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Diminished emotion expressivity but not experience in men and women with schizophrenia

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Abstract

Prior studies indicate that men with schizophrenia are less outwardly expressive but report similar emotion experience as healthy people. However, it is unclear whether women with schizophrenia show this same disconnect between expressivity and experience. Men (n=24) and women (n=25) with schizophrenia or schizoaffective disorder and women without schizophrenia (n=25) viewed emotionally evocative film clips and were video recorded to assess facial expressivity. Participants also reported their emotion experience after each clip. Men and women with schizophrenia did not significantly differ from one another in the frequency of facial expressions, but both groups exhibited fewer expressions than women without schizophrenia. People with schizophrenia also reported lower levels of trait expressivity compared to women without schizophrenia. Overall people with schizophrenia did not differ from controls on self-reported emotion experience with one exception: Women with schizophrenia reported more unpleasant emotion than controls. These results indicate that *both* women and men with schizophrenia exhibit fewer outward expressions but experience comparable emotion experience as people without schizophrenia.

Keywords

Emotion; Expressivity; Schizophrenia; Sex differences

One of the most well-replicated findings in schizophrenia over the past 20 years is that people with this disorder do not outwardly express emotions even when they report experiencing the same amount of emotion as people without schizophrenia (e.g., Kring & Moran, 2008). Where differences are observed in reported experience between people with and without schizophrenia, they tend to be in reported arousal (e.g., Trémeau et al., 2009) or incongruent emotion experience (e.g., more negative emotion reported for positive and neutral stimuli; Cohen & Minor, 2010). Unfortunately, nearly all of these studies have been

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done exclusively with men; we know next to nothing about emotional responding in women with schizophrenia.

How few studies have included women? Only 20 out of 61 non-overlapping studies across three meta-analyses of emotion experience in schizophrenia (Cohen & Minor, 2010; Llerena, Strauss, & Cohen, 2012; Yan et al., 2012) included at least 40% women. Of these studies, only five examined sex differences and found no significant sex differences (Berenbaum & Oltmanns, 1992; Habel, Krasenbrink, Bowi, Ott, & Schneider, 2006; Hudry, Saoud, d'Amato, Daléry, & Royet, 2002; Schneider et al., 1995; Volz, Hamm, Kirsch, & Rey, 2003).

With respect to expressivity, only three studies have examined sex differences in schizophrenia. Two studies did not find sex differences (Davison, Frith, Harrison-Read, & Johnson, 1996; Simons, Ellgring, Beck-Dossler, Gaebel, & Wölwer, 2010). However, Davison et al. (1996) did not include a healthy comparison group and included twice as many men as women; Simons et al. (2010) included nearly twice as many men as women and did not assess emotional expressions. Trémeau et al. (2005) found that women with schizophrenia exhibited more facial movements when recalling an emotional event than did men, but did not assess emotion expressions. None of these studies assessed emotion experience. Thus, no study has examined sex differences, emotion expressions, and self-reported emotion experience in schizophrenia.

Understanding emotional responding in women with schizophrenia is important for many reasons. First, women with schizophrenia differ from men on many aspects of the disorder, including a later age of onset, less pernicious course of illness, and less severe negative symptoms (e.g., Leung & Chue, 2000). Perhaps one reason why women with schizophrenia show a less severe illness course is because they do not show this same disconnect between emotion experience and expressivity. On the other hand, men and women may differ in negative symptoms in aggregate, but may not differ on *all* aspects of these symptoms. Negative symptoms are related to worse functional outcome in schizophrenia (Lysaker et al., 2004), and understanding whether there are sex differences in emotional responding, which is central to the expression and motivation/pleasure domain of negative symptoms, is essential for the assessment and treatment of all people with schizophrenia. Second, including equal numbers of men and women with schizophrenia better represents the prevalence of the disorder, which is roughly the same for men and women (McGrath, Saha, Chant, & Welham, 2008). Third, we can determine whether the disconnect between expression and experience reflects something about schizophrenia, or something about sex.

