

# Is the Levelt and Kelter (1982) Repetition Effect Lexical or Structural Priming?

Katherine Chia<sup>1</sup><sup>a</sup>, Michael P. Kaschak<sup>1</sup>

<sup>1</sup> Department of Psychology, Florida State University, Tallahassee, FL, USA

Keywords: structural priming, linguistic alignment, language production

<https://doi.org/10.1525/collabra.88948>

## Collabra: Psychology

Vol. 9, Issue 1, 2023

Levelt and Kelter (1982) report an experiment where they called businesses to ask about their closing time. They asked (in Dutch) *What time do you close?* or *At what time do you close?* Participants were more likely to use a preposition in their answer (*At 9*) when the preceding question used a preposition than when it did not. This finding is often cited as one of the first experimental demonstrations of structural priming. Nevertheless, it is not clear whether Levelt and Kelter's (1982) finding represents structural priming (participants are primed to use *any* preposition in their answer) or lexical priming (participants are primed to use the lexical item *at* in their answer). We replicate the basic design of Levelt and Kelter's (1982) study, asking questions that use different prepositions (*At/Around/About/What time do you close?*). Our findings suggest that the repetition effect may be driven by lexical and/or pragmatic factors.

*Structural priming* is observed when speakers repeat syntactic structures across utterances (e.g., Bock, 1986). For example, a speaker who uses (or hears) a double object dative construction to describe a transfer event (e.g., *Michael sent Meghan a postcard*) will be more likely to use a double object to describe another transfer event (e.g., *Kathy gave Michelle a gift*) than to describe that event using a prepositional object dative (e.g., *Kathy gave a gift to Michelle*). Structural priming was first reported in the 1980's (e.g., Bock, 1986; Levelt & Kelter, 1982; Weiner & Labov, 1983). Since that time, structural priming has become a central phenomenon in psycholinguistics (see Pickering & Ferreira, 2008, and Mahowald et al., 2016, for reviews).

Levelt and Kelter's (1982) Experiment 3 is regarded as one of the earliest demonstrations of structural priming. An experimenter called businesses and asked (in Dutch) *What time do you close?* or *At what time do you close?*. The purpose of the experiment was to determine whether participants would be more likely to generate a prepositional structure in their response (e.g., *We close at 7* or *At 7 o'clock*) when the preceding question had a preposition (*At what time...?*) than when it did not (*What time...?*). The results confirmed this prediction. Levelt and Kelter's (1982) report of structural priming was of interest for at least two reasons. First, it was one of the first demonstrations of structural priming under controlled experimental conditions. Second, although the study involved experimental control over the prime

sentences, it also involved naturalistic language production. The study showed that structural priming could be observed under natural conditions of language use (see also Weiner & Labov, 1983). Levelt and Kelter's (1982) experiment has been widely cited in the years since its initial publication. As of August 9, 2023, Levelt and Kelter's (1982) paper has been cited 682 times (Google Scholar; 246 times on Web of Science). The classic Levelt and Kelter (1982) structural priming effect is small but reproducible (see Chia et al., 2020, for a discussion of the effect size in this paradigm), having been replicated and extended in a series of recent papers (Chia et al., 2019, 2020; Chia & Kaschak, 2022b, 2022a).

Although Levelt and Kelter's (1982) Experiment 3 is well-known as a demonstration of structural priming, several authors have pointed out that interpreting the study is not straightforward (e.g., Cleland & Pickering, 2003; Dell & Ferreira, 2016; Pickering & Ferreira, 2008). Both Dell and Ferreira (2016) and Cleland and Pickering (2003) find that the design of the study makes its interpretation ambiguous – do participants say *At 7 o'clock* because they have been primed to say *at* (lexical priming) or because they are primed to use a prepositional structure (structural priming)? We believe that the resolution of this ambiguity is of interest because of the utility of the paradigm. The method provides the researcher with some degree of experimental control while also allowing for naturalistic language use.

