ON AN AUTOMATED PRONUNCIATION-HEARING TEST OF FRENCH MONOSYLLABLES FOR JAPANESE SUBJECTS

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Abstract

In a semi-automated environment eleven Japanese subjects were asked to repeat French monosyllabic words. Their performance was judged by a native speaker of French.

Each monosyllable is divided according to the C_iVC_f pattern and levels of difficulty are assigned to each element V, C_i, C_f separately. When C_i or C_f are clusters, they are ascribed levels according to general complexity (number and difficulty of constituents). All possible clusters are analyzed separately for phonotactic regularities. The question is then asked whether these correlate with difficulty of articulation for Japanese students, and if the presence of certain constituents allows to predict levels of difficulty of a whole cluster in relation with its other constituents. It is found that clusters which have the greatest number of constituents are not always the most difficult to pronounce; some initial clusters containing a liquid and a semi-consonant are on the whole easier than those containing only the semi-consonant; the presence of [l] in a final cluster increases its difficulty when compared to the corresponding cluster with [R].

Some descriptions of the pronunciation-hearing test in its theoretical and technical aspects have been given elsewhere.[1, 2, 3, 4] French test material has been developed, and a small series of tests on Japanese students have been conducted. These tests are now being continued and extended into the second stage of the project. In this preliminary note, we shall only explain what kinds of methodological choices we have been confronted with in adapting the test to French, and what tentative conclusions we feel we can draw from the data we have obtained in the first exploratory stage of the experiment.

Methodological Choices

A. The CVC monosyllable

Most researchers who have looked into the problem of the syllable as a phonological or phonetic unit have done so for purposes quite different from ours. Linguists who have been interested in the nature of the syllable in French have often adopted a narrow definition of it ("autant de voyelles, autant de syllabes, " Passy*), their main concern being in dividing the spoken sound wave into a sequence of discrete units, at a time when the trend of linguistic research was strongly oriented toward the written language. The presence of the mute 'e' led to some inconsistencies. Grammont, for example, while giving advice, in his Traité Pratique,[6] to persons who want to pronounce French correctly, stresses that one should avoid pronouncing the 'e' in a word which already contains another vowel, e. g., un(e), grand(e), femm(e), and that word such as outre and ongle should be pronounced with great care, but later on in the same book accepts the syllabic division: gran-de, on-gle when the words occur in isolation.

Delattre emphasized the fact that in the case of the mute 'e' endings there is no vocalic sound but rather, simply a relaxation of the tension for the consonant that precedes the mute 'e.' We are ready to accept this conclusion and to consider grande or ongle as well as muscle or marbre as monosyllables of the C_iVC_f type, where C_i and C_f can be zero, one, or more than one consonant.

Keeping this pattern in mind we have gone through the Petit Larousse and collected all the monosyllabic words following it. We double checked our list with an excerpt from the Littré which had been provided by the Centre d'Etudes du Vocabulaire Français de Besançon.

B. The constituents V, C_i, C_f

Using our own list, and analyses of the French language done by P. and M. Léon,[9, 10] by Mme Denohue-Gaudet,[11] and by E. Companys[12] in the "Test d'Aptitude et de Niveau Phonétique" for vowels and for consonants, we

* quoted in H. Sten.[5]

have drawn together the following specifications for the constituents of our test material:

1. The constituent V

Under this category we have 14 vowels:

[i] of scie, [é] of dé, [ɛ] of sept, [$\tilde{\varepsilon}$] of vingt, [a] of table, [$\tilde{a}$] of cent, [y] of lune, [ø] of deux, [ə] of le, [œ] of fleur, [u] of douze, [o] of veau, [$\tilde{o}$] of onze, [ɔ] of bol.

For the present purpose of this test we decided not to distinguish between [$\tilde{\varepsilon}$] of vingt and [$\tilde{œ}$] of un, between [a] of table and [ɑ] of âne. Firstly, our own dialect is Parisian French in which these distinctions either have already disappeared or are on the verge of doing so. Secondly, we believe that these vowel oppositions are not necessary, at least for foreigners who still have to learn the other more crucial oppositions.

2. The constituent C_i

The consonants that can occur in the C_i constituent are, including the so-called semi-consonants: [p], [t], [k], [b], [d], [g], [m], [n], [ɲ], [f], [v], [s], [z], [l], [ʃ], [ʒ], [R],* and [j], [w], [ɥ]. Several of these can be combined together in the same C_i.

