Jakub Sowiński (jsowinski@vizja.pl), webpage: http://www.mpblab.vizja.pl

Brains out of sync, but still in tune

Jakub Sowiński & Simone Dalla Bella
Department of Cognitive Psychology, University of Finance and Management in Warsaw, Poland

INTRODUCTION

Congenital amusia is a music-specific learning disorder which is mostly characterized by pitch perception deficits (Peretz & Hyde, 2003). Rhythmic deficits occur less frequently and are typically accompanied by deficient pitch perception. It has been suggested that rhythm deficits result from pitch variations in music (Foxton, Nandy, & Griffiths, 2006).

GOAL

Examine the extent to which timing deficits are linked to disorders in pitch perception in the general population.

SCREENING PHASE

PARTICIPANTS

96 university students (13 males and 83 females) (3 with musical education) aged between 19 and 43 years (Mean = 21.8 years)

TAPPING TASKS

Paced tapping, along with

Metronome

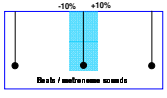
Isochronous sequence of 96 non-musical sounds (IOI = 600 ms)

Music

A computer-generated excerpt of a familiar piano musical piece (Radetzky March, 96 musical beats, IOI = 600 ms)

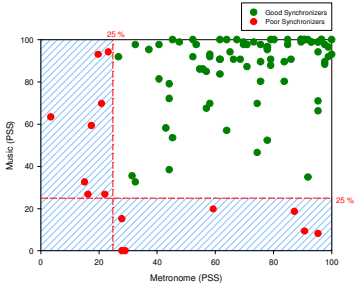
SUCCESSFUL SYNCHRONIZATION

When the tap occurred in the vicinity (± 10% of the IOIs) of musical beats or metronome sounds.



PSS = Percentage of Successful Synchronizations

RESULTS (screening phase)



Fifteen participants yielded the lowest number of well-synchronized taps (i.e., below 25% of the pacing stimuli) either with music or with isochronous sequences.

SYNCHRONIZATION BATTERY

PARTICIPANTS

Poor synchronizers (PS): 15 participants (4 males and 11 females) aged between 19 and 43 years (Mean = 22.8 years)

Good synchronizers (GS): 11 participants (2 males and 9 females) aged between 19 and 23 years (Mean = 20.4 years)

TAPPING TASKS

Paced tapping, along with

Metronome

Isochronous sequences of 96 non-musical sounds (with IOIs = 450, 600, 750 ms)

Music

A computer-generated excerpt of a familiar piano musical piece (Radetzky March, 96 musical beats, IOIs=450, 600, 750 ms)

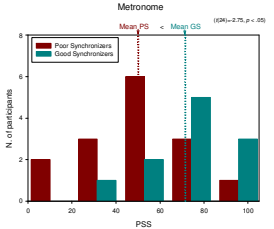
Noise

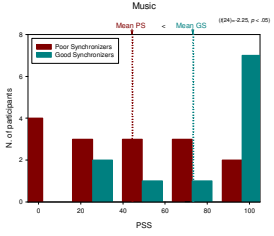
Amplitude-modulated white noise derived from music (96 musical beats, IOIs = 450, 600, 750 ms)

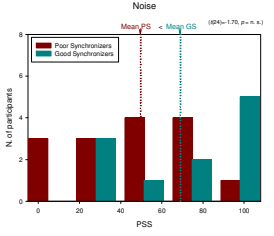
MBEA (Peretz, Champod, & Hyde, 2003)

QUESTION 1

Do Good synchronizers differ from Poor synchronizers in the Synchronization battery?

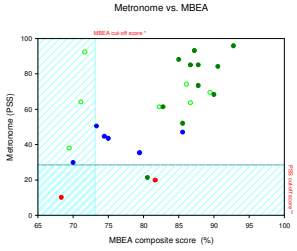




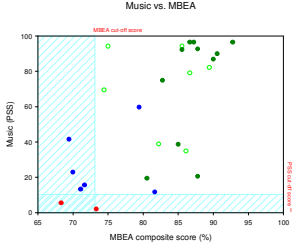


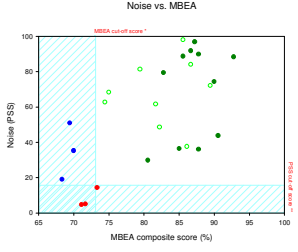
QUESTION 2

Do Poor synchronizers suffer from impaired perception?



Subject	MBEA*	Metronome	Music	Noise
P1				
P2				
P3				
P4				
P5				
P6				
P7				
P8				
P9				
P10				
P11				
P12				
P13				
P14				
P15				





Poor synchronizers in the screening phase:
In the Synchronization battery
○ No deficit
● Slightly impaired
● Seriously impaired

Good synchronizers in the screening phase ●

* 2 SD from the mean MBEA composite score (Cuddy et al., 2005, control subjects)

** 2 SD from mean percentage of successful synchronizations for Good Synchronizers

CONCLUSIONS

- **Deficient synchronization was often accompanied by amusia as revealed by MBEA**
- **Still, in a few cases impaired synchronization was found in absence of amusia**
- **Deficient pitch perception is not a *sine qua non* for impaired timing in sensorimotor synchronization**

References

Cuddy, L.L., Balkwill, L-L., Peretz, I., & Holden, R.R. (2005). Musical difficulties are rare. A study of "Tone deafness" among university students. *Annals of the New York Academy of Sciences, 1060*, 311-324.
Foxton, J.M., Nandy, R.K., & Griffiths, T.D. (2006). Rhythm deficits in 'tone deafness'. *Brain & Cognition*, 62(1), 24-9.
Peretz, I., Champod, S. & Hyde, K. (2003). Varieties of Musical Disorders: The Montreal Battery of Evaluation of Amusia. *Annals of the New York Academy of Sciences, 999*, 58-75.
Peretz, I. & Hyde, K. (2003). What is specific to music processing? Insights from congenital amusia. *Trends in Cognitive Sciences, 7*(8), 362-367.