The Influences of Learners' Basic Attributes and Learning Histories on L2 Speech Fluency: A Case Study of Japanese and Chinese Learners of English

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Abstract

Although the importance of fluency in L2 use by learners is widely acknowledged, what determines fluency and how we can develop fluency is not necessarily clear. In the current study, we examined the influences of sixteen indices of basic attributes and learning history of Japanese and Chinese learners of English on their L2 speech fluency. Our quantitative analyses revealed that speech fluency changes substantially according to the nationality of speakers and it is also influenced by elements such as L2 use outside school and instruction by native speakers. On the basis of our findings, we make some suggestions regarding what teachers can do to help learners develop their speech fluency.

1. Introduction

Fluency is widely regarded as one of the key factors for proficiency in L2 and a greater emphasis has been put on it in teaching English as a foreign language. However, it is still not completely clear what L2 fluency is all about and how it can be influenced by various elements concerning individual learners.

To help address this issue, in the current study, we aim to investigate the relationships between speech fluency in L2 English and a series of indices of learners' basic attributes and learning histories, with reference to a large-scale learner corpus. Our discussion focuses on Japanese and Chinese learners of English.

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2.Literature

Fluency can be seen as a composite of several different skills. For example, (Fillmore, 1979) lists four major constituents of fluency in a given language: (i) the ability to talk at length with few pauses or to fill time with talk; (ii) the ability to talk in coherent, reasoned, and semantically dense sentences or to show mastery of the semantic and syntactic resources of a language; (iii) the ability to say appropriate things in a wide range of contexts or to be at ease in varied conversation settings; and (iv) the ability to be creative and imaginative with one's language use or to express ideas in novel ways, such as punning, joking, attending to the semantic and pragmatic implications of the sounds of words, varying styles, and creating metaphors. (Tavakoli and Skehan, 2005) classify fluency into three types: *breakdown fluency* (e.g., time filled with speech, number of pauses, number of filled pauses), *speed fluency* (e.g., speech rate measured as words per minute, speech rate measured as syllables per minute), and *repair fluency* (e.g., number of false starts, number of repetitions). (Segalowitz, 2010) also classifies fluency into three types, but somewhat different ones: *cognitive fluency* (cognitive processing during speech planning), *utterance fluency* (operation of cognitive fluency during the act of utterance), and *perceived fluency* (listeners' perception of a speaker's cognitive fluency).

Kormos (2006) makes Fillmore's framework more sophisticated by proposing ten criteria to be measured in the evaluation of speech fluency: syllables per minute, syllables per minute (excluding pauses), phonation–time ratio, mean length of runs (of continuous speech without pauses), silent pauses per minute, mean length of pauses, filled pauses per minute, dysfluencies (repetitions, restarts, and repairs) per minute, stressed words per minute, and ratio of stressed words to total words.

However, some suggest that the number of indices that are crucial in the perceived fluency of actual speech is more limited. (Freed, 2000) reports that L2 teachers generally pay attention to "rate of speech," "smother speech with fewer false starts," "fewer pauses," and "better grammar and vocabulary" when evaluating learners' speech fluency. Iwashita, (Brown, McNamara, and O'Hagan, 2008) argue that speed, less pausing, and fewer unfilled pauses characterize speech fluency. (Crossley and McNamara, 2013) reveal that word type counts and word frequency explain more than 60% of the variance of human ratings of fluency, which suggests that it is possible to rate speech fluency even without examining pronunciation and prosody. (Jong, 2011) argues that temporal aspects explain 78% of variance in fluency rating.

In addition to agreeing on measures of fluency, we need to agree on which factors may or may not influence it. Many studies have discussed issues related to this. Concerning the influence of L1 types or L2 proficiency, De Jong, Groenhout, Schoonen, and Hulstijn (forthcoming) analyze the influence of L1 fluency on L2 fluency and conclude that corrected syllable duration is a reliable index for the latter. Cox, (Smemoe, and Malentina, 2013) suggest that fluent L2 speakers are usually fluent in their L1, but that this relation may change according to L1 type. (Iwashita, 2010) reveals that some fluency-related indices are influenced by overall L2 proficiency, but that this kind of proficiency effect may be different according to L2 type. Being native speakers or not, or being proficient in L2 or not, seem to be a decisive factor for speech fluency, but (Osborne, 2008), who compares major fluency measures such as speech rate, pauses, length of utterances, and retracing in speeches by native speakers, proficient non-native speakers, and less proficient non-native speakers, concludes, "whatever single measure is taken, there is dispersion among speakers of the same group […] and there is overlap between the groups."

