Edmond J. Safra Brain Research Center for the Study of Learning Disabilities
מרכז אדמונד י. ספרא לחקר המוח בלקויות למידה
مركز إدموند ج. سفرا لبحوث الدماغ في العسر التعليمي

The Development of Incidental Auditory Category Learning

Noyli Nissan[1], Lori L. Holt[2], Avi Karni[1] and Yafit Gabay[1]

[1] Special Education Department and the Edmond J. Safra Brain Research Center for the Study of Learning Disabilities, University of Haifa, Haifa, Israel

[2] Psychology Department and the Center for the Neural Basis of Cognition, Carnegie Mellon University, Pittsburgh, USA

INTRODUCTION

- A rich literature documents early phonetic category learning but there is increasing evidence for continued development in later childhood (**Zevin, 2012**).
- Studies of children's **non-speech auditory category learning** can be informative as they allow for control over the history of experience difficult to achieve with speech categories (**Holt & Lotto, 2006**).
- Studies have largely used tasks in which listeners are aware of the existence of categories and overtly search for category-diagnostic dimensions by making explicit decisions to maximize experimenter-provided feedback (**e.g. Holt et al. 2004; Mirman et al. 2004; Reetzke et al. 2009**).
- But, this may not necessarily model the more incidental learning conditions in which phonetic category learning typically occurs: **no instructions to search for category-diagnostic dimensions, no overt category decisions and no external feedback**.
- A recent study demonstrates that **adults can incidentally learn auditory categories** (**Gabay, Dick, Zevin & Holt, 2015**). Does such learning occur earlier in development?

RESEARCH QUESTION

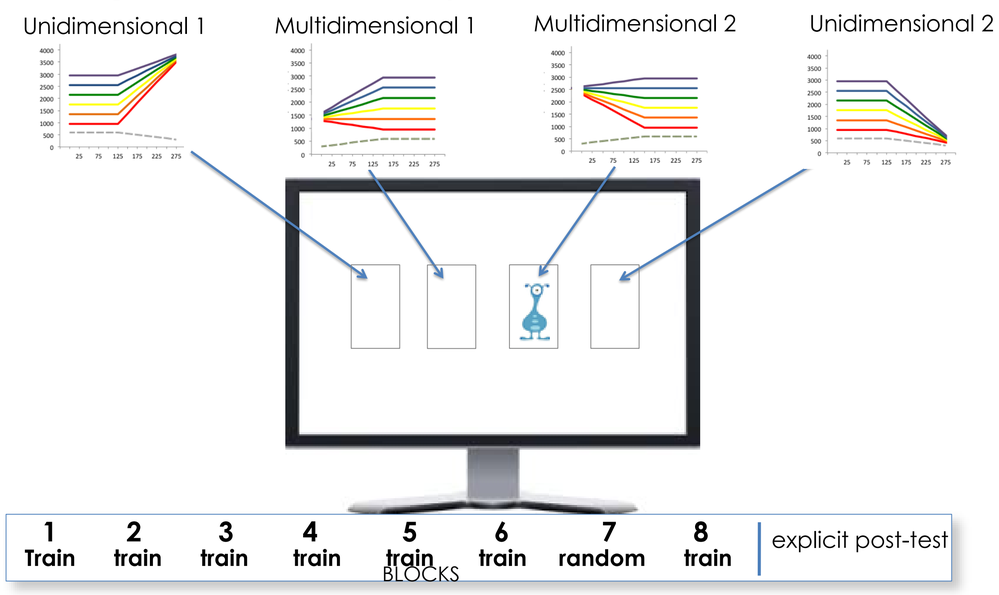
Does incidental auditory category learning occur in early adolescence?

