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特集論文

Stuttering Patterns in Japanese and English Preschool-Aged and School-Aged Children —as a Progress Report—

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日本語と英語に見る幼児・学童児の吃音の型 —中間報告として—

要旨：本研究は，日本語と英語を母語とする児童の吃音のパターンを解明する手がかりを提示した研究である。日英語母語の吃音児の自然発話に現れる非流暢性を対照して，言語のシステムの違いが吃音に反映していることを明らかにした。日本語母語の児童は，機能語より主に内容語に非流暢性を生じている。その反対の機能語で非流暢性をより多発するのが英語母語の児童である。そして理論的に機能語に関わる非流暢性が吃音の診断基準であることに疑問がある。機能語の非流暢性が吃音の診断に関わらないのであれば，機能語に非流暢性が少ない日本語話者は，英語話者よりも吃音と診断される率が少なくなるであろう。

Key words: stuttering, Japanese, English, function word, content word, EXPLAN

1. Introduction

It has only been in the past two decades that substantial interest has grown in the analysis of stuttering in other languages, particularly European languages (Koopmans, Slis and Rietvield 1996, Natke, Sandrieser, Van Ark, Pietrowsky and Kalveram 2004, Dworzynski and Howell 2004, Howell and Au-Yeung 2007) and to a lesser extent Japanese (Ujihira and Kubozono 1994, Ujihira 2000, Shimamori and Ito 2007, 2008). It is at this juncture that this project fits; a cross-linguistic study into potential linguistic factors affecting stuttering patterns seen in young Japanese and English children who stutter. Morpho-phonetic complexity is explored in Section 2 using a modified version of Jakielski's (1998) Index of Phonetic Complexity (IPC).

The study of linguistic factors hypothesised to be relevant to stuttering observed in Japanese marks a departure from studies conducted and theories established based primarily on the Germanic and Romance languages. Due to phonetic and syntactic differences between Japanese and these languages, findings from this interim project report may in the longer term challenge those existing theories and seek to offer new areas for further investigation.

In the Japanese literature, Shimamori and Ito (2007, 2008) looked at elementary school-aged children and hypothesised that stuttering arises because of an increase in difficulty of transition *between* syllables rather than within syllables. For Japanese adult stutterers, Ujihira and Kubozono (1994) found a significant increase in stuttering on word-initial vowels and a higher incidence of word breaks involving consonant/vowel (CV) segments than at the onset/rime boundary. In this study, whole-word repetition was excluded from data analysis because some researchers (Wingate 2002) consider it extraneous to core symptoms of stuttering seen in adults. It is by no means a trivial decision to exclude whole-word repetition since it has lain at the heart of what constitutes overt stuttering behaviour and therefore how we ultimately define the disorder.

1.1 Definitions and Schemata

Johnson et al. (1959) set the scene for stuttering symptomatology with an all-encompassing scheme comprising 8 types of disfluency (Table 1).

Since the average fluent speaker's spontaneous speech contains incomplete phrases and revisions, schemes to encapsulate stuttering symptoms since Johnson et al.'s (1959) inaugural work have dismissed

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Table 1 Johnson et al.'s (1959) symptoms

1. Incomplete phrases	5. Phrase repetitions
2. Revisions	6. Part-word repetitions
3. Interjections	7. Prolongations
4. Whole-word repetitions	8. Broken words

the first two from his list and in addition have attempted to differentiate the core stuttering behaviours from the types of 'normal' disfluency seen in typical child and adult language (interjections and whole-word repetitions) (Conture 1990, Yairi and Ambrose 1999). Howell (2002) took a different view on stuttering types arguing that a child who stutters has recourse to both the core behaviours and normal disfluency types in order to deal with the disruption to the flow of speech. This all-inclusive approach forms part of Howell's EXPLAN theoretical framework, which is discussed in Section 1.2. Given the limited research into childhood stuttering in Japanese, analysis of the data follows a reworking of Johnson et al.'s scheme to accommodate specific types of disfluency predicted in Japanese.

