

Comparison of facial expression in patients with obsessive-compulsive disorder and schizophrenia using the Facial Action Coding System: a preliminary study

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Background: Research shows that impairment in the expression and recognition of emotion exists in multiple psychiatric disorders. The objective of the current study was to evaluate the way that patients with schizophrenia and those with obsessive-compulsive disorder experience and display emotions in relation to specific emotional stimuli using the Facial Action Coding System (FACS).

Methods: Thirty individuals participated in the study, comprising 10 patients with schizophrenia, 10 with obsessive-compulsive disorder, and 10 healthy controls. All participants underwent clinical sessions to evaluate their symptoms and watched emotion-eliciting video clips while facial activity was videotaped. Congruent/incongruent feeling of emotions and facial expression in reaction to emotions were evaluated.

Results: Patients with schizophrenia and obsessive-compulsive disorder presented similarly incongruent emotive feelings and facial expressions (significantly worse than healthy participants). Correlations between the severity of psychopathological condition (in particular the severity of affective flattening) and impairment in recognition and expression of emotions were found.

Discussion: Patients with obsessive-compulsive disorder and schizophrenia seem to present a similarly relevant impairment in both experiencing and displaying of emotions; this impairment may be seen as a chronic consequence of the same neurodevelopmental origin of the two diseases. Mimic expression could be seen as a behavioral indicator of affective flattening. The FACS could be used as an objective way to evaluate clinical evolution in patients.

Keywords: schizophrenia, obsessive-compulsive disorder, facial expression, Facial Action Coding System

Introduction

The ability to identify and express emotions through facial expression is an essential component of human communication and social interaction. The manifestation of a facial expression consequent to an emotion is a complex process that involves functions different from those involved in voluntary movement of facial muscles.^{1,2} Six universal emotions have been established, including amusement, sadness, anger, fear, disgust, and surprise, each of which corresponds to a specific arrangement of facial muscles and has partially separable neurocircuitry processes.³

The elaboration of facial emotions involves specific neuronal systems, including the ventromedial prefrontal cortex, orbitofrontal cortex, fusiform gyrus, inferior

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temporal gyrus, amygdale, ventral striatum, hippocampus, and dorsomedial nucleus of the thalamus.^{4,5} Moreover, it is known that the right hemisphere is more involved in the expression of emotion than the left.^{6–8}

The Facial Action Coding System (FACS) of Ekman and Friesen⁹ is one of the most widely used instruments in the analysis of facial expression. It is based on an anatomical analysis of facial action through the codification of facial expression into 44 “action units.” Action units are anatomically defined, and represent the basic repertoire of human facial expressions. Using FACS, the intensity and variety of facial movements can be observed objectively. It has been repeatedly reported that psychiatric patients and especially patients with schizophrenia show characteristic facial activities,^{10–15} such as reduced levels of facial expressivity compared with healthy controls in reaction to emotional stimuli,^{16–18} during social interactions,¹⁹ and/or as a result of the effects of medication.²⁰

Several studies have evaluated the facial expression of patients with schizophrenia in response to appropriate emotive stimuli using the FACS as a rating system of the emotions expressed, reporting that treatment with neuroleptics induces a deficit in the recognition and expression of emotions,²¹ mainly related to the upper face,¹⁶ and to specific emotions such as amusement, pain, anger, fear, and disgust.²² Further, it was found that reduction in facial expressions in response to emotive stimuli was correlated with the presence of negative symptoms, in particular with affective flattening^{7,23} and that there was no effect of gender with regard to facial expression in schizophrenia.²⁴ Just one study evaluated facial expressiveness in patients with obsessive-compulsive disorder using FACS; Mergl et al²⁵ found that execution of adequate facial reactions to humor was abnormally slow in patients with obsessive-compulsive disorder and correlated with severity of symptoms.

