Too Expressive to Fuse?
Phonological Integrity in Cantonese Ideophones

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1 Introduction

1.1 Ideophones in Languages

- **Ideophones 象感詞**:

    - marked words that depict and mimic sensory imagery and vividness (Doke, 1935).
    - linkage between abstract iconicity and the physical sound shape.
        * exception for Saussarian arbitrariness
        * Onomatopoeia can be categorised as a subset of Ideophones.

- One of the most common ideophonic tools is reduplication cross-linguistically.

    (1) English: *zig-zag* / **zig* / **zag*
        - reduplication ⟷ rhymicity

    (2) Japanese: *kira-kira* / **kira* (sparkling)
        - reduplication ⟷ vividness

    (3) Siwu (Niger-Congo): *kpotoro-kpotoro* / **kpotoro* (moving jerkily like a tortoise; Dingemanse, 2011, 2012)
        - reduplication ⟷ vividness

1.2 Cantonese Reduplication

In Cantonese, reduplication is a very common morphological device for morphological derivation.

(4) Animal onomatopoeia AA 叫
    a. 喵喵叫 (*meu1-meu1-giu3*)
    b. 旺旺叫 (*wou1-wou1-giu3*)

(5) Abstract sound mimics AA 聲
    a. *syut4 syut4* 聲 (*syut4-syut4-seng1*)
    b. *ham4 ham2* 聲 (*ham4-ham2-seng1*)

(6) Nominal compound
    a. 啄啄糖 (*doeng1-doeng1-tong2*)
    b. BB 機 (*bi1-bi1-gei1*)

(7) **Adjectival compound**
    a. **立立令 (*laap3-laap3-ling3*)**
    b. **陰陰凍 (*jam1-jam1-dung3*)**

- (4-6) are obviously involving ideophonic construction.

- (7a-b) are also considered functioning primarily ideophonically, functioning as adding vividness or specific sensory depiction rather than contributing lexical meaning (Tsou, 1978; Bodomo, 2008; Matthews & Yip, 2011; Zhao, 2021; van Hoey, 2023; a.o.).

  - However, some of them seem to really carry lexical meaning (cf. Mandarin, Wang, 2022).

    (8) AAB
        a. 陰陰凍 (glommy.RED-cold)
        b. 赤赤痛 (twinge.RED-pain)
    (9) AA 哋
        a. 傻傻哋 (silly.RED-DIM)
        b. 怪怪哋 (weird.RED-DIM)

  - Are these construction ideophonic or lexical?

1.3 Research Questions and Overview of Proposed Solutions

1. How to differentiate lexical and ideophonic reduplication?

- **Syllable Fusion** can serve as a key diagnostic. The core predictions are:

  - **Fusion-blocking in Ideophones:** Ideophonic constructions, being highly sensitive to their syllabic structure (Piggott, 2010; Kwon, 2017), should strongly resist syllable reduction.

  - **Fusion-licensing in Non-Ideophones:** In contrast, both Lexical and De-ideophonised constructions should readily permit syllable fusion, as they are not subject to the same phonological integrity constraints.

2. Which grammatical architecture can derive these phenomena?

- **Optimality Theory (OT) and Cophonologies**

  - **Default**-Cophonology: **Markedness** ≫ Faithfulness.

    Constraint Ranking: No-Hiatus ≫ Uniformity

  - **IDEO**-Cophonology: **Faithfulness** ≫ Markedness

    Constraint Ranking: Min-Size, Uniformity ≫ No-Hiatus

- **Distributed Morphology (DM)**

  - (Root + [IDEO]) is evaluated in the IDEO-Cophonology in PF.
  - Copy-RED triggered if the (Root + [IDEO]) is monosyllabic to satisfy Min-Size.

2 Syllable Fusion in Connected Speech

2.1 What is Syllable Fusion?

- **Syllable Fusion (or Syllable Contraction):**

    - an optional connected-speech phenomenon
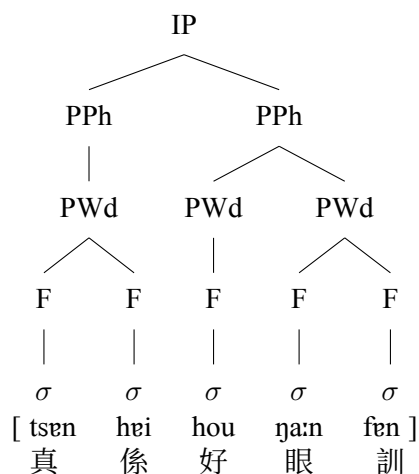   - two syllables blend together ranging along a continuum of the blurred boundaries between the syllables