The consonant clusters that can appear only as the consequence of dropping a mute 'e' in the first syllable of a disyllabic word have not been employed. It may happen indeed that disyllabic words in some particular environments become phonetically monosyllabic. For example, the word secret in son secret, when this is pronounced as [sõskrɛ]. But as Grammont states in his law of three consonants in French,** if the same word secret appears in a different environment, e. g., ce secret, it will be impossible to have *[sskrɛ], giving

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* The glottal stop which could be considered as a sort of consonant is not included in our system.

** "La règle est qu'il [the mute-e] se prononce seulement lorsqu'il est nécessaire pour éviter la rencontre de trois consonnes.... Son maintien ou sa chute dépend essentiellement de ce qui précède. 1° Quand il n'est séparé de la voyelle qui précède que par une seule consonne, il tombe toujours... 2° Quand il est séparé de la voyelle qui précède par deux consonnes, il se prononce toujours." (M. Grammont, Traité Pratique de Prononciation Francaise, quoted in Malécot[14]).

rise to either [ssəkrɛ] or [səskrɛ]. Because in our test material words are presented in isolation, we cannot take such variations into account. These problematic words and the clusters they would offer are therefore excluded from our list.

The consonants occurring in the C_f constituent are the same as those we can find in C_i but except for [j] which has a particular status the other semi-consonants will, of course, not be found.

As we explained in our discussion of the monosyllabic unit in A, the consonant clusters which can occur in C_f have not been limited and each cluster is considered as a whole unit.

C. Assigning the levels of difficulty

When assigning levels of difficulty from 1 to 6 (1 = the easiest, 6 = the most difficult) to the different constituents of the monosyllables, we took two things into consideration as specific causes of difficulty arising from the difference between French and Japanese. One is something to be made clear by a comparative study of the articulatory characteristics of the phonetic units of both languages. Comparing the sounds of French and Japanese according to place and manner of articulation, we made some tentative assumptions on the articulatory difficulty of French sounds for a Japanese speaker (see Table 1).

Secondly, it would be necessary to consider the effects of phonetic environments. In the present state of our program, we are not able to take into account the possible influences of the vowel on the preceding or following consonantal element or vice versa (see Sato,[15] p. 69). Consequently, we give more attention to the conclusion we can draw about the inherent complexity of consonantal clusters. For a Japanese speaker, consonant clusters are often difficult to pronounce because they appear only exceptionally in Japanese phonetic forms. The consequence is that Japanese people have a tendency to insert a kind of vowel segment after each separate consonant. In the first stage of the experiment where we tentatively assign a level of difficulty to each consonant cluster, we adopted the following approach: assign each independent cluster its level of difficulty, assume generally that the more elements a consonant cluster contains the more difficult it is. Also, the

more difficult the constituent consonants are in themselves the more difficult the compound cluster is.

Table 1. Teletype symbols and corresponding phonetic symbols for vowels and single consonants with assigned levels of difficulty

Level	Vowel		Consonant	
	T-T System	Phonetic	T-T System	Phonetic
1	A I E/	a i e	P B M NN J	p b m n j
2	E OA AN	ɛ ɔ ɑ̃	Z L K	z l k
3	U O IN	u o	G S W	g s w
4	EU OE ON	a œ o	QN T D	ɲ t d
5	Y	y	SH ZH F	ʃ ʒ f
6	Ø	ø	R V Q	R v ɥ

In Tables 1 and 2, the WFs* can be found with their assigned levels of

* From here onwards any element coming under C_i, V or C_f is labelled a WF (word feature). [1)]

difficulty as the first guess. These are to be revised for the second stage experiments according to the results obtained in the first stage.

