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DIFFERENCES IN RECOGNITION OF FACIAL EMOTIONAL EXPRESSIONS BETWEEN BIPOLAR DISORDER, SCHIZOPHRENIA AND HEALTHY GROUPS

Abstract

Recognition of facial emotional expression is one of the main skills for efficient functioning in social situations. But schizophrenia (SZ) and bipolar disorder (BD) patients are facing some deteriorations in this skill. Aim of the current research was to explore differences in recognition of facial emotional expression between BD, SZ and healthy groups. Participants were 150 adults (18 till 65 years old) from Bosnia and Herzegovina, 50 of them were BD outpatients, 50 SZ outpatients and 50 healthy controls. Penn Emotion Recognition test (ER40, Kohler et al, 2004) were used. Statistically significant differences were observed in recognition of facial expression of fear and no emotion between BD and healthy group and SZ outpatient and healthy group. Also differences in recognition of facial expression of fear were obtained when these groups were compared for mild and extreme facial emotion expression. The results of this research, the first of this kind in Bosnia and Herzegovina, confirmed some of the previous research findings by obtaining significant differences in recognition of emotionally neutral faces. When it comes to anger, statistically significant differences between the examined groups were not established, which brought new insight for future research

Keywords: Emotion recognition, facial expression, bipolar disorder, schizophrenia

Introduction

Recognition of facial emotional expressions is the skill of a person to acknowledge and differentiate emotions saw on other people's faces (Yalcin-Siedentopf, et al., 2014). It is considered to be one of the very important skills for successful social functioning. Deficits in this competency are connected to poor functioning in social situations (Erickson & Schulkin, 2003).

Deficits in acknowledge of different emotions, expressed on people faces, are very good established findings in patients with schizophrenia (SZ) (e.g., Lee, Hong, Shin, & Kwon, 2015) and also in bipolar disorder (BD) patients (e.g., Samamé, Martino, & Strejilevich, 2011). This is not a surprise if we take into consideration that both disorders are connected to different abnormalities in few brain regions,

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like the ventromedial prefrontal cortex. Those regions are important for abilities that are cognitive in their nature and which outcomes are expressed in social situations (Delvecchio, Sugranyes, & Frangou, 2012).

Many researchers were interested to investigate differences in recognition of emotion that are expressed on someone's face and impairment in schizophrenia patients, so studies results in this field have shown that SZ patients performance on facial emotion recognition tasks were worse when they were compared to healthy control subjects (Muzekari & Bates, 1977; Morrison, Bellack & Mueser, 1988). Also, emotion recognition deficits are believed to persevere beside the SZ acute phases and into periods of recovery and remission (Harvey, Patterson, Potter, Zhong, & Brecher, 2006), suggesting that there is a present feature of emotion recognition deficit in the SZ patients.

Problems in emotional expression in SZ patients have been found in the early portrayed of schizophrenia (Bleuler, 1911). Studies showed that SZ patients performed worse compared to patients with affective psychosis and healthy people or control participants, primarily in recognition of emotions of fear and sadness (Edwards, Pattison, Jackson, & Wales, 2001).

Those deficits in processing emotions can be caused by problems in mesial temporal brain regions. Those problems were observed in SZ patients and it was shown that they are important in recognition of fear emotion, which is impaired in SZ (Gur, et. al., 2000).

According to the research conducted by Kohler, et. al. (2003) SZ patients performed worse compared to the control participants on acknowledge all fundamental emotions and neutral faces. This also included variations of mild and extreme facial emotional expressions. When the focus was on the individual emotions, SZ patients showed more problems and they had worse performance in recognition of fear, disgust, and no emotional expressions. Also for all emotions that were researched, except disgust, extreme intensity facial expressions were better recognized than mild intensity emotions expressions.

