



Reply

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Abstract

We agree with the commentary that discrepant results across cross-task conflict adaptation studies are likely explained by methodological differences. Considering additional studies and paradigms, we argue that, collectively, the weight of the evidence suggests conflict adaptation is domain-specific; the exception being the visual world paradigm. Further argumentation is provided for why the visual world paradigm may in fact be showing domain-specific conflict adaptation within visual attentional control. The additional methodological concerns raised in the commentary about our study either do not appear consistently across all of our experiments or we provide further data or argumentation to demonstrate they are in fact not a concern. Our original article did not claim that cognitive control does not apply in language processing, but that a domain-specific account of cognitive control may be feasible and should be explored in future work.

Keywords: cognitive control; garden-path sentences; cross-task conflict adaptation; domain specificity



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1. The Weight of the Evidence

We start from a point of agreement between the authors of the commentary and ourselves: there are methodological differences between those studies that find support for domain-general conflict adaptation and those that do not. We also agree that self-paced reading is not the most sensitive measure. For that reason, we chose to run a much larger number of participants than is standard for psycholinguistic experiments to help mitigate the signal to noise concern. Our ability to detect conflict (ambiguity effect) and adaptation to it over the course of the experiment (syntactic adaptation) in reading times suggests the measure should in principle be able to detect trial-to-trial changes in conflict. However, we remain open to the possibility that the self-paced reading measure is not sufficiently sensitive, and that this phenomenon should be further tested within a different paradigm, such as eye-tracking while reading.

We did not solely rely on self-paced reading data, however. We also assessed comprehension accuracy, which likewise failed to provide evidence for conflict adaptation. We also looked at full sentence reading time which allows for re-reading, which was a concern raised about self-paced reading in the commentary. Again, while we found all the expected effects (i.e., ambiguity, Stroop and syntactic adaptation effects), we did not find

conflict adaptation. While this method does not allow us to identify the specific location of the effect, the key prediction is that when an ambiguous sentence is preceded by an incongruent Stroop, we should see facilitated reading times. That is, shorter reading times overall. It is not the case that there is a prediction for speeding up in one location and slowing down in another, such that the effects could be cancelled out. Thus, we do not fully agree with the argument provided in the commentary regarding the limitation of our full sentence reading time measure.

A failure to support a domain-general cognitive control mechanism in conflict adaptation in self-paced reading is not constrained to our study (see amongst others [Aczel et al., 2021](#); [Dudschig, 2022](#); [Nozari, 2024](#); [Simi et al., 2023](#)). There is also recent work outside our lab ([Nozari, 2024](#); [Zhu et al., 2024](#)) that fails to show evidence for domain-general conflict adaptation from a multi-source interference task to a picture–word interference task. If conflict adaptation is domain-general, one would expect to observe these effects in such production paradigms. It seems unlikely that self-paced reading, full sentence reading, comprehension accuracy and picture–word interference are *all* not sufficiently sensitive. In conjunction with earlier work outside language processing ([Gratton et al., 1992](#)), we take the weight of the evidence to support task/domain-specific conflict adaptation. A language-specific conflict monitoring mechanism is possible and is something that should be explored in future work across multiple paradigms.

2. Conflict Adaptation with Visual World Paradigm and Other Cases of Support

The above leads us to consider which properties of the visual world paradigm are at play in generating positive evidence for domain-general conflict adaptation when interleaving Stroop/Flanker with garden-path processing ([Hsu & Novick, 2016](#); [Hsu et al., 2021](#)). Stroop, Flanker and the visual world paradigm all contain conflict from the same domain: visual object processing. In Stroop, one needs to inhibit attention to the letters and focus attention on the font colour ([Parris et al., 2022](#)). In Flanker, one needs to inhibit attention to the flanking objects and focus on the central one ([Nozari et al., 2016](#)). In the visual world paradigm, one needs to inhibit attention from the object mentioned in the ambiguous prepositional phrase (PP; *binder* in 1) when reaching the second PP (*onto* in 1) and focus on the correct goal object within the visual display. This attention is of course being directed by syntactic processing, but the facilitation provided by the preceding incongruent Stroop/Flanker may not be occurring during syntactic processing, but after it is mapped to the visual display.

“Put the Horse on the Binder onto the Scarf”

While [Hsu et al. \(2017, 2021\)](#) find that ambiguity affects the proportion of looks to the incorrect object at the point of syntactic conflict (*onto*), they do not find that immediate prior cognitive control engagement mediates this effect. [Hsu et al. \(2021\)](#) find that an immediately preceding incongruent Flanker facilitates looks to the correct goal (i.e., scarf in 1) 800 ms after the end of the sentence (offset of scarf). This is a relatively late effect given that work on the prediction of upcoming words in sentence processing finds that eye fixations on the expected object reduce and fixations on the less expected object increase at the point of conflicting cues ([Chow & Chen, 2020](#); [Gussow et al., 2019](#)). At most, you would expect looks to the correct goal to be facilitated at the onset of the goal word (i.e., scarf). Indeed, this facilitation emerged earlier in [Hsu and Novick \(2016\)](#): 200–600 ms after the onset of the correct goal word (i.e., scarf). The reason for the temporal distinction in where this facilitation is observed is unclear, but nonetheless both results are compatible with post-syntactic processing effects within visual attention. Only in the ambiguous condition are you required to redirect visual

attention from an incorrect goal to an alternative correct goal. While these objects are equally present in the unambiguous condition, they do not generate the same conflict within visual attention, as “the binder” in (1) is not entertained as a goal syntactically or visually. Similarly, Stroop presents letters and a font colour in both congruent and incongruent conditions, but they only vie for attention in the incongruent condition. Thus, incongruent Stroop may engage cognitive control and help the visual system in shifting attention away from objects that were previously relevant but no longer are. This interpretation is compatible with the recent results from [Langlois et al. \(2024\)](#) reported in the commentary.