<sup>a</sup> Correspondence: Katherine Chia or Michael Kaschak, Department of Psychology, Florida State University, Tallahassee, FL, USA  
[katherineschia@gmail.com](mailto:katherineschia@gmail.com), [michael.p.kaschak@gmail.com](mailto:michael.p.kaschak@gmail.com)

Given the potential of the method for addressing theoretically important questions about structural priming (e.g., *Do some speakers elicit priming from their partners more than others?*; Chia & Kaschak, 2022a), it is crucial to know more about the factors that drive the repetition effect.

Levelt and Kelter's (1982) repetition effect might be explained through *lexical priming* (e.g., Cleland & Pickering, 2003; Dell & Ferreira, 2016). The use of the lexical item *at* in the question primes participants to use the word *at* in their response. Deciding to say *at* forces the participant to use a prepositional structure in their response. Thus, the participant says *At 7 o'clock* rather than *7 o'clock*. The lexical priming account leads to a strong prediction for this paradigm, namely that the preposition used in the participants' responses should follow the preposition used in the preceding question. If the question is *At what time do you close?*, participants should use the preposition *at* the majority of the time. If the question is *Around what time do you close?*, participants should use the preposition *around* the majority of the time.

Levelt and Kelter's (1982) repetition effect might also be explained through *structural priming* (e.g., Chia & Kaschak, 2022b). Here, participants' use of a prepositional structure in their answers is primed not by a lexical representation but by a structural representation independent of specific lexical items (e.g., Chang et al., 2006; Reitter et al., 2011). Thus, if the question is *Around what time...?*, participants will not necessarily be more inclined to answer *Around 7* than to answer *At 7*. It is important to note that many approaches to structural priming (e.g., Hartsuiker et al., 2008; Pickering & Branigan, 1998; Reitter et al., 2011) acknowledge both structural and lexical influences on the priming effect. These approaches suggest that there is both a basic structural priming effect that is independent of lexical considerations and a boost to the priming effect that comes with the repetition of lexical material between utterances (e.g., Hartsuiker et al., 2008). From this perspective, the Levelt and Kelter (1982) paradigm should reveal both priming that is independent of the overlap of lexical items between the question and answer (lexically-independent priming) and a stronger priming effect that occurs when the same preposition is used in the question and answer (lexical boost to priming).

We conducted an experiment to test the lexical and structural accounts of priming in Levelt and Kelter's (1982) phone call paradigm. Experimenters called businesses and asked about their closing time. In addition to asking *What time do you close?* and *At what time do you close?*, we also asked *Around what time do you close?* and *About what time do you close?*<sup>1</sup> Both the lexical and structural accounts predict that participants will be more likely to generate a preposition in their response when answering a prepositional question (*At/Around/About what time...?*) than when

answering a non-prepositional question (*What time...?*). However, the accounts differ in their prediction for how the preposition used in the question should affect the choice of preposition used in the participants' responses. The lexical account suggests that the preposition in the participants' responses should follow the preposition used in the question. For example, when the question contains *about*, most responses should contain *about*; when the question contains *around*, most responses should contain *around*. The structural account suggests that using a prepositional phrase in the participants' responses should not depend on the preposition used in the question but may be strengthened by the repetition of lexical items between the question and response.

## Method

**Participants.** We collected data from 2224 participants. The data from 29 participants were excluded from the analysis (see below), leaving a final sample size of 2195.

**Procedure.** The Institutional Review Board of Florida State University approved our research. We trained 17 experimenters to collect data. Each experimenter was asked to call 132 businesses, 33 for each of the four questions in our experiment: *At what time do you close?*, *Around what time do you close?*, *About what time do you close?*, and *What time do you close?*. One experimenter was unable to complete all 132 phone calls, completing only 112 calls. Experimenters were free to call businesses anywhere in the United States with the constraint that they call an equal number of businesses with a \$, \$\$, or \$\$\$ designation from Google for each question. This was done in order to make sure the type of business called by each experimenter was balanced across the individual questions. Data collection was completed in April 2022.

Experimenters called the selected business, waited to be greeted by the participant, and then asked one of the four critical questions (listed above). Next, they immediately transcribed the participants' response word-for-word (noting pauses, fillers, and other types of disfluency). The experimenter then thanked the participant and ended the call.

