Contributors.

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Claim Summary.

This replication tests the following claim from Petersen et al. (2017): “[P]hasic auditory alertness affects visual perception by increasing the visual processing speed and lowering the threshold of conscious perception (Experiment 1).”. See pre-registration here https://docs.google.com/document/d/1ariE_GU2NdUBJAu4bmiiNTOf8XnTOzJzpBfrOs7aHEU/edit?ts=5dafe9bd.

Replication Criteria.

A successful replication of the key SCORE test (H*) would be as follows: After fitting a model to each participant’s probabilities of correct response as a function of exposure duration to the 85 dB SPL cue and no-cue trials separately, the values on parameter v for processing speed will be larger (i.e., steeper slope of performance as a function of target duration) and the values on parameter t_0 for threshold will be smaller (i.e., stimulus duration value at which performance rises above 0) for cue trials than for no-cue trials.

Replication Result.

The replication attempt included 26 participants in the analysis sample to reach the stage 1 data collection (n=26) requirements, and their probability of correct response data as a function of stimulus duration are plotted in Figure 1, with model fits shown for each participant’s data for each condition. The model fits resulted in an average variance explained over 95% for both conditions (R-squared for Cue condition=0.9545, R-squared for No Cue condition=0.9520). As shown in Figure 2, paired t-tests revealed a larger processing speed/velocity parameter v (t(25)=5.0455, p=3.3132x10^-5, two-tailed, d=0.9895) and a smaller perceptual threshold parameter t_0 (t(25)=-2.9445, p=0.0068967, two-tailed, d=-0.5775) when an 85 dB sound cue was presented prior to a visual letter, compared to when no sound cue was presented. Therefore, this replication attempt was successful according to the SCORE criteria, with both significant effects occurring in the predicted direction.

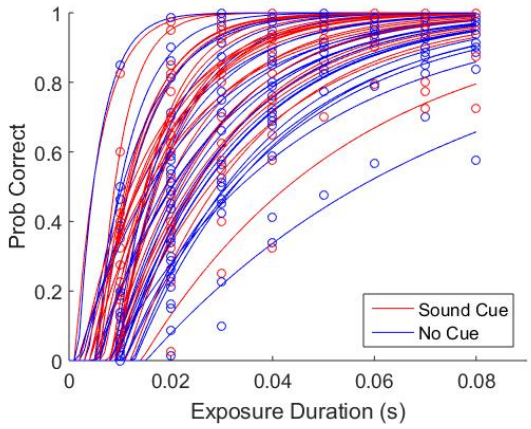

Figure 1. Probability of correct responses for each participant as a function of letter stimulus duration, for conditions with a sound cue (red symbols) and with no sound cue (blue symbols). Curved lines indicate model fits to each participant's data.

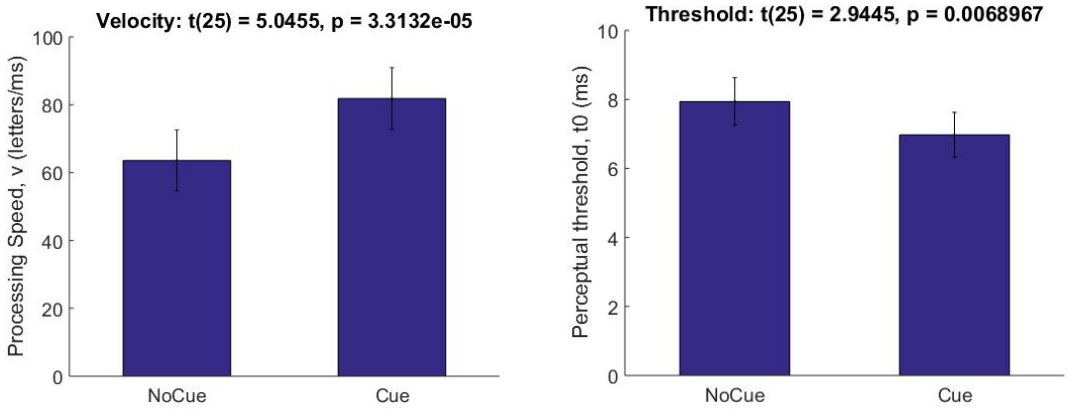

Figure 2. Average (with standard error bars) processing speed/velocity parameter estimates (left) and perceptual threshold parameter estimates (right) for cue and no cue conditions.

Deviations from preregistration.

The preregistration stated that the initial recruitment target for stage 1 data collection was 31 participants to achieve the planned sample size of 26. Based on the exclusion criteria stated on the preregistration, 15 participants were excluded due to not completing the entire experiment, equipment malfunction, and/or their data not showing an expected effect of monotonically better target identification at longer target durations. Additionally, 1 participant was excluded due to reporting having a neurological diagnosis, and 6 participants were excluded due to their data showing negative t_0 values in either or both conditions, indicating a perceptual threshold of less than 0 milliseconds as calculated by the original equation with the given parameters. To not change the original equation or parameters, data were collected from 48 participants to achieve a sample of 26 participants for data analysis.

Description of materials provided.

Data:

A pair of the data files for each of the 48 participants are uploaded to the OSF (filenames 19XX_DayX_MM-DD-YYYY-VAT_replication_scenario.log), along with the .xlsx versions. All materials in this component will be made public here https://osf.io/wtm3e/.

Analysis:

Various versions of the MATLAB script are uploaded to the OSF (filenames analysis_Petersen2017_vX.m), accompanied by a saved workspace that includes concatenated values of parameters v, t_0, and p_g in both cue and no-cue conditions (Petersen2017_data.mat). To load data for analysis, the data files must be saved in a folder labeled “data” in the same directory as the MATLAB script. Also uploaded are a document detailing changes made from each version (Changes made on scripts.docx) and a document describing data from individual participants (Individual Data Descriptions.docx). All materials in this component will be made public here https://osf.io/wtm3e/.

Methods & Materials:

The 85 dB cues, 500Hz and 900Hz, are uploaded to the OSF as Cue_500Hz.wav and Cue_900Hz.wav, respectively, as well as the letter masks, letter_mask_1.jpg and letter_mask_2.jpg, and the Presentation files for the experiment (VAT_replication_expt.exp and VAT_replication_scenario.sce). All materials in this component will be made public here https://osf.io/wtm3e/.

Citation.

Petersen, A., Petersen, A. H., Bundesen, C., Vangkilde, S., & Habekost, T. (2017). The effect of phasic auditory alerting on visual perception. Cognition, 165, 73-81. doi:10.1016/j.cognition.2017.04.004