As for learners' cognitive capacity, (Morris, 2012) reveals that learners' working memory determines to some extent speed or breakdown aspects of fluency. (Jong and Perfetti, 2011) examine the effect of training on the development of speech fluency, reporting that both a group of learners who made three speeches about the same topic and a group who made three speeches about three different topics developed their fluency but that the gain from training was maintained only by the former. This was interpreted as a result of cognitive proceduralization of linguistic knowledge.

Concerning task type, (Ten, 2007) reveals that learners can be more fluent in speech involving answering questions than in picture description and presentation types of speech. (Cucchiarini, Doremalen, and Strik, 2010) suggest that learners' speech fluency can change a lot between read-aloud tasks and spontaneous speech tasks and also add that the number of filled pauses is especially sensitive to task type.

Concerning the social contexts surrounding learners, (Schoonjans, 2012) compares German learners of English studying at German EFL schools with those studying at European schools in Germany, Belgium, and the United Kingdom, and concludes that learners can gain higher L2 fluency in an L2-prominent context.

In contrast to these various factors, however, learners' individual attributes and learning histories have not been wholly examined. For example, how factors such as learners' sex, academic major, L2 learning motivation, or type of L2 training previously received influence their speech fluency has been discussed less often.

3. Research design

3.1. Aims and research questions

As summarized above, previous studies have revealed many noteworthy facts about the influence on L2 fluency of factors related to speakers' L1, L2 proficiency, cognitive capacity, types of speech tasks, and social contexts surrounding speakers, but they have not wholly investigated learners' basic attributes and their learning history.

In the current study, therefore, we examine the influence of sixteen indices concerning basic attributes (demography, proficiency, and motivation) as well as learning history (skills of focus, L2 use situation, and specific types of L2 training) of Japanese and Chinese learners of English on their L2 speech fluency. Our analyses are based on three kinds of statistical techniques: cluster analysis, correspondence analysis, and regression analysis. With a special reference to the studies such as (Crossley and McNamara, 2013) and (Jong, 2011), we define speech fluency in the simplest way, namely, as the number of words that speakers utter in a certain length of time.

Our research questions are as follows.
RQ1 Which indices are clustered together with L2 speech fluency?
RQ2 Which indices are positioned close to L2 speech fluency?
RQ3 Which indices are adopted in the regression models for L2 speech fluency?

When discussing each RQ, we firstly pay attention to Japanese and Chinese learners taken altogether, then to each of them.

3.2. Data

We utilize the spoken module of the International Corpus Network of Asian Learners of English (ICNALE) (Ishikawa, 2014), which is a collection of impromptu L2 English speeches by college students in ten countries of Asia. The version used for the current analysis is Baby 1.2. The ICNALE-Spoken, which includes speeches by more than 1,000 speakers including English native speakers, is much larger than other spoken corpora focusing on Asian learners (e.g., Yoon et al., 2009).

The data collection procedure used in this corpus compilation has three stages. First, participants respond to a questionnaire about their personal attributes as well as their L2 learning history. Then, they take a receptive vocabulary size test. Finally, they are interviewed over the phone. Following the recorded instructions, they make a self-introduction speech (which is not included in the corpus) and four impromptu speeches about given topics: "It is important for college students to have a part-time job" and "Smoking should be completely banned at all the restaurants in the country." Each of these is one minute long. They make two speeches about each topic after some planning time, and are strictly required to continue to speak until the time is up. Speech data is stored in an online server and then transcribed by a team of professional transcribes. Learners' survey data, audio files, and transcripts are all available for research purposes.

The below are samples of transcribed speeches by Japanese and Chinese learners about a part-time job.