**Scoring.** We coded the participants' responses as prepositional or non-prepositional as follows. Responses were coded as prepositional if the response included a preposition (*at*, *around*, *until*, *about*) and a temporal phrase noting the closing time of the business. *We close at 7*, *We close around 9*, *Closing is at 9*, and *Open until 9* would be coded as prepositional. Answers that did not use a prepositional phrase to denote the closing time (*8 pm*, *9 is our closing time*) were coded as non-prepositional. In cases where the participant provided multiple closing times (*We close at 9 tonight, but we usually close around 10*), the coding of prepositional or non-prepositional was based on the first

<sup>1</sup> Chia et al.'s (2019) Experiment 3 includes a similar manipulation of prepositions in the Levelt and Kelter phone call paradigm (*At what time...?* vs. *Around what time...?* vs. *What time...?*). Their overall sample in the phone call paradigm was small ( $n = 283$  across all 3 question types), and as such their data are not sufficient to provide a definitive look at the lexical vs. structural priming question.

**Table 1. Mixed Models Logistic Regression Analysis of the Participants' Responses**

Predictor	Estimate	Std. Error	z-value	p-value
<b>Intercept</b>	<b>0.86</b>	<b>0.18</b>	<b>4.64</b>	<b>&lt; 0.001</b>
<b>Question Type</b>	<b>-0.12</b>	<b>0.05</b>	<b>-2.34</b>	<b>0.019</b>
At vs. Around and About	-0.02	0.06	-0.43	0.671
Around vs. About	0.02	0.07	0.30	0.766

Note: Total sample size is 2195. Significant effects are marked in **bold**.

response (*We close at 9 tonight*). Responses that were non-directive (i.e., the participant did not address the question) or indicated that the business never closed (*We're 24 hours*) were coded as "other" and discarded from the analysis. Twenty-nine responses from our participants were coded as "other" and eliminated from the data set.

**Data Analysis.** We analyzed our participants' responses using mixed models logistic regression. The dependent measure was our coding of the participants' responses as prepositional (coded as 1) or non-prepositional (coded as 0). We predicted the log odds of the participant generating a prepositional response using a set of three orthogonal contrasts to test differences between the four question types. The *Question Type* contrast compared the non-prepositional question (*What time...?*, coded as 3) to the prepositional questions (*At/Around/About what time...?*, each coded as -1). The *Question Type* contrast is a test of the Levelt and Kelter (1982) priming effect, assessing whether the odds of producing a prepositional response is higher for the prepositional questions (as a whole) or the non-prepositional question. The *At vs. Around and About* contrast compared *At what time...?* (coded as 2) to *Around/About what time...?* (each coded as -1; *What time...?* was coded as 0). The *At vs. Around and About* contrast assesses whether the odds of producing a prepositional response are higher when the question uses the preposition *at* than when the question uses either *about* or *around*. The *Around vs. About* contrast compared *Around what time...?* (coded as 1) to *About what time...?* (coded as -1; *What time...?* and *At what time...?* were coded as 0). The *Around vs. About* contrast assesses whether the odds of producing a prepositional response are higher when the question uses the preposition *around* than when the question uses the preposition *about*. Experimenter was included as a random factor in the analysis. The model also included random slopes for the *Question Type* contrast and the *At vs. Around and About* contrast. We conducted our analyses using the *glmertree* library (Fokkema et al., 2018) in R (R Core Team, 2021).

**Data Availability.** The data (<https://osf.io/vhtr2>) and code (<https://osf.io/a3tbn>) for the analyses reported here are available on the Open Science Framework (<https://osf.io/kypna>).