Impairment in the same field was also noted in bipolar disorder (BD) (Kohler, Hoffman, Eastman, Healey, & Moberg 2011). Some studies (Summers, Papadopoulou, Bruno, Cipolotti, & Ron 2006) pointed out that deficits in BD emotion recognition can be just for some emotions, like anger, but usually more generalized deficits in emotion recognition have been found in research like one conducted by Derntl and colleagues (2009). Results of studies conducted about facial emotion recognition performance in BD outpatients showed great distinctions. So Yurgelun-Todd et al. (2000) research results showed that there were no deficits in acknowledge of happiness, but they observed wantage in fear recognition. On the other side, Venn, et. al. (2004) reported no impairment in recognition of facial emotions in the BD outpatients. Beside this, other study (Harmer, Grayson, & Goodwin, 2002) showed increased receptivity that was observed in BD outpatients in the recognition of disgust. But in research conducted by Kim, et. al. (2016) BD patients expressed impairments in recognition of disgust, anger, fearful and no emotions faces compared to healthy groups.

However, there is also a gap in agreement about whether the severity of symptoms in BD patients has an influence on facial emotion recognition. Results of some of the research show no correlation (Venn et al., 2004), but on the other side, there are studies in which researchers observed negative correlations between manic symptoms in BD patients and their recognition of negative emotions (Harmer, Grayson, & Goodwin, 2002). Besides this Gray, et. al. (2006) notified about negative correlations between receptivity in recognizing happiness and depressive symptoms and on the other side about positive correlations between depressive symptoms and recognition of sadness.

Few studies that deliberated to compare SZ and BD patients show higher facial emotion processing deficits in SZ than BD (Goghari & Sponheim, 2013). According to a study conducted by Yalcin-Siedentopf, et. al. (2014) compared to healthy groups, SZ patients showed deficits in the recognition of the following expressions: angry, disgust, sadness and happiness, on the other side patients with BD diagnoses showed deficits just in disgust and happy facial expressions recognitions.

Besides few studies that are conducted in order to investigate the difference in this skill comparing SZ and BD patients (e.g. Goghari & Sponheim, 2013), the majority of the studies are focused either on bipolar disorder (e.g. Kohler, Hoffman, Eastman, Healey, & Moberg 2011) or on schizophrenia (e. g. Lee, Hong, Shin, & Kwon, 2015). So there is still a gap in studies that are focusing on comparing SZ and BD patients groups between themselves and with healthy groups. Also, a majority of previously mentioned studies were conducted with inpatients and not including outpatients. Lastly best to our knowledge in Bosnia and Hercegovina, this kind of study was not conducted.

The aim of the current research was to explore differences in recognition of facial emotional expression between bipolar disorder, schizophrenia and healthy groups.

Methods

Sample and procedures

In the present study, participants were 150 adults age range from 18 to 65 years from Bosnia and Herzegovina. From the total number of participants, 50 were bipolar disorder outpatients, 50 schizophrenia outpatients and 50 healthy controls.

Table 1
Demographic information form descriptive data

Variables	Groups		
	SZ	BD	healthy
N	50	50	50
Mean age (SD)	43.7 (4.72)	45.6 (5.43)	34.5 (4.21)
Gender			
Female	29	23	27
Male	21	27	23
Place of living N(%)			
Urban area	28 (56%)	31 (62%)	38 (76%)
Rural area	22 (44%)	19 (38%)	12 (24%)
Marital status N(%)			
Single	17 (34%)	15 (30%)	18 (36%)
Living with the partner	2 (4%)	1 (2%)	6 (12%)
Married	17 (34%)	17 (34%)	19 (38%)
Divorced	8 (16%)	10 (20%)	7 (14%)
Widow	6 (12%)	7 (14%)	0 (0%)
Education N(%)			
Elementary school	15 (30%)	14 (28%)	4 (8%)
Secondary school	25 (50%)	26 (52%)	23 (46%)
Bachelor degree	7 (14%)	8 (16%)	15 (30%)
Master degree	3 (6%)	2 (4%)	5 (10%)
PhD	0 (0%)	0 (0%)	3 (6%)
Employment status N(%)			
Part time employed	11 (22%)	10 (20%)	10 (20%)
Full time employed	9 (18%)	8 (16%)	24 (48%)
Unemployed	23 (46%)	24 (48%)	16 (32%)
Retired	7 (14%)	8 (16%)	0 (0%)
Income level N(%)			
Low	24 (48%)	22 (44%)	12 (24%)
Middle	18 (36%)	22 (44%)	25 (50%)
High	8 (16%)	6 (12%)	13 (26%)

Outpatients were recruited from Psychiatry Clinic, Clinical Center University of Sarajevo, Bosnia and Herzegovina. All outpatients have been diagnosed with SZ or BD disorder by the Diagnostic and Statistical Manual of Mental Disorders V (DSM-V) and healthy groups were recruited from a healthy population without a diagnosis of BD or SZ and without a family history of same or other psychiatry disorders. This study was approved by the local ethic committee and participants' written informed consent was collected.