Use of video clips to elicit specific emotions has a long history in clinical psychology and psychiatry;²⁶ Gross and Levenson systematized this issue, selecting and validating 16 films that successfully elicited amusement, anger, contentment, disgust, sadness, surprise, fear, and a neutral state.²⁷ Several studies using movie clips to elicit emotions in patients with schizophrenia have reported a diminished emotional response in comparison with healthy controls,¹³ and just one study investigated this issue in patients with obsessive-compulsive disorder.²⁵

Obsessive-compulsive disorder and schizophrenia are considered to have common neurodevelopmental

origins, and comorbidity between these two disorders is quite frequent.²⁸ The objective of this study was to evaluate emotivity, expressed through facial expression, in patients with schizophrenia and obsessive-compulsive disorder in relation to specific emotional stimuli. We hypothesize that both diseases may present with significantly impaired perception and expression of emotions in comparison with healthy controls, suggesting an additional common pathological element between schizophrenia and obsessive-compulsive disorder.

Materials and methods

Participants

The sample consisted of outpatients recruited at the A Fiorini Hospital of Terracina, Sapienza University of Rome, and healthy controls. After signing an written informed consent form, patients underwent a structured clinical interview according to the SCID-I model²⁹ and the criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision. They were then divided in two groups, ie, patients suffering from obsessive-compulsive disorder ($n = 10$) and those suffering from schizophrenia ($n = 10$, Table 1). Patients with significant neurological diseases, other Axis 1 diagnoses, tardive dyskinesia, a history of abuse of alcohol or other drugs of abuse, or on treatment with typical antipsychotics were excluded from the study.

Study design

The first stage of this study required participants to be assessed using the following scales: Brief Psychiatric Rating Scale 24-items (BPRS) for all patients, the Yale-Brown Obsessive Compulsive Scale (Y-BOCS) for patients with obsessive-compulsive disorder, and the Positive and Negative Syndrome Scale (PANSS) for patients with schizophrenia. The BPRS is a rating scale used to measure psychiatric symptoms. Each symptom is rated 1–7 and the following items are scored: somatic concern, anxiety, depression, suicidality, guilt, hostility, elevated mood, grandiosity, suspiciousness, hallucinations, unusual thought content, bizarre behavior, self-neglect, disorientation, conceptual disorganization, affective flattening, emotional withdrawal, motor retardation, tension, uncooperativeness, excitement, distractibility, motor hyperactivity, and mannerisms and posturing.³⁰

The Y-BOCS is a test to rate the severity of symptoms of obsessive-compulsive disorder. The scale is a clinician-rated, 10-item scale (obsession-free interval, interference

due to obsessive thoughts, distress associated with obsessive thoughts, resistance against obsessions, degree of control over obsessive thoughts, time spent performing compulsive behaviors, interference due to compulsive behaviors, distress associated with compulsive behavior, resistance against compulsions, degree of control over compulsive behavior), each item rated from 0 (no symptoms) to 4 (extreme symptoms), yielding a total possible score range from 0 to 40.³¹

The PANSS is a scale used to assess the severity of symptoms among patients with schizophrenia. Administration takes approximately 45 minutes and patients are rated from 1 to 7 on 30 different symptoms subdivided into three subscales: positive (delusions, conceptual disorganization, hallucinations, hyperactivity, grandiosity, suspiciousness/persecution, hostility); negative (blunted affect, emotional withdrawal, poor rapport, passive/apathetic social withdrawal, difficulty in abstract thinking, lack of spontaneity and flow of conversation, stereotyped thinking); and general psychopathology (somatic concern, anxiety, guilt feelings, tension, mannerisms and posturing, depression, motor retardation, uncooperativeness, unusual thought content, disorientation, poor attention, lack of judgment and insight, disturbance of volition, poor impulse control, preoccupation, active social avoidance).³²

In a second phase (film session), all patients watched video clips designed to elicit significant and specific emotions, including amusement, fear, surprise, anger, sadness, disgust, or neutrality. The mimic reaction of each patient in response to the vision of the films was video-recorded. These video clips, all in Italian, were watched by the three groups of people in the same order, according to the protocol of Gross and Levenson:²⁷ video 1, neutral; video 2, amusement; video 3, fear; video 4, surprise; video 5, anger; video 6, sadness; video 7, disgust; and video 8, amusement (Table 2). Between video clips, patients were asked to fill out a post film questionnaire to indicate the emotion experienced in relation to the video (Table 3). Each response to the questionnaire was then scored in relation to the expected emotion.