I disagree with the idea. Now, I have a part-time job twice a week but because of that I don't have time to do my own job, my study. It takes about 2 hours to go home and after that I have to work. It is so hard for me. What I have to do is to study biology or chemistry or something. My own study at university but I have to do chemistry or biology for high school students. That is the waste of time. So, I will quit the job and I will be eager to my own study what I have to do. That is my opinion. (Japanese learners #010)

I think I don't agree that it is of very great importance for students – college students to have part-time job. I am not denying that a part-time job can practice person's ability for working or cooperation or something like that but I think the college student – quite important mission in college is study and I think having a part-time job may influence student's study. But having a part-time job may have some income – extra income in college which may – which my help them. (Chinese learners #009)

An outline of the dataset used for the present analysis is shown in Table 1. L2 proficiency levels are roughly comparable between the two learner groups.

Table 1. Outline of the dataset used for the current analysis

	Japanese learners	Chinese learners
Participants	100	150
Speeches	400	600
Word Types	1,196	2,372
Word Tokens	27,858	67,164

3.3. Indices examined

As mentioned above, each speaker makes four topic-based speeches. We calculate the average number of words used in these four speeches, which is regarded as a fluency index for the current analysis. As demonstrated in many previous studies, the number of words per minute is widely agreed to be one of the most reliable and stable measures of L2 speech fluency. By considering four speeches together, any influence of topic type or number of trials on fluency is controlled to a large extent.

An outline of the sixteen indices is given below. They are based on the speaker information included in the ICNALE (See Ishikawa, 2013 for details).

A: Learners' basic attributes

A1: Demographic attributes: Nationality (NTNL), sex (SEX), age (AGE), academic major at college (MAJ)

A2: Proficiency-related attributes: Receptive vocabulary size (VOC)

A3: Motivational attributes: Strength of integrative motivation (INTM), strength of instrumental motivation (INSM)

B: Learners' L2 learning history

B1: Skills of focus: Listening (LNG), reading (RDG), speaking (SPG), writing (WRG)

B2: L2 use situation: Frequent use of L2 in school (INUSE) and outside school (OUTUSE)

B3: Specific types of L2 training: Instruction by English native speakers (ENS), training of pronunciation (PRON), training of oral presentation (PRES)

Regarding the indices in category A, learners' academic major is classified into three categories in the current analysis: humanities, social sciences, or sciences. Learners' receptive vocabulary size is measured by a vocabulary test based on (Nation and Begler, 2007), in which learners are required to choose the appropriate meaning for a word presented with a short context. The test includes fifty question items taken from the top 5,000 words). The two kinds of motivation score are based on the average of learners' responses (1: *Strongly disagree* to 6: *Strongly agree*) on six statements concerning integrative motivations (e.g.: *I study English because I feel pleasure when I understand the content sufficiently/[…] because learning content is more important than being awarded high grades*) and the other six, concerning instrumental motivations (e.g.: *I study English because I want to get a better job in the future/[…] because I want to be socially acknowledged.*)

Indices in category B are all based on the average of learners' responses (1: *Strongly disagree* to 6: *Strongly agree*) to statements concerning skills of focus (*I read [spoke, listened, wrote] a lot…*), L2 use situation (*I often used English in [outside of] class*), and specific types of L2 training (*I have been taught by English native speakers/I have been taught pronunciation [oral presentation] in the past*).

In order to conduct statistical analyses, nominal variables are converted into dummy variables. For example, Japan and China as nationality parameters are coded as 1 and 2 respectively. Likewise, humanities, social sciences, and sciences as academic major are coded as 1, 2, and 3.

3.4. Procedure

As mentioned above, concerning RQ1, we adopt a hierarchical cluster analysis. First, in order to see an overall tendency, we regard the seventeen indices including fluency as variables and two hundred and fifty Japanese and Chinese learners as cases. Then, in order to have a look at the difference between learner groups, we conduct additional analyses on Japanese and Chinese learners respectively. The distance is calculated as a square root of ($2-2r$), and the Ward's method is adopted as a linkage rule. Concerning RQ2, we adopt a correspondence analysis, where the indices and speakers are regarded as item1 and item 2 respectively. Last, concerning RQ3, we adopt a

regression analysis, where we regard the fluency index as a dependent variable and the learners' attribute and history indices as independent variables. Variables used in the models are selected by a stepwise method *(p* in/out = .2)