Firstly, all participants were asked to read and sign an informed consent and then those participants were evaluated using the Structured Clinical Interview for DSM-5 (SCID-5) to confirm their diagnoses or absence of diagnoses in the

case of healthy control participants. As next step participants were asked to fill demographic information form questionnaire that was designed for purpose of this study. Finally, facial emotion recognition was measured by asking all participants to individually take part in (ER40).

Instruments

SCID-5 is a semi-structured interview guide that is usually used together with DSM-5 as a supplement in confirmation of the diagnoses (APA, 2013).

Penn Emotion Recognition Test (ER40) is used to evaluate recognition of facial expressions of emotion (Kohler, Turner, Gur, & Gur, 2004). A version of the ER40 used in this research includes 40 photos (in color) of stationary faces expressing happy, sad, anger, fear, and neutral expressions. There were eight neutral faces and also for each of four observed emotions there were also eight faces. Besides this half of them were mild and another half was extreme emotional expressions. Also, those color photographs were balanced for actor gender and ethnicity and they included 21 white and 19 non-white faces.

Each correct answer was scored as 1 point and incorrect one was scored as 0 point. According to this, the highest total score was 40 and the lowest was 0. Also, higher scores refer to better recognition of emotional expressions. Besides this individual subscale scores were also taken into consideration for all emotions that were studied. Here the highest score for each subscale was 8 points and the lowest was 0 points (Gur, et. al., 2002). Also, in the current study scores for mild and extreme emotion expression were calculated for each observed emotional expression.

Data were analyzed and results were obtained using IBM SPSS Statistics for Windows, Version 25.0.

Results

Test results on emotion recognition from three groups (BD outpatients, SZ outpatients, and healthy group) were compared and analyses of variance (ANOVA) were conducted, accompanied with Fisher's Least Significant Difference (LSD) post-hoc test that was set at $p < .05$ significant level.

First, three participant groups were compared on total emotion recognition scores (see Table 2.), then they were compared on mild (see Table 3.) and extreme (see Table 4.) emotions recognition scores.

Table 2
ANOVA and post-hoc test results for total emotions recognition scores

Emotions	ANOVA			Post-hoc test (p-values)					
	SZ	BD	Healthy	F	df	p	BDvsH	SZvsH	BDvsSZ
Happiness	M(SD) 7.74(0.60)	M(SD) 7.62(1.01)	M(SD) 7.82(0.63)	0.86	2,15	.426	.132	.328	.105
Sadness	6.38(1.35)	6.26(1.54)	6.66(1.17)	1.14	2,15	.324	.237	.356	.261
Anger	4.50(1.37)	4.22(1.21)	4.72(1.13)	2.05	2,15	.132	.616	.241	.477
Fear	4.90(1.92)	5.02(1.53)	6.16(1.17)	9.81	2,15	.000***	.003**	.004**	.151
No emotion	5.58(2.28)	5.40(2.38)	6.48(1.59)	3.75	2,15	.026*	.012*	.017*	.613

Note. SZ-schizophrenia outpatients, BD-bipolar disorder outpatients, H-healthy group

* $p < .05$; ** $p < .01$; *** $p < .001$

In Table 2 results of the total emotion recognition scores were presented for each observed emotion. As it can be seen that highest mean score on measurement of each emotion was observed in the healthy group. In the SZ outpatient group means of four (happiness, sadness, anger and, no emotion) out of five accuracy of emotion expressions recognition were higher compared to the BD group. Overall between group ANOVA results showed statistically significant differences in recognition of fear ($F(2,15) = 9.81, p < .001$) and no emotion ($F(2,15) = 3.74, p < .01$). But significant differences were not observed for happiness, sadness and anger.

When BD ($M=5.02, SD=1.53$) and healthy group ($M=6.16, SD=1.17$) were compared in post-hoc test statistically significant differences ($p < .01$) were found in emotion recognition of fear. Also, between BD ($M=5.40, SD=2.38$) and the healthy group ($M=6.48, SD=1.59$) statistically significant differences ($p < .05$) were observed in case of no emotion.