    (10)   a. 乜嘢 $mɐt^{55}.jɛ^{13} \xrightarrow{Fusion} mɛ^{55}$

    b. 真係 $tsɐn^{55} hɐi^{22} \xrightarrow{Fusion} tsɐːi^{52}$

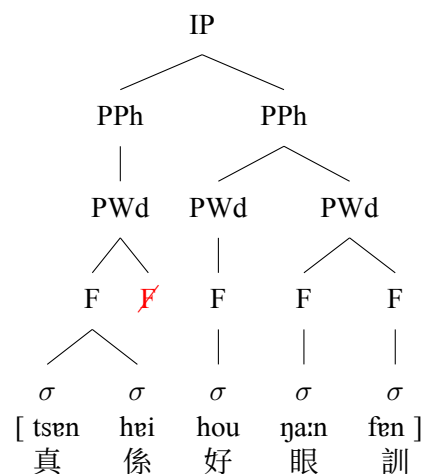- The mechanism of Syllable Fusion:

    - Fused syllables occupy a prosodic unit known as a foot (F), which lies between individual syllables and the higher-level intonational phrase (IP) in the prosodic structure (Wong, 2006; cf. Stress pattern in Mandarin, Lee-Kim, 2017)

    (11)   Prosodic Parsing of「真係好眼瞓」

    a. Before syllable fusion   b. After syllable fusion

2.2 How do they fuse?

The output of the fusion ranges along a continuum:

(12) $EXTREME \xleftrightarrow[CompleteMerge/SyllableMerger/.../Deletion/Assimiltion]{} MILD$

(13)   a. 乜嘢 $mɐt^{55}.jɛ^{13} \xrightarrow{CompleteMerge} mɛ^{55}$ (Tone/Nucleus are completed merged)

b. 真係 $tsɐn^{55}.hɐi^{22} \xrightarrow{Deletion} tsɐ^{55}.hɐi^{22}$ (/n/ is deleted)

Syllable Merger serves as the most quintessential case of syllable fusion.

(14)   a. 真係 $tsɐn^{55}.hɐi^{22} \xrightarrow{Merger} tsɐːi^{52}$

b. 彌敦道 $nei^{21}.tɐn^{55}.tou^{22} \xrightarrow{Merger} ne^{l}ɵn^{215}.tou^{22}$

There are several characteristics of Syllable Merger $\sigma_1 + \sigma_2 \xrightarrow{Merger} \sigma_{1+2}$:

- The output Onset: from σ_1

- The output nucleus:

    - If σ_1 and σ_2 have the **same** nucleus → Compensatory Lengthening

    - If σ_1 and σ_2 have **different** nucleus → Nucleus with higher sonority dominates (Hsu, 2005)

- The output coda: from σ_2 despite the sonority hierarchy.

- The output tone: will all be retained.

2.3   When do they fuse?

Syllable fusion does not take place arbitrarily, but the pattern is highly underexplored.

1. **Prosodic boundary - Left-aligned binary feet**

    (15)   a. [彌敦]道
            b. * 彌[敦道]

    (16)   a. [豬大]腸
            b. * 豬[大腸]

2. **Intra-Prosodic Word condition**

    (17)   a. * 我而家 [喺彌] 敦道睇電視
            b. * 我而家喺彌敦 [道睇] 電視

    (18)   a. * 我買咗好大 [條豬] 大腸比小明
            b. * 我買咗好大條豬大 [腸比] 小明

    (19)   PWd-Sensitive instead of XP-Sensitive
            a. [獅子] 山共和國
            b. 獅子山 [共和] 國
            c. [獅子] 山 [共和] 國

    - **ALIGN-L(PWd, Ft)**
        - Assign a violation if the left edge of a prosodic word (PWd) is not coincident with the left edge of a prosodic foot.

3. Many more but not that relevant today...

    - Sensitivity to the onset of σ_2
    - AGREE(Vowel)
    - ...

3   Syllable Fusion as a Diagnostics of Ideophones

Prediction:

- **Ideophones cannot undergo Syllable Merger** as their syllabic count is essential for necessary ideophonic depiction.