4. Results and discussions

4.1. RQ1: Clustering of the indices

From the hierarchical cluster analysis of all the Japanese and Chinese learners, we obtained a dendrogram, shown in Fig. 1.
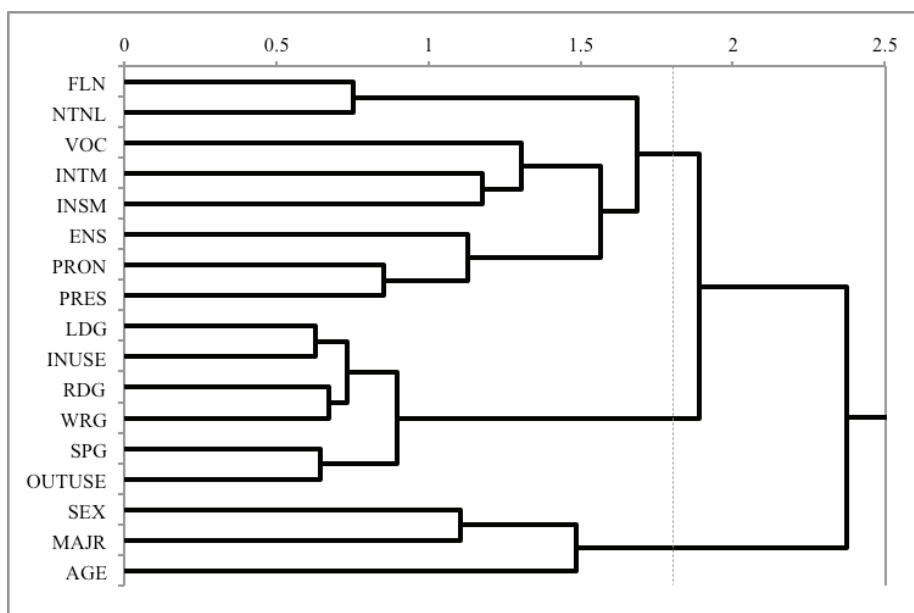

Fig. 1 Dendrogram obtained from a cluster analysis of Japanese and Chinese learners

If a cutting point is set at around 1.8, the seventeen indices can be classified into three major clusters. The top cluster includes fluency and the indices concerning nationality, vocabulary size, motivation, and specific types of L2 training. As seen in the diagram, fluency is revealed to relate most closely to learners' nationality. Although we have often discussed fluency of L2 learners in general, our data strongly imply that it may be inappropriate to apply findings obtained from one particular group of learners across to other groups of learners in a straightforward way. Fluency is also related to vocabulary knowledge, motivation, and specific types of L2 training. If young learners are appropriately motivated to learn L2, receive appropriate L2 training, and acquire sufficient vocabulary knowledge, they are expected to be more fluent in L2 speech. It is of note that vocabulary size, which is often said to be a reliable marker for L2 proficiency in general (e.g., Milton, 2013), is proven to play an important role in L2 speech fluency.

The middle cluster, which is less related to fluency, concerns skills of focus and L2 use situation. This suggests that even if learners have learned and practiced speaking at school or somewhere else, it may not directly improve their speech fluency.

The bottom cluster, which is least related to fluency, concerns learners' demographic attributes, including sex. Although gender studies (e.g., Maccoby & Jacklin, 1974) imply that women are less hostile and more empathetic than men, and therefore often better at chatting and talking, no clear influence of sex on L2 speech fluency is observed here.

