



Sensitivity to musical emotion: Effects of gender and familiarity

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Aims & Introduction: Here we ask how gender interacts with familiarity in the case of experiential and physiological reactions to musical stimuli. From an evolutionary perspective, the primary caretaker hypothesis (Babchuk et al., 1985) may explain why women have an advantage in the recognition of emotional facial expressions: Hampson et al. (2006) found that women recognize positive and negative emotions faster than men, especially negative emotions of facial expression. Male and female parents and non-parents show similar ratings of arousal and valence when listening to infant non-linguistic vocalizations (the equivalent of facial expressions (Belin et al., 2004)), but their brain responses are modulated by sex and experience dependent factors (Seifritz et al., 2003). Familiarity with infants' cries expressing distress decreases the level of perceived distress (Irwin, 2003). One may thus assume that gender and familiarity could also modulate affective perception in music. Women are expected to be more sensitive to emotion in music.

Women are more sensitive to an aversive musical stimulus (heavy metal) in their psychophysiological but not psychological responses (Nater et al., 2006). Sex differences in electrodermal responses to unpleasant film clips have been reported (Kring & Gordon, 1998), but not to unpleasant pictures (Bradley et al., 2001). Women rate unpleasant pictures as more arousing (ibid.). Gender does not affect the performance of children and adults when they are asked to link emotion words to music (Robazza et al., 1994; Kallinen, 2005). Gender differences may also be understood by the novel constructs of "music empathizing" and "music systemizing" (Kreutz et al., 2007).

Cross-cultural studies (e.g., Balkwill & Thompson, 1999) revealed that listeners' judgments of emotions in music are based on both acoustic cues and culture-specific cues. Sensitivity to acoustic cues enables a general understanding of emotion in unfamiliar music. Familiarity influences musical appreciation, such as ratings of preference (Peretz et al., 1998), liking (North & Hargreaves, 1995; Peretz et al., 1998) pleasantness (Ritossa & Rickard, 2004) and emotional intensity (Gabrielsson & Lindström Wik, 2003). Musical arousal ratings may depend on familiarity (Berlyne, 1971). Familiarity and liking tend to be associated with self-reported emotions of joy, calm, and fun, whereas foreignness and dislike may be associated with anger, madness, and fear (Parncutt & Marin, 2006).

We hypothesize that familiarity with a musical style influences SCRs and psychological ratings. In addition, men and women are expected to differ in their SCRs to unpleasant musical stimuli. Finally, psychological responses to music are expected to differ in men and women.

Materials & Methods:

Psychological measurements:

- three instrumental musical styles:
 - Western tonal (18-19th century)
 - Western atonal (20th century)
 - Classical traditional Persian
- more than one instrument, no orchestra
- 5 emotional categories, 5 excerpts per emotion
- duration of 5s, 200ms fade-in and fade-out
- presented at 70dB, equalization of loudness

Psychological measurements:

