In this pre-register study, the authors aim to investigate the dual-task architecture in the study of unconscious processing using a metacontrast masking experiment and event-related potentials (ERPs). The authors will estimate the influence of response-related parameters on the masked priming effects and study the neural underpinnings of our dual-tasking manipulations. For that, response modality (vocal or motor) and task complexity (low vs. high complexity) will be manipulated, and how these two factors affect masked priming effects (i.e., incongruent trials – congruent trials) and the P3b component of the ERPs will be studied.

Overall, the proposal is interesting, as both methodological caveats of the priming paradigm and the cognitive correlates of the P3b are hotly debated topics. There are some issues, however, which I believe the authors should address before a recommendation can be made on the manuscript.

Introduction:

* Pages 3-4. The authors might want to consider the recent study by Jimenez et al. (2023) when discussing studies which have used single and dual task priming designs. In this study, the authors discuss the dual-task character of the designs wen indirect and direct tasks are presented together. Their results show an increase in overall RTs in the dual-task condition as opposed to the single-task condition, where priming effects are found at specific prime-mask SOAs and an overall decrease in RTs is observed.
* Page 5, first paragraph. The study by Biafora & Schmidt (2022) is not explained in the Intro. Since it seems important to the current study, the reader might benefit from a brief description of that study.
* Page 5, second paragraph. “One commonly used experimental design in the line of masked (unconscious) priming research is metacontrast masking (e.g. Mattler, 2003; Vorberg et al., 2003).” The authors might want to include the review by Breitmeyer (2015) for further insights on the different techniques to render a stimulus invisible.
* Page 6. The aim of the section presented here (*Metacontrast-masked response priming and Dual-tasking)* is not very clear. Do the authors want to explain that meta-contrast masking is especially suitable to assess priming effects in dual-task paradigms? On the other hand, how does metacontrast masking specifically relate to the PRP and BCE phenomena?
* Page 6, last paragraph. It is a bit difficult to understand the experimental design of Scerra and Brill (2012). Authors may want to consider rephrasing, for example: " Scerra and Brill (2012) tested participants in several multitasking experiments, in which the input of both tasks was either presented in the same modality (visual prime and target; unimodal dual-task condition) or via different modalities (tactile prime and visual target or tactile prime and auditory target; cross modal dual-task condition)."
* Page 9. The authors use Task 1 (probe response) and Task 2 (prime response) nomenclature. Later in the manuscript (e.g., age 19) the authors use ‘indirect task’ and ‘direct task’ instead of task 1 and task 2. I will advise for a consistent nomenclature through the manuscript.
* Page 10, second paragraph. Further references on objective and subjective measures of awareness might be added to the one by Hesselmann (2013). A recent review on the different measures of awareness can be found in Jimenez et al. (2024) which the reader might find interesting. Also, a more in-depth discussion can be found in Overgaard, 2015; an easier read on Persuh, 2018.
* Page 11, first paragraph. It will probably suffice to say that the PAS instructions were administered in German.
* Page 12, second paragraph. A recent review on the P3b by Verleger (2020) might be added as a reference.

Methods:

* Page 14, last paragraph. Block F will be assessed in a separate session without an EEG recording. Will Block F (prime identification task) be administered in the same day? The measurement of prime awareness would be ideally performed just after the Block E (single task).
* Page 15. A single SOA of 94 ms (plus 24 ms prime presentation) will be used in the experiment. How is the SOA duration determined and justified, is it based on previous research? Will this stimulus presentation ensure PAS reports in all 4 (or 2, depending on the condition) categories?
* Page 15. I wonder how the authors will assess that the participants are correctly using the PAS. This is normally evaluated by introducing catch-trials (e.g., prime absent trials).
* Page 19. Regarding hypothesis 3, if the results show an absence of RT differences and priming effects between 2- and 4-point PAS, how will the authors interpret these results? In other words, is it possible that the PAS response manipulation does not lead to increased task complexity?
* Page 19. Since the authors will explicitly test RT differences between conditions, it may be interesting to explaining why the 1.5 interquartile range (IQR) will be used here, and this is preferred as opposed to alternative approaches.
* Page 20, first paragraph. It is not clear whether in the dual-task condition, all trials will go to the analyses, or only trials for as specific PAS category (e.g., PAS1) will be analysed. If that’s not the case, maybe these analyses can be included as supplementary?
* Page 20, Exploratory Analyses. How do authors intend to explore P3b latency? Will the authors use a single-participant approach or the jackknife approach? Also, based on which specific method (e.g., peak latency, absolute criterion, relative criterion, fractional area) will the latencies be calculated?
* Page 21. Participants will report on their awareness of the primes. However, it is not clear whether the authors pretend to explore the unconscious processing of the primes or not. In the case of the dual-task blocks, that would involve including participants awareness (PAS) into the analyses, or otherwise exploring congruency effects for the PAS1 category.

**References**

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Verleger, R. (2020). Effects of relevance and response frequency on P3b amplitudes: Review of findings and comparison of hypotheses about the process reflected by P3b. *Psychophysiology, 57(7)*, e13542. <https://doi.org/10.1111/psyp.1354>