Indeed, multitudes of studies with healthy people find that women are more expressive than men (for reviews see Brody & Hall, 2008; Kret & De Gelder, 2012). Women smile more than men, a finding that persists after accounting for factors such as culture and age (LaFrance, Hecht, & Paluck, 2003). This sex difference holds across different methods, including self-report (e.g., Hess et al., 2000; Simon & Nath, 2004), observer ratings in laboratory settings (e.g., Chentsova-Dutton & Tsai, 2007; Kring & Gordon, 1998) and naturalistic contexts (e.g., Campos et al., 2013), and EMG corrugator and zygomatic response (e.g., Huang & Hu, 2009; Lang, Greenwald, Bradley, & Hamm, 1993). By

contrast, results on sex differences in reported experience are mixed (Brody & Hall, 2008; Hyde, 2014; Stevens & Hamann, 2012). Some studies find that women report more intense emotion experience than men (e.g., Huang & Hu, 2009), while others do not find sex differences (e.g., Kemp, Silberstein, Armstrong, & Nathan, 2004; Kring & Gordon, 1998). The mixed findings likely reflect the variety of methods (e.g., ecological momentary assessment; self-report trait questionnaires; adjective checklists following evocative stimuli) and definitions of emotion experience (e.g., responses to stimuli; retrospective reports across days).

Taken together, these findings suggest two competing hypotheses about emotion expression and experience in women with schizophrenia. First, based on prior studies showing that men with schizophrenia differ in expression but not experience compared to men without schizophrenia, we can hypothesize that women with schizophrenia will show the same pattern. That is, compared to women without schizophrenia, women with schizophrenia will be less expressive but will not differ in reported experience. Second, based on prior studies showing that healthy women are more expressive than men, we can hypothesize that women with schizophrenia will be more expressive than men with schizophrenia yet will not differ in reported experience.

To test these hypotheses, we examined emotion expression and experience in men and women with schizophrenia. Women without schizophrenia were chosen as the control group to examine whether women with schizophrenia would more closely resemble men with schizophrenia (competing hypothesis one) or healthy women (competing hypothesis two). We did not include a male control group as this was not directly relevant to these hypotheses, and several prior studies have demonstrated that men with schizophrenia differ from men without schizophrenia.

Method

Participants

Men (n=24) and women (n=25) with schizophrenia or schizoaffective disorder and women without schizophrenia (n=25) participated. Participants were recruited through community board and care homes, non-profit agencies for people with mental illness, and Craigslist, and screened over the phone. All participants with a history of head trauma, stroke, or neurological disease; a current mood episode; or substance dependence within the past six months or substance abuse within the past month were not invited to participate. Female controls with a current DSM-IV Axis I disorder, previous psychiatric hospitalization, family history of schizophrenia, or who took psychiatric medications were not invited to participate.

Participants did not differ significantly on any demographic variable (see Table 1), with one exception: Women without schizophrenia were significantly younger than women with schizophrenia, t (48) = 2.32, p = 0.03. Age was not significantly correlated with either observed or reported emotion expressivity or reported experience. All but five people (two men, three women) with schizophrenia were taking first- or second-generation antipsychotic medication at time of testing.

Stimuli

Short film clips used in prior studies (Kring & Earnst, 1999; Kring & Neale, 1996) were selected to evoke positive (happiness, amusement), negative (sadness, disgust), or no emotions (neutral). The positive film clips included a scene in which a boy talks to an elderly man about family and a comedy scene in which a husband and wife attempt to repair a house. The negative film clips included a scene in which a man is swarmed by cockroaches and a scene in which two children say goodbye to their dying mother. The neutral film clips included two scenes from a documentary on trains. Participants were randomly assigned to view the clips in one of two orders.

Procedure

After participants completed informed verbal and written consent, diagnoses were confirmed with the Structured Clinical Interview for DSM-IV Patient Version (SCID-P; First, Spitzer, Gibbon, & Williams, 1994) or the SCID-non-patient version (SCID-NP). Symptom ratings were made using the 24-item Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962; Lukoff, Neuchterlein, & Ventura, 1986). A subset of participants (22 women with schizophrenia, 17 men with schizophrenia, 20 women without schizophrenia) completed the Emotional Expressivity Scale (EES; Kring, Alpert, Neale, & Harvey, 1994), a self-report measure of trait-level expressivity (Cronbach's alpha in this sample = .73).

All participants viewed the film clips on a 16.1" LCD laptop screen. They were instructed to start and stop each film by pressing a labeled key on the keyboard. Participants were video recorded with their knowledge and consent while they watched each film, although the camera was unobtrusive.

