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Reexamining Mass/Count Flexibility in the Nominal Domain: A Real-Time Comprehension Study

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Abstract

Are the 'portioning' readings ('several beers') and 'grinding' readings ('a bit of pear') the result of lexical derivations with real-time processing effects? The evidence is inconclusive. While Frisson and Frazier (2005) argue that these readings are visible as cost, although with different time courses (i.e., 'portioning' earlier than 'grinding'), Lima (2019) reports no such effects. Here, we address this inconsistency through two English self-paced reading experiments using Frisson and Frazier (2005)'s materials. Experiment I testing the 'portioning' reading ('several pears' vs. 'several beers') reveals no additional processing effects. By contrast, Experiment II testing the 'grinding' reading ('a bit of beer' vs. 'a bit of pear') reveals higher reading times for the 'grinding' condition one word after the critical noun. We propose that these results provide empirical support for an asymmetrical relationship between individuated 'count' readings and non-individuated 'mass' readings, whereby the former represent the default conceptual representation resulting in no cost and the latter result from a conceptual expansion to include a container-containee conceptualization. Such expansion must be done in real-time, resulting in cost. This asymmetry finds direct support from acquisition, psycholinguistic, and brain lesion data, motivating a model of linguistic individuation that is rooted in non-linguistic conceptual dynamics.

Keywords: Mass Nouns; Count Nouns; Self-Paced Reading; Nominal Flexibility

A Domain in Flux: Linguistic, Developmental, and Processing Evidence

Linguistic Evidence of Nominal Flexibility

It has been traditionally assumed that nouns are encoded in the mental lexicon as either conceptually non-individuated, or 'mass', or as conceptually individuated, or 'count' (e.g., Gillon, 1999; Jackendoff, 1991; Langacker, 1990). Yet, it has also been observed that these groupings are not categorical. In certain contexts, non-individuated meanings are given count forms, which results in 'count' readings and vice versa (e.g., Gleason, 1965; Jespersen, 1924; Pelletier, 2012). These cases are normally analyzed as 'derived' (e.g., Chierchia, 2010; Copestake and Briscoe, 1995), arising through the implementation of 'portioning'/'grinding' lexical operators (Bunt, 1981; Copestake, 1992; Copestake and Briscoe, 1995; Gillon, 1992; Kilgarriff, 1995; Pelletier, 1975; Pustejovsky, 1995). (1a) below shows a mass noun ('water') used in its 'derived' count form while (1b) shows a count noun ('cookie') used in its 'derived' mass form.

(1) a. The customers ordered two **waters**$_{count}$.

b. What a mess! There's **cookie**$_{mass}$ all over the floor.

Under a rule-based approach, the processor first commits to the 'underived' reading of the noun, and then, if there is a mismatch between the lexical feature and the local morphosyntax, a lexical derivational rule generates the 'derived' sense of the noun. For example, **beer**$_{mass}$ composed with a plural becomes **beers**$_{count}$.

A Bias Towards Count Nouns

While intuition based on object complexity would suggest that mass nouns are the more basic and unmarked form, and therefore easier to acquire (Chierchia, 1998; Krifka, 1995; Partee, 1999; Rothstein, 2010), evidence from acquisition shows a strong bias for count nouns as opposed to mass nouns (Barner and Snedeker, 2005; Witteloostuijn and Schaeffer, 2014; Zanini et al., 2017). For languages like Dutch, Hebrew, Italian and English, this asymmetry in favor of count nouns has been attributed to syntactic bootstrapping: the language-specific overtness of count noun syntax (i.e., plural marking, determiners, numerals, etc.) increases their salience in the input and thus facilitates their acquisition (Borer, 2005; Landau and Gleitman, 1985). Moreover, the primacy and non-arbitrariness of object representation systematically favors individuated "countable" entities over substances (Carey, 2009; Prasada et al., 2002). This bias is also cross-linguistically attested. While there are no languages that encode only mass nouns (Doetjes, 2021), there *do* appear to be some languages that encode only count nouns (Lima, 2014). Further, psycholinguistically, reaction time and event-related potentials (ERP) data from adults reveal an increase in 'cognitive effort' for mass nouns (Gillon et al., 1999; Mondini et al., 2009). Finally, neurological case studies show that patients with brain damage will substitute 'mass' quantifiers (e.g., 'much') for 'count' determiners or quantifiers (e.g., 'a' or 'many') (Fieder et al., 2014). Altogether, the patterns observed evidence a greater cognitive effort required for the conceptualization of non-individuated/'mass' entities as opposed to individuated/'count' ones.