METHOD

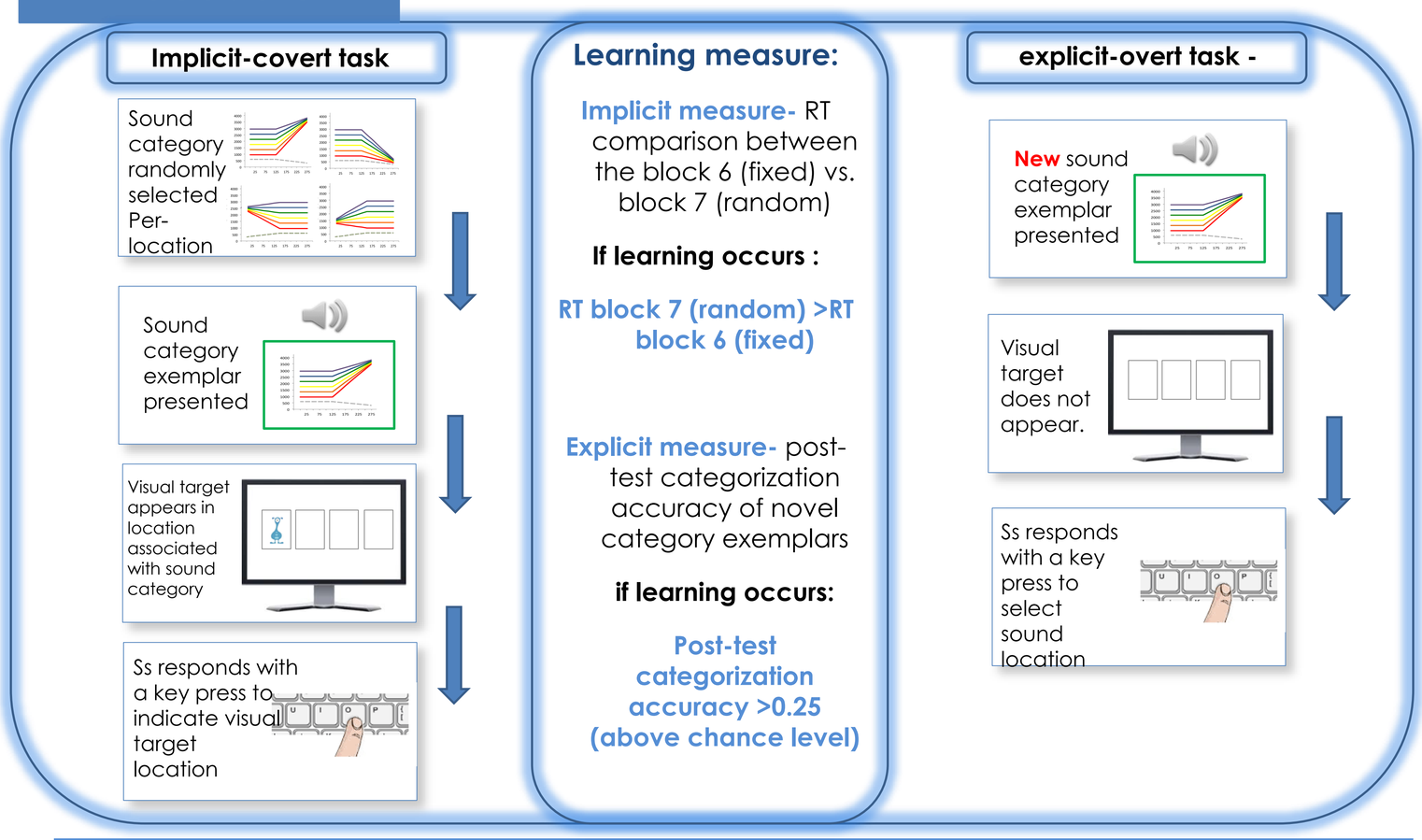
Participants. Two age groups: 11-12 years old child group and 18-30 year-old adults. Each group N=40. All were native Hebrew speakers.

Task. The Systematic Multimodal Associations Reaction Time (SMART) task (Gabay et al. 2015). sound stimuli preceding the visual cue.

Category sounds. (1) **Two unidimensional categories** (category membership can be determined by a single acoustic property (2) **two multidimensional categories** (there is no single acoustic property which can determine category membership).