After each film, participants completed an emotion experience form used in prior studies (e.g., Earnst & Kring, 1999; Kring & Earnst, 1999) that included emotion words equally representing all octants of the affective circumplex covering valence (pleasant and unpleasant) and arousal (low and high) (Larsen & Diener, 1992; Russell & Barrett, 1999). Participants rated the extent to which they felt each of the emotions using a 5-point Likert scale (1 = very little or not at all, 5 = extremely) after watching each film. After viewing all films, participants answered 18 content questions (e.g., "What color were the locomotives?") to assess understanding of the films.

Measures of expression and experience

Facial expressions were coded using the Facial Expression Coding System (FACES; Kring & Sloan, 1991). Trained raters blind to diagnostic status coded the valence (positive or negative) and frequency of facial expressions for each film. Two participants (one woman with schizophrenia and one woman without schizophrenia) watched every film except for the disgust film. We computed the average number of positive expressions during positive films, negative expressions during negative films, and positive and negative expressions during neutral films.

We computed four emotion experience scales: pleasant (e.g., excited, happy, calm), unpleasant (e.g., angry, unhappy, bored), high arousal (e.g., stimulated), and low arousal (e.g., quiet).

Data analytic plan

Separate 3 (Group: Women with schizophrenia, men with schizophrenia, women controls) × 3 (Film Type: Positive, negative, neutral) mixed-effect ANOVAs were used to examine group differences in expressivity and emotion experience. Greenhouse-Geisser corrections are reported when the sphericity assumption (based on Mauchly's Test) was violated. Paired-samples *t* tests with Bonferonni corrections were used to examine within- and between-subjects effects.

Results

Interrater agreement for FACES frequency ratings was computed for a two-way random effects model, in terms of Case 2 intraclass correlation (ICC; Shrout & Fleiss, 1979). Because rater agreement was high, ranging from 0.86 to 0.98 with an average ICC of 0.93, frequency ratings were averaged across raters for analyses.

Men ($M = 14.13$, $SD = 1.87$) and women with schizophrenia ($M = 14.00$, $SD = 2.33$) and women without schizophrenia ($M = 14.80$, $SD = 1.98$) did not significantly differ in the number of correct responses (total possible = 18) to content questions across films, $p > 0.05$, thus indicating comparable understanding of film content.

As shown in Table 1, men and women with schizophrenia did not significantly differ in total BPRS or positive symptoms. However, men exhibited more negative symptoms than women, $t(47) = 2.08$, $p = 0.04$, and women tended to exhibit more depression symptoms than men, $t(47) = 1.90$, $p = 0.06$.

Observed facial expressivity

For observed expressivity, we found a significant group main effect, $F(2, 71) = 7.26$, $p = 0.001$, $\eta_p^2 = 0.17$. As shown in Figure 1, men ($M = 3.07$, $SD = 4.52$) and women ($M = 3.89$, $SD = 3.69$) with schizophrenia did not significantly differ from one another in frequency of facial expressions, $p > 0.05$; however, women without schizophrenia ($M = 7.90$, $SD = 5.84$) exhibited significantly more facial expressions compared to both men ($p = 0.002$) and women with schizophrenia ($p = 0.01$). The Group × Film Type interaction approached significance, $F(2.44, 86.77) = 2.53$, $p = 0.07$, $\eta_p^2 = 0.07$. Healthy women exhibited significantly more expressions than people with schizophrenia ($p < 0.05$) across all films with one exception: Healthy women tended to exhibit more expressions than men with schizophrenia during neutral films ($p = 0.09$). Men and women with schizophrenia did not differ from one another in facial expressivity across all films (p's > 0.05).

The film type main effect was also significant, $F(1.22, 86.77) = 41.01$, $p < 0.001$, $\eta_p^2 = 0.37$. All participants exhibited more facial expressions during negative films ($M = 3.97$, $t(73) = 4.19$) and positive films ($M = 8.22$, $t(73) = 6.86$) compared to neutral films ($M =$

2.66, $p < 0.001$), and more facial expressions during positive compared to negative films, $t(73) = 5.91$, $p < 0.001$.[1]

Trait expressivity

We found a significant group main effect on the EES, $F(2, 56) = 4.34$, $p = 0.02$, $\eta_p^2 = 0.13$, indicating that healthy women ($M = 69.45$, $SD = 10.08$) reported greater trait expressivity than men ($M = 60.47$, $SD = 10.08$, $p = 0.03$) and women with schizophrenia ($M = 61.59$, $SD = 10.83$, $p = 0.05$). Men and women with schizophrenia did not differ in their EES scores, $p > 0.05$. Consistent with observed expressivity results, women without schizophrenia reported being more emotionally expressive compared to both men and women with schizophrenia, and men and women with schizophrenia did not differ from one another.

