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Segmentless Sentence-Final Particles in Cantonese: An Experimental Study

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Abstract

A sentence-final particle (SFP, henceforth) is an optional component for a sentence in Cantonese. Traditionally an SFP contains at least one independent segment. The present study proposes that for sentences without a segmental SFP, sentence-final intonation can act as a segmentless SFP. Systematical acoustic experiment was conducted based on this assumption. Two cross-cutting dichotomies were compared: declarative versus declarative-question, and absence versus presence of a segmental SFP. The results show that for sentences with a segmental SFP, the SFP itself carries the function of expressing intonation. For sentences without a segmental SFP, pitch shows extraordinary patterns to express intonation of the sentence, which can be regarded as a segmentless SFP.

Keywords

sentence-final particle, segmentless, intonation, pitch, Cantonese

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1. Introduction

There are a large number of sentence-final particles (SFPs, henceforth) in Cantonese. SFP is an optional component of a sentence, i.e., a sentence can be with or without an SFP. Tang (2002) and Tang (2006: 227) mentioned that SFPs in Cantonese can be divided into two main categories. The first category indicates tense or focus, such as [la:^{33}] (a marker for perfect tense) and [tsa:^{33}] (a marker for focus). The second category is closely related to intonation of a sentence, such as [wa:^{25}] (an indication for echo-question) and [pɔ:^{33}] (an indication for exclamation). The SFPs discussed henceforth are limited to the second category only.

Previous work has identified about thirty SFPs in Cantonese (Kwok 1984, Leung 2005). As these particles can be used in combination, the actual number of SFPs (simple and compound) currently used in Cantonese may reach a hundred. These identified SFPs, no matter in single use or in combination, usually have at least one segmental component. For example, the vowel [a:] is the segment for the SFP [a:^{33}]. Two segments, [l] and [a:] are segmental components for the SFP [la:^{55}]. More segments can be found in a combined SFP, like [la:^{33} wɔ:^{33}] is composed of segments [l], [a:], [w], and [ɔ:].

Another linguistic concept, intonation, is closely related to SFP in that they share similar function of expressing subtle connotations. Actually the definition of intonation has been full of ambiguity. From previous works on intonation, we can summarize several consensus points. Firstly, intonation involves suprasegmental phonetic features. Pitch is universally acknowledged to be the primary parameter of intonation (Cruttenden 1986, Gussenhoven 2004, Hirst and Cristo 1998, Ladd 1996, Pierrehumbert 1981, Pike 1945, Tench 1996, Wells 2006, Yuan, Shih, and Kochanki 2002). Secondly, intonation refers to the pitch variation at the utterance level. This criterion is used to differentiate intonation from tone. Tone applies to lexical items while intonation applies to "phrases or utterances as a whole, such as sentence type or speech act, or focus and information structure (Ladd 1996: 7)". The meanings conveyed by intonation are often less concrete (Cruttenden 1986: 10). Thirdly, intonation conveys linguistic or paralinguistic information, such as sentence type or speech act, or focus and information structure.

Fox, Luke, and Nancarrow (2008) systematically studied Cantonese intonation. In their analysis, the distributing domains of Cantonese intonation were divided into two main parts: utterance-body intonation and utterance-final intonation. To be consistent with the term of "sentence-final particle", we call them as sentence-body intonation and sentence-final intonation henceforth. Sentence-body intonation refers to the overall trend of a sentence. Sentence-final intonation (or boundary tone) mainly affects the pitch of the last syllable in a sentence. In Cantonese, it mainly exerts an effect on sentences without an SFP.

The relationship between English intonation and SFP in Cantonese was discussed in some previous literature. Tang (1998: 60-62) noted that the rising

intonation for echo questions in English may be phonetically realized as a segmental morpheme in Cantonese, such as [wa:^{25}]. Wakefield (2010) examined the English intonational equivalents of four Cantonese SFPs. He found that each SFP translates consistently into English as a specifically-shaped pitch contour by Cantonese/English native-bilingual participants, regardless of the discourse context or the syntactic structure of the sentence. Wakefield (2010) confirmed that the segmental SFPs in Cantonese and the suprasegmental intonation in English share the same function and meaning.