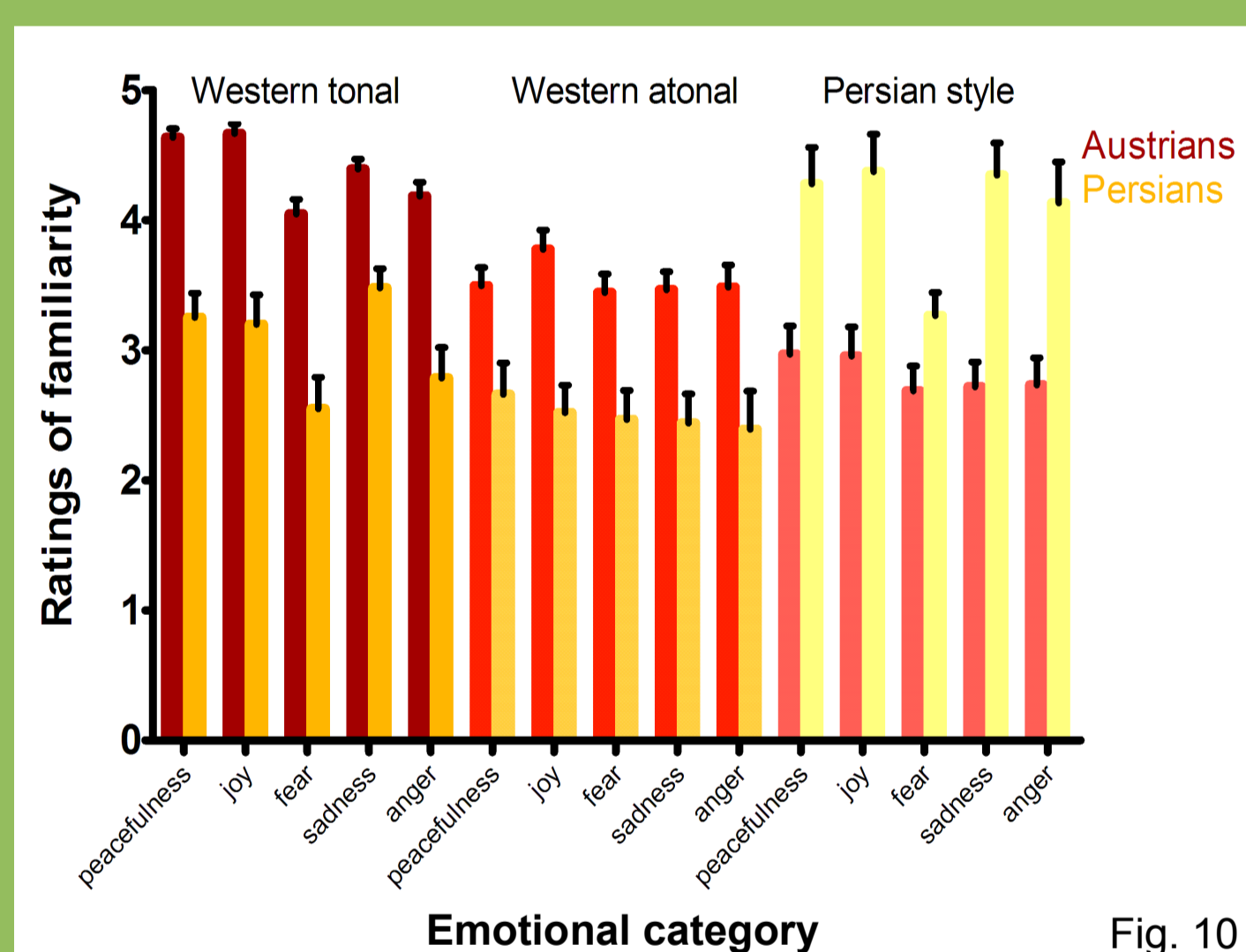
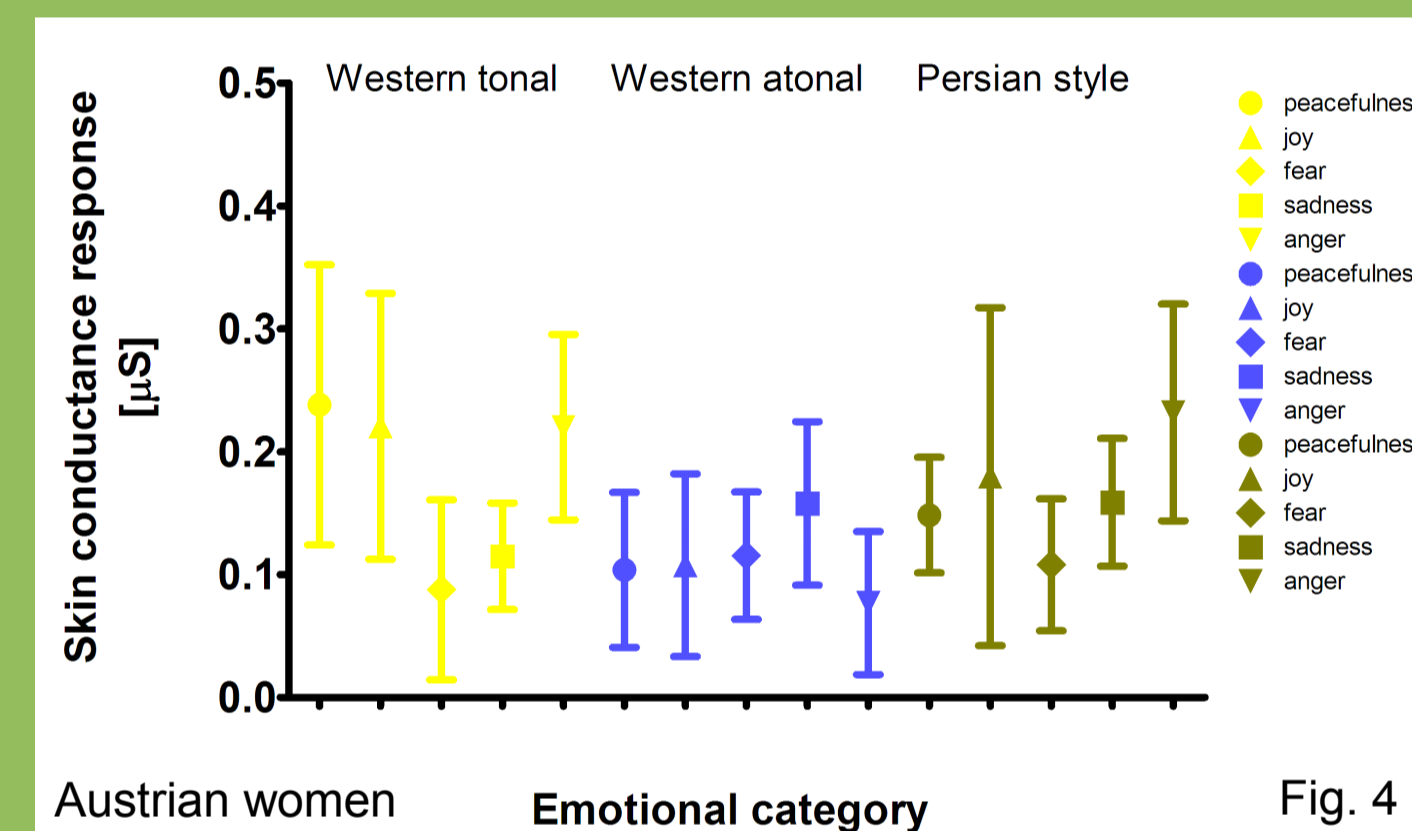
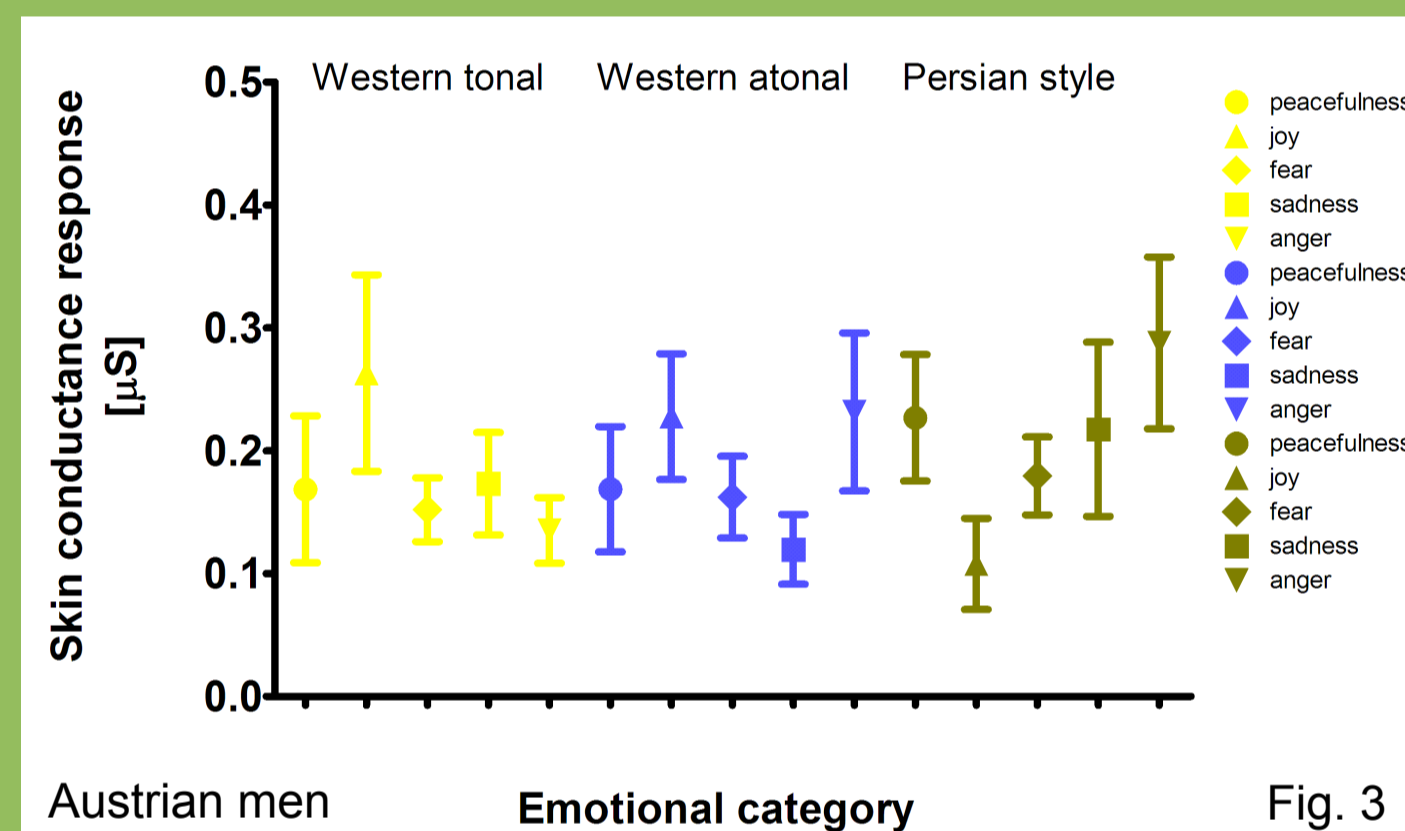
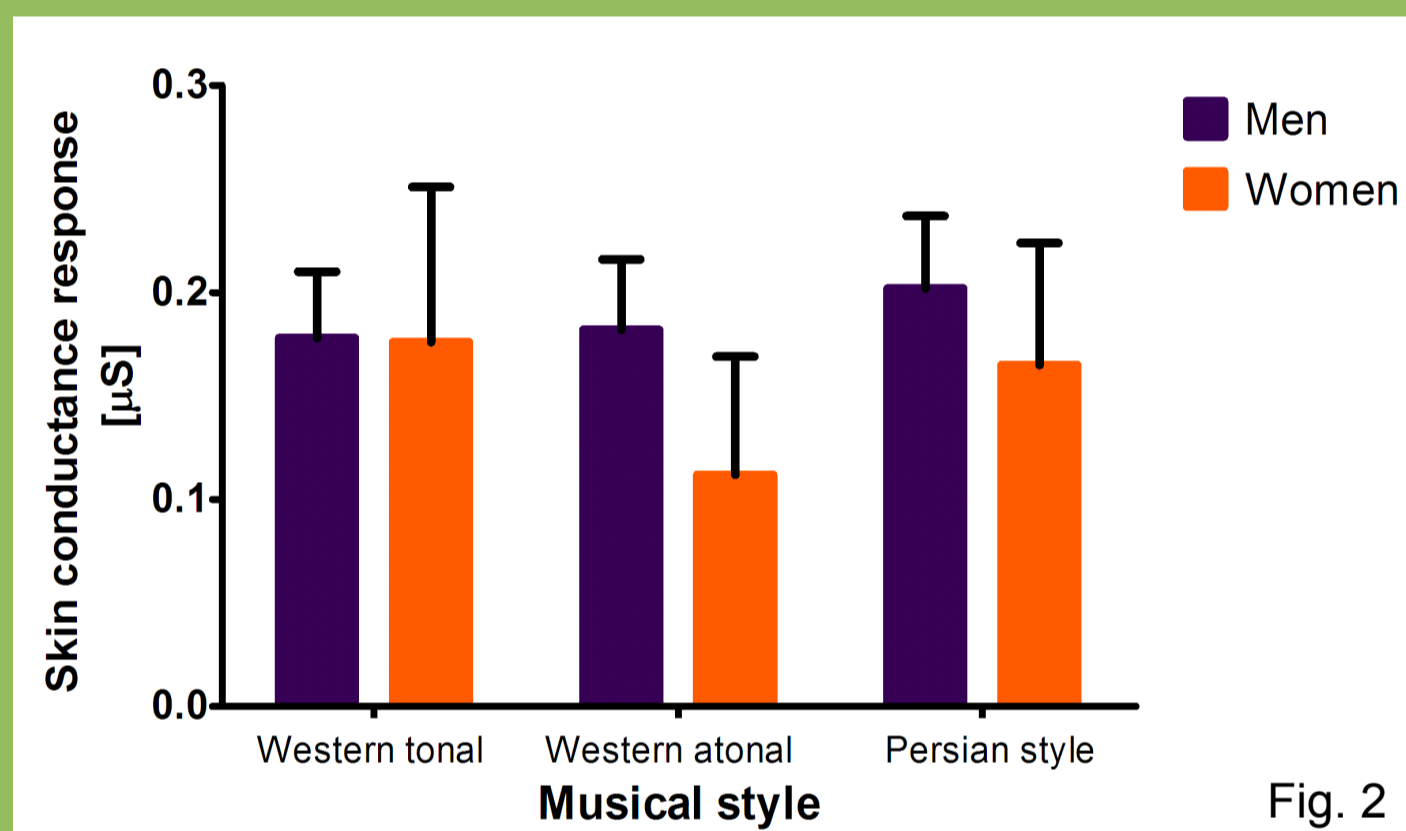
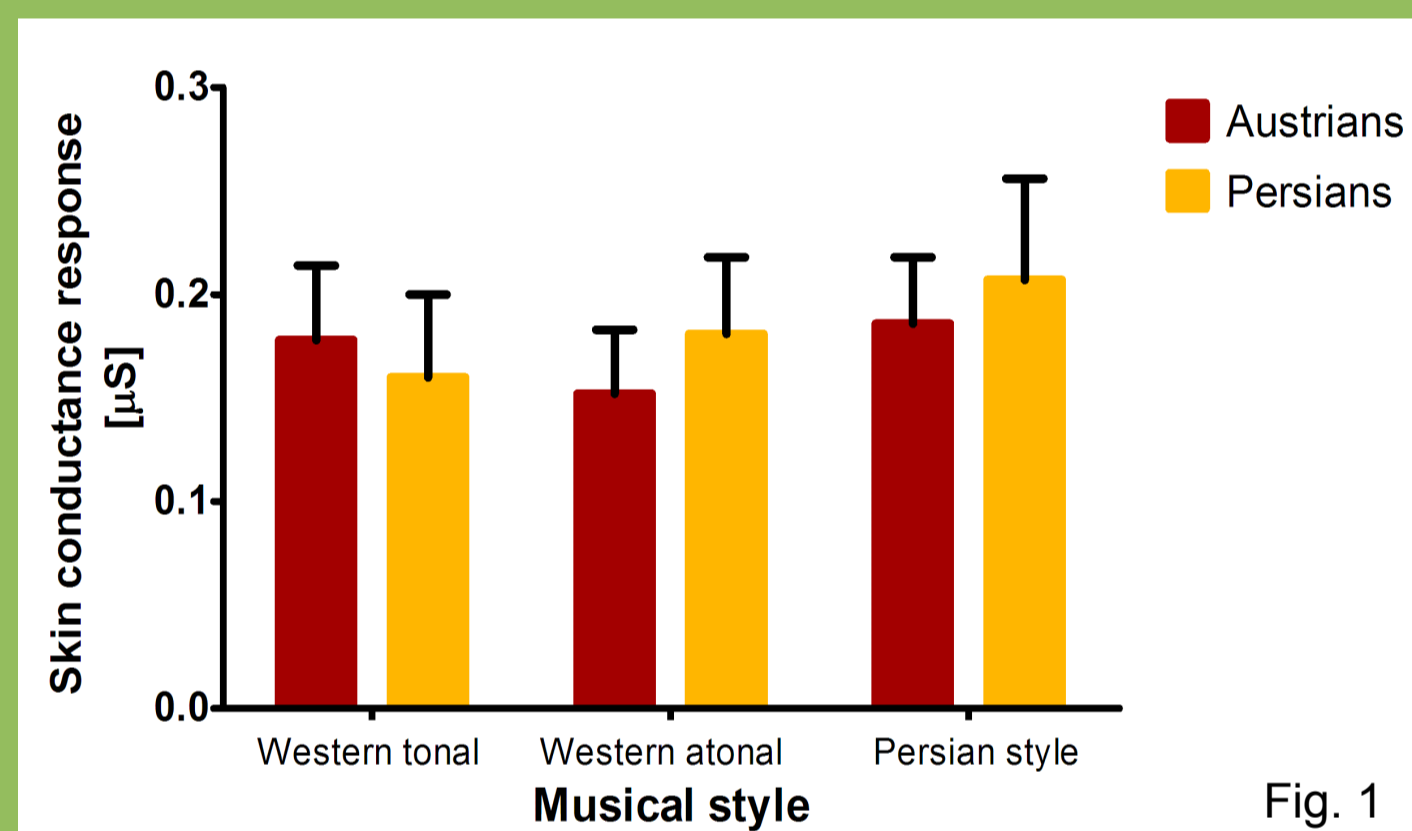
- ratings for each excerpt (computer):
 - familiarity, liking (5-point rating scales)
 - arousal, pleasantness (SAM, 5-point version)
 - emotion word, emotional intensity (1-5)
- questionnaires (in German versions):
 - Beck Depression Inventory (BDI)
 - Multidimensional Mood Questionnaire (MDBF)
 - Stress Reactivity Scale (SRS)
 - Perceived Stress Scale (PSS)
 - NEO-FFI, Scales for the Experience of Emotions (SEE)

