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Facial emotion recognition in a sample of psychotic depressives from Anambra state Nigeria

Ucheagwu, Valentine A.
Department of Psychology, Anambra State University, Igbariam, Nigeria (afamval@yahoo.com)
Udoh, Felix U.
College Liberal Arts, St. John University, New York, USA
Ugokwe-Ossai, Rita N.
Department of Psychology, Nnamdi Azikiwe University, Awka, Nigeria
Ezeokana, Jude O.
Department of Psychology, Nnamdi Azikiwe University, Awka, Nigeria
Ossai, Jesse P.
Psychiatric Rehabilitation Centre, Obosi, Nigeria

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Abstract

The abilities to produce and recognize facial expressions of affects are important components of interpersonal communication in humans and primates. The present study was on facial affect (emotion) recognitions in psychotic depressives. Similar studies in the past had focused on schizophrenic group and depressed without psychotic features group. Forty two participants (21 psychotic depressives [PDP] and 21 normal controls [NC]) recruited from the community rehabilitation center and the department of psychology, Madonna University respectively, all in Anambra state controlling for gender were used for the study. Eight pairs of computer generated adult human faces showing emotions of happiness, sadness, anger, surprise, shame, excitement, fear and shy were used to examine the groups on their recognition abilities of the emotions. Gender differences in responses were also studied while age was controlled through covariance method. Between group design was used for the study while multiple analysis of covariate (MANCOVA) was used for data analysis. The findings showed no significant differences between the groups on the recognitions of emotions studied except emotions of shame, excitement and shy. Similarly, gender differences were found on the recognitions of emotions of anger and sadness. Part of the study did not support some previous studies that significant differences existed between psychiatric groups and normal controls on the recognition of basic emotions, although part of the study supported the findings on differences in secondary emotions between psychiatric groups and normal controls. Conversely, the present findings supported recent studies on gender differences in face recognition irrespective of groups. Further studies are needed to understand the differences between basic and secondary emotions in psychiatric patients that accounted for the major contributions of the study.

Keywords: emotions; facial; affects; psychotic depressives

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1. Introduction

Ability to recognize other people's emotions and theory of mind (ToM) have been identified as important in social cognitions. Development of the capacity to recognize emotions and the ability to understand ToM occur along somewhat different trajectories. Emotion perceptions develop in stages with evidence for significant maturation around 10 years of age (Kolb, Wilson, & Taylor, 1992; Tonks, Williams, Frampton, Yates, & Slater 2007) and again at 14, consistent with spurts in brain development (Kolb, Wilson, & Taylor, 1992). Recent advances in social neuroscience have started reviewing the roles of the brain in social cognition.

ToM has recently been defined as the ability to recognize that other people can have a mind different from one self (Fonagy, 2001) or to infer what is happening (thoughts, assumptions, plans, ambitions) in someone else's mind (Gabband, 2005). In short, ToM is used to explain and predict the reactions of other people. It is crucial in any successful social interaction, allowing accurate perception and interpretation of social signals including motivation, emotion, attention, memory and decision making (Adolps, 2001). Facial emotion recognition has been studied as part of social cognition more in people with traumatic brain injury (TBI) (Anderson, Beauchamp, Yeats, & Crosslley, 2013). Dennis, Barnes, Wilkinson, and Humphreys (1998, 2012) demonstrated that Emotional and Emotion Faces Test (EEFT) could be used to differentiate children with autism and traumatic brain injury, and associated social impairment from healthy controls.

