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From sounds to melodies: Memory for sequences of pitch and loudness

Marion Cousineau^a, Daniel Pressnitzer^a and Laurent Demany^b

^aCNRS UMR 8158 ; Univ. Paris Descartes ; Ecole Normale Supérieure, 29 rue d'Ulm, 75005 Paris, France

^bCNRS UMR 5227 ; Univ. Victor Segalen, 146 rue Léo Saignat, 33076 Bordeaux, France

In order to understand speech or appreciate music, listeners have to process and remember patterns of sounds that vary along many perceptual dimensions. Here we investigated the perception of pitch sequences and loudness sequences, using a psychophysical method that uncouples discriminability and memory capacity. Pitch could be produced by either resolved or unresolved harmonics. Random sequences were constructed for which a single attribute (pitch or loudness) could take only two different values. These values were selected individually for each participant to produce equal discriminability (d') for isolated sounds. The participants then had to perform Same-Different judgments on pairs of sequences of two, four or eight elements each. We found that performance decreased rapidly with the number of elements for the loudness and pitch of unresolved harmonics conditions. With sequences of four and eight elements, performance was markedly better for the pitch of resolved harmonics condition. These findings show that short-term auditory memory capacity changes with the type of attribute that is varied within a sequence. For pitch, resolved harmonics yield a higher capacity than do unresolved harmonics; this could explain part of the difficulties encountered by cochlear implant users when listening to music.