SCR measurements:

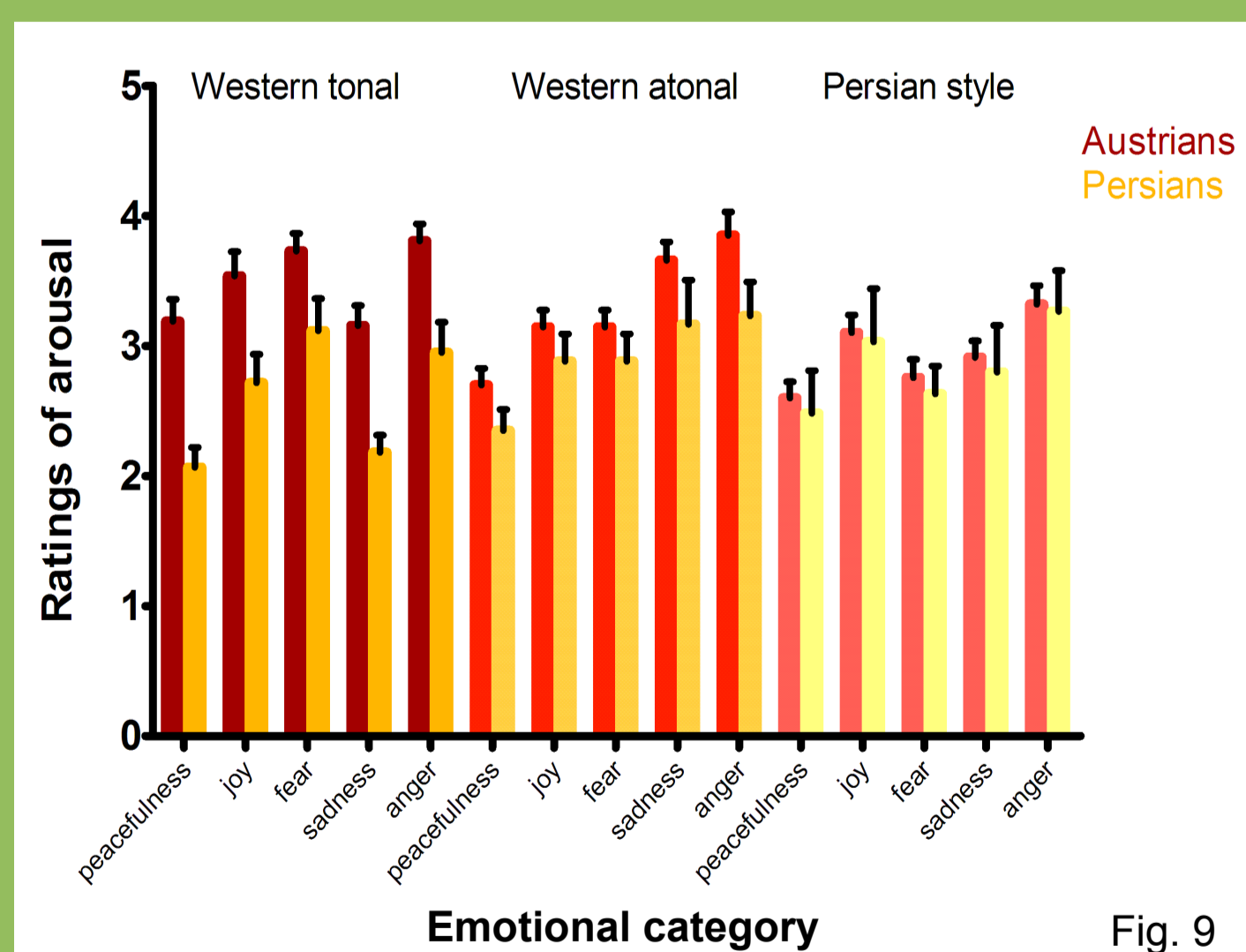
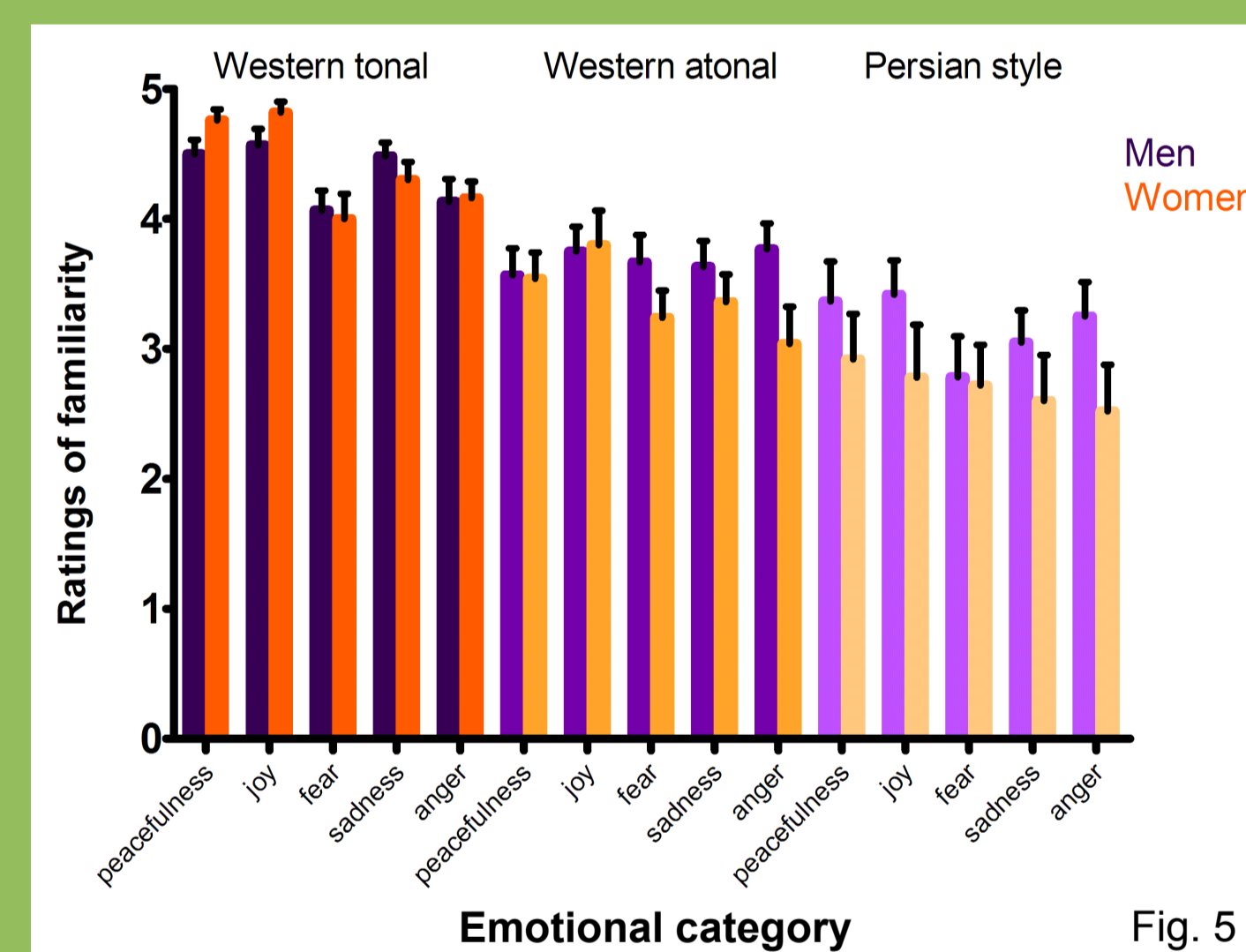
- non-dominant hand
- double-insulated cabin
- Matlab: presentation
- Cassy-Lab: recording
- Ledalab 2.0: evaluation
- min. amplitude: 0.02 μ S
- time window: 1-7 s
- min. responses: 25%
- recordings before ratings