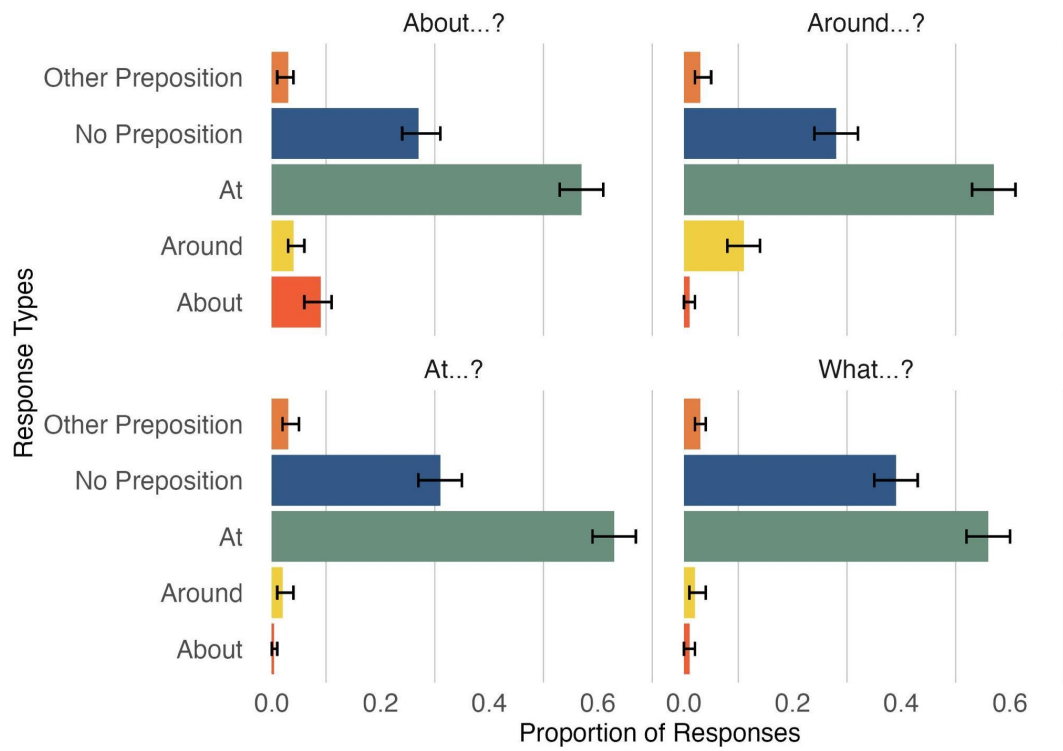
## Results

The results of the mixed models logistic regression analysis predicting the log odds of the participant using a preposition in their response are presented in [Table 1](#). The

*Question Type* contrast was significant ( $p = .019$ ). Participants were more likely to generate a prepositional response when the question contained a preposition (means: *At what time...?* = .69, *Around what time...?* = .71, *About what time...?* = .70) than when it did not (*What time...?* mean = .61). The effect of *Question Type* replicates the repetition effect first reported by Levelt and Kelter (1982). Neither the *At vs. Around and About* ( $p = .671$ ) nor the *Around vs. About* ( $p = .766$ ) contrasts were significant, suggesting that the odds of generating a prepositional response did not differ across the three prepositional question types.

Having demonstrated a reliable priming effect in our data, we next examined the pattern of preposition use across the conditions in the experiment. [Figure 1](#) presents the proportion of trials in which participants produced a response containing *at*, *around*, *about*, *other prepositions*, or *no preposition* across question types. Consistent with our procedure for scoring the responses, we only counted prepositions that occurred in the participant's initial response to our question. In addition, there were a small number of cases where the participant used two prepositions together (*We close at around 9*). We counted tokens for both prepositions in these cases. [Figure 1](#) also presents 95% confidence intervals for each response type within each *Question Type*. The confidence intervals were calculated such that each response type was considered a binary variable (e.g., for the *At* questions, the proportion of *at* responses is treated as a binary [ $at = 1$ , all other responses = 0]). The confidence intervals were computed using an online calculator (Kohn & Senyak, 2021).