Yairi and Ambrose (2005) reported a mean onset age of stuttering of 33 months and put a conservative estimate of spontaneous recovery at 74% at variable periods within 4 years post-onset (Yairi and Ambrose 1999). An estimate of the prevalence, based on meta-analyses of several studies, has been set at 1% or just under (Bloodstein and Bernstein Ratner 2008), although it is to be noted that they used whole-word repetition as a core feature of stuttering which would lead to a higher figure.

Research into early childhood stuttering symptoms has demonstrated the preponderance of whole-word repetition, primarily monosyllabic, in utterance-initial position (Buhr and Zebrowski 2009, Richels et al. 2010, Au-Yeung, Howell and Pilgrim 1998). Moreover a dichotomous pattern has emerged in which children who stutter (CWS) have a greater tendency for whole-word repetition of function words at the start of an utterance whereas adult stutterers reduce such behaviour and in exchange generate word breaks and sound prolongations (i.e. the core behaviours) on content words at word-initial position (Howell, Au-Yeung and Sackin 1999). Function words comprise pronouns, articles, demonstratives, prepositions and conjunctions. Content words comprise nouns, verbs, adjectives and adverbs.

Based on the conclusions of all these studies, two key points can be inferred: 1) the majority of young children diagnosed will recover within childhood; 2) for those who persist, a transition of stuttering behaviours occurs from function to content words.

1.2 Function and content words: EXPLAN theory

Howell (2010) has used this word class dichotomy as a way of representing difficulties in linguistic processing. Function words per se do not induce whole-word stuttering because stuttering rarely occurs on a function word *preceded* by a content word. This finding can be understood by adopting Selkirk's (1984) notion of the prosodic or phonological word (PW) that defines the main word stress of a prosodic unit. To illustrate this, the PW "I saw him", contains the main stress of the content word "saw", together with the prefixal function word "I" and the suffixal function word "him". Disfluency would therefore occur prefixally but rarely suffixally in CWS (Howell Au-Yeung and Sackin 1999, Au-Yeung, Howell and Pilgrim 1998). EXPLAN attempts to explain these heuristic relationships between word class and stuttering and word class and symptom type.

PWs are hypothesised to act as the interface between language planning (PLAN) involved and the subsequent motor speech execution (EX) of an utterance. Whole-word repetitions of prefixal function words or pauses before a content word—known as stallings—suggest a delaying strategy of the forthcoming content word whose plan is incomplete, hence a repeat of the already planned motor processes of the function word. The core stuttering behaviours—known as advancings—suggest an attempt at delivery of the motor output of the content word despite an incomplete plan for it. Inherent in this theory is the belief that the content word is the locus of difficulty for the speaker, whether it is stuttered itself (advancings) or whether it is spoken fluently but the preceding function word is disfluent (stallings). Content words are considered problematic on a range of linguistic properties, such as length, stress, phonetic complexity, frequency of usage and neighbourhood density. Function words, conversely, are a finite class of words, typically monosyllabic, unstressed and phonetically simpler. This project aims to investigate some of these factors cross-linguistically in Japanese and English.

Throneburg, Yairi and Paden (1994) attempted to determine phonetic factors that increased the likelihood of stuttering. First, nine late emerging consonants[1)] (LEC) were selected for analysis. Second, consonant clusters (CS) were identified and scored and third, multisyllabic words were scored separately. Despite selecting these three factors considered to increase the

phonetic difficulty of the word, no significant effects were found for stuttering rates on words containing these factors compared with the remaining phonetically simpler words. However a subsequent re-analysis of the data from this study (Howell, Au-Yeung and Sackin 2000), by dividing words into the content- and function-word categories, revealed a higher incidence of stuttering on LEC and CS in word-initial position for those participants aged 12 and above.