Two different reports were produced. In the report of concordant responses, a score of 1 was given for each emotional report concordant with the expected emotion, and a score 0 was given if the patient reported not having felt any emotion (neutrality) or having felt an emotion different from that expected. Scores could range between a minimum of 0 and a maximum of 8. In the report of discordant responses, a score of 1 was given for each emotional report discordant

with the expected emotion associated with the video clip and 0 if the patient reported not having felt any emotion (neutrality). Scores could range between a minimum of 0 and a maximum of 8.

At the end of the film session, the mimic reactions to the video clips were coded following the indications in the FACS investigator's guide.³³ The same three examiners (EP, GV, DL) evaluated all the video registrations. The three examiners previously attended a specific three-day workshop organized by the FACS Research Center at the University of Trieste. The scoring took into account the specific emotion associated with the video expected²⁷ and the combination of action units observed in response. Because each video was evocative of only one specific emotion,²⁷ specific combinations of action units were expected in relation to each video.³³ If one of the expected combinations of emotion and action units occurred, the examiners assigned a score of 1; if the expected combinations did not occur, the examiners assigned a score of 0 (this scoring was repeated for each movie clip).

Statistical analysis

The data were analyzed using Statistical Package for the Social Sciences (SPSS Inc, Chicago, IL) software version 17. Means, standard deviations, and Pearson's correlation coefficient were used. One-way univariate analysis of variance was performed to compare the means of patients divided into diagnosis groups. Because the diagnosis factor had more than two levels, post hoc tests were calculated using the Bonferroni test.

Results

Demographics

Ten patients were enrolled in each of the three groups of participants: obsessive-compulsive disorder group (mean age 40.22 ± 13.49 years), schizophrenia group (mean age 40.88 ± 12.97 years), and healthy participants (mean age 40.20 ± 10.49 years). Each group included five males and five females (Table 1). At the time of evaluation, obsessive-compulsive disorder patients were treated with the following medications: clomipramine ($n = 7$), fluvoxamine ($n = 4$), sertraline ($n = 1$), escitalopram ($n = 1$), citalopram ($n = 1$), valproic acid ($n = 3$), gabapentin ($n = 1$), alprazolam ($n = 3$), lorazepam ($n = 1$), and zolpidem ($n = 1$). Schizophrenia patients were treated with the following medications: paliperidone ($n = 3$), aripiprazole ($n = 4$), olanzapine ($n = 1$), quetiapine ($n = 1$), clozapine

Table 1 Study participants

Diagnosis	Patients (n)	Mean age	Gender	Schooling (years)
Obsessive-compulsive disorder	10	40.22 ± 13.49	5 women 5 men	13.7
Schizophrenia	10	40.88 ± 12.97	5 women 5 men	12
Healthy controls	10	40.20 ± 10.49	5 women 5 men	13.5

(n = 1), risperidone (n = 1), valproic acid (n = 4), and lithium (n = 1).

Post film questionnaire: concordant and discordant responses

In the report of concordant responses, analysis of variance showed that the diagnosis factor influenced the total score of concordant responses in the post film questionnaire ($F[2.25] = 16.413$; $P \leq 0.001$).

Comparing the groups between them with the post hoc Bonferroni test, our results showed that healthy controls had significantly higher scores (7.60 ± 0.516) than both obsessive-compulsive disorder patients (5.11 ± 1.833 ; difference of means -2.489 ; $P = 0.004$) and schizophrenia patients (3.78 ± 1.787 ; difference of means -3.822 ; $P < 0.001$). There was no difference in performance between patients with obsessive-compulsive disorder and those with schizophrenia (Figure 1).

In the report of discordant responses, analysis of variance showed that the diagnosis factor influenced the total score of discordant responses in the post film questionnaire ($F[2.25] = 9.205$; $P = 0.001$). Post hoc comparisons indicated that the number of discordant responses in the healthy participant group (0 ± 0) was significantly lower than for patients with either obsessive-compulsive disorder (2.222 ± 1.716 ; difference of means -2.222 ; $P = 0.003$) or

schizophrenia (2.222 ± 1.563 ; difference of means -2.222 ; $P = 0.003$). No statistically significant difference was found between patients with obsessive-compulsive disorder and those with schizophrenia (Figure 2).