Participants:

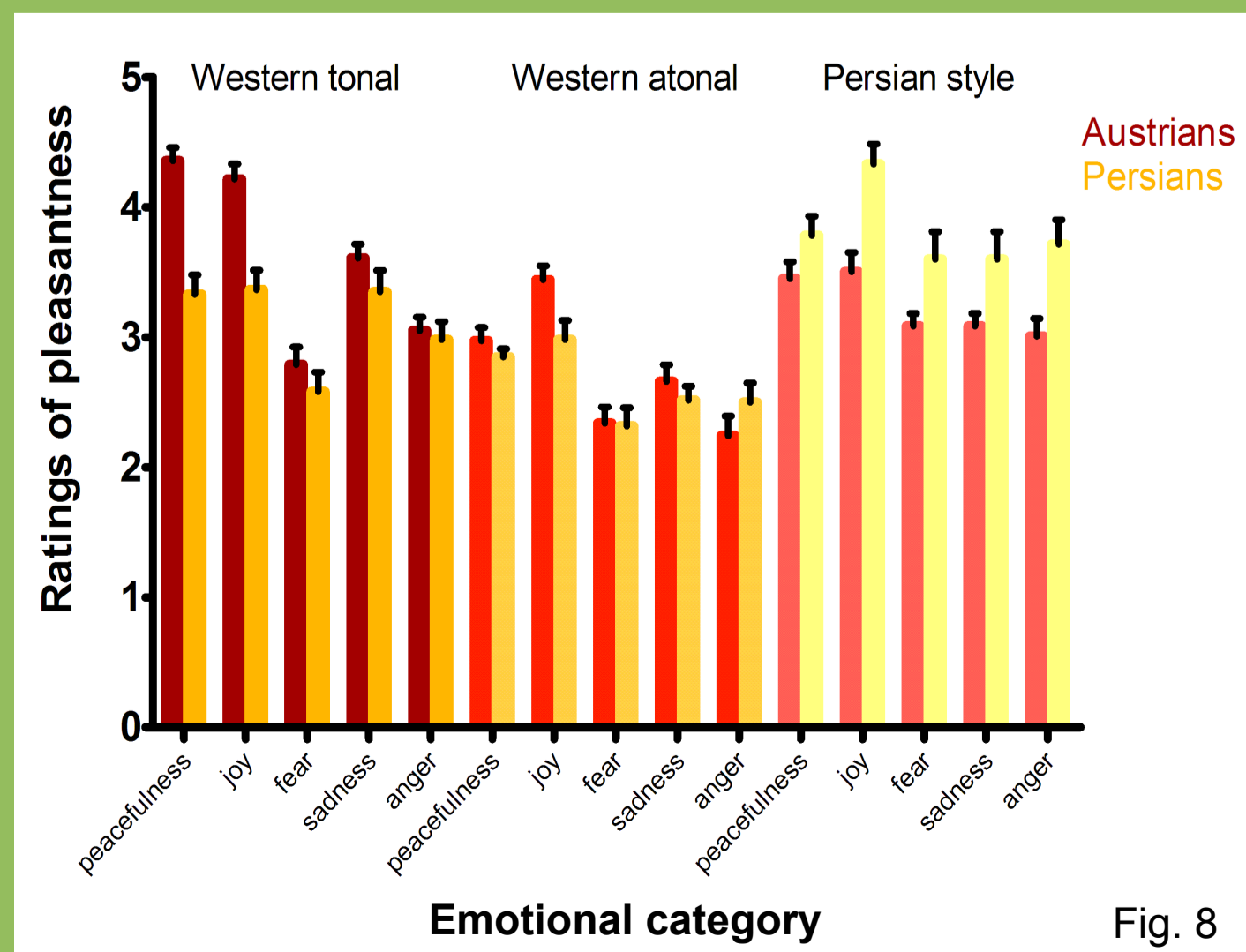
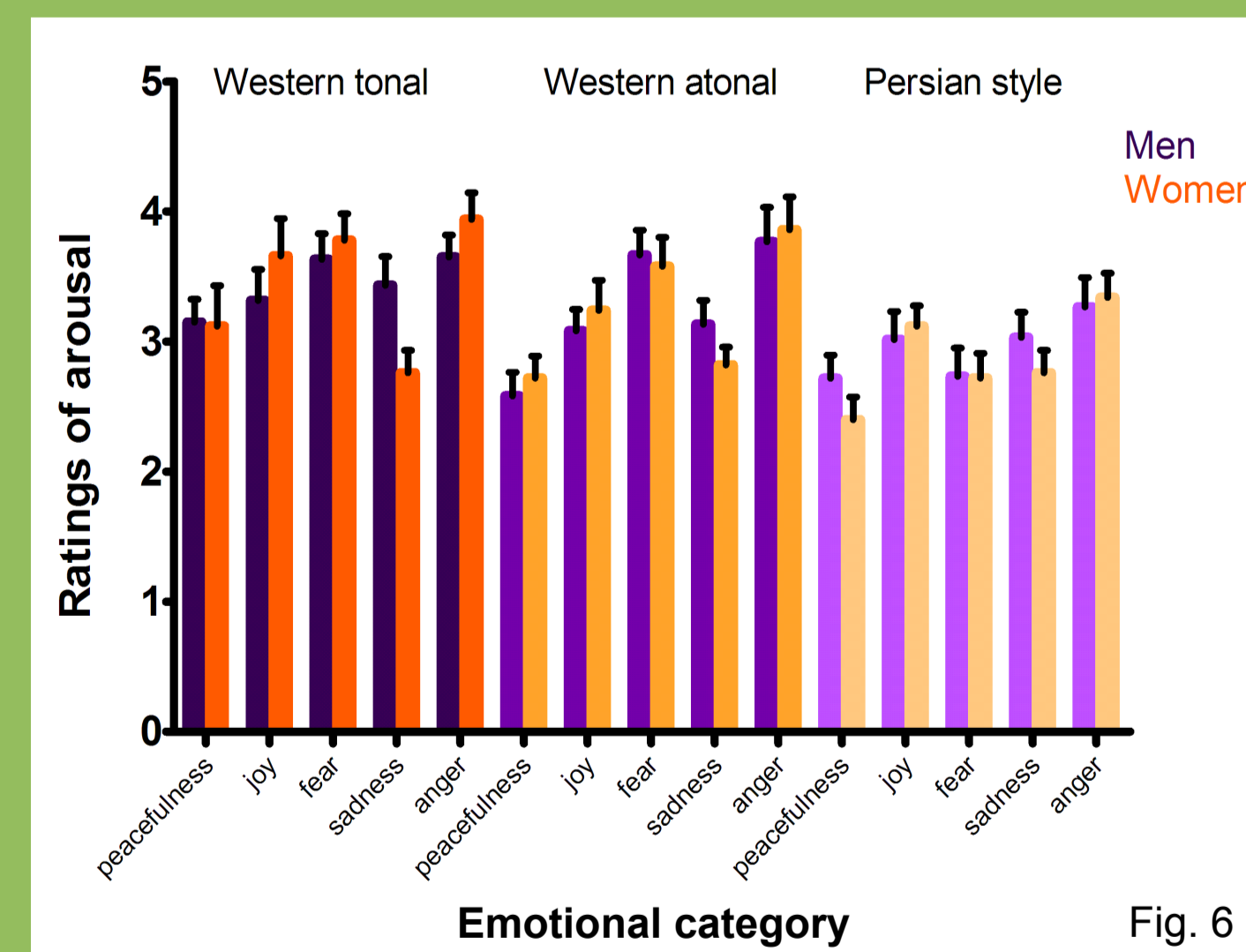
- 29 Austrian participants
 - 13 males, 16 females; mean age: 29.4 years, SD = 4.27
 - equal distribution of non-musicians and amateur musicians
 - like listening to Western classical music
- 18 Persian (Iranian) participants
 - 9 males, 9 females; mean age: 25.9 years, SD = 5.00
 - mainly non-musicians
 - like listening to Persian music
 - average time of residence in Austria: 5.4 years, SD = 2.98
 - good command of German



