2.07 (1.55)	2.17 (1.44)	1.99 (1.66)	276 (.51)
	0.21 – 6.47	0.21 – 6.47	0.22 – 5.31	
≥3 iterations	0.14 (0.28)	0.15 (0.35)	0.14 (0.23)	271.5 (.45)
	0 – 1.08	0 – 1.08	0 – 0.84	
Multisyllabic word repetitions	0.17 (0.25)	0.17 (0.24)	0.16 (0.26)	280 (.56)
	0 – 0.91	0 – 0.91	0 – 0.76	
Phrase repetitions	1.48 (0.98)	1.54 (0.82)	1.42 (1.12)	260 (.33)
	0 – 4.15	0.45 – 3.34	0 – 4.15	
Revisions	2.56 (1.48)	2.46 (1.36)	2.65 (1.59)	281.5 (.58)
	0.36 – 8.24	0.4 – 5.71	0.36 – 8.24	
Interjections	3.68 (2.18)	3.43 (2.19)	3.89 (2.18)	267 (.40)
	0.77 – 10.07	0.77 – 10.07	1.14 – 9.42	

Total non-stuttered disfluencies	7.89 (3.09)	7.61 (3.00)	8.13 (3.21)	274 (.48)
	2.84 – 15.83	3.66 – 15.83	2.85 – 15.69	
Total stuttering-like disfluencies (including all monosyllabic words)	2.67 (1.71)	2.69 (1.62)	2.65 (1.81)	286 (.64)
	0.42 – 7.91	0.42 – 7.91	0.65 – 6.33	
TOTAL disfluencies	10.55 (4.48)	10.29 (4.25)	10.77 (4.74)	294 (.76)
	3.98 – 23.74	5.66 – 23.74	3.98 – 20.20	

Table 3

Distribution of children (in per cent) across the range of all disfluencies, non-stuttered disfluencies, stuttering-like disfluencies, and monosyllabic word repetitions.

		0 - 3	3.01 – 6	6.01 – 10	10.01 – 15	15.01 – 20	20.01 – 25
All Disfluencies	Both	0 %	10.0 %	40.0 %	32.0 %	14.0 %	4.0 %
	Girls	0 %	4.35 %	47.83 %	34.78 %	8.69 %	4.35 %
	Boys	0 %	14.81 %	33.33 %	29.63 %	18.52 %	3.70 %
Non-Stuttered Disfluencies	Both	2.0 %	30.0 %	46.0 %	18.0 %	4.0 %	0 %
	Girls	0 %	30.43 %	47.83 %	13.04 %	4.35 %	0 %
	Boys	3.70 %	25.93 %	44.44 %	22.22 %	3.70 %	0 %
Stuttering-Like Disfluencies	Both	60.0 %	34.0 %	6.0 %	0 %	0 %	0 %
	Girls	56.52 %	39.13 %	4.35%	0 %	0 %	0 %
	Boys	62.96 %	29.63 %	7.41 %	0 %	0 %	0 %
SLD Without Monosyllabic Word Repetitions <3 iterations	Both	100%	0 %	0 %	0 %	0 %	0 %
	Girls	100%	0 %	0 %	0 %	0 %	0 %
	Boys	100%	0 %	0 %	0 %	0 %	0 %
Monosyllabic Word Repetitions Only	Both	66 %	32 %	2 %	0 %	0 %	0 %
	Girls	69.57 %	26.09 %	4.35 %	0 %	0 %	0 %
	Boys	62.96 %	37.04 %	0 %	0 %	0 %	0 %