Table 2. Assignment of levels of difficulty for consonant clusters

	Initial Clusters	Final Clusters
Level 1	PS TS PJ TJ DJ MJ NNJ KJ	KS PS PT KT
Level 2	KL PL SP SM SNN PNN SJ ST SK KW PW MW SW NNW TW SKJ TS	SM PNN MNN DNN SK ET SP ST
Level 3	LJ GW BW LW GL SL BPL DW GNN SB BL PSH TSH	PL KL LK FL LP LT LF
Level 4	PLW KLW GLW SF FW FL FJ SHJ SHNN SHW TM	RB LB KR FR PR TR RK RP RS RT RF LM
Level 5	SHL ZHW DZH PR KR TR FR STR SKR SPR PQ TQ KQ NNQ FQ	RM RNN RL GL BL GM RSH TSH VR BR DR GR RD RV
Level 6	RJ RW VJ VW VL VR SV BR GR DR PRW BRW KRW GRW TRW FRW DRW SKW SQ BQ LQ GQ DQ SHQ ZHQ RQ PLQ BRQ TRQ FRQ DRQ GLQ PRQ	RQN RZH LZH RST LV LG RG RDR RBR RTS RSK RTR RPR PTR KTR KST SPL SPR STR SKL LTR SHTR

D. The test

We have tested thirteen Japanese subjects, but for technical reasons, only eleven were used for the analyses of the results. It must be stressed that our choice of subjects included some who had no previous knowledge of French or of other foreign languages.

The evaluator whom we asked to judge the acceptability of the students'

repetition of the pre-recorded word list was a native speaker of French, without any knowledge of French phonetics (her major was economics). Although she was a Dauphiné native, her dialect was very near the Parisian one, and we felt we could rely on her judgement. She was instructed to listen to each word as it was played by the computer-controlled tape and to decide whether the student's imitation of the stimulus could be identified as the word by a native speaker of French. More specifically, the criteria were: is the student's pronunciation clear enough for you to immediately identify the word, or do you have to ask the student to repeat for unmistakable identification?

The First Conclusions

To analyze the data from the test sessions, we have used two of the three programs described by Mrs. Harada.[16] We used the Level Improvement program to obtain the mean percentage score of the results of all the subjects for each word feature. The typeout format displays the test results for each test session in the form of both the number of times each WF was presented (c) and the number of times it was successfully produced by the student (s). The Level Improvement program using the same information calculates the mean percentage value of the ratio s/c covering all the students for each WF, and then arranges the WFs according to the obtained average from -100 to +100. We are thus able to see which WFs were easiest and which ones were most difficult on the average for all the students. We also made use of the "Word Feature Component Research for Group" program to find out what percentage of subjects had more difficulty in pronouncing a complex WF rather than in pronouncing the WF that contains only part of its constituent units, viz., the constituent WF.

A. The V word features

Out of the fourteen vowels, six were pronounced with completely satisfactory results. (We present on Table 3 the results obtained for those vowels.) We would like to point out here that this is an important reflection of the nature of the test where the validity criterion is not that of a similarity of the produced sound to an abstractly defined so-called "correct French sound,"

Table 3. The s/c scores for vowels in percent, average of 11 students.

A	100
I	100
E/	100
E	100
OA	100
EU	100
Ø	90
AN	80
OE	68
ON	66
O	66
IN	61
U	60
Y	55

but rather the acceptability for identification of the produced sound for a person whose first language is French. In other words, we do not try to obtain theoretical phonetic correction but minimal practical correction.

B. The C_i and C_f word features

1. The single consonant elements (in initial or final position)

Table gives a comparison between the initial and final consonantal WFs which differ only by their position in the monosyllable. It is interesting to note that when an initial WF is in the higher part of the table because of its high score, its final WF counterpart has a lower score. But when an initial WF has a low score, its final WF counterpart gets a better score. From -K downwards scores are between 90 and 61, while the same elements in initial position have scores between 67 and 30. These results may be related to what some teachers of French in this country have noted: the main difficulty of the French language for Japanese students resides primarily in the tension which articulation of consonants requires, so that when a single consonant element is difficult to pronounce, it is more difficult in initial position (which presumably requires tenser articulations) than in final position.

Table 4. Comparing the results obtained for single consonants in initial and in final position (% average).

M-	100	-M	94
P-	95	-P	72
W-	94		
B-	90	-B	75
D-	89	-D	79
NN-	87	-NN	96
SH-	87	-SH	67
V-	83	-V	51
QN-	82	-QN	79
J-	81	-J	78
Z-	74	-Z	72
S-	73	-S	77
Q-	71		
L-	69	-L	65
K-	67	-K	90
G-	65	-G	81
T-	61	-T	61
F-	50	-F	61
R-	47	-R	66
ZH-	30	-ZH	72

2. The cluster elements

The test results show that the range of success rate for clusters is better if these appear in final position (mean percentage value of s/c: from +100 to -18 in that case; from +100 to -45 for final positions).

a. Initial clusters*

We note that among the single consonants that can occur by themselves as C_is in French, a certain number** can be combined with other consonantal segments to make complex WFs. We can define several different classes of clusters as shown in Table 5 according to the kinds of other segment sequences that are combined. For example,

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* See appendix 1 for complete tables of these clusters.