This linguistic, psycholinguistic, and neurolingusitic evidence supporting the primacy of count readings calls into question the implicit assumption of symmetric or unified lexical representation of count versus mass conceptualization on which the linguistic analysis of mass/count flexibility rests. Instead, the evidence suggests an *asymmetric* distribution whereby only the count reading is lexically encoded or 'specified'. From this, it would follow that only the 'grinding' readings require a semantic derivation.

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Debated Processing Costs of Mass/Count Flexibility

When examining the real-time processing of mass/count flexibility itself, the evidence remains inconclusive. Through an eye-tracking study, Frisson and Frazier (2005) report processing cost for English mass and count nouns when used in their 'derived' form (e.g., 'several beers' and 'a bit of pear') as opposed to their 'underived' forms (e.g., 'a bit of beer' and 'several pears'). However, these costs differed in magnitude and time course, suggesting different processes. The inconclusiveness of this pattern is further evidenced by a follow-up sentence-level reading-time study examining these derivations in Brazilian Portuguese (Lima, 2019). This study did not replicate the patterns from English, reporting instead no processing cost differences for either hypothesized derivation type. We note, though, that in contrast to English, where count nouns are typically preceded by a determiner, in Brazilian Portuguese, count nouns can surface as bare singular, allowing for either a 'count' or 'mass' interpretation. This introduces the possibility that a lack of replication is due to unresolved ambiguity, which would show no observable processing difference.

The Current Study

We seek to reconcile these inconsistencies by examining the English 'portioning' and 'grinding' readings during real-time comprehension using self-paced reading. We based our materials and experimental design on Frisson and Frazier (2005). In reconciling the evidence, we also seek to further explore the possibility of an asymmetrical approach to mass/count lexicalization and processing. To this end, we carried out two experiments: Experiment I examines whether there are increased processing costs when a mass noun is used in its count form ('portioning'), and Experiment II examines these costs when a count noun is used in its mass form ('grinding').

Experiment I: 'Portioning'

The aim of Experiment I is to replicate Frisson and Frazier (2005)'s processing costs. Specifically, we ask whether there are increased processing costs for non-individuated/'mass' nouns when presented in count form. Frisson and Frazier (2005) report that when mass nouns were presented in count form (as in (1a)), a small "attendant cost" was reported starting on the critical noun. This pattern contrasts with Lima (2019)'s findings which show no cost for the 'derived' forms despite using the same (translated) stimuli.

Methods

Participants We recruited 46 native monolingual speakers of American English to participate in this study through Prolific (www.prolific.com). All participants self-reported to have no history of speech, language, hearing, or visual impairments. Further, 9 participants were excluded from data analysis due to having less than 80% response accuracy on comprehension questions and/or answering 'no' to a question prompting whether they participated to the best of their ability. Thus, a total of 37 participants (25 female, 11 male, and 1 other; mean age: 44) were included in data analysis.