Facial expression

Analysis of variance indicates that the “diagnosis” factor influenced the number of film-elicited emotions correctly expressed on the face ($F[2.25] = 19.991$; $P < 0.001$). FACS scores for healthy participants were significantly higher (7 ± 0.816) than in patients with obsessive-compulsive disorder (4.11 ± 1.453 ; difference of means -2.889 ; $P < 0.001$) or schizophrenia (3.33 ± 1.658 ; difference of means -3.667 ; $P < 0.001$). There was no statistically significant difference between patients with obsessive-compulsive disorder and those with schizophrenia. No significant difference was found between patients with obsessive-compulsive disorder and those with schizophrenia (Figure 3).

Correlation between Y-BOCS, FACS, and post film questionnaire scores in patients with obsessive-compulsive disorder

A statistically significant positive correlation was found between FACS score and concordant responses ($r = 0.746$; $P = 0.021$). Statistically significant negative correlations

Table 2 Video clips used to elicit emotions

Video	Description	Elicited emotion	Length of film clip (min:sec)
1. MGM introduction	Roaring lion	Neutrality	0:10
2. When Harry met Sally	Discussion of orgasm in café	Amusement	2:35
3. The Shining	Boy playing in hallway	Fear	1:22
4. Capricorn one	Agents burst through door	Surprise	0:49
5. Cry Freedom	Police abuse protesters	Anger	2:36
6. The Champ	Boy cries at father's death	Sadness	2:51
7. Pink Flamingos	Person eats dog feces	Disgust	0:30
8. Roberto Benigni and Massimo Troisi video interview	Comedy routine	Amusement	1:30

Table 3 Post film questionnaire

Emotion	Video							
	1	2	3	4	5	6	7	8
Fear								
Sadness								
Happiness								
Surprise								
Anger								
Disgust								
Neutrality								

were found between discordant responses and concordant responses ($r = -0.883$; $P = 0.002$) and between discordant responses and FACS scores ($r = 0.713$; $P = 0.031$). Negative correlations approaching statistical significance were found between Y-BOCS and FACS scores ($r = -0.657$; $P = 0.054$) and between Y-BOCS scores and concordant responses ($r = -0.659$; $P = 0.053$). The positive correlation between Y-BOCS scores and discordant responses was not significant ($r = 0.550$; $P = 0.125$, Table 4).

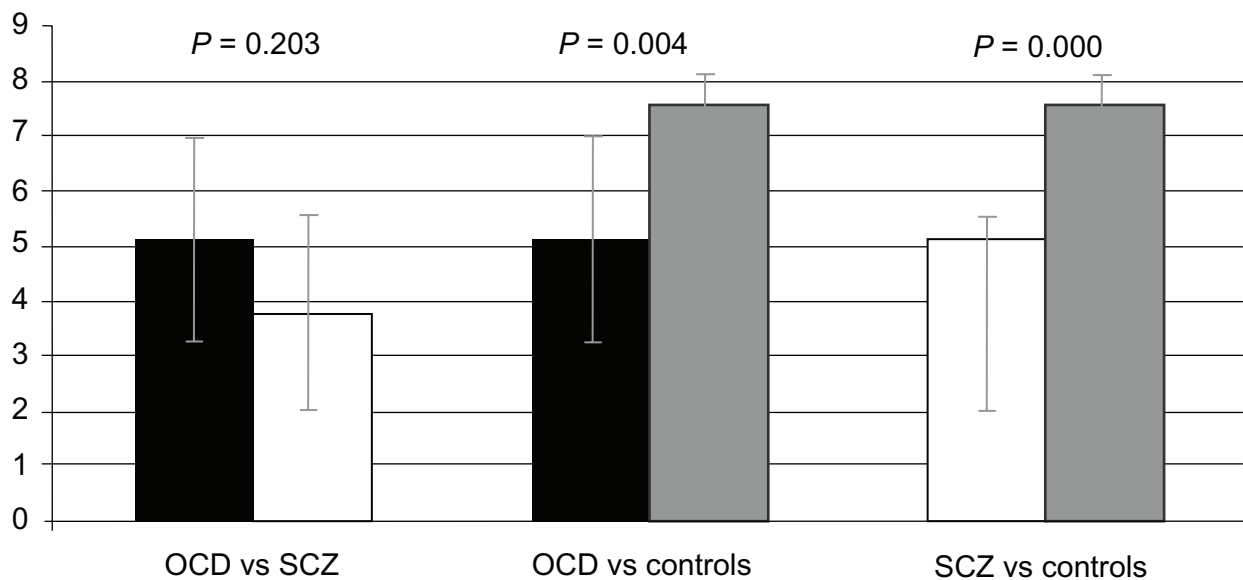
Correlation between PANSS, FACS, and post film questionnaire in patients with schizophrenia