Cheung (1986: 251) discussed the interrelationship among tone, intonation, and SFPs in Cantonese. He pointed out that "Tone shares the form and SP[1] shares the content of intonation." Both tone and intonation make use of pitch as the main phonetic manifestation, while SFP and intonation fulfill similar function to express sentential connotations.

Cheung (1986: 256) further proposed that "S[F]P may be segmentless." This may initially seem hypothetical, as traditionally SFP are regarded as a kind of function word, which should be composed of a segment or a sequence of segments. Tang (2006: 227-228) also mentioned that the rising intonation for interrogatives in Cantonese (which is segmentless) can be regarded as an SFP and occupies a certain position in syntax.

Cheung (1986: 256) and Tang (2006: 227-228) put forward an innovative concept of segmentless SFP but did not have further investigation. The present study started from this notion and carried out syntax-phonetics interdisciplinary research. Through systematic acoustic experiment, the distribution and mechanism of SFP and sentence-final intonation were analyzed and discussed, which provided a better understanding of the syntax of SFP.

2. Method

In previous experimental studies on utterance-final intonation of Cantonese, e.g., Fox, Luke, and Nancarrow (2008), Ma (2007), Ma, Ciocca, and Whitehill (2004, 2006a, 2006b), Mai (2000), Vance (1976), Xu and Mok (2011), investigators usually tended to use content words as the final syllable and avoided using SFPs in their designed stimuli. No previous work has been done to systematically compare utterances with and without an SFP. The systematic acoustic experiment conducted here filled this gap – from this experiment we can get a more profound understanding of the relationship between utterance-final intonation and SFPs.

Two cross-cutting dichotomies are dealt with here: one is declarative versus declarative-question; the other is absence versus presence of an SFP. Thus, there are four sentence types: declarative without an SFP (DN, henceforth), declarative-

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[1] The "SP" in Cheung (1986) is the abbreviation for "sentence final particle", i.e., SFP in the present study.

question without an SFP (QN, henceforth), declarative with an SFP (DP, henceforth), and declarative-question with an SFP (QP, henceforth).

There is an inevitable paradox for the experimental design of comparing N-type sentences and P-type sentences: if the same trunk utterance is used, P-type must be one syllable (the SFP itself) longer than N-type; if equal-length of sentences is required, P-type and N-type must use different trunk utterances, which may introduce more interferences out of control. To reduce interfering factors, the first type of design was adopted, i.e., same-trunk utterances are applied to both N-type and P-type.

Chao (1956/2006, 1933/2006) proposed that pitch contours are the algebraic sum of tone and intonation in Chinese. To avoid the interference of lexical tone, a convenient method to observe intonation pattern in Cantonese is to compare the pitch of same-tone syllables located at different positions of an utterance. A set of same-tone-sequence trunks were designed, i.e., each trunk is composed of syllables of the same tone. There are six lexical tones in Cantonese: T1: high-level / high-falling; T2: high-rising; T3:mid-level; T4: low-level / mid-low-falling; T5: mid-low-rising; T6: mid-low-level. Accordingly, there are six trunks in our design.

The trunks are all in the format of "Subject (3 syllables) + Adverbial Modifier (2 syllables) + Verb (2 syllables) + Object (2 syllables)". This format is designed to meet the following criteria:

(1) Structure consistency: all trunks must be in the same syntactic structure to ensure that they have the same prosodic structure.

(2) Naturalness: the utterance structure must be one that is frequently used in daily conversation so that the informants can produce them fluently and naturally.

(3) Equal trunk length: to make the trunks of the six tones comparable, the length is controlled to be the same for all these trunks. In order to avoid the phrasing effect differences caused by different lengths of corresponding syntactic units, a consistent number of syllables is maintained for every component in the utterance structure.