Stimuli The experimental sentences used in the study were modified from Frisson and Frazier (2005), whose critical words were mass and count food-related nouns (e.g., 'beer', 'pear', 'water', 'bagel', etc.). Crucially, the critical words have both mass and count interpretations (e.g., mass: 'a bit of water/pear', 'too much water/pear'; count: 'many pears/waters', 'several pears/waters', etc.). The stimuli were selected in order to explicitly determine whether the results from Frisson and Frazier (2005) replicated. In this experiment, count nouns were presented in their 'underived' form (i.e., as count nouns) and mass nouns were presented in their 'derived' form (i.e., as count nouns). In addition, each noun was presented in a 'neutral' context and a 'helping' context condition. For neutral sentences, nouns were modified by a "neutral" adjective (e.g., 'refreshing' or 'delicious'). While some adjectives may have a higher likelihood of associating with a particular noun (e.g., perhaps 'refreshing beer' is more likely than 'refreshing pear'), this likelihood was counterbalanced across conditions to minimize any potential biases in co-ocurrence. In the helping condition, nouns are modified by an individuation quantifier that facilitates a count interpretation. The quantifiers used in this study were changed from Frisson and Frazier (2005)'s materials, given reported complications. The following quantifiers were distributed across the items: 'many', 'several', and 'a few'. Sample stimuli of a quadruple (2 noun types x 2 sentence contexts) are presented in Table 1. 112 sentences (28 items x 4 sentences per item) were presented to participants in a within-subjects design. Stimuli were pseudo-randomized so no two sentences from the same condition were presented consecutively.

Table 1: Sample Critical Stimuli from Experiment I

Noun Type and Condition:	Example Sentence:
Count Noun, Neutral Context	Yesterday, John bought *refreshing* imported **pears** at the counter of the local supermarket.
Count Noun, Helping Context	Yesterday, John bought *several* imported **pears** at the counter of the local supermarket.
Mass Noun, Neutral Context	Yesterday, John bought *refreshing* imported **beers** at the counter of the local supermarket.
Mass Noun, Helping Context	Yesterday, John bought *several* imported **beers** at the counter of the local supermarket.

Additionally, 112 filler sentences were presented interspersed with critical sentences to prevent any learning effects. Half of the fillers were nonsensical mass (n = 28) and count (n = 28) sentences. These sentences were ungrammatical as there was a mismatch between the count or mass quantifier and the count or mass morphosyntax (i.e., a count quantifier with a bare count noun or a mass quantifier with a plural mass noun). The other half of the fillers were subject (n = 28) and object (n = 28) position metonymic sentences from Borneo and Piñango (2024). All fillers included words of similar length and frequency to those in the critical stimuli.

Procedure Once recruited from Prolific, participants were redirected to an online experiment hosted on PennController for IBEX (PCIbex) (Zehr and Schwarz, 2018). Participants received detailed instructions and completed four practice trials: two matched the critical sentences (one 'portioning', one 'grinding') and two matched the filler sentences (one nonsensical mass, one subject-position metonymy). Items in the practice session were not shown again in the experiment. Then, for each trial, participants completed two tasks. First, in a self-paced reading task (SPRT), following a moving window technique, participants pressed the space bar on their keyboard to make each word of the sentence appear. Thus, the sentence was displayed one word at a time according to the participant's reading speed. The second task was an acceptability rating: after reading each sentence, participants rated its acceptability on a 1–5 Likert scale (adapted from Sánchez-Alonso et al. (2019); see Table 2). To ensure participants were paying attention, 112 yes/no comprehension questions were randomly distributed across the conditions, with answers balanced (50% 'yes', 50% 'no'). The study took approximately 60 minutes to complete.

Table 2: Acceptability Rating Scale

Rating	Rating Explanation
1	I do not understand this sentence and I or any speaker of English would never say it this way.
2	I or any speaker of English would not say this but I can understand the meaning.
3	I am not sure. The sentence sounds good but a speaker of English would not say it this way.
4	A speaker of English would say these sentences. I understand the meaning but I could or could not say it in this way.
5	A speaker of English would definitely say these sentences. I understand the meaning and I myself would say it in this way.