The only significant correlation was found between PANSS total score and the negative PANSS subscale score ($r = 0.787$; $P = 0.012$). Among the others, the strongest

positive correlations were found between discordant responses and the negative PANSS subscale score ($r = 0.412$) and the strongest negative correlation was found between FACS and PANSS total score ($r = -0.369$, Table 5).

Correlation between BPRS, FACS, and post film questionnaire

In the overall sample, there were significant positive correlations between BPRS total score and the BPRS affective flattening item ($r = 0.697$; $P = 0.001$) and between the number of concordant responses and FACS total score ($r = 0.779$; $P < 0.001$); significant negative correlations were found between FACS total score and BPRS total score ($r = -0.469$; $P = 0.049$) and between the BPRS affective flattening item and number of concordant responses ($r = -0.487$; $P = 0.040$). In the obsessive-compulsive disorder group, significant positive correlations were found between BPRS total score and the BPRS affective flattening item ($r = 0.707$; $P = 0.033$) and between the number of concordant responses and FACS total score ($r = 0.746$; $P = 0.021$); significant negative correlations were found between the BPRS affective flattening item and FACS total score ($r = -0.732$; $P = 0.025$), between the number of concordant responses and number of discordant responses ($r = -0.883$; $P = 0.002$), and between FACS total score and number of discordant responses ($r = -0.713$; $P = 0.031$). No statistically significant correlations were found in the schizophrenia group (Table 6).

**Figure 1** Mean number of concordant responses in obsessive-compulsive disorder, schizophrenia, and control groups.

Abbreviations: OCD, obsessive-compulsive disorder; SCZ, schizophrenia.

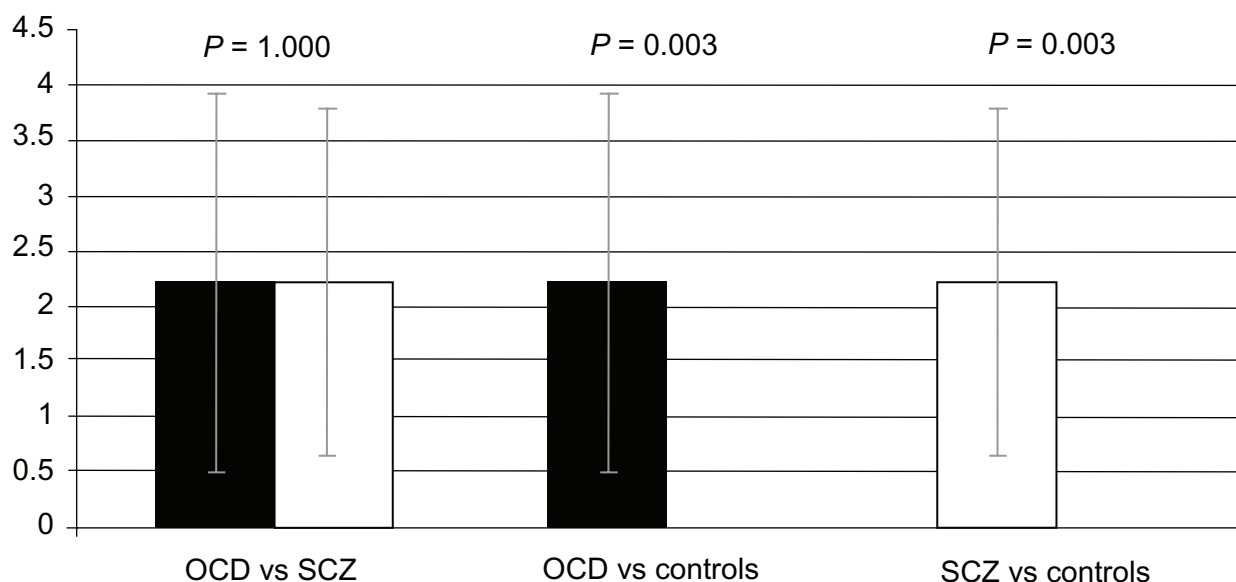


Figure 2 Mean number of discordant responses in obsessive-compulsive disorder, schizophrenia, and control groups.