(4) Maximized utterance length: the utterance length is maximized as possible to reveal more details of the sentence body: the subject is three syllables (rather than two syllables) long and a two-syllable adverbial modifier is added rather than the simple "Subject + Predicate + Object" structure.

(5) Non-stopped syllables: all the syllables of the designed utterance are non-stopped syllables, so as to avoid the intrinsic differences between stopped and non-stopped syllables.

The targeted variations were produced by adding the required SFP or telling the informants what kind of intonation we intended to obtain. Take the sentences of

T3 as an example. The trunk is "宋志慶過去愛好寄信 [sʊŋ^{33} tsiː^{33} hɪŋ^{33} kɔː^{33} hɵy^{33} ɔːi^{33} hou^{33} kei^{33} sən^{33}]" ("SONG Zhiqing liked sending letters in the past"). For the DN sentence, it is in a declarative intonation, and is just the trunk. The investigator told the informants that this sentence is to tell a fact that SONG Zhiqing liked sending letters in the past. For the QN sentence, it is a declarative-question, and literally it is also only the trunk. The investigator told the informants that this sentence was to ask whether SONG Zhiqing liked sending letters in the past. For the DP sentence, we told the informants that this was a declarative sentence again, but adds the SFP [aː^{33}] (which strengthens the declarative function in Cantonese) after the trunk. For the QP sentence, the investigator let the informants know that this was also a declarative-question, but with the interrogative SFP [aː^{21}] at the end.

For all these four types of sentences, a detailed demonstration with concrete examples was provided to the informants. They knew clearly what kinds of intonation were required at the end of our instructions. In the recording session, if the informants pronounced wrong intonation or missed the SFP, they were required to read the sentences aloud again until they were in the correct intonation and pronounced fluently.

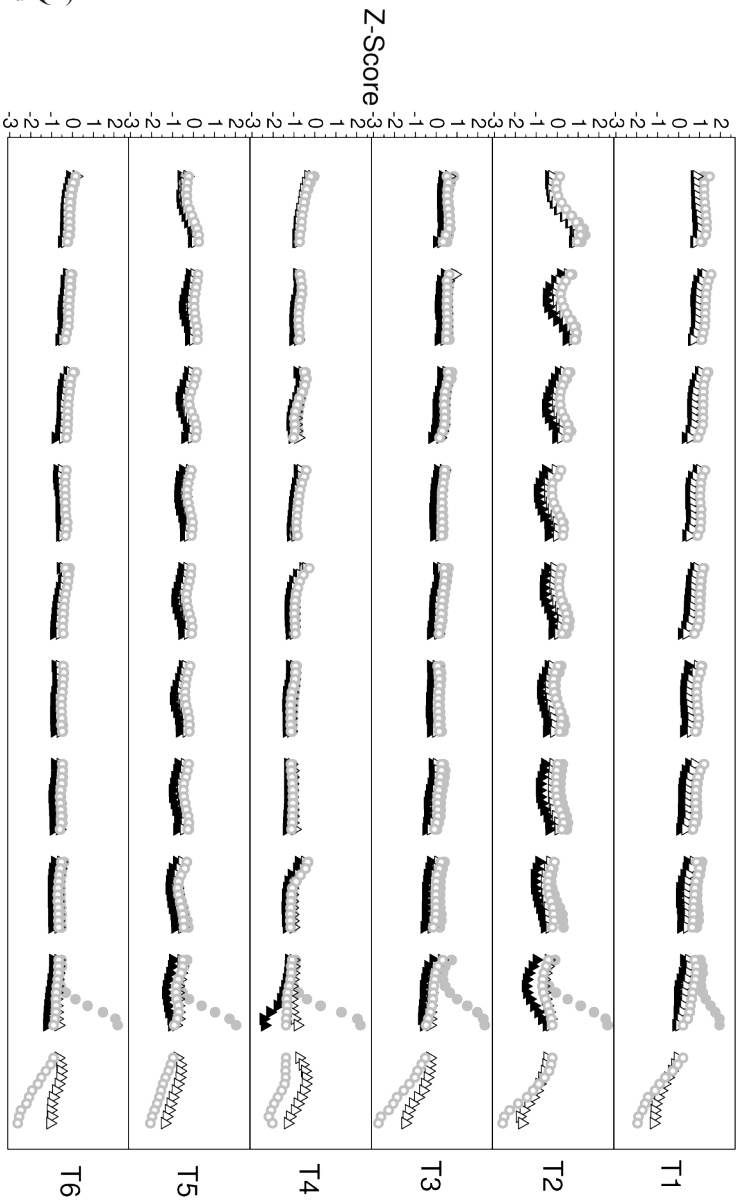
The utterances were grouped together according to sentence type rather than tone, so that informants could feel more comfortable and keep a certain type of intonation consistent with all the tones. The informants were also required to read each sentence twice and the better version is chosen for analysis.