Diagnostics:

1. Fusion-blocking in true ideophones

    (20)   Ideophonic
        a. * 架 [叮叮] 車喺喺走咗喇
        b. * 隻貓喺度 [喵喵] 叫

    (21)   Lexical
        a. 出面真係 [陰陰] 凍
        b. 條友都 [傻傻] 哋

2. Fusion-licensing after de-ideophonisation

    (22)   a. 隻貓 [meu1 咗] 好多下
         b. 隻狗已經 [wou1 咗] 成日

3.1   Pilot Acceptability Experiment

3.1.1   Stimuli

7 constructions × 4 tokens = 28 items

Category	Sub-category	Items (Cantonese)
Ideophonic	AA 叫	喵喵叫, 汪汪叫, 咩咩叫, 呱呱叫
	AA 聲	發發聲, 咯咯聲, 嘩嘩聲, 索索聲
	Nominal AAB	BB 機, 啄啄糖, 叮叮車, 砵砵車
	Adj AAB	卜卜脆, 立立令, 陀陀擰, 囉囉攣
Lexical	Adj AAB	陰陰凍, 大大隻, 細細粒, 赤赤痛
	Adj AA 哋	傻傻哋, 怪怪哋, 驚驚哋, 甜甜哋
De-ideophonised	Verb A 咗	喵咗, 旺咗, 咩咗, 叮咗

Table 1: List of Stimuli Used in the Acceptability Experiment

3.1.2   Fusion pattern

Foot-internal σ_1-σ_2 coalescence will be systematically employed in the working stimuli.

$$[\sigma_1\sigma_2](\sigma_3) \xrightarrow{Merger} \sigma_{1+2}\text{:}\sigma_3$$

Whether [meu^{55} meu^{55}] kiu^{33} $\xrightarrow{Merger}$ meːu^{55} kɪu^{33} is acceptable?

3.1.3 Procedure & Task

1. 8 native Cantonese speakers are recruited, ranging from 19-35 years old.

2. Baseline sentence (unfused) is played once.   「隻貓喺度 meu^{55}.meu^{55}.kɪu^{33}」

3. Test sentence (fused, same carrier) is played immediately.   「隻貓喺度 meːu^{55}.kɪu^{33}」

4. Listener rates test sentence for relative naturalness on a 6-point Likert scale
   (0 = completely unacceptable, 5 = equally natural).

3.2 Preliminary Result

Linear Mixed Model (LMM) was conducted to systematically illustrate the differential acceptability of syllable fusion across different word categories.

3.2.1 Fixed Effects Results

Condition	Estimated Mean Rating	β (vs. Ideophonic)	SE	df	t-value	p-value
Ideophonic	1.0313	—	0.2193	9.92	4.703	0.000857
Lexical	4.5938	3.5625	0.2017	25.00	17.660	1.24×10^{-15}
De-ideophonised	4.4063	3.3750	0.2604	25.00	12.960	1.3610×10^{-12}

Table 2: Fixed Effects Estimates from LMM on Syllable Fusion Acceptability Ratings

- **Ideophonic** strongly resist syllable fusion (EMR = 1.03, SE = 0.22).

- **Lexical** items demonstrated a significantly higher acceptability rating after fusion (Estimate = 3.56, EMR = 4.59, SE = 0.20, $t(25) = 17.66$, $p < .001$) compared to Ideophonic items.

- **De-ideophonised** items also received significantly higher acceptability ratings than Ideophonic items (Estimate = 3.38, EMR = 4.41, SE = 0.26, $t(25) = 12.96$, $p < .001$).
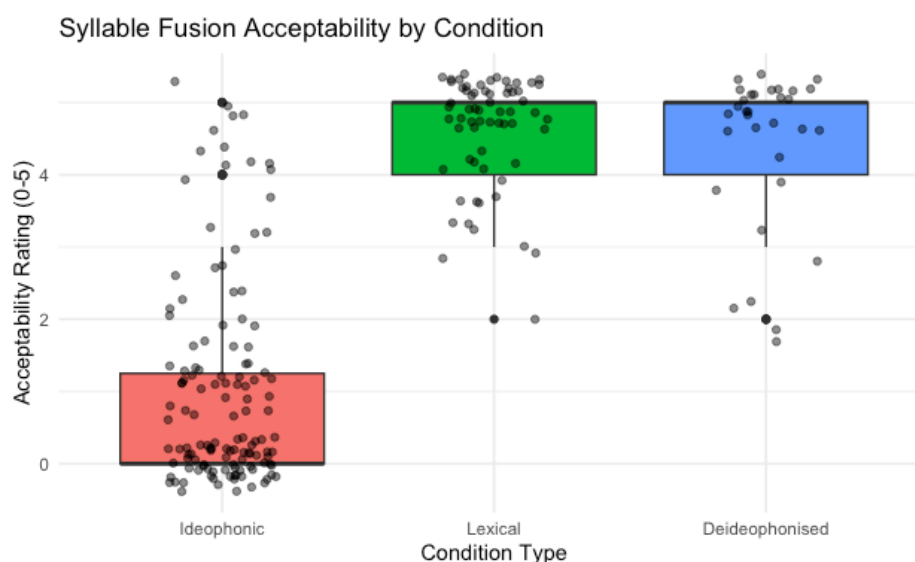

Figure 1: Acceptability ratings of syllable fusion across different word conditions.