When SZ ($M=4.90, SD=1.92$) and healthy group ($M=6.16, SD=1.17$) were compared, statistically significant differences were observed in recognition of fear ($p < .01$), also between SZ ($M=5.58, SD=2.28$) and healthy group ($M=6.48, SD=1.59$) significant difference were observed on the no emotion ($p < .05$).

But when BD and SZ groups were compared, no statistically significant differences in recognition of any of the five observed emotions were obtained.

Table 3
ANOVA and post-hoc test results for mild emotions recognition scores

Emotions- mild	ANOVA						Post-hoc test (p-values)		
	SZ	BD	Healthy	F	df	p	BDvsH	SZvsH	BDvsSZ
	M(SD)	M(SD)	M(SD)						
Happiness	6.94(0.82)	6.82(1.21)	7.54(0.83)	0.75	2,15	0.563	0.042	0.295	0.119
Sadness	5.88(1.45)	5.86(1.43)	6.56(1.18)	1.05	2,15	0.428	0.117	0.478	0.371
Anger	4.33(1.38)	4.12(1.32)	4.62(1.43)	2.15	2,15	0.156	0.546	0.341	0.587
Fear	4.68(1.82)	4.92(1.67)	6.11(1.07)	8.72	2,15	0.000**	0.002**	0.003**	0.243

Note. SZ-schizophrenia outpatients, BD-bipolar disorder outpatients, H-healthy group;

* $p < .05$; ** $p < .01$; *** $p < .001$

In the Table 3 results of the mild emotions recognition scores were presented for each observed emotion. As it can be seen the highest mean score on measurement of each mild emotion recognition was observed in the healthy group. Also between group ANOVA results showed statistically significant differences in recognition of mild expression of fear ($F(2, 15) = 8.72, p < .001$).

Then when BD ($M=4.92, SD=1.67$) and healthy group ($M=6.11, SD=1.07$) were compared statistically significant differences were found in recognition of mild expression fear ($p < .01$).

Also, when SZ ($M=4.68, SD=1.82$) and healthy group ($M=6.11, SD=1.07$) were compared significant differences were found in mild emotion recognition of fear ($p < .01$).

But when BD and SZ groups were compared, no statistically significant differences were found in recognition of any of the five mild emotions that were observed.

Table 4
ANOVA and post-hoc test results for extreme emotions recognition scores

Emotions- extreme	ANOVA						Post-hoc test (p-values)		
	SZ	BD	Healthy	F	df	p	BDvsH	SZvsH	BDvsSZ
	M(SD)	M(SD)	M(SD)						
Happiness	7.34(0.71)	7.22(1.11)	7.68(0.73)	0.65	2,15	.354	.157	.398	.254
Sadness	6.13(1.40)	6.06(1.49)	6.61(1.17)	1.29	2,15	.438	.134	.387	.578
Anger	4.42(1.38)	4.17(1.27)	4.68(1.28)	2.35	2,15	.198	.646	.351	.653
Fear	4.79(1.87)	4.97(1.60)	6.14(1.12)	8.81	2,15	.000**	.006**	.004**	.312

Note. SZ-schizophrenia outpatients, BD-bipolar disorder outpatients, H-healthy group

* $p < .05$; ** $p < .01$; *** $p < .001$

In Table 4 results of the extreme emotion recognition scores were presented for each observed emotion. The highest mean score on measurement of each extreme emotion was observed in the healthy group. Overall between group ANOVA results showed significant differences in recognition of fear ($F(2, 147) = 8.81, p < .001$).

When BD ($M=4.97, SD=1.60$) and healthy group ($M=6.14, SD=1.12$) were compared statistically significant differences were found in recognition of extreme expression of fear ($p < .01$).

Besides this when SZ ($M=4.79, SD=1.87$) and healthy group ($M=6.14, SD=1.12$) were compared significant differences were found in recognition of extreme expression of fear ($p < .01$).

However, when BD and SZ groups were compared, no statistically significant differences on any of the five extreme emotion recognition were observed.