Analysis and Results

Acceptability Rating Data The mean acceptability scores show that participants found count noun sentences to be more acceptable (Neutral: M = 4.42, SD = 0.97; Helping: M = 4.58, SD = 0.82) than mass noun sentences (Neutral: M = 4.05, SD = 1.13; Helping: M = 4.21, SD = 1.06). These results were corroborated with a linear mixed-effect model (LMEM) implemented in R (Team, 2021) and the lme4 package (Bates et al., 2015). The model was fit to assess the effects of noun type (count vs. mass) and sentence context (neutral vs. helping) on the acceptability rating score of the sentences. In addition, by-participant and by-item random intercepts were included in the model. These intercepts allow us to account for individual participant differences and potential item-related effects. The variables were treatment coded with the reference levels being count nouns for noun type, and neutral context for the sentence context.

The model showed significant effects of noun type and context. Count nouns were rated higher ($\beta = 4.419$, SE = 0.096, $p < 0.001$) than mass nouns ($\beta = -0.371$, SE = 0.050, $p < 0.001$) and sentences in helping contexts were also rated higher as compared to neutral contexts ($\beta = 0.160$, SE = 0.050, $p < 0.05$). Pairwise comparisons with Bonferroni correction also revealed significant differences, as shown in Figure 1.

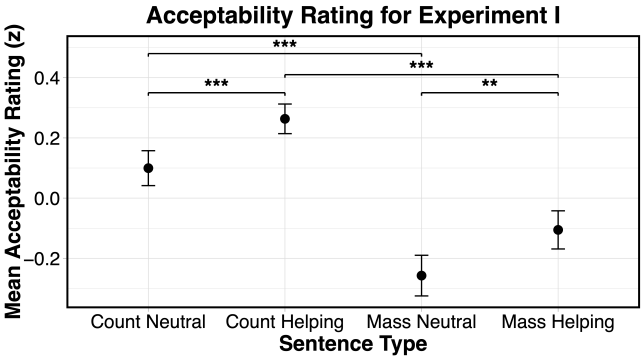

Figure 1: Acceptability Rating Results for Experiment I

Self-Paced Reading Data We established a priori limits in reading times to filter words that were read too quickly or too slowly. These boundaries were reading times of less than 100 milliseconds or more than 2000 milliseconds, respectively. Additionally, outliers of a z-score of ± 3 were removed to exclude extreme values. In total, only 1.7% of word reading times were excluded.

We aimed to assess whether there was an effect of noun type and sentence context on reading times. To do so, reading times were first log-transformed in order to recreate a normal distribution. Further, given that other unrelated variables may affect reading times, we fit an LMEM to the log-transformed z-scored reading times with fixed effects of character length, trial number, word frequency (obtained from the Corpus of Contemporary American English (COCA: Davies, 2008)) as well as the preceding word's log-transformed z-scored reading time. The model also included by-participant and by-item random intercepts. The model showed that these variables impacted reading times: shorter words were read faster, words were read faster at the end of the experiment, more frequent words were read faster, and the previous word's reading time impacted the current word's reading time. After assessing normality and homoscedasticity, the log-transformed reading times residuals were analyzed rather than the raw reading times.

Recall that in Frisson and Frazier (2005), reading time differences were reported on the 'critical word' (i.e., the mass or count noun in the sentence). Given this, we analyzed individual reading times at the word level. The conventions used to label words of interest are shown in Table 3. While the adjective or quantifier is located at the 'critical word - 2' ('cw-2') position, the mass or count noun is located at the critical word ('cw') position.

To determine whether there are word-level reading time differences, log-transformed residualized word reading times were analyzed using LMEMs for each word position. The fixed effects were noun type and sentence context, and their interaction with by-participant and by-item random inter-

Table 3: Word Position Conventions

Condition	cw-2	cw-1	cw	cw+1	cw+2	cw+3
Count Neutral	...refreshing	imported	pears	at	the	counter...
Count Helping	...several	imported	pears	at	the	counter...
Mass Neutral	...refreshing	imported	beers	at	the	counter...
Mass Helping	...several	imported	beers	at	the	counter...

cepts. Variables were treatment coded with the reference levels being count for noun type, and neutral for sentence context.