3.2.2 Random Effects Results:

The LMM also revealed the sources of variability in the data (Table 3).

Groups	Name	Variance	Std.Dev.
Item	(Intercept)	0.070 66	0.2658
Participant_ID	(Intercept)	0.276 12	0.5255
Residual		1.170 94	1.0821

Table 3: Random Effects Estimates from Linear Mixed Model

- Certain items might have been perceived as slightly more or less natural than others within their respective categories.($\sigma^2 = 0.071$, SD $= 0.266$)
    - There might be some subtle segmental nuances among individual words, but these differences had a minor impact on their overall fusion tendencies.

- Some participants generally rated items higher or lower than others, regardless of the item category ($\sigma^2 = 0.276$, SD $= 0.526$).
    - Different participants might have had their own scoring tendencies or varying interpretations of "naturalness," leading to some fluctuations in their ratings.

- There is unexplained variability in ratings that is not accounted for by the fixed effects or the random effects ($\sigma^2 = 1.171$, SD $= 1.082$).
    - The model might not be able to fully capture all potential random patterns in the data with a somewhat small sample size (N=8) of participants.

3.3 Conclusion

- **Ideophones systematically resist syllable fusion** and underscores their unique phonological integrity.

- Both **Lexical** and **De-ideophonised** constructions **readily permit this process** and yield highly acceptable fused forms.

- This divergence strongly supports the diagnostic potential of syllable fusion in differentiating ideophonic and non-ideophonic expressions in Cantonese phonology.

4 Theoretical Analysis of the Ideophonic Resistance to Fusion

4.1 Some Essential Backgrounds

- **Optimality Theory (OT):** Sound forms are chosen by ranking a universal set of violable constraints; the surface candidate that best satisfies the ranking wins.

- **Cophonologies:** Within one language, different types of morphemes can trigger their own miniature OT grammar.

- **Distributed Morphology (DM):** Both Lexicon and Syntax are built from abstract morphemes; the derived structure will be sent to Phonetic Form (PF) and phonological materials will be inserted in PF phase by phase. OT Constraints are ranked in PF.

4.2 Competing Constraints in OT and Cophonologies

4.2.1 Key Constraints

Structural Constraints (High-ranked in both Cophonologies)

- **Align-L(PWd, Ft):** Assigns a violation if the left edge of a prosodic word is not coincident with the left edge of a prosodic foot.

Driving Force (Markedness)

- **No-Hiatus:** Assigns a violation for every sequence of adjacent vowels across syllable boundaries.

Resisting Force (Faithfulness)

- **Uniformity:** Assigns a violation if an element in the output corresponds to more than one element in the input. (McCarthy & Prince, 1995)

4.2.2 Proposed Cophonologies and Rankings

1. **Default-Cophonology:** Markedness ≫ Faithfulness (Permit potential syllable fusion)

   (23)   Default-Cophonology: No-Hiatus ≫ Uniformity[1]

Input: /jɐm^{55} jɐm^{55} doŋ^{33}/	Align-L(PWd, Ft)	No-Hiatus	Uniformity
a. [jɐm^{55} jɐm^{55} doŋ^{33}]		*!	
b. ☞ [jɐːm^{55} doŋ^{33}]			*
c. [jɐm^{55} jɐˈoŋ^{53}]	*!		*

2. **IDEO-Cophonology:** Faithfulness ≫ Markedness (Block syllable fusion)

   (24)   IDEO-Cophonology: Uniformity ≫ No-Hiatus

Input: /meu^{55} meu^{55} kiu^{33}/	Uniformity	No-Hiatus
a. ☞ [meu^{55} meu^{55} kiu^{33}]		*
b. [meuː^{55} kiu^{33}]	*!	

4.3 Triggering Cophonologies - The role of [IDEO]

One ontological problem arises: **are ideophonic root monosyllabic or disyllabic**?

