

INTERACTION BETWEEN SHORT-TERM AND LONG-TERM MEMORY IN THE MUSICAL DOMAIN: THE IMPACT OF MUSICAL KNOWLEDGE AND MUSICAL EXPERTISE

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INTRODUCTION

The grounding of short-term memory (STM) in long-term memory (LTM) knowledge is well established, especially in the domain of verbal STM (e.g., Gathercole, Frankish, Pickering & Peaker, 1999 ; Majerus, Martinez Perez & Oberauer, 2012). The aim of this study is to provide further evidence for these STM-LTM interactions, by exploring the dependency of STM for musical stimuli on LTM for musical knowledge.

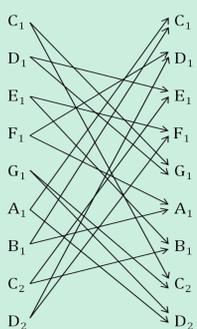
AIM

To determine the impact of musical LTM knowledge and musical expertise on STM performance for tone sequences.

METHODS

Participants

- 16 adults with no active musical experience and training
- 11 adults with musical training and regular musical activities



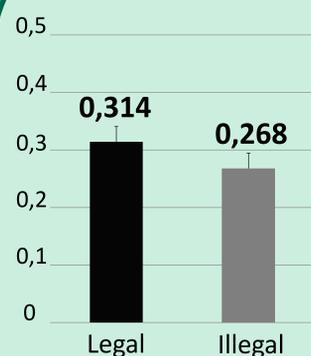
Task 1: Learning of new musical knowledge

The participants heard through headphones a continuous sequence of tones governed by a new artificial musical grammar during 30 minutes. This sequence was presented as noise distraction during a complex drawing coloring task and the participants were asked not to pay attention to the musical sequence.

Task 2: Learning transfer on STM performance

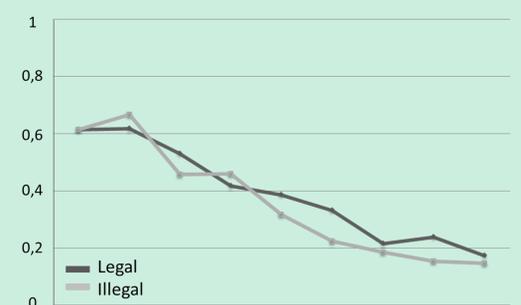
- Immediate serial recall task for tone sequences of increasing length
- Half of the sequences followed the same rules as those embedded in the artificial musical grammar of the implicit learning task, the other sequences were illegal relative to this grammar
- Length : 2 to 10 tones (3 trial per length)
- Reproduction of the sequences by humming

RESULTS



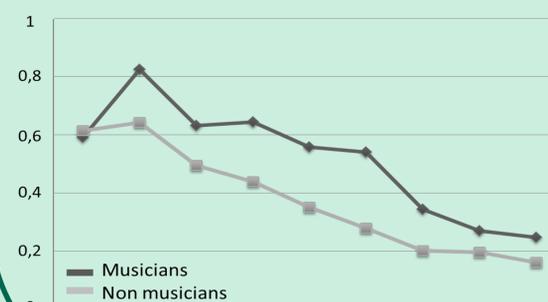
MEAN RECALL PERFORMANCE IN NON-MUSICIANS

Effect of condition
 $t(16) = 3.43, p = .004$



MEAN RECALL PERFORMANCE AS A FUNCTION OF LIST LENGTH IN NON-MUSICIANS

Effect of condition
 $F(1, 15) = 5.42, p = .034$



MEAN RECALL PERFORMANCE AS A FUNCTION OF LIST LENGTH IN MUSICIANS AND NON-MUSICIANS

Effect of group
 $F(1, 25) = 12.83, p = .001$

Effect of interaction (GROUPE * LENGTH)
 $F(8, 200) = 2.83, p = .005$

DISCUSSION

We observed a significant advantage for legal lists recall in comparison to illegal list recall in the non-musician group. This result supports our hypothesis assuming strong interactions between newly learnt musical knowledge and musical STM performance. Moreover, the musician participant group outperformed the non-musician group reflecting the existence of preexisting musical knowledge on musical STM performance. Interestingly, no evidence for an effect of implicit learning of new musical rules on STM performance was observed in the musician group, possibly due to their higher familiarity for musical stimuli and resulting overlearned associations of musical tones, echoing similar results obtained in artificial grammar learning experiments for other types of overlearned material such as digits (Majerus et al., 2012).

These results are the first to show a close dependency of STM on LTM in the musical domain and provide further evidence for STM-LTM interactions as a universal defining feature of STM.

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References:

Gathercole, S. E., Frankish, C. R., Pickering, S. J., & Peaker, S. (1999). Phonotactic influence on short-term memory. *Journal of Experimental Psychology*, 25(1), 84-95.
Majerus, S., Martinez Perez, T., & Oberauer, K. (2012). Two distinct origins of long-term learning effects in verbal short-term memory. *Journal of Memory and Language*, 66(1), 38-51.