Noise to control the audibility of pure tones in online studies (#119171)

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1) Have any data been collected for this study already?
No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?
We will test whether using a specific kind of masking noise, Threshold-Equalizing Noise (TEN, Moore et al., British Journal of Audiology, 2000), can equalize audibility thresholds over a broad range of frequencies in online experiments.

3) Describe the key dependent variable(s) specifying how they will be measured.
Audibility thresholds of frequency-modulated tones (half-octave FM width) will be measured with a self-adjustment procedure. Participants will adjust the volume of the tones so that they are just audible. The dependent variable is the software attenuation applied at threshold, in dB re: max (we cannot control sound pressure level in online experiments). The threshold estimate at each center frequency will be the average of two measurements. If for a given frequency the difference between the first two measurements is superior to 4 dB, a third measurement will be added at this frequency. Threshold will be calculated as the average of the two closest measurements.

4) How many and which conditions will participants be assigned to?
Each participant will be tested on two conditions, with or without background TEN (boundaries between 74 Hz and 6727 Hz, which is half an octave below and above the lowest and highest instantaneous frequencies of the FM tones). Conditions will be presented in a random, counterbalanced order. For each condition, participants will have to complete two measurements for each of the 6 tested carrier frequencies (125, 250, 500, 1000, 2000 and 4000 Hz) also in random order, with the procedure described above.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
We will test whether frequency has an effect on the audibility threshold, in quiet and in noise. Because we hypothesize no difference in threshold with noise, we will use a standard one-way ANOVA in the "quiet" and "noise" conditions. We will also perform a Bayesian ANOVA (as implemented in JASP) to estimate Bayes factors. Since previous studies on TEN did not include the 125-Hz frequency, if the ANOVA on the full frequency range reveals a frequency effect, we will also conduct the same analysis excluding the 125-Hz measurements to allow for comparison. In addition, we will test whether adding noise reduces the variance of the threshold estimates across all participants. We will use a multi-dimensional Levene test (Anderson 2006, Biometrics).

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
Participants will have to successfully complete a "headphone check" procedure before participating in the study (Woods et al., 2017, Attention, Perception & Psychophysics). A self-adjustment of overall volume will then be performed using the TEN from the main experiment. Next, a single threshold measurement at 1000 Hz will be performed during the screening process. If the result does not fall between 50 and 80 dB, the participant will be asked to repeat the self-adjustment of volume until the threshold criterion is met. Participants who complete the experiment but then display at least one threshold measurement below 25 dB in the absence of background noise will be excluded as it suggests that they changed overall volume after screening, or that they have a hearing loss.

7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.
100 participants will be recruited using Prolific, based on contingency and initial estimates of the Bayes factor for the pilot data.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
Data for 32 participants using a similar task have been collected as a control condition in a previous experiment. We now wish to make improvements to the task and collect stand-alone data.