Abbreviations: OCD, obsessive-compulsive disorder; SCZ, schizophrenia.

Discussion

To our knowledge, this is the first study investigating and comparing facial expressions in patients with schizophrenia and those with obsessive-compulsive disorder using the FACS system. As expected, the healthy controls showed more appropriate experience of emotion and facial expression than patients with schizophrenia and those with obsessive-compulsive disorder. It is known that patients with schizophrenia are impaired in their ability to

discriminate and recognize emotions expressed by others, have difficulty in expressing their own emotional states, and show a marked deficiency in facial expression that may be correlated with length and type of pharmacological treatment.¹³

Doop et al showed that worse social functioning is correlated with errors in recognition of emotional expressions on the face, and that patients with schizophrenia show general deficits in processing of emotional expressions which,

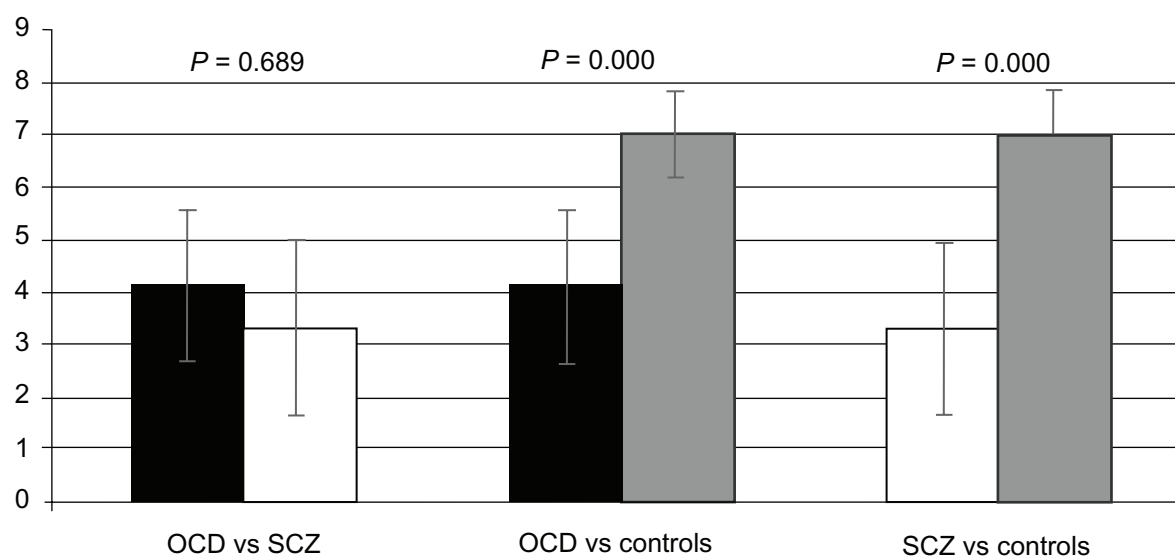


Figure 3 Mean FACS scores in obsessive-compulsive disorder, schizophrenia and control groups.

Table 4 Correlation between Y-BOCS scores, FACS scores and post film questionnaire in patients with obsessive-compulsive disorder

	Y-BOCS total score	Concordant responses	Discordant responses	FACS score
Y-BOCS total score				
Pearson correlation	1	−0.659	0.550	−0.657
Sig. (two-tailed)		0.053	0.125	0.054
Concordant responses				
Pearson correlation	−0.659	1	−0.883	0.746
Sig. (two-tailed)	0.053		0.002	0.021
Discordant responses				
Pearson correlation	0.550	−0.883	1	−0.713
Sig. (two-tailed)	0.125	0.002		0.031
FACS score				
Pearson correlation	−0.657	0.746	−0.713	1
Sig. (two-tailed)	0.054	0.021	0.031	

Note: Bold text highlights statistically significant data ($P < 0.05$).

Abbreviations: Y-BOCS, Yale-Brown Obsessive Compulsive Scale; FACS, Facial Action Coding System.

in turn, are associated with worse symptoms and reduced social functioning.³⁴ However, an emotion subjectively or objectively “experienced” by patients may be different from the emotion “recognized” by patients. For instance, a patient may recognize that a video is happy, but due to his/her affective psychopathology, experience sadness.

