Gradience at the Syntax-Phonology Interface

Evidence from Mandarin and Wenzhounese

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In Mandarin Chinese, there are abundant words that have monosyllabic and disyllabic equivalents. For example, the verb for 'to plant' can be monosyllabic *zhòng* or disyllabic *zhòng.zhí* (the dot marks syllable boundaries), and the noun for 'tree' can be *shù* or *shù.mù*. As such, there are four logically possible combinations for the verb-object (VO) phrase *to plant trees*, as listed in (1), where "1" and "2" refer to monosyllabic and disyllabic forms, respectively.

(1) a. 1+1 *zhòng shù*
b. 1+2 *zhòng shù.mù*
c. *2+1 *zhòng.zhí shù*
d. 2+2 *zhòng.zhí shù.mù*

However, it has long been observed that for VO phrases in Mandarin, the 2+1 (disyllabic + monosyllabic) combination is usually ill-formed (Lü, 1963). The general unacceptability of 2+1 VO phrases has been confirmed by corpus studies (Duanmu, 2012) and judgement experiments (Duanmu et al., 2018).

This notwithstanding, it is unclear if the syllabicity constraint on 2+1 VPs applies in other Chinese dialects, where there are also words with mono- and disyllabic variants. This study aims to fill this research gap by investigating Wenzhounese, a Wu dialect spoken in the southeast of Zhejiang Province, China (Zhengzhang, 2008).

A production test and a judgement test were carried out to examine the robustness of the syllabicity constraint in Wenzhounese. Thirty-two native speakers of Wenzhounese were recruited for these experiments.

For the production test, verbs with mono- and disyllabic variants, shown in Chinese characters, were coupled with a picture stimulus, which corresponded to a noun with mono- and disyllabic variants. Participants were asked to complete the sentence based on the characters and picture stimuli. The test aimed to examine if a disyllabic verb was more likely to induce a disyllabic object than a monosyllabic verb was. A linear mixed-effects model, based on the data collected, showed that a monosyllabic verb had a 46% chance of inducing a disyllabic object, whereas a disyllabic verb had a 69% chance of inducing a disyllabic object. A likelihood ratio test revealed that the syllabicity of the verb is a reliable predictor of the syllabic of the object ($\chi^2(1) = 20.90$, $p < 0.0001$).

In the judgement test, participants listened to audio-recorded sentences containing 2+1 and 2+2 VO phrases and were asked to rate each sentence against a seven-point Likert Scale. The aim was to investigate whether 2+2 VPs would be rated higher than 2+1 VPs. The results showed that the average rating for 2+1 VPs was 5.96 (z-score = 0.52) and that for 2+2 VPs was 6.26 (z-score = 0.68). A likelihood

ratio test, based on mixed-effects modelling, suggested that the syllable count of the object was a reliable predictor of the acceptability of 2+1 and 2+2 VPs ($\chi^2(1) = 16.37$, $p < 0.0001$).

These experiments show that the syllabicity constraint also applies in Wenzhounese. However, it differs from Mandarin in that the penalised 2+1 VPs are still grammatical, despite their degraded acceptability in perception and lowered frequency in production. At this point, it is important to ask how the gradient acceptability rating reflects grammaticality, as the relation between the two is highly indirect (Haider, 2019). I argue that it does reflect gradient grammaticality because: (i) the stimuli were simple sentences, so they were unlikely to induce extra-grammatical (e.g., processing) difficulties that would lower the acceptability rating; (ii) the observed gradience is compatible with the results of the production test, in which the preference for 2+2 over 2+1 VPs is high but not predominant; and (iii) as Lau et al. (2017: 1235-1236) states, a theory that incorporates gradience into linguistic competence enjoys more empirical support than a theory that only acknowledges binary grammaticality.

How, then, can we analyse the syllabicity constraint, which has different effects in Mandarin and Wenzhounese? From the perspective of OT-LFG (Bresnan, 2000; Mohanan and Mohanan, 2003), both varieties take the same c-structure [$_{V'}$ V NP] as the input, and the output candidates are c-/p(rosodic)-structure pairs. For the sake of discussion, let us assume a markedness constraint C_1 that penalises p-structures with 2+1 syllabicity, a markedness constraint C_2 that penalises 2+2, and the ranking $C_1 \gg C_2$. As illustrated in (2), standard OT predicts that 2+1 VPs shall never be the optimal output.

(2)

[$_{V'}$ V NP]	...	C_1	C_2	...
☞ a. 2+2			*	
b. 2+1		*!		

This captures the Mandarin data but is too strict for Wenzhounese because 2+1 VPs do surface. Reversing the ranking would also fail because 2+1 VPs are indeed suboptimal, as the experiments show. The conundrum is as follows: we need the same set of constraints and the same ranking to penalise 2+1 VPs, but these VPs are ungrammatical in Mandarin and grammatical in Wenzhounese, which is not formulable in standard OT.

Now, does the LFG grammar itself offers a solution to capturing gradient grammaticality? Pullum (2020: 11) suggests a positive answer, stating that for model-theoretic frameworks, "the number of constraints satisfied or not satisfied can be counted up." However, even if we agree that the number of violations can be counted, Pullum's point is not entirely correct, because there is no explicit way to map cumulative constraint violations to different degrees of grammaticality. In other words, an expression is either a model of the theory of not, and there is nothing in between and hence no gradient grammaticality. One way to approach this challenge is to define grammaticality as a fuzzy set whose membership is on a 0 to 1 scale (Nguyen et al., 2019: 3), but again, the mechanism that maps a structure to some value $x \in (0, 1)$ remains unclear.

Given that neither standard OT nor LFG is able to account for the degraded grammaticality in Wenzhounese *and* the corresponding ungrammaticality in Mandarin, it is necessary to introduce constraint weight to OT constraints. Take Boersma's (1997) probabilistic OT. For the tableau in (2), C_1 and C_2 will be assigned a real number x and y, respectively, and $x > y$, indicating that C_1 dominates C_2. At each evaluation, a Gaussian random variable z will be introduced, such that if the values for x and y are close

enough, there is a chance for C_2 to outrank C_1, in which case 2+1 VPs surface. The difference between x and y is much larger in Mandarin than in Wenzhounese, so the chance of getting a 2+1 VP is much lower in Mandarin than in Wenzhounese. In other words, the varying degrees of grammaticality of Mandarin and Wenzhounese 2+1 VPs are not due to constraint types or constraint ordering, but due to different constraint weights.

In this paper, I will present more data from Mandarin and Wenzhounese and demonstrate why they are problematic for classic (OT-)LFG. I will also exemplify in more detail the weighted OT analysis, which is able to address these challenges.

In sum, there is a syllabicity constraint that penalises syntactically well-formed VO phrases. In Mandarin, violating this constraint results in ungrammaticality; in Wenzhounese, violating this constraint results in degraded grammaticality. Under the framework of OT-LFG, I argue for the necessity of assigning weight to constraints, without which the model would either wrongly rule in 2+1 VPs in Mandarin or wrongly rule out 2+1 VPs in Wenzhounese.

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