At the 'cw-1' position, the model showed an effect of sentence context with words in helping contexts read faster than those in neutral contexts (β = -0.134, SE = 0.032, $p < 0.0001$). However, there was no significant effect for noun type (β = 0.029, SE = 0.032, p = 0.370) nor an interaction between sentence context and noun type (β = -0.007, SE = 0.045, p = 0.873). Post hoc pairwise comparisons were conducted with the emmeans package (Lenth, 2017) with p-values corrected by Tukey to explore this significant interaction. The effect is consistent at the 'cw-1' position for both count ($\beta = 0.134$, SE = 0.032, $p < 0.001$) and mass nouns (β = 0.141, SE = 0.032, $p < 0.0001$). At this word position, there is a decrease in reading time for words in the helping context for both noun types as compared to the reference neutral context. Yet, this effect goes away by the time the critical word is reached suggesting a processing facilitation associated with the quantifier and therefore independent of the 'portioning' process at issue.

Crucially, in contrast to Frisson and Frazier (2005), we did not find significant effects for any other word position as shown in Figure 2. That is to say, at the critical word position and in the spillover region, we found no differences between reading times for nouns in their 'underived' or 'derived' forms.

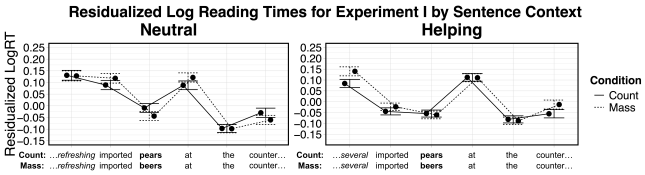

Figure 2: Experiment I Word Level Reading Times (No effect of noun type observed)

Discussion

When examining a coarse offline behavioral measure like acceptability ratings, we found that when mass nouns are used in count form, they were judged as less acceptable than the 'underived' count counterparts. We also found an effect of sentence context with helping context sentences judged as more acceptable than neutral context sentences. Importantly, this result is expected given their corresponding frequency differences with 'underived' forms being more frequent than the 'derived' forms. A post hoc Wilcoxon rank-sum test with continuity correction showed a significant difference in frequency between the 'underived' count nouns and their 'derived' counterparts (W = 625, $p < 0.001$). We thus interpret this behavioral measure as reflecting a preference for linguistic form rather than a true measure of cognitive processing.

We also examined a more fine-grained online behavioral measure: reading times. Whereas previous eye-tracking accounts (Frisson and Frazier, 2005) reported there to be a processing cost for the 'derived' form of a noun, we found no such cost. This questions the processing motivation for a derivational process that supports the individuated/'count' use of nouns that can also be used as mass. This is further consistent with the generalizations from developmental and linguistic evidence that count lexicalization is primary regardless of the possibility of a non-individuated/'mass' use.

Experiment II: 'Grinding'

The aim of Experiment II was to replicate the effects reported by Frisson and Frazier (2005) for the 'grinding' readings, this time, using a self-paced reading task.

Methods

Participants We recruited 40 native monolingual speakers of American English through Prolific. All participants self-reported to have no history of speech, language, hearing, or visual impairments. 6 participants were excluded from data analysis following the exclusion criteria of Experiment I. A total of 34 participants (14 female, 20 male, and 0 other; mean age: 37) were included in the data analysis.

Stimuli & Procedure The stimuli used in Experiment II are from Frisson and Frazier (2005) and follow the modifications described in Experiment I. For this set of stimuli, the following quantifiers were used to facilitate a mass interpretation: 'a bit of', 'too much', 'very little'. Table 4 presents a sample of the experimental stimuli used. Fillers used in Experiment II were the same as for Experiment I. Altogether, the task participants completed in Experiment II is identical to that of Experiment I but with the corresponding stimuli.