** These are: [b], [d], [f], [g], [k], [l], [m], [n], [p], [r], [s], [ʃ], [t], [v], [ʒ].

Table 5. Types of initial clusters.

Regular Clusters			
A'-type WFs		A"-type WFs	B-type WFs
constituent (a) + {J, Q, W}		constituent (a) + {L, R}	constituent + {L, R} + {Q, W}
Ex.	FW-	FR-	FRW-
Irregular Clusters			
F-type WFs		F'-type WFs	
(a) + (b) conditions: a, b = constituent a ≠ b		constituent + {A'-type WF, A"-type WF} condition: a ≠ b	
Ex.	PS-	SPR-	

the initial consonant [f] is contained in complex WFs such as FW-, FR- and FRW-, F is said to be a constituent of these complex WFs.

The distinction between regular and irregular clusters as seen in Table 5 refers only to conditions concerning monosyllabic words. Clusters of the irregular types F and F' are those WFs with unusual combinations of consonants that are either found in loan words or characteristically seen in polysyllabic words.

We may wonder if such regularities observed in the phonemic structure of words can be related to a hierarchy of articulatory difficulties which the Japanese (or any other foreign) student has to overcome in

learning French. Thus, for the initial consonant clusters we have attempted to answer the following questions by inspecting the data we have obtained from this experiment:

1) Is there any correspondence between the difficulty of production of a given constituent WF and that of the related complex WFs?

2) In the A"-type WFs is the difficulty level of these complex WFs determined by the inherent difficulty of R- or L-?

3) Does the presence of J-, Q- or W- in the A'-type WFs and B-type WFs correlate with the difficulty of articulation of these clusters?

Our data do not give a precise answer to the first question. Our hypothesis adopted in the "first guess" of the difficulty levels was that the difficulty of production of consonant clusters would be higher if the number of consonants it contained was larger, or if the difficulty of the constituent elements was higher. It can be observed that this is true in some cases; for example, for P- the mean average of s/c is 95%, PR- is produced with a 73% average success, and PRW- is not successfully produced at all. But Table 6 shows that this is often not true. For some clusters, the whole cluster is produced with less difficulty than the constituent WF by itself. F-, for instance, is produced with a 50% average success, FR- with 46%, while FRW- is produced with as high as a 91% average success. Similarly, T-gets a 61% score, TR- 37%, but TRQ- 73%.

These last results could possibly be interpreted in terms of the hypothesis on the "tension" proposed by Professor Guberina[18] and his colleagues, but we would still need to explain why in some cases single consonants are easier than complex WFs, whereas in other cases the opposite is true.

Table 6. Average scores obtained for the set of regular clusters.

Constituent WFs		A'' type WFs		B type WFs		A' type WFs	
B-	90	BL-	70			BJ-	88
		BR-	61	BRQ-	27	BQ-	30
				BRW-	82	BW-	32
D-	89					DJ-	42
		DR-	88	DRQ-	45	DQ-	93
				DRW-	45	DW-	88
F-	50	FL-	94			FJ-	81
		FR-	46	FRQ-	64	FQ-	24
				FRW-	91	FW-	42
G-	65	GL-	62	GLQ-	9		
				GLW-	45		
		GR-	76	GRW-	54	GW-	94
K-	67	KL-	76	KLW-	-18	KJ-	91
		KR-	80	KRW-	73	KQ-	76
						KW-	72
L-	69					LJ-	79
						LQ-	82
						LW-	67
M-	100					MJ-	92
						MW-	79
NN-	87					NNJ-	76
						NNQ-	84
						NNW-	56
P-	95	PL-	68	PLQ-	36	PJ-	100
				PLW-	82	PQ-	94
		PR-	73	PRQ-	-9	PW-	54
				PRW-	0		
R-	47					RJ-	53
						RQ-	1
						RW-	64
S-	73					SJ-	75
						SQ-	45
						SW-	97
SH-	87					SHJ-	23
						SHQ-	-18
						SHW-	76
T-	61					TJ-	76
		TR-	37	TRQ-	73	TQ-	64
				TRW-	9	TW-	69
V-	83	VL-	-45			VJ-	64
		VR-	82			VW-	41
ZH-	30					ZHQ-	48
						ZHW-	44

Table 7 presents the answer to the second question. From this table we see that the difficulty of a given WF does not come from the presence of a particular constituent WF in the cluster, R- or L-, but from the whole combination of the constituent WFs in the complex WF, and that our starting policy of dealing with different WFs rather than phonemes independently was appropriate as a general first-step approach.