Discussion

In the research conducted by Ruocco, et. al. (2014) healthy groups compared to SZ and BD patients showed significant deficits in emotion recognition, in particular in the case of neutral and angry faces. Besides this in the same research it was found that fearful, happy and sad faces were better recognized by BD patients compared to SZ patients.

Results of the current research partly confirm previously mentioned research results and found statistically significant differences for neutral or no emotion faces, but in recognition of the angry faces statistically significant differences were not found. Also in the current research there were statistically significant difference for recognition of fearful faces, which was not the case in the previously mentioned research. But Kohler, et. al. (2003) found significant differences in emotion recognition of all basic emotions, including fear and in the current research impairment in fear recognition were confirmed but differences were not found for happiness, sadness and anger. Also, some other research (Penn, et. al., 2000) suggested that individuals with SZ and BD are impaired in their ability to recognize the facial emotion expression of others and that this deficit can be more expressed in the acute compared to patients in remission. Because in the current study impairment was found just for fear and no emotion and it was conducted with outpatients which were in the remitted phase of their illness this can be part of the explanation why slightly different results were obtained compared to previous research (Ruocco, et. al., 2014).

Besides this when SZ and BD groups were compared statistically significant differences were not found for any of the observed emotions. Also, when attention is paid to the mean scores, higher mean scores, which means better recognition of emotions, were observed in SZ compared to the BD group. This is contrary to previous research (Ruocco, et. al., 2014) because it was found that BD patients

perform better when they were compared to SZ patients.

However, results of the research that included healthy participants showed consistently in emotional recognition of happiness, which is the most easily identified emotion, even at low levels of intensity (Hess, Blairy, & Kleck, 1997). In the current research, it was found that mean scores for happiness were the highest in all three observed groups which are in the line with previous research. Another research (Kohler, Turner, Gur, & Gur, 2004) suggest that after happiness most accurately recognized were neutral expressions, then fear, sadness, anger, and lastly disgust expressions. In the current research according to mean results after happiness, most accurately were recognized sadness, no emotion, fear and lastly anger.

Also, according to Kohler, et. al. (2004) recognition of extreme intensity of emotion expressions for all emotions, except disgust, was better compared to the mild intensity emotions expression. In the current research higher mean scores were observed in all three groups in extreme emotional expression (see Table 4) compared to mild emotions expressions (see Table 3). Also in both mild and extreme emotion expression conditions statistically significant differences were found for fear when SZ and healthy and BD and healthy groups were compared.

However few limitations should be taken into consideration while trying to interpret the results of this study. All possible emotional expressions were not investigated and the focus was just on basic emotions that were already quite extensively studied in patients with psychiatry disorders. So, for example disgust as an emotion was not examined and in some previous research (e.g. Harmer, Grayson, & Goodwin, 2002) statistically significant differences were observed in disgust when healthy and SZ and BD patients groups were compared. Besides this SZ and BD outpatients included in this study may not be quite representative participants for further generalization, because they voluntarily accepted to take part in the research and come to the hospital. Also detailed diagnoses, course of the illness and medication that they are currently taking were not analyzed. Lastly, location on which research was conducted was the hospital which may have an influence on the results and for the future research it should be considered to conduct it in the different location.

Conclusions

According to the study results, two out of three hypotheses that were set were partly confirmed. So statistically significant differences in emotional recognition of facial expressions between bipolar disorder outpatients and healthy group and between schizophrenia outpatients and healthy group were found. These differences were observed just in the case of two (fear and no emotion) out of five expressions (happiness, sadness, anger, fear and no emotion). These results were partly in the line with previous studies (e.g. Ruocco, et. al., 2014), but not completely because differences were not found for happiness, sadness and anger.

On the other side, statistically significant differences in emotional recognition of facial expressions between bipolar disorder and schizophrenia outpatients were not found. This gives new insight for future research.

When the focus was on the intensity of emotion expression statistically significant differences in fear were observed in both mild and extreme emotional expression between SZ and healthy group and BD and healthy group.

Also at the same time, it should be noted that his study had some methodological limitations because not all emotions were observed, and there is a question about the representativeness of the sample and the effect of the hospital as a location in which the study was conducted.

Lastly, this was a preliminary study that was for the first time conducted in Bosnia and Herzegovina and it open some questions for future research.

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