We observe two important patterns in [Figure 1](#). First, responses containing *at* predominate across all question types. *At* responses occur over half the time for *What time...?* (56%), *Around what time...?* (57%), *About what time...?* (57%) and *At what time...?* (63%) questions, and responses to the *Around what time...?* and *About what time...?* questions are more likely to include *at* than they are to include either *around* or *about*. The predominance of *at* responses suggests that participants are not simply repeating the preposition that was used in the preceding question. The predominance of *at* further suggests that the participants' responses may be shaped by pragmatic and/or semantic factors (e.g., the meaning of *at* is most appropriate for conveying a specific closing time). We return to this idea in the Discussion section. The second important pattern in [Figure 1](#) is a same-preposition boost to rates of use for *at*, *around*, and *about*. Participants were most likely to use a specific preposition when the preceding question also



**Figure 1. Proportion of different response types to each question type. Error bars represent 95% confidence intervals.**

used that preposition: *at* occurs most frequently after *At what time...?* questions, *around* occurs most frequently after *Around what time...?* questions, and *about* appears most frequently after *About what time...?* questions. The confidence intervals in [Figure 1](#) suggest that the same-preposition boost is significant for all three prepositions.

The structural priming account suggests that the participants' choice to use a prepositional phrase in their response should not depend on the preposition used in the question but may be strengthened by the repetition of lexical items between the question and response. The same-preposition boost observed in [Figure 1](#) could be interpreted as evidence for the latter part of the claim, where participants are most likely to use *at*, *around*, or *about* in cases where the respective preposition was in the preceding question. We address the claim that the repetition effect should be found even when the preposition does not repeat between the question and answer in an additional set of analyses.

We began our analyses by creating three binary dependent variables coding responses as prepositional (1) or non-prepositional (0). Prepositional and non-prepositional responses were coded as in our main analysis, except that in each of the three variables the responses containing one of the target prepositions (*at*, *around*, *about*) were omitted from the dataset. Thus, there was one variable coding prepositional vs. non-prepositional responses in which any response using *at* was deleted, one variable in which any response using *around* was deleted, and one variable in which any response using *about* was deleted. Each variable was used in an analysis that compared the rates of prepositional

responses between the condition where the question involved the omitted preposition and the condition where the *What time...?* question was asked. The variable in which *at* responses were deleted was used as the dependent measure in an analysis comparing the *At what time...?* condition to the *What time...?* condition. The variable in which *around* responses were deleted was used as the dependent measure in an analysis comparing the *Around what time...?* condition to the *What time...?* condition. The variable in which *about* responses were deleted was used as the dependent measure in an analysis comparing the *About what time...?* condition to the *What time...?* condition. Each analysis provided an assessment of the structural priming effect observed when considering only trials on which a preposition other than the one used in the question was used. That is, the analyses assessed lexically-independent structural priming.

For each analysis, the log odds of producing a prepositional response was predicted by Question Type (1 = prepositional question, 0 = non-prepositional question). Experimenter was included as a random factor in each analysis. The random slope of Question Type across Experimenters was included for the *Around* and *About* analyses, but not the *At* analysis due to model fit issues. The results of the analyses are presented in [Table 2](#).

Participants were more likely to produce a prepositional response following a prepositional question in each of the analyses (*About vs. What*, .70 vs. .61; *Around vs. What*, .68 vs. .61; *At vs. What*, .16 vs. .12), but these differences were not statistically reliable. These results suggest that lexically-independent structural priming did not have a strong influence on the form of the participants' responses. These data

**Table 2. Mixed Models Logistic Regression Analysis of the “Different Preposition” Responses**

Predictor	Estimate	Std. Error	z-value	p-value
<i>About what time...? vs. What time...?</i>				
<b>Intercept</b>	<b>0.50</b>	<b>0.19</b>	<b>2.58</b>	<b>0.010</b>
Question Type	0.28	0.17	1.68	0.093
<i>Around what time...? vs. What time...?</i>				
<b>Intercept</b>	<b>0.49</b>	<b>0.20</b>	<b>2.47</b>	<b>0.013</b>
Question Type	0.27	0.14	1.83	0.067
<i>At what time...? vs. What time...?</i>				
<b>Intercept</b>	<b>-1.97</b>	<b>0.21</b>	<b>-9.50</b>	<b>&lt; .001</b>
Question Type	0.29	0.28	1.05	0.296

Note: Sample sizes: About vs. What = 1050; Around vs. What = 1030; At vs. What = 448. Significant effects are marked in **bold**.

are inconsistent with a structural priming account of our data.