Table 7. A'' type WFs (average % of s/c).

F-	50	FL-	94	FR-	46
K-	67	KL-	76	KR-	80
B-	90	BL-	70	BR-	61
P-	95	PL-	68	PR-	73
G-	65	GL-	62	GR-	76
V-	83	VL-	-45	VR-	82

The answer to the third question can be drawn from Table 6 where we purposely grouped B-type WFs and A'-type WFs together, and from Table 8, in which -- thanks to our second data-processing program -- we list the numbers of students for whom the clusters containing the

Table 8. Semi-consonants and assessment of WF difficulty.

	A'-type WFs			B-type WFs		
	-diff.	=	+diff.	-diff.	=	+diff.
J	28	40	32			
W	31	32	43	26	44	28
Q	31	28	40	35	36	24

The figures represent in percentage the numbers of students who found the pronunciation of the initial clusters with the semi-consonants less difficult than, as difficult as, or more difficult than the corresponding initial clusters without the semi-consonant.

semi-consonants were less difficult, equally difficult, or more difficult to pronounce in comparison with the corresponding WFs without the semi-consonants. We can see that the presence of J- does not have much bearin on the difficulty of the A'-type WFs, while W- and Q- seem to augment their difficulty on the average. In contrast, with the B-type WFs, the presence of W- does not affect the articulatory difficulty, and the presence of Q- even seems to facilitate the articulation of the other consonantal elements.

b. Final clusters*

The classes of clusters coming under the label C_f are described in the following table. We have used the same method as for the initial clusters. Among the single final consonants which can occur by themselves as C_fs, a certain number** can combine with other segments. They thus are the constituents of some complex WFs. We can classify all the final clusters into several types as in Table 9.

Table 9. Final cluster

Final Clusters				
C-type WFs	D-type WFs†	E-type WFs	G-type WFs	H-type WFs
$\begin{matrix}-L \\ -R\end{matrix}$ + cstit. WF	-cstit. (a) + $\begin{matrix}L \\ R\end{matrix}$	-cstit. (a) + cstit. (b) condition: a ≠ b	-cstit. (b) + D-type condition: a ≠ b	3 different cstits. concatenated to form C_f

† in this class R can be a constituent combining L only with to its right.
"cstit." stands for "constituent."

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* See appendix 2 for complete tables of these clusters.

** These are [b], [d], [f], [g], [k], [l], [m], [n], [p], [R], [s], [ʃ], [ɨ], [v], [ʒ], [ɲ].

As far as the C-type WFs are concerned, it seems that those final clusters whose first constituent is L are generally more difficult to pronounce than those which have R as the first constituent (cf. Table 10).

Table 10. Results for C-type clusters (% average).

-R + constituent		-L + constituent	
-RS	95		
-RG	93	-LG	27
-RM	81	-LM	82
-RB	78		
-RSH	77		
-RL	74		
-RD	73		
-RT	71	-LT	38
-RQN	68		
-RV	61	-LV	45
-RF	51	-LF	59
-RP	51	-LP	32
-RNN	50		
-RZH	46	-LZH	-18

We note the same tendency in the D-type WFs as well (cf. Table 11). This comparison could be extended to the G-type WFs if it were not for the lack of existing WFs. We may ask, however, about the G-type WFs,

Table 11. R-L comparison for D-type WFs (% average).

-KR	100	-KL	58
-PR	91	-PL	80
-GR	85	-GL	26
-BR	84	-BL	50
-DR	76		
-FR	67	-FL	35
-VR	65		
-TR	53		

whether the difficulty of articulation of the whole cluster can be correlated with that of the corresponding D-type constituent WFs. For example, is the difficulty of -RDR related to that of -DR? Table 12 shows that in some cases the degree of difficulty in pronouncing G-type WFs (e. g., -RBR and -RDR) correlates with that of their constituent D-type WFs (-BR and -DR), but there are also other cases where this kind of correlation is not found (e. g., -PR, -PL and -TR compared with -RPR etc.). In the latter cases the complex WF apparently presents a type of difficulty which cannot be predicted from the pertinent D-type constituent WF.