While cognitive dysfunction has been thoroughly evaluated across neuropsychiatric disorders, impairments in emotional recognition have received increasing attention within the past 15 years (Kohler, Turner, Gur, & Gur, 2004). Early investigations on emotion recognition were limited to groups of persons with schizophrenia, depression and brain injury (Kohler et al., 2004) based commonly on the Ekman and Friessen black and white face recognitions (Ekman & Friessen, 1975). Overall researches on emotional face recognition in schizophrenia have showed impaired recognition of facial affect (Morrisson, Bellack, & Mueser, 1988; Mandal, Pandey, & Prased, 1998). Such emotional processing deficits may relate to dysfunction of medial temporal regions which has been documented in schizophrenia (Gur, Ture, Asky, & Cowell, 2000; Nickson, Saykin, & Flashmen, 1998). Some studies have also reported on associations of emotion processing in schizophrenia and duration of illness (Mueser, Poonan, & Penn, 1996; Penn, Combs, & Retchie, 2000), positive and negative symptomatology (Schneider, Gur, & Gur, 1995; Mandal, Jain, & HaqueNizamie, 1999) and cognition (Schneider, Gur, & Gur, 1995; Kohler, Bilker, & Haggendorn, 2000; Bryson, Bell, & Lysaker, 1997) with reference to attention, memory and social competence.

Cui, Nazarov, Macqueen, and Mckinnon (2013) investigated theory of mind (ToM) in a sample of depressed patients with mild symptom severity using a measure with varied cognitive processing demands. Patients demonstrated impaired performance on second – order, cognitively demanding ToM scenarios. Reduced ToM ability was associated with poor psychosocial functioning. Yamada, Inoue and Kanba (2015) investigated the association between ToM deficits and the outcome in patients who had recovered from major depressive episodes. They evaluated ToM abilities of 100 patients with major depressive disorder during a period of remission. The patients were followed up for one year and their outcomes observed. After one year, patients who had a ToM deficit according to a second order false belief question relapsed significantly more frequently than did patients who did not have a deficit. Significant differences between these two groups were shown in scores of the Global Assessment of functioning scale. Their findings suggest that a ToM deficit after symptom remission in patients with major depressive disorder predicts a higher relapse rate and lower social function one year after recovering from a major depressive episode.

Furthermore Bourke, Douglas and Porter (2010) reviewed past literature about facial emotion expression in

patients with major depression. Their findings showed reasonably consistent evidence of a negative response bias toward sadness in individuals with major depression, so that positive (happy), neutral or ambiguous facial expressions tend to be evaluated as more sad or less happy compared with healthy control groups. There is also evidence of increased vigilance and selective attention towards sad expressions and away from happy expression, but less evidence of reduced general or emotion specific recognition accuracy. Similarly, Douglas and Porter (2010) reported negative interpretation bias in the depression group. Neutral faces were more likely to be interpreted as sad and less likely to be interpreted as happy compared with controls. The depression group also displayed a specific deficit in the recognition of facial expression of disgust, compared with controls. According to them, this may relate to impaired functioning of fronto-striatal structures, particularly the basal ganglia.

Similarly, Stuhrmann, Suslow, and Dannlowski (2011) in their systematic review of neuro imaging findings in facial emotion processing in major depression disorder (MDD) showed abnormalities in MDD patients in a common face processing network, pointing to mood congruent processing bias (hyper activation to negative and hypo activation to positive stimuli) particularly in the amygdala, insula, para hippocampal gyrus, fusiform face area and putamen. Furthermore, abnormal activation patterns were repeatedly found in parts of the cingulate gyrus and the orbito frontal cortex which are extended by investigations implementing functional connectivity analysis. Some inconsistencies are however observed despite several converging findings particularly in prefrontal areas probably caused by heterogeneities in paradigms and patient samples.

Weiss, Kohler, Brensiger, Bilker, Loughead, and Margarete (2007) studied gender difference in facial emotion recognition in persons with chronic Schizophrenia as well as patterns of classification errors in both gender. They found a significant sex difference in the patterns of error rates in the Penn Emotion Recognition Test. Neutral faces were more commonly mistaken as angry in Schizophrenic men whereas Schizophrenic women misinterpreted neutral faces more frequently as sad. Moreover, female faces were better recognized overall, but fear was better recognized in same gender photographs whereas anger was better recognized in different gender photographs. Their findings lend support to the notion that sex differences in aggressive behaviors could be related to a cognitive style characterized by hostile attributions to neutral faces in Schizophrenic men. Rotter and Rotter (1988) studying sex differences in the encoding and decoding of negative facial emotions among healthy young adults found that overall, females exceeded males in their ability to recognize emotions whether expressed by males or by females. As an exception, males were superior to females in recognizing male anger. However these authors lend their discussion of the results to social sex roles in the gender.