## Discussion

We conducted this experiment to better understand the repetition effect first reported by Levelt and Kelter (1982). There were five main findings: 1) we replicated Levelt and Kelter’s (1982) repetition effect, with participants being more likely to generate a prepositional answer to a prepositional question than to a non-prepositional question; 2) the overall rate of preposition use was equivalent for the three prepositional questions; 3) responses using *at* predominate for all question types; 4) over and above the predominance of *at* responses, there was a boost in the rate of production for each preposition when the preceding question used the same preposition (e.g., *about* was used most frequently following *About what time...?*); and 5) the analysis of different-preposition responses reveals little evidence for lexically-independent structural priming. Neither of the accounts described in the introduction (lexical or structural priming) can provide a complete account of the participants’ linguistic behavior in this experiment. In what follows, we sketch an account of Levelt and Kelter’s (1982) repetition effect that is grounded in the pragmatics of the interaction between the participant and our experimenters.

We begin our account by expanding on the earlier suggestion that the predominance of *at* responses points to the influence of pragmatic and/or semantic factors on our participants’ utterances. The question that we asked typically has a precise answer, as most businesses have an exact closing time. It is the participant’s job to provide that precise answer, and they may do so with either a bare noun phrase (A: *What time do you close?* B: *Six*) or using the preposition *at* (A: *What time do you close?* B: *At six*). Both responses entail a precise closing time, whereas prepositions such as *around* and *about* imply an approximate closing time that does not accurately characterize the operation of most businesses. Accordingly, bare noun phrase (i.e., non-prepositional) responses and *at* responses predominate in all conditions. The overall preference for *at* re-

sponses over bare noun phrases may reflect a higher level of formality in the employee-customer interactions captured here. More formal speech is associated with fuller linguistic forms (e.g., Jacobs & MacDonald, 2023), such as replying in a full sentence (*We close at six*) rather than with a non-sentential response (*At six*). Chia et al. (2020; Chia & Kaschak, 2022b) report that full sentence responses in this paradigm are highly likely to contain prepositions.

We observed a consistent base rate of 56-57% *at* responses for the *Around...?*, *About...?* and *What time...?* conditions, suggesting that the pragmatic and semantic factors noted above establish a base rate of *at* responses that is independent of the nature of the preceding question. The base rate yields a roughly equal rate of prepositional responding across prepositional and non-prepositional questions. The structural repetition effect (more prepositional responses following prepositional questions) is the result of the same-preposition boost that operates on top of the pragmatic/semantic base rate (see Figure 1). For example, when compared to the *What time...?* condition, participants in the *At what time...?* condition produced about 7% more *at* responses (63% vs. 56%). Similarly, participants in the *Around what time...?* condition produced about 9% more *around* responses (11% vs. 2%) than in the *What time...? condition*. When compared to the *What time...?* condition, participants in the *About what time...?* condition produced approximately 8% more *about* responses (9% vs. 1%). Across the three prepositional questions, the same-preposition boost is about 8%, which accounts for the ~ 9% difference in prepositional responses between prepositional (70%) and non-prepositional (61%) questions (see earlier discussion of the overall repetition effect).

If the same-preposition boost drives Levelt and Kelter’s (1982) repetition effect, what drives the same-preposition boost? One possibility is that the same-preposition boost arises from lexical priming that operates on top of the pragmatic/semantic effects described above. The pragmatic/semantic effects set a base rate of prepositional responding, and lexical priming increases the rate of prepositional responding for the specific preposition that was used in the preceding question. It could be argued that the lexical boost

known to occur in structural priming would offer a similar account of the same-preposition boost, but a structural priming account would still need to explain the lack of lexically-independent priming observed here.

An alternate possibility is that the same-preposition boost is the result of higher-level pragmatic factors. The default assumption in interactions of the sort captured here is that businesses have a specific, set closing time and that the customer wants to know that precise information. The experimenter and participant would share this assumption, explaining the predominance of both *at* responses and non-prepositional responses. By using a specific preposition in their question, the experimenter may convey a different set of assumptions to the participant. For example, by asking *Around what time...?*, the experimenter may imply to the participant that it is understood that closing times are approximate (e.g., a restaurant officially closes at 9, but may refuse seating a new customer at 8:57). The participant responds in kind, indicating the closing time as an approximation (*Around 9*). Higher-level conceptual factors have been shown to affect structural repetition effects (e.g., Bunker et al., 2013), and a pragmatic account of the present data would be consistent with such findings. A pragmatic account suggests that the locus of the same-preposition boost (and Levelt and Kelter's repetition effect) may be found at a relatively early stage of the production process (e.g., Jacobs & MacDonald, 2023; Levelt, 1989).