Table 4: Sample Critical Stimuli from Experiment II

Noun Type and Condition:	Example Sentence:
Mass Noun, Neutral Context	Yesterday, John wanted *refreshing* imported **beer** after the rich main course. His girlfriend didn't want anything.
Mass Noun, Helping Context	Yesterday, John wanted *a bit of* imported **beer** after the rich main course. His girlfriend didn't want anything.
Count Noun, Neutral Context	Yesterday, John wanted *refreshing* imported **pear** after the rich main course. His girlfriend didn't want anything.
Count Noun, Helping Context	Yesterday, John wanted *a bit of* imported **pear** after the rich main course. His girlfriend didn't want anything.

Analysis and Results

Acceptability Rating Data As expected, participants found mass noun sentences more acceptable (Neutral Context: M = 4.26, SD = 1.04; Helping Context: M = 4.25, SD = 1.04) than count noun counterparts (Neutral Context: M = 3.83, SD = 1.21; Helping Context: M = 3.82, SD = 1.19). These

results were further corroborated through an LMEM, which assessed the effects of noun type and context on the acceptability of the sentences. By-participant and by-item random intercepts were also included with variables being treatment coded to reference levels of mass for noun type and neutral for the sentence context.

The model showed a significant effect of noun type, with mass nouns (β = 4.264, SE = 0.130, $p < 0.001$) rated higher than count nouns (β = -0.433, SE = 0.063, $p < 0.001$), but no effect of sentence context (β = -0.015, SE = 0.063, p = 0.809). Moreover, pairwise comparisons with Bonferroni correction also revealed significant differences as shown in Figure 3.

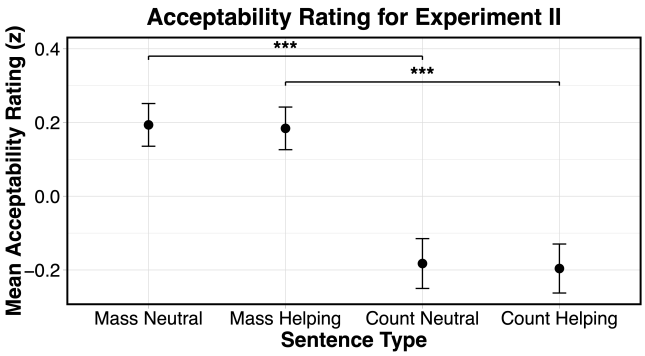

Figure 3: Acceptability Rating Results for Experiment II

Following Experiment I, participants rated sentences with the 'underived' form of the noun (here, mass nouns) as more acceptable than those of the 'derived' form of the noun. However, in contrast to Experiment I, for neither the 'underived' nor the 'derived' form of the nouns is there a role of sentence context. That is, the acceptability for the neutral context was not significantly different from that of helping context sentences. This may be a result of difficulties with the quantification of mass nouns as compared to count nouns.

Self-Paced Reading Data To analyze the reading time data, we used the same exclusion criteria as in Experiment I. Only 2.3% of word reading times were excluded. Reading times were log-transformed and then an LMEM was fit to the reading times with fixed effects of character length, trial number, word frequency as well as the preceding word's log-transformed and z-scored reading time. The model also had by-participant and by-item random intercepts. The model showed that only character length, word frequency, and the preceding word's log-transformed reading time, but not the order of trial number, impacted reading times. Thus, only the significant fixed effects were included in the model. After assessing normality and homoscedasticity of the model, the log-transformed reading time residuals were analyzed.

As in Experiment I, we analyzed individual reading times at the word level. To do so, we ran an LMEM for each word position to individual residualized word reading times with fixed effects being noun type and sentence context and by-participant and by-item random intercepts. The variables were treatment coded with the reference levels being mass nouns for noun type, and the neutral context for the sentence context.

