

Dear Professor Welch,

As a recipient of the SEMPRES Conference Award, I would like to express my gratitude to SEMPRES for giving me the opportunity to attend the ISPS 2013 in Vienna earlier in August. The conference proved to be very fruitful for me: I enjoyed the experience immensely and gained much from hearing the presentations of outstanding researchers whose work I had previously read and admired. In addition, I won invaluable insights into the latest research methods, topics and findings in Performance science. Moreover, participation in a variety of discussion groups helped me to develop new ideas and to circulate our research findings in a A4 format (attached) to people with similar research interest. And finally, I have made very useful connections with leading researchers in the field which I intend to maintain in future. None of that would have been possible should you have not given me the funds to attend the conference, so thank you ever so much!

Wishing SEMPRES success with all future endeavours.

Yours truly,
Stanislava Angelova

Emotion-related Musical Variables Affect Person Perception: Differential Effects for Men and Women in a Synchronization Task

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Background

• **Keeping together in time** (e.g., dance, drill) has been described as crucial in human social evolution (McNeil, 1999). Recent studies showed enhanced cognitive performance, increased liking, similarity and prosocial measures in participants synchronising simple behaviours to a metronome beat (Macrae et al., 2008; Valdesolo & Desteno, 2010). **Attempting a more ecologically valid framework, we investigated the above responses in function of variables associated with affect in music (tempo and mode) when participants synchronised motor behaviour to music rather than metronome.**

• **Music is as ubiquitous as language in humans.** Similarly to language, it is a complex domain that involves systematic rhythmically organised sequences of syntactically ordered elements within different cultural traditions. However, it has been argued that, differently from language, music is referentially opaque but **uniquely organised around an external regular pulse**, so affording entrainment to the beat and interpersonal synchronization (Cross & Woodruff, 2009; Juslin & Sloboda, 2010). Beyond a strong link between perception and action, synchronization has been associated also with the need to anticipate others' behaviours (Latin, Joffers, Cheng & Chartrand, 2003) in a variety of rhythmically organised phenomena, which occur intentionally or unintentionally in everyday life (Lakens & Stel, 2011).

• **However, rhythm and tempo are not emotionally neutral aspects of a musical experience.** The complexity of music has been broken down into separate variables in order to study how emotional qualities are conveyed to listeners (Sloboda & O'Neil, 2001; Juslin & Västjäll, 2008). Positive emotions (e.g., happiness) have been found to be associated with fast tempo / major mode, whereas sadness tends to be associated with slow tempo / minor mode (Dalla Bella et al., 2001, among others).



Thus, besides synchronization per se, the present study aims to investigate the effects on person perception of moving together to music characterised by different emotional qualities.

Method

SAMPLE: 128 participants equally distributed across conditions (N=16 per condition in each gender were tested using a 2x2x2 independent factors design: gender (50% female), tempo (fast/slow) and mode (major/minor).

TASK: After brief practice trial, stepping left/right from midline with a researcher to the musical beat for approx. 1 minute.



In order not to reveal facial affect that might influence the participant, the researcher wore a simple mask



During the stepping phase, the researcher pronounced 20 words aloud (approx. every 5/3 beats with fast/slow tempo respectively): *cold, shirt, walk, step, desk, stick, smile, spoon, milk, talk, book, watch, shoe, nose, tree, glass, horse, bush, door* – same category in the MRC Psycholinguistic Database (all with estimated means for words' frequency count = 88.9, and number of phonemes = 3.4).

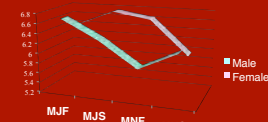
MUSIC: four bars looped to form a 1.09-minute basic sound track, adjusted from original stimulus 1-4 from Peretz et al. (1998) and developed into four variants © B. Bouchard 1998 :

- major mode / fast tempo (original)
- major mode / slow tempo
- minor mode / fast tempo
- minor mode / slow tempo

Fast tempo = 126 BPM , Slow tempo = 84 BPM.

Results

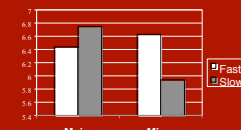
Likeability of synchronized partner
ANOVAS revealed a significant gender x mode x tempo interaction for Likeability of the synchronized partner ($F_{1,120} = 6.5, p = .01$): **Figure 1**



Mode: MJ=major, MN= minor - Tempo: F=fast, S=slow

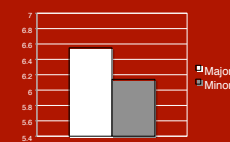
Follow-up analyses by gender yielded a significant mode x tempo interaction for **women** ($F_{1,60} = 5.26, p = .025$), who liked the researcher most with major/slow or minor/fast music and least with minor/slow:

Fig. 2 Female: mode x tempo



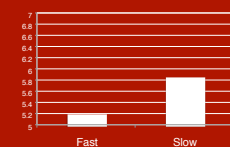
Men presented an independent effect of mode, as they liked the researcher best overall with major mode ($F_{1,60} = 4.64, p = .033$):

Fig. 3 Male: mode



Men also found the experience more "interesting" with slow than fast tempo ($F_{1,60} = 4.62, p = .036$):

Fig. 4 Male: "interesting"




Discussion points

We consider this study a "proof of concept" and a pilot to devise an appropriate paradigm to investigate emotional variables and synchronization.

• **LIKEABILITY:** Ceiling effects scores were very high in general. This might be due to the musical dimension in the study (e.g., more pleasant than metronome) or to experimental limitation (researcher recruiting participants and synchronizing with them was the same person). Mode x tempo interaction is mediated by GENDER: men's score higher with MAJOR, women's scores higher with MAJOR/SLOW and MINOR/FAST. Gender effects have not been controlled in synchronization studies: Macrae et al. (2008) had >80% participants female!

• Men found the synchronization experience more "interesting" (puzzling?) with slow tempi.

WHY GENDER? Women show more differentiated responses to music (Juslin & Sloboda 2010 for a review), are more sensitive to intermediate qualities on a happy/sad continuum based on mode, tempo and texture Webster & Weir (2005). More symmetrical brain processing of music in women from childhood (Koelsch et al., 2003a,b) and expertise-related anatomy affects men but not women (corpus callosum, Lee, Chanandg & Schlaug, 2003); women respond equally well to a variety of musical types when synchronizing exercise, men better with metronome (Kargorghis et al. (2010); arousal and pain reduction associated with music in female but not male patients (Mabiata et al. 2007)

• **WE NEED TO INVESTIGATE THE EVOLUTIONARY IMPLICATIONS** (warning: highly speculative!!) 
Heightened arousal/fast tempo + major mode (positive in-group emotion e.g., military drill or anthems) → fight as cooperative group action
More differentiated female experience towards music → infant-directed speech and music, caring

ACKNOWLEDGMENTS

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IMAGE: On the streets of Shanghai 2012 © F. Franco