A more comprehensive index of phonetic complexity was then formulated from Jakielski's (1998) IPC, which was originally developed from MacNeilage and Davis' (1990) work on infant babbling. The IPC is an 8-factor additive index, incorporating Throneburg et al's factors and adding new ones based on manner and place of phonemes deemed either easy or difficult. A number of studies have now adopted this scheme for stuttering research in English (Howell, Au-Yeung, Yaruss and Eldridge 2006), in German (Dworzynski and Howell 2004), in Spanish (Howell and Au-Yeung 2007). These studies indicated that there was relationship between the IPC score and stuttering on content words, rather than function words for stutterers over the age of at least six. In the early years therefore it was concluded that some non-phonetically related factor was mediating stuttering patterns.

Section 2 outlines the IPC's original 8-point factors and the rationale for its modification for this project once a discussion of the peculiarities of Japanese linguistics has taken place.

2. Modified index of Phonetic Complexity

An adaptation of Jakielski's (1998) Index of Phonetic Complexity Scheme (IPC) is outlined and justified to investigate morpho-phonetic properties of Japanese.

The original 8-factor scheme is presented in Table 2. No score represents a phonetically easier factor and is therefore predicted to be more likely to be associated with fluent spoken output. One point, however, is the opposite and predicts a factor of phonetic complexity that may cause a stuttering event.

Table 3 displays the Modified IPC to be used for data analysis in this project. Dorsal consonants are not considered by all authorities to be late-emerging (Ota 2006), so the 'Consonant by place' factor seems irrelevant to Japanese. As a result Factor 1 and 2 have been collapsed into a 'Consonant Acquisition' factor: 0 points for early acquired; 1 point for late acquired, based on Ota's (2003) research. No empirical data have emerged that diphthongs are more challenging for Japanese speakers than single vowels, so 'Vowel by class' factor was removed. 'Word shape' factor was modified to reflect the heavy/light syllable differences

Table 2 Jakielski's (1998) original Index of Phonetic Complexity

IPC Scoring Scheme

Factor	No score	One point each
1. Consonant by place	Labials, Coronals, Glottals	Dorsals
2. Consonant by manner	Stops, Nasals, Glides	Fricatives, Affricates, Liquids
3. Singleton Consonants by place	Reduplicated	Variegated
4. Vowel by class	Monophthongs, diphthongs	Rhotics
5. Word shape	Ends with a vowel	Ends with a consonant
6. Word length (syllables)	Monosyllables, disyllables	>= 3 syllables
7. Contiguous consonants	No clusters	Consonant clusters
8. Cluster by place	Homorganic	Heterorganic

Table 3 Modified IPC scheme for Japanese

Modified IPC Scoring Scheme for Japanese

Factor	No score	One point each
a) Consonant acquisition	/w, n, m, p, b, t, d, k, g, N, j, ʧ, ʤ/	/ɸ, h, ç s, z, ʃ, ts, dz, ɾ/
b) Syllable shape	Heavy	Light
c) Word length (syllables)	Monosyllables, disyllables	>= 3 syllables
d) Verbal morphology	V-stem verbs, dictionary forms	C-stem verbs; passive voice

in Japanese. Words with light-syllabic onset received 1 point; heavy-syllabic onset received 0 points. Some evidence has suggested that utterance length positively correlates with stuttering (Logan and Conture 1995). Given the agglutinative nature of Japanese, words of 3 syllables or more are readily formed through this process, together with underived words from the lexicon. As all other studies using the IPC have included 'Word length' (Howell et al. 2006, Dworzynski and Howell 2004, Howell and Au-Yeung 2007), it seemed appropriate to include it for comparative purposes. The results from the IPC analysis will be analysed and reported at a later date.

3. Method

3.1 Overview of sample

The data analysed thus far is presented below. Further data are planned to be added to strengthen sample size over the coming months.

For the Japanese CWS, 11 participants were included in the project; 10 boys and 1 girl (mean age = 5 years 3 months; SD = 1 year 1 month). Within the preschool-aged group, the age range was 3 years 10 months to 4 years 6 months. Within the school-aged group, the age range was 6 years to 6 years 10 months.