At both the 'cw-2' and 'cw-1' positions we found a significant effect of sentence context ('cw-2': β = -0.086, SE = 0.037, $p < 0.05$; 'cw-1': β = -0.157, SE = 0.033, $p < 0.001$). However, there was no significant effect for noun type ('cw-2': β = -0.039, SE = 0.037, p = 0.292; 'cw-1': β = 0.002, SE = 0.033, p = 0.957) nor an interaction between sentence context and noun type ('cw-2': β = -0.002, SE = 0.052, p = 0.964; 'cw-1': β = 0.035, SE = 0.046, p = 0.454). At these positions, there was a decrease in reading time for words in the helping context as compared to the reference neutral context.

Given these significant effects, post hoc pairwise comparisons were conducted as in Experiment I. These tests show that this effect is consistent at the 'cw-1' positions for both mass (β = 0.157, SE = 0.033, $p < 0.0001$) and count nouns (β = 0.123, SE = 0.033, $p < 0.001$) tapering off before the critical word. As in Experiment I, this indicates that they are independent of the semantic derivation process at issue.

Moreover, at the 'cw+1' position, the LMEM shows that there was a significant effect of noun type (β = 0.098, SE = 0.035, $p < 0.01$). However, there was no significant effect for sentence context (β = -0.023, SE = 0.035, p = 0.506) nor an interaction between sentence context and noun type (β = 0.024, SE = 0.049, p = 0.625). At this word position, count nouns were read slower than the 'underived' mass nouns.

Post hoc pairwise comparisons show that, at the this position, there is a consistent difference between noun types for both the neutral (β = -0.098, SE = 0.035, $p < 0.05$) and helping contexts (β = -0.122, SE = 0.035, $p < 0.01$). The 'derived' count nouns are read more slowly in both contexts. This stands in contrast with Experiment I, where there were no differences in reading time for 'underived' versus 'derived' forms of the nouns. These effects are presented in Figure 4.

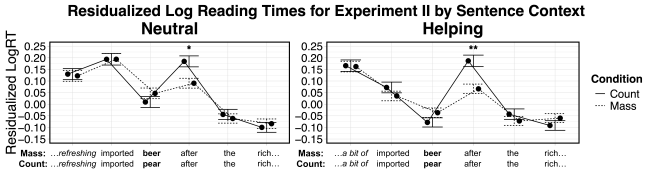

Figure 4: Experiment II Word Level Reading Times (Effect of noun type observed at 'cw+1' position)

Discussion

As in Experiment I, we analyzed two distinct behavioral measures to examine how speakers comprehend count nouns used in mass form. In an acceptability rating task, we found that participants rated nouns in their 'underived' form as more acceptable than nouns in their 'derived' form. This parallels the results of Experiment I. Once again, this can be explained by the greater frequencies of the 'underived' forms as compared to the 'derived' forms. A post hoc Wilcoxon rank-sum test with continuity correction showed a significant difference in

frequency between the 'underived' mass nouns as compared to the 'derived' nouns (W = 228, $p < 0.01$).

When examining individual word reading times, we found a significant difference between reading times one word *after* the critical word. This suggests the processing costs result from the conceptualization of an individuated/'count' entity into a non-individuated/'mass' one.

General Discussion

In both Experiments I and II, we found that sentences with 'underived' nouns are rated as more acceptable than those with 'derived' nouns. Upon closer examination, these acceptability differences are attributable to frequency differences present in the stimuli. Turning to the individual word reading times, we found a significant increase in reading time but only when count nouns are used in mass form ('grinding'), thus distinguishing processes impacting mass conceptualization from those of count conceptualization, in line with the psycholinguistic and developmental observations. To directly make comparisons of results across experiments, we ran an LMEM to determine whether there was an interaction between noun type (underived vs. derived) and experiment type ('portioning' vs. 'grinding') on residualized reading time at the 'cw+1' position. Random intercepts were included for participants and items. The model showed an interaction between noun type and experiment ($\beta = 0.093$, SE = 0.033, $p < 0.01$), indicating that, at this word position, 'derived' nouns incurred longer reading times but only for 'grinding' and not 'portioning' readings. The asymmetrical effect observed here is unlikely to be explained by lexical ambiguity (e.g., 'beer' has both mass and count lexical entries) as count nouns are also frequently used in mass form (e.g., 'pear' can refer to 'pear slices', 'pear puree', 'pear juice', 'pear flavoring', etc.).