Emotion experience

Square root transformations were applied because scale scores did not conform to a normal distribution. Raw data are reported in Table 2. Analyses of the pleasant, unpleasant, high arousal, and low arousal scales yielded significant film type main effects (all p's < 0.001, η_p^2 ranging from 0.19–0.43). These indicated that all participants reported the expected emotions for each film (i.e., more pleasant emotion to positive compared to negative or neutral films, more unpleasant emotion to negative compared to positive or neutral films, more high arousal emotion to positive and negative compared to neutral films, more low arousal emotion to neutral compared to positive or negative films).

None of the Group × Film Type interactions were significant. We found one significant group main effect for unpleasant emotion, $F(2, 71) = 3.07$, $p = 0.05$, $\eta_p^2 = .08$. Women with schizophrenia reported more unpleasant emotion compared to women without schizophrenia, $p = 0.05$. All other comparisons were nonsignificant, $p > 0.05$.[2]

Discussion

Prior research on the disconnect between emotion expression and experience in schizophrenia has been done almost entirely with men. In the present study, we found support for the hypothesis that emotional responses of women with schizophrenia would resemble those of men with schizophrenia. Specifically, men and women with schizophrenia did not differ from one another in expressivity, and both groups were less expressive than healthy women. This investigation expands our understanding of emotion in schizophrenia by showing that diminished expressivity is not unique to men, but rather is also observed among women with schizophrenia. Moreover, men and women with schizophrenia reported less trait expressivity than women without schizophrenia. Showing that people with schizophrenia have some awareness of their reduced expressivity is an important step

[1]We had data from 10 men without schizophrenia. Conducting a 3 (film) × 4 (group) mixed-effects ANOVA yielded identical results: Significant film type and group main effects but no significant Group × Film interaction. Follow-up tests indicated that women controls ($M = 7.90$, $SD = 5.84$) were significantly more expressive than men controls ($M = 2.95$, $SD = 1.64$), men with schizophrenia ($M = 3.07$, $SD = 4.52$), and women with schizophrenia ($M = 3.89$, $SD = 3.69$).

[2]When we included our small sample of men without schizophrenia in these analyses, similar main effects of film type and group were found as well as the same significant Group × Film Type interaction. There was a trend that women with schizophrenia reported more unpleasant emotion compared to both women ($p = 0.08$) and men without schizophrenia ($p = 0.07$).

toward translating the observations of discrepancies between expressivity and emotion experience to clinical intervention. For example, people with schizophrenia who are more aware of their diminished expressivity may benefit more from feedback regarding their diminished outward expressions than people who are less aware.

People with schizophrenia did not differ from healthy women in reports of emotion experience, with one exception: Women with schizophrenia reported more unpleasant emotion to all film types (including positive and neutral films) compared to women without schizophrenia. Prior studies show that men with schizophrenia report more unpleasant emotion in response to positive and neutral stimuli compared to men without schizophrenia (Cohen & Minor, 2010). It is unclear why only women with schizophrenia (and not men) showed this pattern. Despite this difference, people with and without schizophrenia reported experiencing the expected emotions for each film type more than other emotions.

One significant limitation of our study is that we had only one control group: Women without schizophrenia. Given that our interest was whether women with schizophrenia would be more similar to healthy women or men with schizophrenia in expressivity, we chose to only include a female control group. We obtained data from a small number of men without schizophrenia (n=10), but we did not include these participants in our main analyses given the unequal sample sizes. Thus, we are limited by the lack of a fully-crossed design in our study, which precluded our ability to fully test interactions between diagnosis and sex. However, many prior studies have compared emotion responding in men with schizophrenia to men without schizophrenia (Kring & Moran, 2008).

There were several methodological advantages to the current study. This is the first study to measure both emotion expressivity and experience in a sample with comparable numbers of men and women with schizophrenia. Second, we measured expressivity in two ways—observer ratings and self-report — and the findings were the same across both measures. Third, the use of emotionally evocative films provides more experimental control than other paradigms, such as recalling an emotional event from memory. All participants viewed the same films and retained similar memory for the films. Fourth, we comprehensively assessed emotion experience by fully measuring the arousal and valence dimensions of emotion. We also measured emotion expressions (positive, negative) rather than facial movements that are not necessarily linked with emotion.