A Meta analytic review of sex differences in facial expression processing and their development in infants, children and adolescents by McClure (2000) indicated a female advantage at facial expression processing which are consistent with predictions derived from an integrated neurobehavioral/Social constructivist model. Similarly Thayer and Johnson (2000) studied sex differences in judgment of facial affect based on a multivariate analysis of recognition errors. Their findings showed that in both males and females, emotional displays could be correctly classified but females had a higher rate of correct classification, while males were more likely to have difficulty distinguishing one emotion from another. Females rated emotions identically regardless of whether the emotion was displayed by a male or female face. Furthermore, the two factor structure of emotion based on a valence and an arousal dimension was only present for female participants. Thayer and Johnson (2000) study has been supported by other studies including Montagne, Kessels, Frigerio, de Haan, and Perrett (2005), Rahman, Wilson, and Abrahams (2004) that also showed that females were more accurate in identifying male faces than female ones.

On a similar note, Erwin, Gur, Gur, Skolnick, Mawhinney – Hee, and Smaitis (1992) studied facial emotion discrimination on task construction and behavioral findings in normal subjects. In experiment I, same sex stimuli were used to examine the performance of normal participants (24 men, 15 women) on three tasks. Performance was better during the emotion discrimination tasks than during the age discrimination task and males had higher sensitivity scores for the detection of sad emotion. However experiment II showed that the sex of the stimulus

interacts with the sex of the participants. Compared with female participants, male participants (n = 10) were selectively less – sensitive to sad emotion in female faces. Female participants (n = 10) were more sensitive to overall emotional expression in male faces than in female faces. Thus men and women differed in performance depending on the sex of the facial stimulus.

On further support to the gender differences on face emotion processing, Lee, Lui, Hoosain, Liao, Wu, Yuen, Chan, Fox, and Gao (2002) showed that male and female participants used a rather different set of neural correlates when processing faces showing either happy or sad expressions. This was more noticeable when they were processing faces portraying sad emotions than happy emotions. Their findings provide some preliminary support for the speculation that the two genders may be associated with different areas of brain activation during emotion recognition of happy or sad facial expression. This suggests that the generalizability of findings in regard to neural correlates of facial emotion recognition should consider the gender of the participants. The Lee et al study has been further validated by Lee, Liu, Chan, Fang, and Gao (2005) pointing out the contributions of the insula (right) and left thalamus for men during facial processing, and Hofer, Siedentoff, Ischebeck, Rettenbacher, Verius, Felber, and Wolfgang (2007).

Conversely Demenescu, Mathiak, and Mathiak (2014) investigated the import of age and gender related variations of emotion recognition in Pseudo words and faces. Overall, Older participants (56 – 75 years) had a lower accuracy rate in categorizing emotions than young and middle aged participants. Interaction effects were seen as females performed better that males in recognizing emotions from voices and this gender difference emerged in middle age and older participants. Their study provides further evidence for an interaction of age and gender effect on emotion recognition. The advantage of females seems to be age and stimulus modality dependent.

The Demenescu et al. (2014) study was validated by that of Voelkle, Ebner, Lindenberger, and Riediger (2012), Ebner and Johnson, (2009), and Macpherson, Phillips, and Della (2006). The overall literature report on age contribution to facial emotion processing thus tilted towards the possible role of older age group on poor processing of face emotion of the young and old face stimuli as well as emotional and neutral faces.

The present study was on the assessment of facial emotion recognition in psychotic depressives. While numerous studies have examined emotion recognitions in schizophrenia and depression only limited number of studies have examined affective disordered group with psychotic features. Similarly, extensive literature search by the authors showed paucity of literature of African origin on face emotion recognition in psychiatric patients. The present study therefore was a move to bridging the gap in African studies on social cognition in psychiatric patients.