As it was shown that learners' nationality influences speech fluency most decisively, we conducted additional cluster analyses of Japanese and Chinese learners respectively. The obtained dendrograms are shown in Fig. 2.
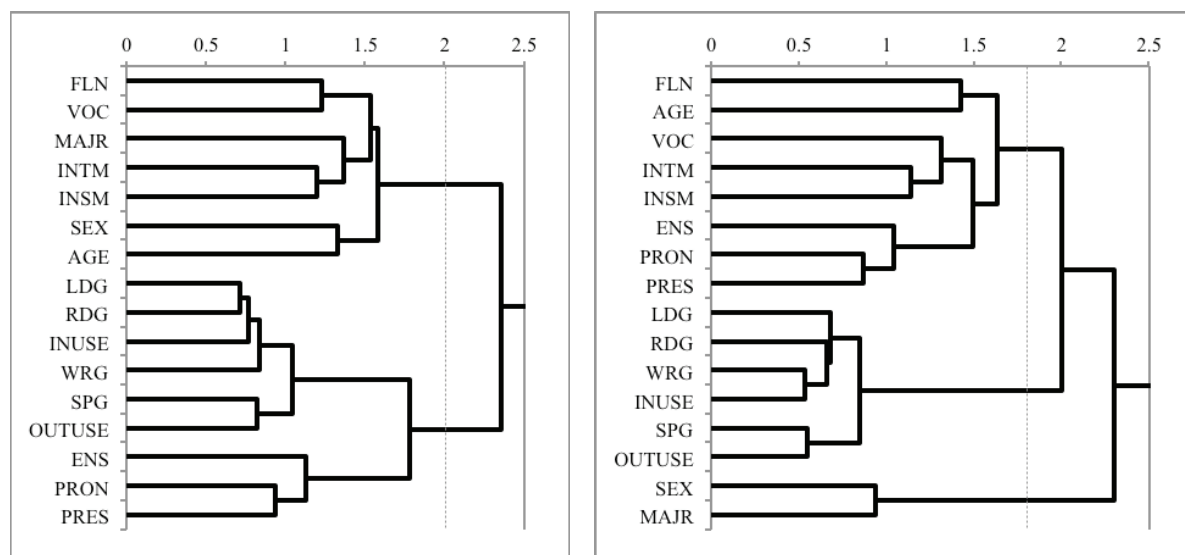
Fig. 2 Dendrograms obtained from cluster analyses of Japanese learners (left) and Chinese learners (right)

For Japanese learners, the indices of basic attributes and those of learning histories are separately classified into two major clusters and the former is more closely related to speech fluency than the latter. However, for Chinese learners, such parallelism in clustering is not necessarily observed: fluency is closely related to a part of basic attributes (age, vocabulary size, and motivation) and learning histories (specific types of L2 training), while less closely related to the other part of basic attributes (sex, and major) and learning histories (skills of focus, and L2 use situation).

It is of note that only three indices, namely, age, vocabulary size, and motivation are positioned close to fluency both for Japanese and Chinese learners. The number of factors commonly influencing fluency of L2 speeches by different learner groups may be smaller than generally believed.

4.2. RQ2: Positioning of the indices

From the correspondence analysis of all the Japanese and Chinese learners, we obtained a scatter plot, shown in Fig. 3. The contributions to variance of Z_1 (horizontal axis) and Z_2 (vertical axis) are 47.9% and 16.0% respectively, suggesting that more than 60% of variance in the dataset is explained by these two axes.

On the horizontal axis, fluency and nationality are found in the right half and the other indices in the left half. An important finding here is that the same axis also classifies most of the Chinese learners (coded as C) in the right half and most of the Japanese learners (coded as J) in the left half. This corroborates the idea that Chinese learners are generally more fluent in L2 English speech than Japanese learners.

On the vertical axis, meanwhile, sex, major, age, vocabulary size, and motivation are placed in the upper region; fluency and nationality in the middle region near zero; and skills of focus, L2 use situation, and specific types of L2 training in the lower region. Although fluency seems to be largely independent, it shows some closeness to motivation (especially integrative motivation) and vocabulary size. Considering that vocabulary size may represent learners' autonomy in L2 learning as well as their L2 proficiency (EFL learners acquire L2 vocabulary often by autonomous learning), we can say that learners' attitude influences speech fluency more strongly than their demographic attributes or types of teaching that they have received in school.
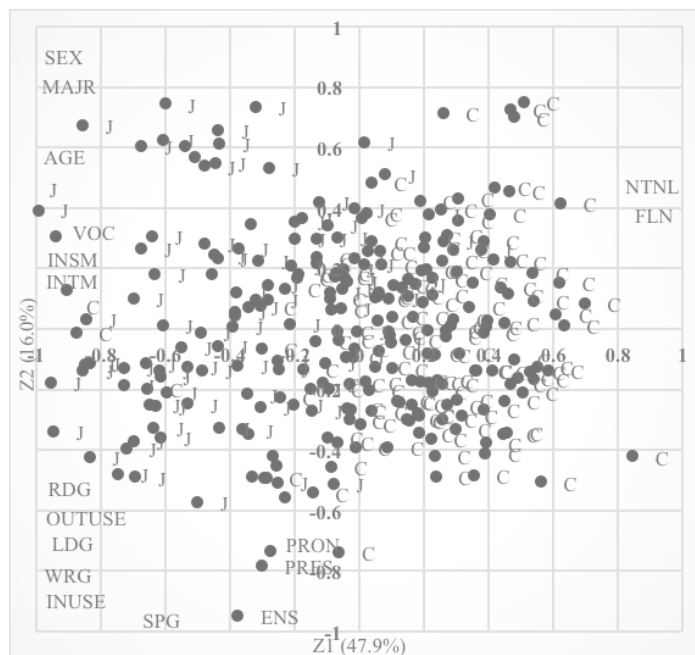
Fig. 3 Scatter plot obtained from a correspondence analysis of Japanese and Chinese learners