Although there remains little research on emotion experience and expressivity in women with schizophrenia, the present findings begin to fill this gap by showing that men and women with schizophrenia are equivalently inexpressive compared to healthy women and that their representations of trait expressivity is comparable to what others observe. Our findings illustrate the importance of examining emotion components (experience, expressivity) rather than just assessing an aggregate of negative symptoms to more fully understand emotional responding in schizophrenia. In our sample, men had significantly more negative symptoms than women with schizophrenia, but both men and women did not differ in expressivity (either observed or self-reported) or emotion experience. Researchers and clinicians who only examine negative symptoms may unintentionally overlook that women exhibit comparably diminished expressivity in response to emotionally evocative

material as do men. Importantly, there may well be sex-related consequences to the severity of diminished expressivity; for example, this may be more strongly associated with poor social functioning depending on the sex of the person. By continuing to examine these separate aspects of emotion in men and women, we are able to ascertain whether emotional responding has distinct functional correlates for men and women.

Future research can begin to tackle other questions, including whether functioning is related to observed expressivity as well as trait expressivity. Also, future research is necessary to assess the extent to which emotional responding among men and women with schizophrenia may vary depending upon social context. For example, examining sex differences in emotional responding during a social role play task or during spontaneous social interactions will help to constrain the boundary conditions under which men and women with schizophrenia may (or may not) differ.

This study is the first to examine emotion expression and experience simultaneously in men and women with schizophrenia. Our findings indicate that women with schizophrenia, like men, do not outwardly express much emotion, despite reporting similar amounts of emotion as healthy people. Future studies should continue to include equivalent sample sizes of both men and women to further understand all aspects of schizophrenia. Diminished facial expressivity is a potential treatment target that is relevant to both men and women with schizophrenia, and the outcome of such interventions may be mediated by a person's awareness of his or her expressivity.

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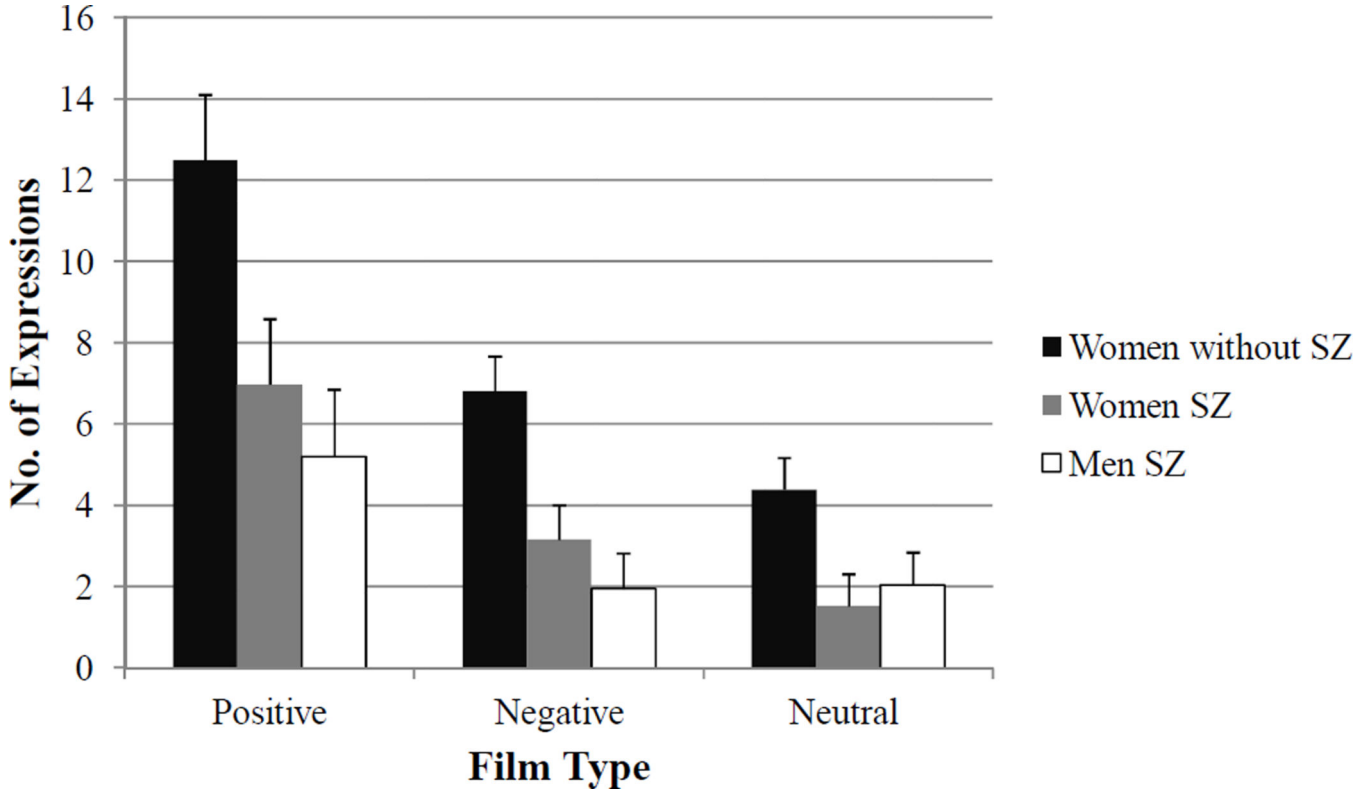