There were twelve young native informants of Cantonese participating in this experiment, six male and six female informants aged twenty to thirty. Seven of the informants were recorded in a soundproof room at The Hong Kong Polytechnic University and the other five informants were recorded in quiet rooms at their homes. All the informants were recorded with a Marantz PMD620 Professional Handheld Digital Audio Recorder. The microphone was set at mono channel, the sampling rate was 44,100 Hz, and the resolution was 16-bit.

Acoustic measurements were carried out by using the Praat software (Boersma and Weenink 2009). For every syllable, measurement was applied to the vocalic portion. f_0 at every 10% of the duration was measured. These 11 evenly-distributed points were connected to approximate the pitch contour. By this method, time-normalized f_0 contours were obtained. The tessitura differences of individual speakers (especially between-gender differences) were normalized by converting data from Hz to semitones (Hart, Collier, and Cohen 1990: 24, Zhu 2005: 54) and applying the Z-Score method (Jassem 1971, Menn and Boyce 1982, Rose 1987, Zhu 2005).

3. Results

Figure 1 Mean pitch contours of every syllable of the whole sentences (DN, QN, DP and QP)



The mean pitch contours of every syllable of the whole sentences are displayed in Figure 1, with the DN, QN, DP and QP versions of the same tone juxtaposed within

the same graph. In Figure 1, solid triangles denote pitch points of DN, solid circles denote those for QN, unfilled triangles denote those for DP, and unfilled circles denote those for QP. Several grey rectangles below the graph mark the coverage of the constituents of the sentences: three intervals for subject, two intervals for adverbial modifier, two intervals for verb, two intervals for object, and the final interval for SFP of DP and QP (null for DN and QN). The coverage of the trunk is also marked under the grey rectangles, in which all the segmental components are the same for DN, QN, DP and QP. For DN and QN, the final syllable of the trunk is also the final syllable of the sentence. For DP and QP, SFP occupies an extra interval after the trunk.

Figure 1 shows that from the first to the eighth syllable interval, there is much overlap among different sentence types, especially among the QN, DP and QP. DN is slightly deviated from the other two types in that it is lower. A common characteristic of all the sentence types (including QN) is the pitch slope declination effect across the sentence-body domain, which is also the representative characteristic of the speaking speech style (Zhang and Cheung 2011, Zhang 2013).

The main difference among the four sentence types appears in the sentence-final position and the SFP, i.e., the last two syllable intervals of the graph: QN has a very sharp rising pitch contour at the final syllable (penultimate syllable interval of the graph); the final syllable of DN (also the penultimate syllable interval of the graph) is the lowest among the four sentence types; the trunk-final syllable of DP and QP does not show extraordinary behaviour but the pitch contours of the SFPs are obviously different: QP-SFP has a slightly lower beginning point and a much more steeply declining pitch slope than the DP-SFP.