We set out to distinguish between lexical priming and structural priming accounts of Levelt and Kelter's (1982) repetition effect. Our data suggest that neither lexical nor structural priming alone can explain the pattern of our participants' responses. It appears that pragmatic or semantic factors are the main driver of the participants' responses, and that the repetition effect itself is associated with lexical factors. Whether the lexical influence reflects lexical priming, the lexical boost to structural priming, or the operation

of higher-level pragmatic or conceptual factors remains to be seen.

### Author Contributions

Contributed to acquisition of data: KC  
 Contributed to analysis and interpretation of data: KC and MK  
 Drafted and/or revised the article: KC and MK  
 Approved the submitted version for publication: KC and MK

### Competing Interests Statement

The authors do not have any conflicts to declare.

### Acknowledgements

The authors would like to thank Alexis Fiorillo, Alison Dobel, Molly Berrios, Cara Levin, Chelsea Brubeck, Giana Packan, Harrison Bourekas, Jordan Getchell, Karina Paz Salazar, Kirsten Strickland, Lauren Mello, Mikayla Hall, Sara Hirschfeld, Shaelyn Snellings, Summer Quartell, Veronica Falcon, and Yasmine Khabou for their assistance in collecting the data reported here. We would also like to thank Cassandra Jacobs and one anonymous reviewer for comments on a previous draft of this paper.

### Data Accessibility Statement

The data (<https://osf.io/vhtr2>) and code (<https://osf.io/a3tbm>) for the analyses reported here are available on the Open Science Framework (<https://osf.io/kypna>).

Submitted: May 08, 2023 PDT, Accepted: August 26, 2023 PDT



This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CCBY-4.0). View this license's legal deed at <http://creativecommons.org/licenses/by/4.0> and legal code at <http://creativecommons.org/licenses/by/4.0/legalcode> for more information.