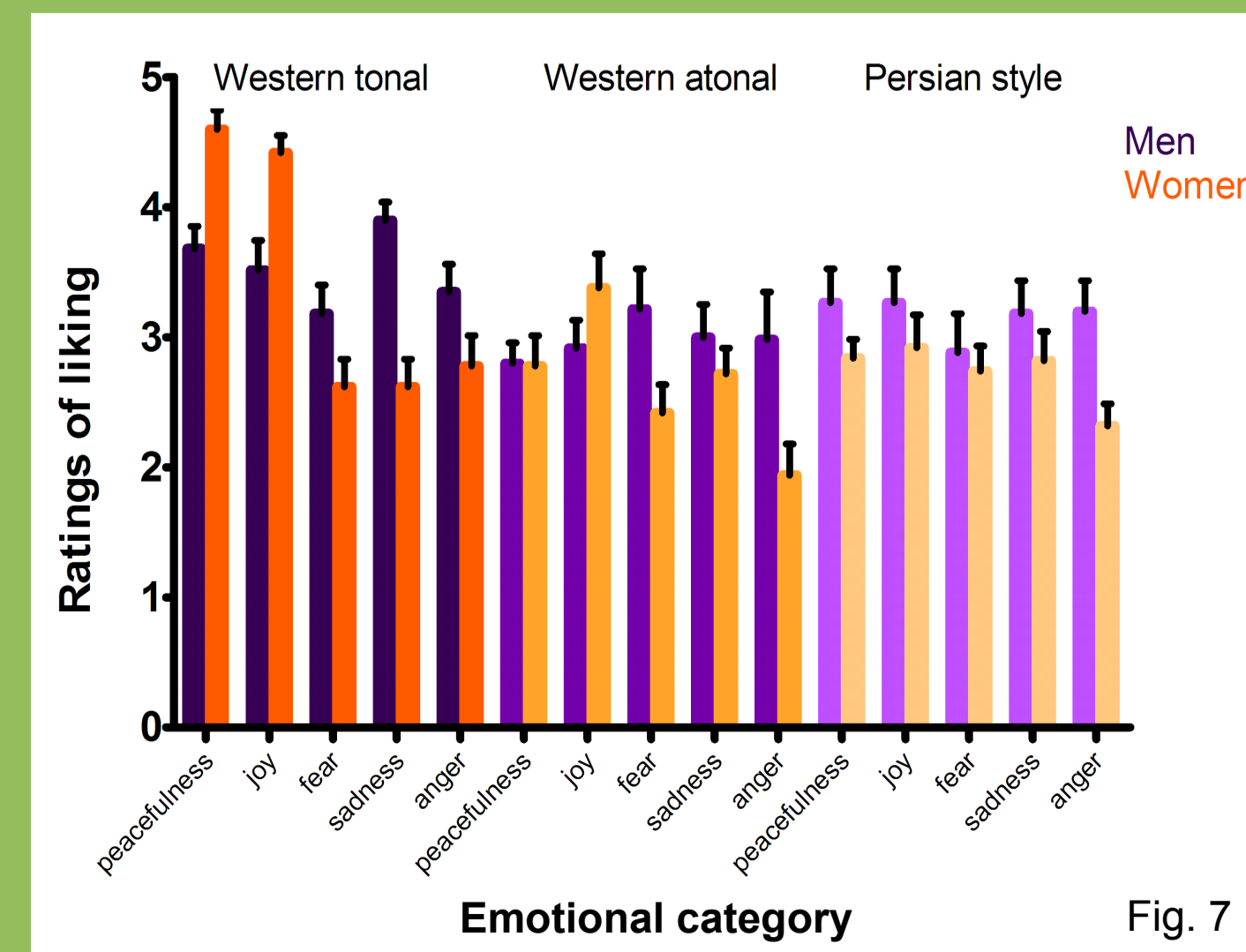
Results & Discussion:	
Questionnaires	Subject characteristics: Differences between Austrians and Persians & Gender differences
NEO-FFI	Persians exhibited higher neuroticism scores, but lower openness, conscientiousness and agreeableness scores than Austrians; Austrian women showed higher neuroticism and conscientiousness scores than Austrian men. No gender differences in Persians.
BDI	No significant difference between Austrians and Persians; no significant gender differences.
SRS	Persians showed higher scores in the post-stress subscale. Austrian women showed higher dispositional stress reactivity than Austrian men in all subscales except for social conflicts. Persian women scored higher than men in only two subscales (social conflicts & work failure).
PSS	Persians perceived more stress in the month before the experiment; no gender differences.
SEE	Persians showed higher "lack of emotion" scores, Austrians exhibited higher emotion acceptance scores. Austrian men exhibited higher scores than women in the subscales acceptance of emotion and control over emotion. No gender differences in Persians.
MDBF	Before listening to the music, Austrians were more relaxed than Persians. After the music presentation, Austrians were in a better mood and more relaxed than Persians. Mood did not significantly change after stimuli presentation within both groups. No gender differences.
Musical preferences	Music played a greater role in Austrian men's lives; they listened more often to Hard Rock.