(25)   a. Disyllabic: √喵喵 + √叫
       b. Monosyllabic: √喵-RED + √叫

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[1]Since syllable fusion is an optional process, it is essentially of free variation. Yet, to emphasise the driving force of fusion, the unfused one is considered to be not the optimal candidate for the clarity of analysis.

I argue that ideophonic roots are essentially **monosyllabic**:

1. **Monosyllabic counterparts without ideophonic properties exist for ideophones**

   - A lot of ideophonic syllables can be de-ideophonised.

     (26)　a. 喵喵叫 → 喵咗 / * 喵喵咗
     　　　b. 哇哇叫 → 哇嚓哇去

   - Recall that 喵咗 can even fuse (Section 3.2), showing its non-depictive properties.
   - The dynamic use of monosyllabic counterpart suggests that it is **not likely a monophthongisation process** in language change, but being parallel in grammar.

2. **Mono/disyllabic counterparts are sysmtematically sensitive to Syntactic Category**

   - Ideophones behave like noun-y and modificational elements when not fully verbalised.

     (27)　Noun-y
     　　　a. 糖糖（Infant-direct Speech）
     　　　b. 叮叮（電車）

     (28)　Modificational
     　　　a. 喵喵叫
     　　　b. *syut4 syut4* 聲
     　　　c. 叮叮車

     (29)　Verbalised
     　　　a. 喵咗 / wou1 咗
     　　　b. 哇嚓哇去

Proposal: A monosyllabic root is determined to be ideophonic via a non-verbal categorisation and a functional projection/feature IdeoP/[IDEO][a].

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[a]The label [IDEO] is used here for transparency, directly linking to the "ideophone" phenomenon under discussion. Conceptually, a more abstract feature like [EXPR(essive)] may be more accurate, as it avoids implying that phonological/sound-relating content is present in the narrow syntax.

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(30)
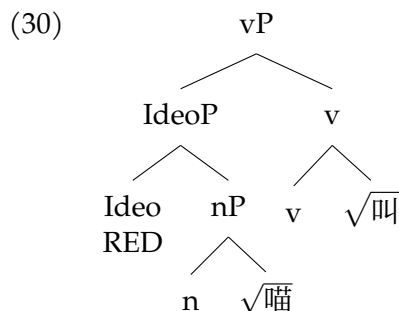
   - It accounts for both noun-y and modificational reading.
   - IdeoP provides the RED morpheme for performing depictive reduplication.
   - The IdeoP serves as an abstract morpheme triggering **IDEO-Cophonology in PF**.

5 Conclusion

This study has provided compelling evidence for a phonological asymmetry in Cantonese syllable fusion, driven by the distinction between ideophonic and non-ideophonic expressions.

- **Empirical Contribution:** Through a pilot acceptability experiment, I have demonstrated that:
    - **Ideophones** systematically resist syllable fusion
    - Syllable fusion is otherwise readily permitted in both **lexical** and **de-ideophonised** constructions.

- **Theoretical Contribution:** I proposed a formal analysis within **OT and Cophonologies** and argued that this asymmetry arises from a different ranking of universal constraints in two distinct grammars:
    - In the **IDEO-Cophonology**, high-ranked **Faithfulness constraints** (e.g., Uniformity) preserve the phonological integrity of ideophones by blocking fusion.
    - In the **Default-Cophonology**, high-ranked **Markedness constraints** (e.g., No-Hiatus) drive syllable fusion to achieve an economical and rhythmically well-formed output.

  I also proposed a formal analysis within Distributed Morphology and demonstrated that the ideophones are rooted within the configuration of the grammar:
    - Ideophones are derived from **monosyllabic roots** that are categorised as ideophonic via a functional projection, **IdeoP**, which carries a syntactic feature [IDEO].
    - At the **PF interface**, this [IDEO] feature triggers evaluation by a special **IDEO-Cophonology**, where high-ranked **Faithfulness constraints** preserve the phonological integrity of ideophones by blocking fusion.

- **Limitation:**
    - The current analysis focuses on fusion within the initial two syllables $(\sigma_1 \sigma_2)$ of a prosodic word. This paradigm cannot yet account for structures like **ABB adjectives**, where the relevant phonological processes might occur at different prosodic boundaries (e.g., $\sigma_2 \sigma_3$).

- **Future Directions:**
    - **A larger-scale study** with more participants would further solidify the statistical findings and allow for the modelling of more complex random effects.
    - The generality of this effect can be further tested by systematically examining **quadrisyllabic ideophones** to refine the understanding of the prosodic constraints at play

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