Thus, although we intended to observe more details of sentence body (the reason for designing long stimuli), the results turned out the final two syllable intervals are more worthy of elaborative analysis and discussion. Figure 2 shows the focused scope of the penultimate syllable interval of Figure 1, which more clearly displays the difference of the final syllable of the trunk.

It can be observed from Figure 2 that the first half of QN-final pitch contours still preserves the pitch register feature of the beginning point of the original tone shape, but all tones converge to reach the same extremely high pitch at the end. Although it is not listed here, it should be mentioned that the duration data of the final syllables are much longer than the non-final syllables. The pitch contour of DN is always the lowest and at the bottom of the graphs. The pitch contours of DP and QP are very close and nearly overlapping for all tones except T1 (for T1, QP is higher than DP, and there is a certain distance between DP and QP).

Quantitative analyses were carried out to further study the sentence-final intonation of DN and QN. Linear regression of Z-Score was conducted to get the pitch slope value. The parameter for pitch register is defined as the median of pitch points within a syllable. The data of final syllable and non-final syllables were

compared to see whether there are consistent patterns. Following-up statistical tests (One-Way ANOVA or Brown-Forsythe test) were also run to examine whether the difference between final and non-final syllables is significant. The statistical results are listed in Table 1 (for DN) and Table 2 (for QN). In both tables, "0.000"represents $p < 0.001$. If $p < 0.05$ (indicated by an asterisk in the tables), the difference between final and non-final syllables is significant.

