Non-Linguistic Context Affects Processing of Ambiguous Speech

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Listeners are frequently faced with ambiguous speech and must determine what was said. An important question in psycholinguistics is how this ambiguity resolution is affected by top-down factors such as lexical accessibility (e.g., word frequency; Gibson et al., 2013; Samuel, 1981a), and by non-linguistic contexts and individual experience. In this project, we take advantage of the sudden increase in the lexical frequency of certain words (e.g., *mask, washing, sick*) precipitated by the COVID-19 pandemic, asking a) whether this continued lexical exposure affects the perception and resolution of auditorily ambiguous words, and b) whether non-linguistic sounds related to the pandemic increase accessibility of relevant words. To assess this, we use a phonemic restoration paradigm (Samuel, 1981a, 1981b).

Method. We created 16 item quadruplets, each consisting of two minimal pairs differing by a single phonological contrast (e.g., *mask/task | map/tap*; *washing/watching | lashing/latching*; *sick/sit | kick/kit*). The COVID TARGET word was covid-related (*mask*); the COVID COMPETITOR word (*task*) was not. The CONTROL TARGET word (*map*) and CONTROL COMPETITOR word (*tap*) were both covid-unrelated, but included the same phonological contrast in the same position. A speaker recorded the COMPETITOR words. For both COVID and CONTROL items, the minimal pair phoneme(s) (/t/*ask, wa*/tch/*ing, si*/t/) was masked, either by a COUGH or by grey NOISE. All COVID pairs (*mask/task)* and TARGET pairs (*mask/map)* were matched for frequency using pre-pandemic norms, so that differences in processing can be attributed to pandemic-related changes in word frequency. 240 native English speakers listened to 4 items from each of 4 conditions (COVID/COUGH, COVID/NOISE, CONTROL/COUGH, CONTROL/NOISE; 16 trials total) and were instructed to "write the word you heard". Data were collected via Mechanical Turk.

Analyses and Predictions. Responses were coded as "target" or "competitor"; non-matching responses, including other input-consistent competitors (*ask* or *flask*; 22%), input-inconsistent responses (*mast*; 28%), and non-responses (*I don't know*; 3%), were discarded. A binomial GLMM contained fixed effects of Word Pair (COVID vs. CONTROL), Interference (COUGH vs. NOISE) and their interaction, and the maximal random effects supported by the data. Future analyses will assess the relationship with demographics, emphasizing individuals' affectedness by the pandemic. We predicted higher restoration rates to the target word in the COVID vs. CONTROL condition overall (main effect of Word Pair, reflecting increased frequency of COVID-related words [*mask* over *task*]) and when blocked by a COUGH (Word Pair $\times$ Interference interaction).

Preliminary Results. There was a significant effect of Interference, with COUGH resulting in more restoration to the target word than NOISE (β=.56, z=2.28, p=.022), but only a marginal effect of Word Pair (β=1.53, z=1.93, p=.054), and no interaction (β=.32, z=0.96, p=.335; see Fig. 1). The difference between COUGH and NOISE was significant for COVID word pairs (β=.72, z=2.62, p=.009), such that participants perceived more COVID-related words when blocked by a COUGH vs. NOISE, but there was no such difference for CONTROL word pairs (β=.40, z=1.26, p=.207). The study is currently being replicated in a new sample (*N*=480).

Discussion. These data demonstrate that short-term experiences can significantly change accessibility and perception of lexical items. This is important on several levels: First, we demonstrate sudden frequency shifts on lexical ambiguity resolution in an externally valid setting; second, we add to the growing evidence that environmental, non-linguistic context interfaces with linguistic processing (Orgs et al., 2006); and third, we show that not only do global events affect mental health (Brooks et al., 2020), but that the blanket effects of this pandemic can also be found in higher-order cognition, specifically, language processing.
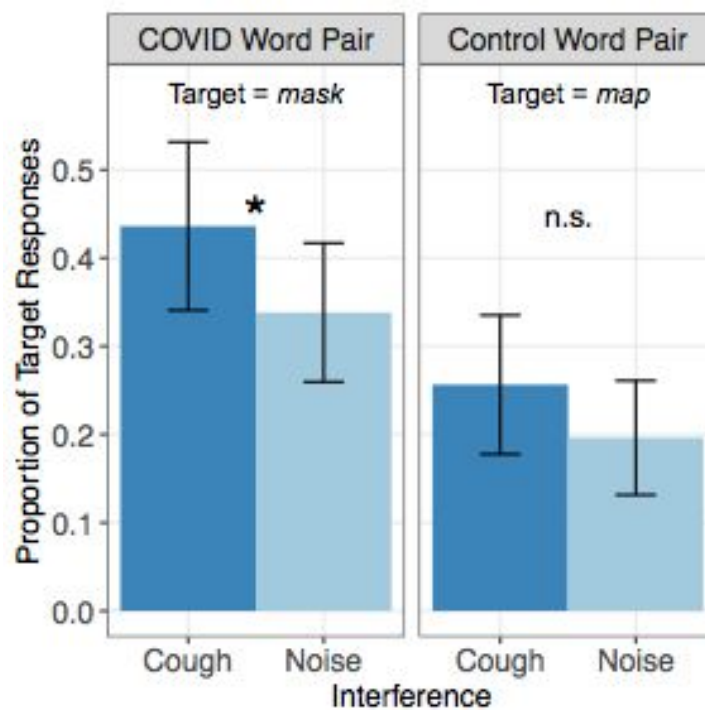
Fig. 1. Mean responses by condition for COVID and CONTROL word pairs as a function of interference (cough vs. noise). Higher values indicate more participants selecting the TARGET item of the COVID word pairs (e.g., *mask* instead of *task*; left panel) or of the CONTROL word pairs (e.g., *map* instead of *tap*; right panel). Error bars = 1 SEM. Differences reported in the text may not be fully apparent in the figure because binomial mixed models analyze single-trial data in log-odds space, whereas the figure depicts standard F2 proportion means for easier-to-interpret visualization.

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