Then, we conducted additional correspondence analyses of Japanese and Chinese learners respectively. The obtained dendrograms are shown in Fig. 4.
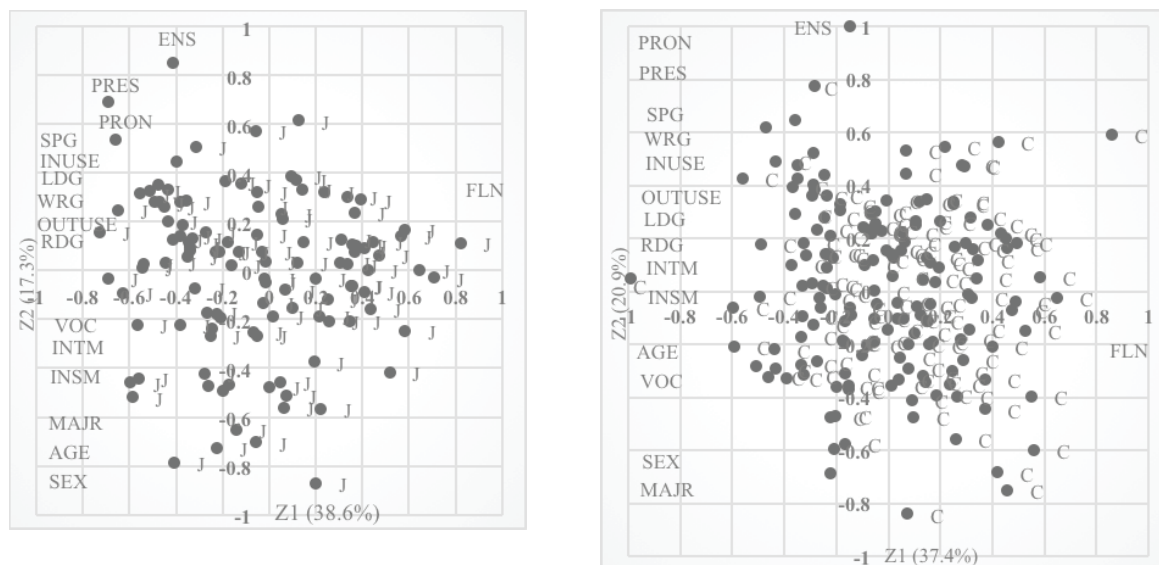

Fig. 4 Scatter plots obtained from correspondence analyses of Japanese learners (right) and Chinese learners (left)

On the horizontal axes, fluency is still in the right half and the other indices in the left half. Fluency seems to be equally distant from all indices in case of Japanese learners, while it is somewhat close to instruction by native speakers and age, as well as using L2 outside school, motivation, sex, and major in case of Chinese learners. The horizontal positioning of indices suggest that L2 speech fluency may have less meaningful connection to learners'

attribute and learning history indices for Japanese learners in comparison to Chinese learners.

On the vertical axis, fluency shows some closeness to indices such as reading as a skill of focus and vocabulary size in case of Japanese learners, and to motivation in case of Chinese learners.

4.3. RQ3: Indices adopted in regression modelling

From the regression analysis of all the Japanese and Chinese learners, we obtained a model summarized in Table 2. The squared correlation (corrected) is .57 and AIC is 1466.2.