Figure 2 Final syllable of the trunk – pitch contours of DN, QN, DP and QP

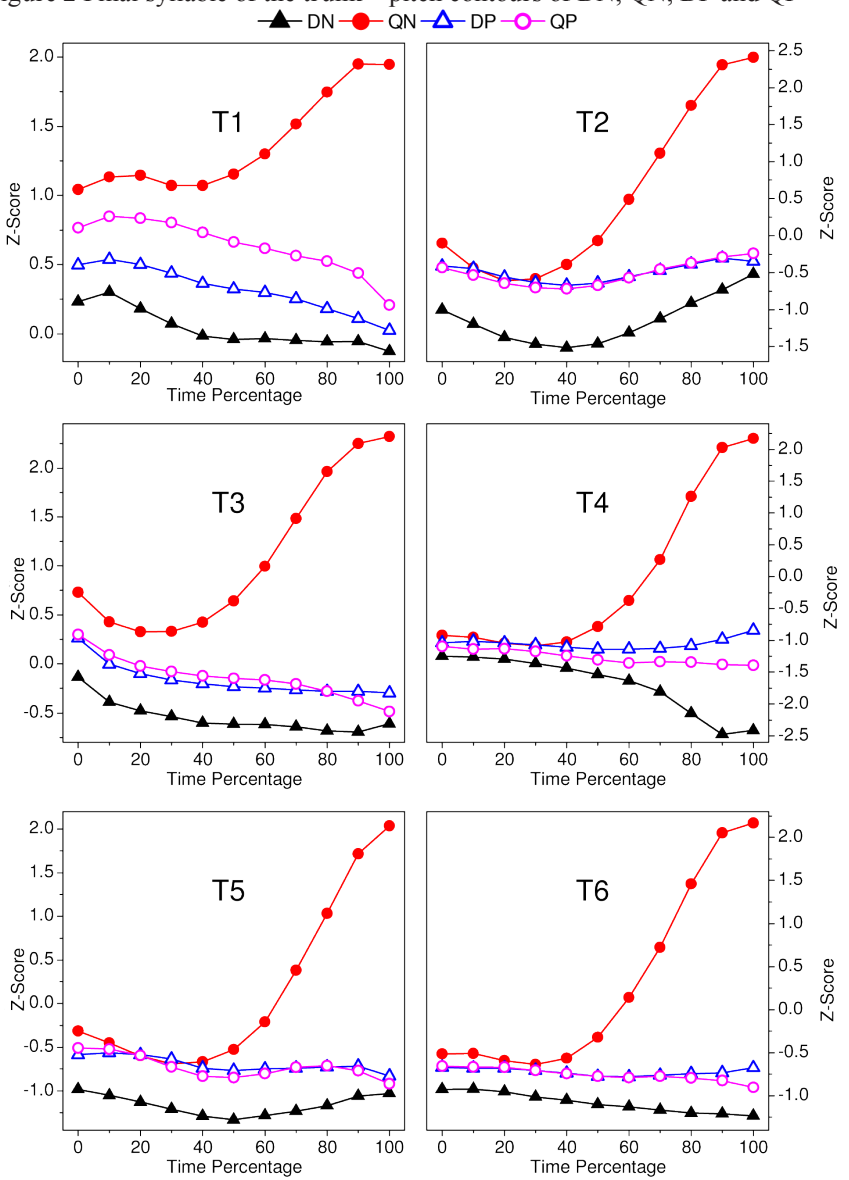


Table 1 One-Way ANOVA / Brown-Forsythe test on final and non-final syllables for DN

Tones	Test	df_1	Slope		
			$df_{2\ slope}$	F_{slope}	p_{slope}
T1	One-Way ANOVA	1	106	2.075	0.153
T2	One-Way ANOVA	1	106	0.722	0.397
T3	One-Way ANOVA	1	106	5.687	0.019 *
T4	Brown-Forsythe	1	11.162	5.538	0.038 *
T5	One-Way ANOVA	1	106	1.820	0.180
T6	One-Way ANOVA	1	106	2.180	0.143
Tones	Test	df_1	Register		
			$df_{2\ register}$	$F_{register}$	$p_{register}$
T1	One-Way ANOVA	1	106	11.122	0.001 *
T2	One-Way ANOVA	1	106	34.500	0.000 *
T3	One-Way ANOVA	1	106	22.297	0.000 *
T4	One-Way ANOVA	1	106	22.396	0.000 *
T5	One-Way ANOVA	1	106	39.519	0.000 *
T6	One-Way ANOVA	1	106	13.584	0.000 *

Table 2 One-Way ANOVA / Brown-Forsythe test on final and non-final syllables for QN

Tones	Test	df_1	Slope		
			$df_{2\ slope}$	F_{slope}	p_{slope}
T1	Brown-Forsythe	1	12.049	89.768	0.000 *
T2	Brown-Forsythe	1	12.050	61.870	0.000 *
T3	Brown-Forsythe	1	11.640	175.395	0.000 *
T4	Brown-Forsythe	1	11.718	387.282	0.000 *
T5	One-Way ANOVA	1	106	275.560	0.000 *
T6	Brown-Forsythe	1	11.400	235.920	0.000 *
Tones	Test	df_1	Register		
			$df_{2\ register}$	$F_{register}$	$p_{register}$
T1	One-Way ANOVA	1	106	2.954	0.089
T2	One-Way ANOVA	1	106	1.284	0.260
T3	One-Way ANOVA	1	106	8.143	0.005 *
T4	Brown-Forsythe	1	11.637	0.986	0.341
T5	One-Way ANOVA	1	106	0.278	0.599
T6	One-Way ANOVA	1	106	0.166	0.685

For DN, the comparison results show that final syllables have a significant lower pitch register ($p < 0.05$ for all tones in Table 1) and a slightly more declining pitch shape ($p > 0.05$ except T3 and T4 in Table 1) compared with non-final syllables. Thus, DN exhibits significant sentence-final intonation, which is characterized by register-lowering effect.

For QN, the comparison results show that final syllables have a significantly more rising pitch slope ($p < 0.001$ for all tones in Table 2) and a similar pitch register ($p > 0.05$ except T3 in Table 2) compared with non-final syllables. Therefore, QN also exhibits significant sentence-final intonation, which is characterized by a sharp rising pitch contour.