1.1 Purpose of the Study

The purpose of the study was to examine differences in emotional face recognition between psychotic depressives (PD) and normal controls (NC). On the other hand, age and gender differences as well as their interaction effects on facial emotion recognitions were studied. The study therefore asked pertinent research questions as to whether group differences would exist between PD and NC on facial emotion recognitions in the participants studied. It was hypothesized that significant group differences would exist on various aspects of facial emotions studied. However no differences would be seen on gender and age as variables of study.

2. Method

2.1 Participants

Forty two participants were used for the study. They were divided into 2 groups: Psychotic Depressives (PD) and Normal Controls (NC). The PD was made up of 21 participants selected from an inpatient Community

Rehabilitation Centre in Anambra State Nigeria. Their diagnoses were made by two consultant Clinical Psychologists working in the center. Their criteria for diagnosis were based upon DSM IV TR diagnostic criteria. The exclusion criteria were as follows:

- Schizophrenia
- Anxiety disorders
- Depression without psychotic features
- Psychotic features without history and symptoms of depression
- History of Brain injury

The NC group was also recruited from undergraduate student population in the department of psychology, Madonna University, Okija Anambra State controlling for gender in the PD group. Table 1 showed the demographic characteristics of the participants.

Table 1

Demographic profiles of the participants

Demography		Group		df	t
		PDP	NC		
N		21	21		
Age range		21-60	19-28		
Mean age		40.42	22.66	40	7.95*
Gender	Male	14	14		
	Female	7	7		

Table 1 showed significant age differences between the two groups studied. While Table 2 showed the sample homogeneity. Significant heterogeneity was seen in the groups. This is likely to be the result of age disparities within the group (PD) and between the groups.

Table 2

Homogeneity Profile of the Samples

Source	SS	df	Ms	F	Sig.
Intercept	37254	1	37254	657.75	.001
Gender	0.58	1	0.58	0.01	.910
Group	2964.29	1	2964.29	53.77	.001
Gender * group	0.29	1	0.29	0.005	.940

2.2 Instruments

Eight pairs of computer generated adult human facial emotions were used for the study. The emotions generated were:

- Happy
- Sad
- Anger
- Surprise
- Shame
- Excitement
- Fear
- Shy

In each facial emotion, a male and female faces were represented. The present emotions studied represented five basic emotions used in the Emotional and Emotive Face Task (EEFT) (Dennis, Agostino, Taylor, Bigler, & Rukin, 2013) with addition of three secondary emotions: shame, excitement, and shy. Inter-rater content validation of the pictures was done using four raters. They were asked to remark using: strongly represented, represented

with modifications and not representation of the emotion, the extent over which the pictures truly represent the emotion(s) in question. Seventy five percent (3/4) inter-raters' agreement was the basis for a picture inclusion.

2.3 Procedure

The PD group was tested at the Community Psychiatric Centre where they were inpatients as at the time of the study. The examiner after creating rapport would show a picture to the participant asking the person to choose from the lists of the appropriate emotions listed the one the person on the picture is exhibiting. For example a male picture showing angry face is presented. The examiner asked the participant to look at the picture and choose from the lists the type of emotion he is presenting. The lists of emotions to choose from where the eight emotions listed in the instrument section, the study was part of the ongoing clinical study on the evaluation of emotions and executive functions in psychiatric patients in Anambra State. The same procedure was used for the Normal control. However, their testing was done at Psychology laboratory of Madonna University Okija. The study strictly followed the human studies ethical guidelines of the Madonna University Okija.

2.4 Design

Between groups quasi experimental design was used and multiple analyses of covariance (MANCOVA) statistics were further used for the data analysis.

3. Results

The findings of the study showed significant statistical differences between gender on correct recognition of pictures showing sad male and angry female respectively (see Table 3 for summary of the results). The result further showed medium effect sizes and high observed powers for the two significant emotions. The mean scores showed that males had more correct recognitions of the two emotions than the females (See table 4). On the other hand, significant statistical differences were found between groups on pictures showing shame male, excited female and shy female. As was expected, the NC had better recognitions of the emotions than the PD (See table 5). A significant interaction effect of group and gender on picture showing happy male was also found in the study (see figure 1 for summary).