The results obtained by administration of the post film questionnaire showed that patients with schizophrenia and those with obsessive-compulsive disorder showed fewer concordant responses compared with healthy people (Figure 1). It is interesting to note that there was no significant difference between the results for patients with schizophrenia and those

with obsessive-compulsive disorder (Figure 1), indicating that patients with obsessive-compulsive disorder have an impairment almost identical to that in patients with schizophrenia with regard to experiencing emotions, even though this kind of impairment is usually considered a classical phenomenon related to schizophrenia and not to obsessive-compulsive disorder.^{35,36}

This finding is strengthened by the scoring of facial activity in response to video clips eliciting emotion, ie, patients with obsessive-compulsive disorder showed mimic emotional responses very similar to those in patients with schizophrenia, and the scores for the two groups did not differ

Table 5 Correlation between PANSS scores, FACS scores, and post film questionnaire in schizophrenia patients

	PANSS total score	Negative subscale of PANSS	Concordant responses	Discordant responses	FACS score
PANSS total score					
Pearson correlation	1	0.787	−0.044	0.390	−0.369
Sig. (two-tailed)		0.012	0.910	0.299	0.328
Negative subscale of PANSS					
Pearson correlation	0.787	1	−0.273	0.412	−0.265
Sig. (two-tailed)	0.012		0.478	0.270	0.491
Concordant responses					
Pearson correlation	−0.044	−0.273	1	−0.293	0.239
Sig. (two-tailed)	0.910	0.478		0.444	0.536
Discordant responses					
Pearson correlation	0.390	0.412	−0.293	1	0.305
Sig. (two-tailed)	0.299	0.270	0.444		0.424
FACS score					
Pearson correlation	−0.369	−0.265	0.239	0.305	1
Sig. (two-tailed)	0.328	0.491	0.536	0.424	

Note: Bold text highlights statistically significant data ($P < 0.05$).

Abbreviations: PANSS, Positive and Negative Syndrome Scale; FACS, Facial Action Coding System.

Table 6 Correlation between BPRS scores, FACS scores, and post film questionnaire

Patients group	BPRS total score	BPRS affective flattening	Concordant responses	Discordant responses	FACS total score
All patients					
BPRS total score					
Pearson correlation	1	0.697	−0.265	0.257	−0.469
Sig. (two-tailed)		0.001	0.288	0.304	0.049
BPRS affective flattening					
Pearson correlation	0.697	1	−0.487	0.097	−0.470
Sig. (two-tailed)	0.001		0.040	0.703	0.049
Concordant responses					
Pearson correlation	−0.265	−0.487	1	−0.758	0.779
Sig. (two-tailed)	0.288	0.040		0.000	0.000
Discordant responses					
Pearson correlation	0.257	0.097	−0.758	1	−0.585
Sig. (two-tailed)	0.304	0.703	0.000		0.001
FACS total score					
Pearson correlation	−0.469	−0.470	0.779	−0.585	1
Sig. (two-tailed)	0.049	0.049	0.000	0.001	
OCD					
BPRS total score					
Pearson correlation	1	0.707	−0.479	0.462	−0.590
Sig. (two-tailed)		0.033	0.192	0.210	0.095
BPRS affective flattening					
Pearson correlation	0.707	1	−0.523	0.458	−0.732
Sig. (two-tailed)	0.033		0.148	0.215	0.025
Concordant responses					
Pearson correlation	−0.479	−0.523	1	−0.883	0.746
Sig. (two-tailed)	0.192	0.148		0.002	0.021
Discordant responses					
Pearson correlation	0.462	0.458	−0.883	1	−0.713
Sig. (two-tailed)	0.210	0.215	0.002		0.031
FACS total score					
Pearson correlation	−0.590	−0.732	0.746	−0.713	1
Sig. (two-tailed)	0.095	0.025	0.021	0.031	
Schizophrenia					
BPRS total score					
Pearson correlation	1	0.387	0.195	0.212	−0.304
Sig. (two-tailed)		0.303	0.615	0.583	0.426
Affective flattening					
Pearson correlation	0.387	1	−0.108	−0.339	−0.087
Sig. (two-tailed)	0.303		0.783	0.373	0.824
Concordant responses					
Pearson correlation	0.195	−0.108	1	−0.293	0.239
Sig. (two-tailed)	0.615	0.783		0.444	0.536
Discordant responses					
Pearson correlation	0.212	−0.339	−0.293	1	0.305
Sig. (two-tailed)	0.583	0.373	0.444		0.424
FACS total score					
Pearson correlation	−0.304	−0.087	0.239	0.305	1
Sig. (two-tailed)	0.426	0.824	0.536	0.424	