## References

- Bock, J. K. (1986). Syntactic persistence in language production. *Cognitive Psychology*, 18(3), 355–387. [https://doi.org/10.1016/0010-0285\(86\)90004-6](https://doi.org/10.1016/0010-0285(86)90004-6)
- Bunger, A., Papafragou, A., & Trueswell, J. C. (2013). Event structure influences language production: Evidence from structural priming in motion event description. *Journal of Memory and Language*, 69(3), 299–323. <https://doi.org/10.1016/j.jml.2013.04.002>
- Chang, F., Dell, G. S., & Bock, K. (2006). Becoming syntactic. *Psychological Review*, 113(2), 234–272. <https://doi.org/10.1037/0033-295x.113.2.234>
- Chia, K., Axelrod, C., Johnson, C., Bressler, M., Cooperman, H., Chu, A., Dash, E., Di Bella, J., Engelhardt, A., Farruggio, V., Folsom, S., Gomariz, H., Greiner, E., Hager, S., Hansen, N., Kenefick, C., King, J., King, K., Lavaud, M., ... Kaschak, M. P. (2019). Structural Repetition in Question Answering: A Replication and Extension of Levelt and Kelter (1982). *Discourse Processes*, 56(1), 2–23. <https://doi.org/10.1080/0163853x.2018.1515556>
- Chia, K., Hetzel-Ebben, H., Adolph, M., Amaral, M., Arriaga, M., Booth, H., Boudreau, V., Carpenter, J., Cerra, C., Clouden, M., Cryderman, J., Darji, R., Dollison, J., Franco, N., Ghogasian, L., Hamilton, L., Karosas, K., Kenoyer, C., Krenz, V., ... Kaschak, M. P. (2020). Examining the factors that affect structural repetition in question answering. *Memory & Cognition*, 48(6), 1046–1060. <https://doi.org/10.3758/s13421-020-01036-2>
- Chia, K., & Kaschak, M. P. (2022a). It's not you, it's me: Some speakers elicit structural priming more reliably than others. *Collabra: Psychology*, 8(1), 36312. <https://doi.org/10.1525/collabra.36312>
- Chia, K., & Kaschak, M. P. (2022b). Structural priming in question-answer dialogues. *Psychonomic Bulletin & Review*, 29(1), 262–267. <https://doi.org/10.3758/s13423-021-01976-z>
- Cleland, A. A., & Pickering, M. J. (2003). The use of lexical and syntactic information in language production: Evidence from the priming of noun-phrase structure. *Journal of Memory and Language*, 49(2), 214–230. [https://doi.org/10.1016/s0749-596x\(03\)00060-3](https://doi.org/10.1016/s0749-596x(03)00060-3)
- Dell, G. S., & Ferreira, V. S. (2016). Thirty years of structural priming: An introduction to the special issue. *Journal of Memory and Language*, 91, 1–4. <https://doi.org/10.1016/j.jml.2016.05.005>
- Fokkema, M., Smits, N., Zeileis, A., Hothorn, T., & Kelderman, H. (2018). Detecting treatment-subgroup interactions in clustered data with generalized linear mixed-effects model trees. *Behavior Research Methods*, 50(5), 2016–2034. <https://doi.org/10.3758/s13428-017-0971-x>
- Hartsuiker, R. J., Bernolet, S., Schoonbaert, S., Speybroeck, S., & Vanderlind, D. (2008). Syntactic priming persists while the lexical boost decays: Evidence from written and spoken dialogue. *Journal of Memory and Language*, 58(2), 214–238. <https://doi.org/10.1016/j.jml.2007.07.003>
- Jacobs, C. L., & MacDonald, M. C. (2023). A chimpanzee by any other name: The contributions of utterance context and information density on word choice. *Cognition*, 230, 105265. <https://doi.org/10.1016/j.cognition.2022.105265>
- Kohn, M. A., & Senyak, J. (2021). *Sample size calculators*. <https://www.sample-size.net/>
- Levelt, W. J. M. (1989). *Speaking: From intention to articulation*. MIT Press.
- Levelt, W. J. M., & Kelter, S. (1982). Surface form and memory in question answering. *Cognitive Psychology*, 14(1), 78–106. [https://doi.org/10.1016/0010-0285\(82\)90005-6](https://doi.org/10.1016/0010-0285(82)90005-6)
- Mahowald, K., James, A., Futrell, R., & Gibson, E. (2016). A meta-analysis of syntactic priming in language production. *Journal of Memory and Language*, 91, 5–27. <https://doi.org/10.1016/j.jml.2016.03.009>
- Pickering, M. J., & Branigan, H. P. (1998). The representation of verbs: Evidence from syntactic priming in language production. *Journal of Memory and Language*, 39(4), 633–651. <https://doi.org/10.1006/jmla.1998.2592>
- Pickering, M. J., & Ferreira, V. S. (2008). Structural priming: A critical review. *Psychological Bulletin*, 134(3), 427–459. <https://doi.org/10.1037/0033-2909.134.3.427>
- R Core Team. (2021). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. <https://www.R-project.org/>
- Reitter, D., Keller, F., & Moore, J. D. (2011). A computational cognitive model of syntactic priming. *Cognitive Science*, 35(4), 587–637. <https://doi.org/10.1111/j.1551-6709.2010.01165.x>
- Weiner, E. J., & Labov, W. (1983). Constraints on the agentless passive. *Journal of Linguistics*, 19(1), 29–58. <https://doi.org/10.1017/s0022226700007441>

## Supplementary Materials

### Peer Review History

Download: [https://collabra.scholasticahq.com/article/88948-is-the-levelt-and-kelter-1982-repetition-effect-lexical-or-structural-priming/attachment/183656.docx?auth\\_token=j5bPY1rt0yAkvDVE4AtN](https://collabra.scholasticahq.com/article/88948-is-the-levelt-and-kelter-1982-repetition-effect-lexical-or-structural-priming/attachment/183656.docx?auth_token=j5bPY1rt0yAkvDVE4AtN)

---