4. Discussions and conclusions

Several arguments can be made based on the experimental results.

Firstly, SFP and sentence-final intonation are in complementary distribution. In sentences with no SFP, sentence-final intonation changes the pitch of the final syllable. The final syllable of DN has a significantly lower pitch register and a slightly more declining pitch contour compared with non-final syllables. The final syllable of QN keeps the pitch register unchanged but has a sharply rising pitch slope, regardless of the pitch contour shape of the original lexical tone. When an SFP is present, there is no intonation used on the trunk-final syllable that proceeds the SFP, i.e., adding an SFP to a sentence can discharge the intonation burden on the final content word.

Secondly, SFP and sentence-final intonation carry similar functions. They are in complementary distribution and do not exist simultaneously. However, either SFP or sentence-final intonation can independently signify a sentence type: the lowering sentence-final intonation of DN is equivalent to the SFP [a:^{33}] in DP for carrying the function of labeling sentences as declaratives. Similarly, the sharp-rising sentence-final intonation in QN and the SFP [a:^{21}] in QP are equivalent in labeling sentences as declarative-derived questions.

Thirdly, sentence-final intonation can be regarded as a kind of segmentless SFP. Luke (1990: 3) described the features of SFP, including: (1) they have no semantic content; (2) they serve to indicate the mood of a sentence; (3) they are used to express attitudes and emotions; (4) they are attached (as boundary forms) to the end of sentences. Feature (1) to Feature (3) are about the function of SFP, while Feature (4) is about the position of SFP. Regarding both function and position, sentence-final intonation has all the features of SFP. Their difference only exists in their realization form: traditionally an SFP has segmental component(s), while sentence-final intonation is segmentless. If we can be more open-minded and cross this boundary, the sentence-final intonation can be regarded as a segmentless SFP.

On the basis of the above three arguments, here we further propose that the default form of a sentence is with an SFP to indicate a certain sentence type, and that this SFP may be either segmental or segmentless. The segmental form of SFP is the traditionally observed form, which associates with at least one independent segment. If there is not an independent segment for SFP, it can be realized in a segmentless form -- a floating contour acting on the final syllable of the utterance, i.e., the sentence-final intonation. This floating contour was called “tonal pragmatic

morpheme" in the terminology of Wong, Chan, and Beckman (2005).

In sum, through syntax-phonetics interdisciplinary research on SFP and intonation, we built a bridge between these two important linguistic concepts. Sentence-final intonation is regarded as segmentless SFP. For DN, the segmentless SFP is in the form of register-lowering effect on pitch of the sentence-final syllable. For QN, the segmentless SFP is in the form of sharp-rising pitch shape of the sentence-final syllable. As segmentless SFP is in complementary distribution with segmental SFP, it can be assumed that a sentence has an SFP by default, either in segmental form (as the traditional SFP) or segmentless form (sentence-final intonation studied here). Segmental form is prior to segmentless form: the existence of a segmental SFP can discharge the burden of the pitch of the final content word; the segmentless SFP only happens when there is no segment component for an independent SFP. Further investigations should be conducted on more types of segmental and segmentless SFPs to test this assumption.

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粵語超音段句末助詞的實驗研究

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提要

傳統來說，粵語句子的句末助詞可有可無，而句末助詞一般具有獨立的音段。本文提出句末助詞可以是超音段的：傳統認為沒有句末助詞的句子，實際上都帶有句末語調，以音高曲線變化的形式作用在句末音節上。本文為此對有句末助詞和沒有句末助詞的陳述句和疑問句進行了系統的聲學實驗比較研究。實驗結果表明，若句子有句末助詞，句子在音高方面沒什麼特殊變化；若句子沒有句末助詞，句末音節通過特定的音高變化來表達某種語調。這些特定的音高變化即為超音段的句末助詞。

關鍵詞

句末助詞，超音段，語調，音高，粵語