For the English CWS, 9 participants were included in the project; 6 boys and 3 girls (mean age = 5 years 2 months; SD = 1 year). Within the preschool-aged group, the age range was 3 years 10 months to 4 years 8 months. Within the school-aged group, the age range was 5 years 6 months to 6 years 9 months.

Ages were matched as closely as possible in order to provide the best cross-linguistic analysis of the stuttering behaviours present for this young age range.

3.2 Modified Index of Phonetic Complexity

Section 2 explained the rationale for the selected and modified factors from Jakielski's (1998) Index of Phonetic Complexity. Table 4 summaries the modified four IPC factors that were analysed for the Japanese CWS data.

Summary of key analyses to be undertaken:

1. Analyses were undertaken to investigate the effect of the content- and function-word class on the Japanese CWS together with the types of disfluency that are exhibited. The English CWS group acted as a cross-linguistic comparison.
2. A series of analyses then sought to explore the relationship between stuttering and the morpho-phonetic complexity of Japanese as measured using a modified version of the Index of Phonetic Complexity. To be reported at a later date.

4. Result

4.1 Word Class for Japanese and English CWS

The first analysis undertaken was to establish whether stuttering rates differed on content words versus function words. A Wilcoxon matched pairs signed-ranks test was carried out on the stuttering rate for each age group, in each language. For the preschool-aged Japanese CWS, there was no significant effect, $z = -1.483$, $p = 0.188$. This was likely due to Participant J2 having a high number of stuttering events on function words relative to the other Japanese CWS, particularly the word 'kore' meaning 'this one'. The school-aged Japanese CWS stuttered more on content words (Mdn = 14.30) than function words (Mdn = 0.85), $z = -2.201$, $p = 0.028$. For the preschool-aged English CWS, there was no significant effect, $z = -1.461$, $p = 0.144$, nor was the case for the school-aged English CWS, $z = -1.753$, $p = 0.08$.

A mixed ANOVA was run with the percentage stuttering rate for each child as the dependent variable, with word class as the within-subject factor and with language group as the between-subjects factor. Age groups were pooled together for each respective language. There was a statistically significant main effect for word class, $F(1, 18) = 6.143$, $p = 0.023$, indicating that function words (M = 4.77, SD = 4.47) have a lower stuttering rate than content words (M = 10.1, SD = 8.54). There was also significant main effect for lan-

Table 4 Modified IPC scheme for Japanese

Modified IPC Scoring Scheme for Japanese

Factor	No score	One point each
e) Consonant acquisition	/w, n, m, p, b, t, d, k, g, N, j, ʧ, ʤ/	/ɸ, h, ç s, z, ʃ, ts, dz, ɾ/
f) Syllable shape	Heavy	Light
g) Word length (syllables)	Monosyllables, disyllables	>= 3 syllables
h) Verbal morphology	V-stem verbs, dictionary forms	C-stem verbs; passive voice

guage, such that the Japanese CWS had a higher stuttering rate than the English CWS, $F(1, 18) = 5.763$, $p = 0.027$. Finally, there was a significant interaction between word class and language, $F(1, 18) = 19.787$, $p = 0.001$. The result suggests that the Japanese CWS stutter more on content words than function words, while the English CWS demonstrate the opposite tendency.

The interaction suggests that stuttering behaviours grouped according to the function/content word dichotomy are operating differently for the languages in question. The results produced regarding the English CWS group confirmed previous findings (Au-Yeung, Howell and Sackin 1998) that function words are more likely to be stuttered than content words for young children.

Further analyses were undertaken to investigate the types of disfluency and how they operated differently on function and content words. These will be written up in full at a later date.

5. Discussion

5.1 Word Class and Disfluency Types

This interim project report first sought to investigate the content/function-word dichotomy and how it may mediate the types of disfluency behaviour seen in young children who stutter in English and in Japanese. Second, a modified Index of Phonetic Complexity was used for analysis of morpho-phonetic complexity that may influence stuttering in the Japanese group of young children who stutter.