Figure 1.
Average frequency of facial expressions across groups by film type. Errors bars represent standard error.

Table 1

Demographic and clinical characteristics.

	Women SZ (n=25)	Men SZ (n=24)	Women without SZ (n=25)
Age (Mean & SD)	45.76 (9.83)	42.54 (10.86)	39.52 (9.21)
Years of Education (Mean & SD)	13.96 (2.21)	14.17 (3.50)	14.56 (2.55)
Married/Cohabitating	3 (12%)	1 (4%)	10 (40%)
White	10 (40%)	12 (50%)	11 (44%)
African-American/Black	9 (36%)	4 (17%)	7 (28%)
Asian	4 (16%)	3 (13%)	3 (12%)
Hispanic	1 (4%)	4 (17%)	4 (16%)
Other/Multiple Race	1 (4%)	1 (4%)	0 (0%)
Schizophrenia Diagnosis	22 (88%)	18 (75%)	
Schizoaffective Diagnosis	3 (12%)	6 (25%)	
First Generation Antipsychotic	4 (16%)	3 (13%)	
Second Generation Antipsychotic	13 (52%)	16 (67%)	
Multiple Antipsychotics	5 (20%)	3 (13%)	
Age of Onset (Mean & SD)	22.00 (9.24)	22.54 (9.60)	
BPRS Positive (Mean & SD)	2.24 (0.91)	2.29 (0.83)	
BPRS Depression (Mean & SD)	2.22 (0.95)	1.73 (0.83)	
BPRS Negative (Mean & SD)	1.63 (0.74)	2.03 (0.60)	
BPRS Total (Mean & SD)	43.06 (10.19)	42.81 (9.94)	

Note: BPRS = Brief Psychiatric Rating Scale.

Table 2

Means and standard deviations for raw self-reported emotion scales across film types.

Film Type	Self-Reported Emotion Scale	Women SZ	Men SZ	Women without SZ
Positive	Positive	2.62 (0.75)	2.54 (0.81)	2.42 (0.86)
	Negative	1.59 (0.60)	1.45 (0.48)	1.30 (0.25)
	High Arousal	2.39 (0.85)	2.18 (0.87)	1.92 (0.82)
	Low Arousal	1.95 (0.55)	1.87 (0.85)	1.71 (0.64)
Negative	Positive	1.66 (0.77)	1.73 (0.64)	1.36 (0.47)
	Negative	2.13 (0.69)	2.06 (0.69)	1.86 (0.65)
	High Arousal	2.42 (0.89)	2.27 (0.87)	2.11 (1.40)
	Low Arousal	1.96 (0.72)	1.93 (0.78)	1.68 (0.69)
Neutral	Positive	2.16 (0.99)	2.20 (1.00)	1.73 (0.63)
	Negative	2.00 (0.65)	1.74 (0.70)	1.65 (0.60)
	High Arousal	1.75 (0.90)	1.87 (1.02)	1.30 (0.44)
	Low Arousal	2.35 (0.67)	2.34 (0.93)	2.04 (0.83)