Table 2. Coefficients of the selected variables (Japanese and Chinese learners)

Variables	Coefficient	Std. Coefficient	F	t	p
NTNL	41.55	0.72	254.02	15.94	0.00
OUTUSE	6.99	0.22	11.54	3.40	0.00
MAJR	-5.25	-0.16	13.21	-3.63	0.00
PRES	-2.76	-0.15	7.53	-2.74	0.01
ENS	2.33	0.14	8.98	3.00	0.00
WRG	-3.59	-0.12	3.50	-1.87	0.06
Intercept	31.47	---	18.99	4.36	0.00

Among sixteen indices, six are adopted in the model. It suggests that nationality, namely, Japanese or Chinese, is the most staple factor influencing L2 speech fluency. In addition, learners are expected to be more fluent if they have used L2 more outside school (standardized coefficient is +0.22), if they major in humanities rather than social sciences or sciences (-0.16), if they have received less training of oral presentation (-0.15), if they have been taught more by native English speakers (+0.14), and if they have studied writing less (-0.12). It attracts our attention that training of oral presentation and writing may lead to disfluency rather than to fluency. Both of them often require learners to use L2 in a fixed manner and structure, which seems to cause a kind of inhibition in a free impromptu speech. These findings shed some light on what teachers need or do not need to do so as to help learners develop their L2 speech fluency in an effective way.

Then, the same analyses were conducted on Japanese leaners and Chinese learners respectively. The results are shown in Tables 3 and 4. The squared correlation (corrected) and AIC are .05 and 573.8 in the model for Japanese learners; while .14 and 893.4 in the model for Chinese learners. Due to elimination of a nationality index, the degree of fitness of the models becomes lower.

Table 3. Coefficients of the variables in two regression models (Japanese learners)

Variables	Coefficient	Std. Coefficient	F	t	p
VOC	0.85	0.25	6.47	2.54	0.01
Intercept	40.05	---	11.64	3.41	0.00

Table 4. Coefficients of the variables in two regression models (Chinese learners)

Variables	Coefficient	Std. Coefficient	F	t	p
MAJR	-5.56	-0.25	9.38	-3.06	0.00
PRES	-3.79	-0.25	6.85	-2.62	0.01
ENS	2.76	0.24	6.83	2.61	0.01
OUTUSE	5.37	0.22	7.11	2.67	0.01
Intercept	110.67	---	167.19	12.93	0.00

It is of note that the influence of learners' attribute and learning history indices on L2 fluency considerably varies between Japanese and Chinese learners. For the former, fluency is more independent and it is significantly influenced by vocabulary knowledge alone; while for the latter, fluency can relate to major and it is negatively influenced by training of oral presentation, and positively influenced by instruction by native speakers and L2 use outside school. It should be noted that instruction by native speakers, whose importance has been widely admitted, may not be effective for every learner with different L1 and learning background.

5. Conclusion

The current study examined sixteen indices that might be related to fluency of speeches by L2 learners. Our

quantitative analyses have shown that (i) speech fluency is related most closely to learners' nationality and then to vocabulary size, motivation, and specific types of L2 training; (ii) Chinese learners are generally more fluent than Japanese learners, and learners majoring in humanities are more fluent than learners majoring in social sciences or sciences; and (iii) L2 use outside school and instruction by native speakers positively influence fluency, while training of oral presentation and writing negatively influence it. Also, our analysis focusing on each of Japanese and Chinese learners has proven that (iv) speech fluency is less closely related to learners' attribute and learning history indices for Japanese learners in comparison to Chinese learners; (v) speech fluency is relatively close to vocabulary size for Japanese learners; and (vi) it is close to academic major as well as learning history indices such as L2 use outside school, instruction by native speakers, and training of oral presentation for Chinese learners.

Although we have obtained many interesting findings about the influence of indices concerning learners' basic attributes and their learning history on their L2 speech fluency, there remains much to be improved in the current analysis. First, learners with other L1s should be incorporated into the analysis. Second, not only the number of uttered words but more varied temporal and non-temporal fluency measures need to be compared together. And finally, not only topic-based speeches but also other types of speeches—picture descriptions, for example—need to be examined and compared. We plan to investigate these matters in future studies.

Acknowledgements

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