Mean percentages of s/c have also been compared for E-type and H-type clusters with their constituent WFs, but no systematic tendency has been discovered.

Table 12. Results for G-type WFs compared to those of corresponding D-type constituent WFs (% average).

-RBR	73	-BR	84
-RDR	85	-DR	76
-RPR	-9	-PR	91
-SPR	9		
-SPL	9	-PL	80
-LTR	-9	-TR	53
-PTR	27		
-RTR	65		
-STR	51		
-KTR	45		
-SHTR	9		

The New Level Assignment

We shall now give a brief summary of our findings with some comments and conclude the paper with a new assignment of the level of difficulty for each WF according to the test results.

For the vocalic element V, we have compared the order in which the WFs had been automatically ranked according to the test results (by the Level Improvement program) with their frequencies of occurrence as reported in a recent study by J. P. Haton[17] on samples of everyday spoken French language (Table 13). We find it interesting to note that the most frequent vowels in French correspond to those WFs that offered least difficulty to the Japanese subjects.

In the case of the consonantal WFs, we must deal with C_i and C_f separately. For C_i, one interesting result of our enquiries is that initial clusters are in some cases less difficult to pronounce than any of their constituent WFs that consist of single consonants. We find this particularly true when the last constituent of a B-type cluster is Q. This finding contradicts a tradi-

Table 13. Vowels: a comparison

	Results obtained during the test (% average)	Frequency count (%)
A	100	7.50
I	100	6.79
E/	100	5.82
E	100	4.81
OA	100	2.16
*EU	100	5.42
Ø	90	
AN	80	3.73
OE	68	0.60
ON	66	2.13
O	66	1.07
IN	61	0.97
U	60	2.46
Y	55	0.20

* In his treatment of vocalic sounds Mr. Haton considered the sounds Ø and EU, which we have distinguished, as capable of being assimilated.

tionally held opinion that the phonetic sound [ɥ] is one of the most difficult sounds for Japanese students. We suspect that initial clusters may be divided into two sub-categories: those for which the presence of a certain constituent WF will help to predict the difficulty in comparison with the remainder, and those for which no regular prediction can be made from their presence in the complex WF. We find that most B-type WFs can be grouped in the first category and will very often be assigned to a lower level of difficulty than their constituent WFs (whether they are single initial WFs or A''-type WFs).

As we discussed above, the presence of L- or R- does not predict the difficulty levels of A''-type WFs and they cannot be assigned levels according to the difficulty of other constituents either, so the assignment will be done for each WF independently. This is true also for F- and F'-type WFs.

For C_f we saw that although levels of G-type WFs were not predictable from their constituent WFs, there was some possibility that C- and D-type WFs might be predictable, clusters containing -L being on the whole more difficult than those containing -R.

The new assignment of levels of difficulty can be found on Table 14.

Table 14. New assignment of levels of difficulty for word-features.

Level 1	A I E E/ OA EU M- MJ- MW- SNN- NNJ- NNW- PJ- PW- PL- PSH- W- -M -NN -MNN -KR -PR -K -KTR -KT
Level 2	BW- BQ- BRQ- BL- NN- KL- KQ- KJ- KW- KR- KRW- D- DQ- DW- DR- DZH- DRW- DRQ- SL- P- PLW- PLQ- PQ- PNN- PS- PR- SPR- STR- SW- QN- -J -G -GM -S -STR -PS -PTR -SKL
Level 3	AN OE NNQ- SHJ- SHQ- VW- SHW- VJ- J- Q- B- K- SPL- SQ- ST- SP- SM- FL- SJ- TM- TW- TRW- SKJ- SKW- Z- TRQ- -KS -KST -P -ST -SK -SM -SP -BL -ZH -Z -LT -LZH -GR -LTR -D -DNN -PT -PNN
Level 4	O ON S- BJ- BR- BRW- DJ- SH- V- VR- T- G- L- RQ- PRW- PRQ- SKR- SV- FRW- SK- KLW- -KL -QN -LK -LP -LB -R -RZH -RNN -FR -B -SHTR -T -F -DR -SPR -PL
Level 5	U IN TS- SHNN- SHL- LW- LQ- LJ- FR- F- R- GL- GLQ- GLW- GR- GRW- GNN- GW- SB- ZHQ- SPL- -LV -L -RV -RM -RT -RB -RD -RF -RP -FL -GL -TR -TSH -BR -V -SH -RBR -RPR -FT -RSH
Level 6	Y VL- TJ- TQ- FJ- FQ- FW- ZH- TR- ZHW- RJ- RW- FRQ- SF- -LF -LG -LM -RL -RQN -RG -RK -RS -VR -RTR -RST -RDR -RSK -RTS -SPL