Familiarity with musical styles differed in Austrians and Persians ($F(2,64) = 28.96, p < 0.001$). Austrians rated Persian music as least familiar, while Persians rated Western atonal music as least familiar. Familiarity with musical styles (see fig. 1) did not significantly influence SCRs ($F(2,60) = 0.94, p > 0.1$). Friedman RM-ANOVA revealed a tendency for an effect of emotional category in Austrians ($\chi^2 = 9.33, df = 4, p < 0.1$) and Persians ($\chi^2 = 8.30, df = 4, p < 0.1$) for the Persian style, indicating that SCRs are sensitive measures of musical emotion elicited by excerpts of 5s duration (Khalfa et al. (2002) used excerpts of 7s duration). In Austrians, gender (see fig. 2) did not significantly affect SCRs to different styles ($F(2,38) = 1.93, p > 0.1$). However, a tendency for a main effect of style ($F(2,16) = 3.33, p < 0.1$), which may be associated with lower SCRs to the Western atonal musical style, was observed in women (see fig. 4). In men (see fig. 3), we found a tendency for an interaction between style and emotional category only ($F(8,88) = 1.9, p < 0.1$).



Subjective ratings of familiarity (see fig. 10) showed an interaction of ethnic group with style and emotional category. Arousal ratings in Austrians and Persians (see fig. 9) exhibited interactions of style and emotional category. Austrians reported less arousal for Persian music; however, SCRs to the Persian style were not lower than to the other styles (see fig. 1). Pleasantness (see fig. 8) and liking ratings showed highly significant interactions between style and emotional category and respective main effects in Austrians and Persians. Western atonal music received the lowest pleasantness ratings. In all musical styles, peacefulness and joy received high ratings of pleasantness in both groups. In familiarity ratings by Austrians (see fig. 5), gender significantly interacted with emotional category ($F(4,80) = 3.15, p < 0.05$) but not with style. In arousal ratings (see fig. 6), we found a similar result ($F(4,84) = 2.97, p < 0.05$). In addition, we observed an interaction between emotional category and style ($F(8,168) = 5.65, p < 0.001$). Ratings of liking (see fig. 7) showed an interaction of gender with style and emotional category ($F(8,168) = 5.16, p < 0.001$). A similar result was obtained for pleasantness ratings. Our results demonstrate that familiarity and gender influence psychophysiological and psychological reactions to music in many subtle ways. Specifically, we observed that unfamiliar music may induce lower ratings of arousal, which may not correlate with SCRs.



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