Note: Bold text highlights statistically significant data ($P < 0.05$).

Abbreviations: BPRS, Brief Psychiatric Rating Scale 24-items; FACS, Facial Action Coding System; OCD, obsessive-compulsive disorder.

significantly (Figure 3). These findings indicate that patients with schizophrenia and those with obsessive-compulsive disorder seem to suffer from similar impairments with regard to both experiencing and expressing emotions.

This common feature increases the number of characteristics shared between the two diseases. Obsessive-compulsive disorder and schizophrenia are, in fact, considered to be neurodevelopmental disorders with dysfunctional frontal

subcortical circuitry.³⁷ A possible common neurodevelopmental origin is suggested by several lines of evidence: both obsessive-compulsive disorder and schizophrenia have a juvenile onset and chronic course; relevant neurological soft signs are present in both diseases;^{38,39} patients with obsessive-compulsive disorder and those with schizophrenia have more adverse perinatal experiences than healthy controls;^{38,40} obsessive-compulsive symptoms are clinically important phenomena in people with schizophrenia; and people with obsessive-compulsive disorder often experience psychosis.⁴¹ In line with this theory, the impaired capacity to experience and express emotions may be seen as another chronic consequence of the same neurodevelopmental origin of the two diseases.

The hypothesized common neurodevelopmental origin of impaired expression and experience of emotions in obsessive-compulsive disorder and schizophrenia is also supported by the fact that this kind of impairment is less frequent and less relevant in psychiatric patients affected by diseases with a different presumed etiopathogenesis. For example, it is known that patients with bipolar disorder⁴² or unipolar depression¹⁶ are more accurate in recognizing emotions than patients with schizophrenia.

This study revealed an important correlation in the overall sample of patients between affective flattening, incongruent answers to a post film questionnaire, and low FACS scores (Table 6), leading to the idea that mimic expression is a behavioral indicator of affective flattening,¹⁸ which is considered to be the most important negative symptom of schizophrenia, even if not pathognomic of the disease. Controversy surrounds the issue of whether second-generation antipsychotics are more effective than first-generation antipsychotics in the treatment of negative symptoms. However, it is undisputed that negative symptoms persist in many cases despite pharmacological treatment.^{43–45} Negative symptoms are known to be strongly connected with neurogenesis, and thus present in both schizophrenia and obsessive-compulsive disorder: Flagstad et al⁴⁶ recently found that disruption of neurogenesis in the rat led to behavioral changes that mimic the negative symptoms of schizophrenia.

The results of this study also show a correlation between the severity of psychopathology and impaired ability to feel, express, and communicate emotions. A more severe psychopathological condition (measured on the BPRS scale) correlated with poorer facial expressiveness in the overall sample of patients, and more severe obsessive-compulsive symptoms (measured on the Y-BOCS scale) correlated

with a minor number of concordant responses and with inappropriate mimic expression in patients with obsessive-compulsive disorder. These data partially confirm the results of previous studies¹³ and highlight the fact that the FACS system could be used as a reliable semi-objective method to evaluate the clinical course in patients.

The small number of participants is a major limitation of this study and, for this reason, the results can only be considered preliminary. The choice to reduce the power of FACS to a binary number (expression prototype present or absent) makes it a less sensitive measure and, as such, different degrees of more refined and subtle facial movements could not be evaluated. However, this step was deemed necessary because it reduced the possibility of codification bias. Further studies are needed to assess further the differences and similarities between emotional responses in obsessive-compulsive disorder, schizophrenia, and other psychiatric disease.

Disclosure

The authors of this paper report no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties. All authors acknowledge that the conflict of interest disclosures are complete for both themselves and their coauthors, to the best of their knowledge.

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