Hopefully the above simultaneously clarifies that we do not think that visual attention, in general, accounts for the conflict adaptation effect in the [Hsu et al. \(2017, 2021\)](#) studies, as is reported in the commentary. Rather, we think conflict is relevant but in terms of visual attention for objects or their features. Critically, however, we argue that recruitment of cognitive control by conflict in one representational format (visual) would have no impact on a conflict in another format (syntactic), either in terms of detection or resolution. This would at least require some domain-specific constraints and would not be compatible with a completely domain-general mechanism.

While we argue that conflict adaptation is not a domain-general mechanism, we do not deny that domain-general resources play a role in sentence processing. Just as attention is widely regarded as a domain-general resource required during sentence processing, a goal-oriented control mechanism for overriding automatic processing may also be domain-general. Evidence of neural overlap in the prefrontal cortex across tasks requiring cognitive control ([Hsu et al., 2017](#); [Nozari & Novick, 2017](#)) suggests that different domains draw on shared resources. One possibility that we are partial to is that these regions shift the system from automatic to controlled processing, with the controlled operations depending on connectivity with domain-specific representational systems or on distinct subnetworks. In either case, the conflicts being resolved differ across domains, making conflict detection and/or resolution likely to be domain-specific. This perspective is compatible with the consistent failure of studies to demonstrate cross-task conflict adaptation ([Aczel et al., 2021](#); [Dudschig, 2022](#); [Nozari, 2024](#); [Simi et al., 2023](#); [Zhu et al., 2024](#)). In short, shifting to controlled processing may draw on shared resources across domains, but the implementation of controlled processing is constrained by domain-specific subnetworks or connections, preventing conflict resolution to transfer across tasks.

[Novick et al. \(2025\)](#) further mention that additional eye-tracking while reading studies show that upregulation of cognitive control via training over weeks leads to improved revision of garden-paths ([Hussey et al., 2017](#)). However, those data provide limited evidence for a domain-general conflict resolution mechanism in language processing. A common concern with training studies is that their apparent transfer effects may simply reflect the performance of the most motivated participants. In the present case, syntactic improvement was not linked to improvement across all executive function training tasks, but only to improvement on the most demanding version—the *n*-back task with lures. It is possible that this task’s difficulty served as a filter, such that only the most motivated (and perhaps highest-ability) learners improved on it, and these same participants also performed better on the most challenging sentence-processing tasks. This is to say the evidence is correlative rather than causative. By contrast, measures such as conflict adaptation, which examine trial-to-trial transfer from one task to another, are less susceptible to this “motivation filtering” interpretation and provide more directly causative evidence.

The reported oscillatory EEG data ([Ness et al., 2024](#)) likewise offers limited support for a domain-general conflict resolution mechanism, as they provide only correlational evidence and do not directly assess conflict adaptation. Finally, the reported greater P600 effect for syntax-semantic anomalies post-incongruent Stroop ([Ovans et al., 2022](#)) is hard

to interpret given both the different interpretations of what the P600 reflects and that a non-standard analysis of the number of electrodes showing a P600 effect across Stroop congruency was applied rather than the assessment of an interaction of Stroop congruency and Anomaly on the P600 amplitude.

3. Methodological Issues Raised Beyond Self-Paced Reading

The authors raise a variety of other methodological points (length of response deadline, inclusion of incorrect responses) which are relevant, but without testing each of them it is hard to comment on whether, or how, they would affect the results. However, we want to make clear that those methodological choices were based on the earlier work of [Hsu and Novick \(2016\)](#) and [Hsu et al. \(2021\)](#) that *did* find conflict adaptation in the visual world paradigm. Given we were interested in providing evidence for cross-task conflict adaptation outside the visual world paradigm, we wanted to change as little else as possible. We have, however, rerun the analyses for the disambiguating region for all four experiments while excluding trials with incorrect Stroop and trials with incorrect comprehension questions (as well as separately). Analysis with this reduced sample demonstrates all of the same main effects, however we still find no evidence for conflict adaptation.

The one methodological point about [Kuz et al. \(2024\)](#) raised by the authors that exceptionally differed from [Hsu and Novick \(2016\)](#) and [Hsu et al. \(2021\)](#) was that we allowed for an increasing expectation for the less probable structure in Exp. 1–3. This was critical for our interest in simultaneously studying the two timeframes of adaptation. As mentioned in the original article, we would have expected to observe a three-way interaction between Stroop, ambiguity and experimental item trial if increasing expectation for the same syntactic structure were to have an effect on conflict adaptation, but that was never observed at significance. Moreover, the increasing expectation for the less frequent structure does not apply to Exp. 4 where we used the same principles of [Hsu and Novick \(2016\)](#) and did not observe syntactic adaptation nor conflict adaptation.

4. Conclusions

We thank [Novick et al. \(2025\)](#) for the commentary and find this methodological discussion fruitful in drawing attention to the need for more work on conflict adaptation in both language comprehension and production. Collectively, the current evidence across studies seems to suggest that cross-task conflict adaptation in language comprehension depends on the visual world paradigm. We have an alternative perspective from the authors of the commentary for why that is, but we would embrace further empirical insights to better distinguish between our two views. While *our* hopes for domain-general conflict adaptation have fizzled, we are excited to further explore the specificity of conflict adaptation in language comprehension across various paradigms.

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