Inflexible stimulus-specific representations acquired during auditory implicit perceptual-motor sequence learning

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Background

- The application of knowledge to novel contexts (transfer) is critical in real-world skill learning
- Prior studies of implicit perceptual-motor sequence learning have found this type of learning to be inflexible.1,2,3
- Hypothesis: implicit sequence learning occurs within sensory-specific neural pathways, leading to stimulus-specific representations. Greater knowledge inaccessibility occurs when transfer conditions are more perceptually different from original learning
- Prediction: greater similarity in perceptual features between training and novel contexts will produce more transfer

Quantifying implicit knowledge and transfer

Auditory Serial Interception Sequence Learning1,2
Participants listen to auditory cues and make motor responses
Cues follow a covertly embedded 12-item repeating sequence

Keeping the same precisely-timed motor sequence, transfer is assessed with novel tones

Time within-trial

Tone 1  Tone 2  Tone 3

Assign keypress based on tone
Duplicate tone indicates rhythm of keypress timing
Precisely-timed keypress occurs on third tone of triplet

Greater perceptual similarity, greater flexibility

- Sequence knowledge was accessible when tones were transposed to smaller frequency difference (1 semitone) compared to larger difference (2 semitones)
  - Suggests less discriminable perceptual categorical boundary at 1 semitone allowed for full transfer to novel context
- Less training, full feedback, and/or stimulus type potentially contributed to increased knowledge availability under novel contexts

Robust trained performance, impaired transfer

- Sequence-specific learning occurs as a log-linear function of sequence repetition amount7
- Impaired but non-zero transfer, graded flexibility across perceptual conditions (poster E31)

Future work

- Effects of sleep-based interventions (TMR) to enhance transfer of implicit sequence knowledge to novel contexts
- Systematic investigations of variables on transfer amount:
  - Frequency gradient (0.5-3 semitones), training amount (low vs. high repetitions), stimuli type (naturalistic vs. synthetic), feedback type (full vs. minimal feedback)

References


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