Concluding Remarks

Most teachers engaged in the task of teaching French to Japanese subjects recognize that some sounds give particular difficulties to their students. The purpose of this test is to give a more systematic view of all the consonant clusters as well as single consonants and vowels that can appear in French monosyllables and to rank these sounds in a hierarchy according to the learning difficulty. This knowledge will be useful in offering the students learning material which is organized with gradually increasing difficulty. Even though we have obtained some interesting specific conclusions about predictability of the word feature difficulties from the difficulty levels of the constituent word features, we were not able to find any generally applicable theoretical and structural account for the hierarchy of difficulty levels, and we have no abstract characterization that would entitle us to label each of the six levels of difficulty.

We now are in the process of having Japanese students of French take the test with the new material set up according to the new level assignment. We have divided them into a beginners' group and an advanced students' group. The results of this second series of tests will be reported on later.

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APPENDIX 1

Set of Regular Clusters

Constituents	A' type WFs	A'' type WFs	B type WFs
B-	BJ-	BL-	
	BQ-	BR-	BRQ-
	BW-		BRW-
D-	DJ-	DR-	DRQ-
	DQ-		DRW-
	DW-		
F-	FJ-	FL-	
	FQ-	FR-	FRQ-
	FW-		FRW-
G-	GW-	GL-	GLQ-
			GLW-
		GR-	GRW-
K-	KJ-	KL-	KLW-
	KQ-	KR-	KRW-
	KW-		
L-	LJ-		
	LQ-		
	LW-		
M-	MJ-		
	MW-		
NN-	NNJ-		
	NNQ-		
	NNW-		
P-	PJ-	PL-	PLQ-
	PQ-		PLW-
	PW-	PR-	PRQ-
			PRW-
R-	RJ-		
	RQ-		
	RW-		
S-	SJ-		
	SQ-		
	SW-		
SH-	SHJ-		
	SHQ-		
	SHW-		
T-	TJ-	TR-	TRQ-
	TQ-		TRW-
	TW-		
V-	VJ-	VL-	
	VW-	VR-	
ZH-	ZHQ-		
	ZHW-		

Set of Irregular Clusters

Constituents	F type WFs	F' type WFs
D-	DZH-	
G-	GNN-	
P-	PNN-	
	PS-	
	PSH-	
S-	SP-	SPL-
		SPR-
	SK-	SKR-
		SKJ-
		SKW-
	ST-	STR-
	SM-	
	SF-	
	SNN-	
	SV-	
	SL-	
	SB-	
SH-	SHL-	
	SHNN-	
T-	TM-	
	TS-	

APPENDIX 2

Set of Final Clusters

Constituents	C type WFs	D type WFs	E type WFs	G type WFs	H type WFs
-B	-LB	-BL			
	-RB				
-D	-RD	-DR	-DNN		
-F	-LF	-FL	-FT		
	-RF	-FR			
-G	-LG	-GL	-GM		
	-RG	-GR			
-K	-LK	-KL	-KS	-KTR	-KST
	-RK	-KR	-KT		
-L	-RL			-LTR	
-M	-LM		-MNN		
	-RM				
-NN	-RNN				
-P	-LP	-PL	-PS		
	-RP	-PR	-PT	-PTR	
-R				-RBR	-RSK
				-RDR	-RST
				-RPR	-RTS
				-RTR	
-S	-RS		-SK	-SKL	
			-SM		
			-SP	-SPL	
				-SPR	
			-ST	-STR	
-SH	-RSH			-SHTR	
-T	-LT		-TSH		
	-RT	-TR			
-V	-LV				
	-RV	-VR			
-ZH	-LZH				
	-RZH				
-QN	-RQN				