We take this pattern of results as the first step in the reconciliation of the seemingly disparate patterns associated with the count/mass distinction. Although Frisson and Frazier (2005) found processing costs for 'portioning' and 'grinding' readings, the effects differed not only in magnitude but also in location ('portioning' earlier than 'grinding'). We take this difference to suggest the workings of two categorically distinct mechanisms rather than the result of two lexical rules of the same kind. Regarding Lima (2019), who found no increased processing cost when measuring sentence-level reading times, we argue that, in addition to the language-specific factors that favor no cost differences, a sentence-level measure such as the one they used may be too coarse to detect any possible difference between conditions. Indeed, for both Experiment I and Experiment II at the sentence-level, we too found no significant difference between sentences with 'underived' and 'derived' nouns: LMEMs to overall residualized sentence reading times (fixed effects of noun type and sentence context and their interaction with by-participant and by-item random intercepts) showed there was no effect of noun type for neither Experiment I ($\beta = -0.002$, SE = 0.014, $p = 0.916$) nor Experiment II ($\beta = 0.011$, SE = 0.013, $p = 0.380$). Further, regarding methodological differences, it could be argued that measures from a self-paced reading task are less sensitive than those from eye-tracking. Yet, this still does not explain why there would be observable cost in Experiment II and not in Experiment I.

We propose that the finding of cost only in the 'grinding' case supports the primacy of the individuated/'count' conceptualization and suggests that the mass/count distinction needs to be addressed not at the linguistic level but at the conceptual level. Specifically, whereas there is cognitive work in the conceptualization of a non-individuated entity as an individuated one (i.e., acquiring and using the lexical item 'juice' as in 'a juice'), the resulting cost once incurred need only happen once, at the moment of lexicalization, when the non-individuated entity is first encountered by the individual which will likely be in its individuated form and linguistically expressed as 'a glass of juice', 'a bottle of juice', 'a juice box', 'a juice', etc. But the converse is not the case. It is not a necessity that an individuated entity that is conventionally used as count, be also conceptualized as non-individuated (e.g., 'a pear' as 'pear'). Accordingly, when this happens, as in the expression 'a bit of pear', a conceptualization *expansion* process from a part-whole relation must occur to also support a container-containee conceptualization, which both are connected to the pronunciation [pear]. We propose that it is this conceptualization expansion process that underpins the processing cost observed. It is not the result of a lexical rule application, but rather the result of a morphosyntactically triggered conceptualization expansion process, one that needs to happen every time the linguistic context demands it.

Finally, we conjecture that the role of conventionalized usage manifested in the stimuli selected may have played some role in the effects observed. The mass nouns tested (e.g., 'water', 'beer', 'pudding', etc.) are, by necessity, encountered in containers directly inducing individuated/'count' readings. Future studies should explicitly test whether non-individuated readings of entities that are not typically encountered in containers incur an additional processing cost and whether context (i.e., making salient a container) can modulate such effects. The analysis presented above predicts that this should be the case.

Conclusion

We have reported on two SPR experiments with corresponding acceptability rating tasks seeking to reconcile contradictory patterns in the comprehension of 'portioning' and 'grinding' readings of English nominals. Consistent with the primacy of count noun use observed in psycholinguistic, neurolinguistic, cross-linguistic, and developmental studies, results show additional processing cost only for 'grinding' readings (Experiment II). Altogether, the data are consistent with the workings of a system whereby 'grinding' (but not 'portioning') readings result from corresponding real-time conceptual expansions in the meaning system induced by morphosyntactic form.

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