Many studies have reached similar conclusions regarding the tendency for young children to stutter on function words. However, these studies have been either based on English or other European languages, the latter of which have a syntactic structure that is not radically different from that of English. It was argued that Japanese does have function words, more commonly referred to as particles, yet their syntactic relationship with content words was markedly different, as was explained through the notion of the phonological word (Selkirk 1984).

A significant difference in stuttering rate was found between content words and function words for the Japanese CWS, with the overwhelming majority of stuttering events falling on content words. By comparison, the English CWS stuttered more on function words, though the difference in stuttering rate across the two word categories for this group was less pronounced. For the Japanese CWS, none of the postpositional particles was stuttered in the entire data, which supports the evidence for the heuristic nature of function words and the usefulness of the phonological-word concept. They are therefore not inherently harder to say, nor is their contribution to the phonetic bulk of an utterance, as was speculated, affecting the stuttering rate. In summary, Japanese function words are operating differently to those in English in two important ways. First, they are postpositional; second, some of them can be omitted, leaving a heavy content-word utterance, as was found in the raw data.

5.2 Implications for EXPLAN

Howell's EXPLAN (2010) theory for the developmental course of stuttering has accounted for the trends seen in English, Spanish and German stutterers precisely because the role and position of each of these languages' function words are similar. In these languages stuttered function words tend to be utterance-initial, unstressed and monosyllabic. They are hypothetically less difficult to articulate. They provide the platform for stalling when the following plan for the content word is not fully accessible. In Japanese, this stalling platform, in terms of a linguistic and syntactic *pre*positional word on which to falter, is generally not available and when it potentially is, i.e. with demonstratives, a typical stalling disfluency type is not seen. For those participants who stuttered on function words, they primarily exhibited a '*light syllable*' (mora) repetition of the word—an advancing type disfluency—as if were yet another content word.

If one subscribes to the belief that language factors are an influential variable on stuttering, then the exploration into linguistic properties in Japanese may further elucidate the controversial issue of whole-word repetition outlined in Section 1.1. Whole-word repetition was a common disfluency for the English CWS on function words. It has been shown in English that early childhood stalling on function words and the exchange of these to later childhood advancing on content words leads to persistence in stuttering, whereas a lack of such exchange leads to recovery (Howell 2007). In this project's English group, there was little evidence of this exchange process taking place. Two reasons for this are possible. First, the small sample size reflected the fact that most of the participants had already started to recover, therefore the exchange to advancings would never take place. Furthermore, Yairi and Ambrose (2005) reported that recovery happens relatively quickly after onset of symptoms. Second, the age-range was too young for a transition to the core behaviours to have started yet as the oldest child was only 6 years 9

months. Howell, Au-Yeung and Sackin (1999) reported that this process can occur up to the age of eleven.

For Japanese, a discussion in the same manner is impossible because stalling strategies on function words (e.g. whole-word repetitions) do not exist and the participants appeared to demonstrate adult-like disfluency from the onset. This is important clinically because it greatly reduces the chance of misdiagnosis and an inflated recovery rate. Wingate's (2002) argued precisely against an all-inclusive approach to diagnosing stuttering; many children risk being misdiagnosed based on counts of whole-word repetitions.

5.3 Conclusion

Overall, Japanese is a phonetically simpler language with fewer consonant clusters and codas. It is however a richly agglutinative language which may balance out the simpler phonetic structure. With these broad linguistic features combined and accounted for in the modified IPC, it showed that morpho-phonetic complexity is not only potentially exerting an influence on stuttering, but it is doing so in children at a younger age than has been found in other studies. This is because function words are used differently in Japanese and do not allow for the stalling-type disfluency seen in English, German and Spanish. The EXPLAN model based on the word class dichotomy does therefore not apply to Japanese and further investigations are required to determine whether other linguistic factors are affecting stuttering. Whole-word repetitions were not a common disfluency type in Japanese which should lead to fewer misdiagnosed cases in Japan.

Notes

1) LEC: fricatives: /v, θ, ð, s, z, ʃ, ʒ/ affricates: /ʧ, ʤ/

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