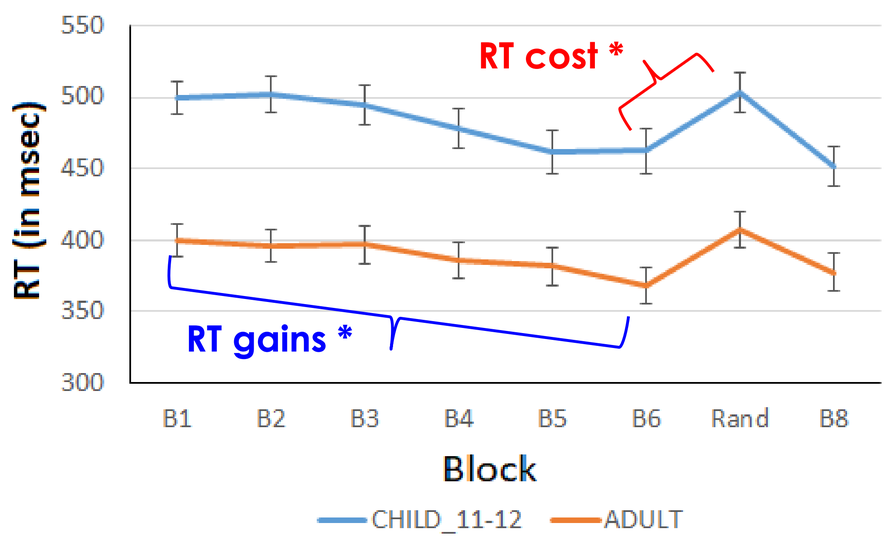


Procedure



RESULTS

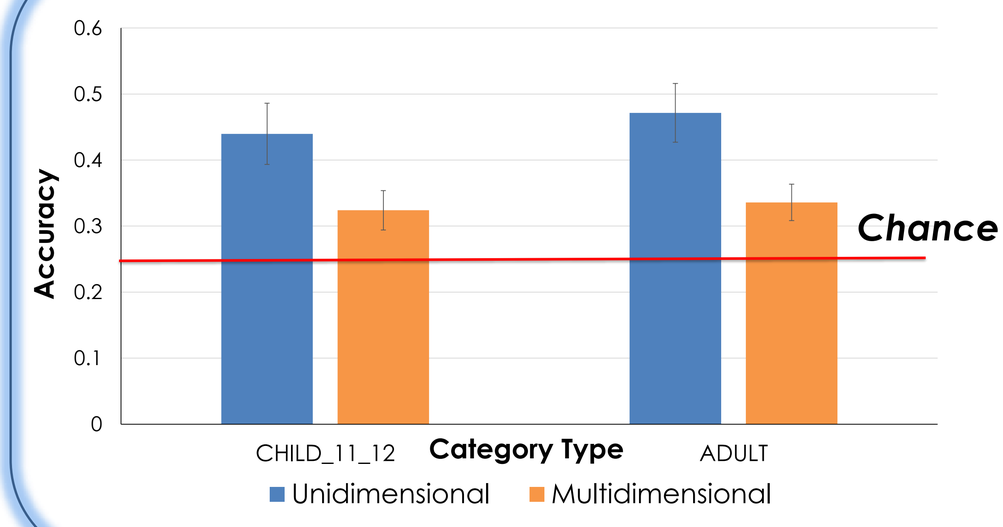
Covert learning measures



Both groups - significant **RT gains** and **RT cost**.

No significant learning measures by group interactions, $F<1$.

Overt learning measures



Both groups - categorization above chance indicative of generalization.

No significant group differences.

CONCLUSIONS

- **Children, 11-12 years-old, can incidentally learn complex non-speech auditory categories and generalize this knowledge to novel, untrained exemplars in an overt labeling test. In this they are as good as young adults.**
- **The paradigm provides a novel approach to probe the development of mechanisms supporting the acquisition of categories of acoustically -variable sounds via repeated incidental experience.**

Bibliography

1. Gabay, Y., Dick, F. K., Zevin, J. D., & Holt, L. L. (2015). Incidental auditory category learning. Journal of Experimental Psychology: Human Perception and Performance, 41(4), 1124.
2. Holt, L. L., & Lotto, A. J. (2006). Cue weighting in auditory categorization: Implications for first and second language acquisition. The Journal of the Acoustical Society of America, 119(5), 3059-3071.Fahle, M. (2005). Perceptual learning: Specificity versus generalization. Current Opinion in Neurobiology, 15(2), 154–160.
3. Holt, L. L., Lotto, A. J., & Diehl, R. L. (2004). Auditory discontinuities interact with categorization: Implications for speech perception. The Journal of the Acoustical Society of America, 116(3).
4. Mirman, D., Holt, L. L., & McClelland, J. L. (2004). Categorization and discrimination of nonspeech sounds: Differences between steady-state and rapidly-changing acoustic cues. The Journal of the Acoustical Society of America, 116(2), 1198-1207.
5. Reetzke, R., Maddox, W. T., & Chandrasekaran, B. (2016). The role of age and executive function in auditory category learning. Journal of experimental child psychology, 142, 48-65.
6. Zevin, J. D. (2012). A sensitive period for shibboleths: The long tail and changing goals of speech perception over the course of development. Developmental Psychobiology 54(6): 632-642.

Email: noyli444@gmail.com