Table 3

Summary table MANCOVA of Gender and Group on Face Recognition with Age as a Covariate

Dependent variable	SS	df	MS	F	Effect size	Observed power
Corrected model:						
Happy male	1.56	4	0.39	1.95	0.17	0.53
Happy female	0.60	4	0.15	0.61	0.06	0.18
Sad male	1.95	4	0.48	2.17	0.19	0.58
Sad female	1.29	4	0.32	1.43	0.13	0.40
Anger male	2.19	4	0.54	2.50	0.21	0.65
Anger female	4.26	4	1.06	6.73**	0.42	0.98
Surprise male	3.27	4	0.81	4.24**	0.31	0.88
Surprise female	0.52	4	0.13	0.68	0.06	0.20
Shame male	0.83	4	0.20	1.36	0.12	0.38
Shame female	0.65	4	0.16	0.66	0.06	0.19
Excitement male	1.29	4	0.32	1.33	0.12	0.37
Excitement female	1.82	4	0.45	2.02	0.18	0.55
Fear male	1.00	4	0.25	1.11	0.10	0.31
Fear female	1.43	4	0.36	1.57	0.14	0.43
Shy male	0.71	4	0.17	1.04	0.10	0.29
Shy female	3.72	4	0.93	5.25*	0.36	0.94

Table 3 … continued

Dependent variable	SS	df	MS	F	Effect size	Observed power
Age:						
Happy male	0.01	1	0.01	0.09	0.003	0.06
Happy female	0.38	1	0.38	1.57	0.04	0.23
Sad male	0.02	1	0.02	0.11	0.003	0.06
Sad female	0.22	1	0.22	0.99	0.02	0.16
Anger male	0.05	1	0.05	0.23	0.006	0.07
Anger female	0.001	1	0.001	0.003	0.001	0.05
Surprise male	0.29	1	0.29	1.53	0.04	0.22
Surprise female	0.12	1	0.12	0.62	0.01	0.12
Shame male	0.14	1	0.14	0.94	0.02	0.15
Shame female	0.008	1	0.008	0.03	0.001	0.05
Excitement male	0.008	1	0.008	0.03	0.001	0.05
Excitement female	0.34	1	0.34	1.53	0.04	0.22
Fear male	0.02	1	0.02	0.12	0.003	0.06
Fear female	0.10	1	0.10	0.46	0.01	0.10
Shy male	0.07	1	0.07	0.42	0.11	0.09
Shy female	0.08	1	0.08	0.48	0.13	0.10
Gender:						
Happy male	0.19	1	0.19	0.96	0.02	0.15
Happy female	0.001	1	0.001	0.001	0.001	0.15
Sad male	0.96	1	0.96	4.30*	0.10	0.52
Sad female	0.41	1	0.41	1.85	0.04	0.26
Anger male	0.42	1	0.42	1.93	0.05	0.27
Anger female	3.04	1	3.04	19.25*	0.34	0.99
Surprise male	0.04	1	0.04	0.22	0.006	0.57
Surprise female	0.01	1	0.01	0.05	0.002	0.05
Shame male	0.01	1	0.01	0.06	0.002	0.05
Shame female	0.006	1	0.006	0.001	0.001	0.05
Excitement male	0.006	1	0.006	0.001	0.001	0.05
Excitement female	0.01	1	0.01	0.05	0.002	0.05
Fear male	0.75	1	0.75	3.28	0.08	0.42
Fear female	0.005	1	0.005	0.001	0.001	0.05
Shy male	0.11	1	0.11	0.62	0.01	0.12
Shy female	0.94	1	0.94	5.31*	0.12	0.61

Table 4

Summary Table of Mean Scores of Gender on Facial Recognition

Picture stimulus	Gender	Mean	Std. Error
Sad – Male	Male	0.53	0.09
	Female	0.21	0.12
Anger - Female	Male	0.78	0.07
	Female	0.21	0.10

Note. Significant is at $p<0.05$ level

Table 5

Summary Table of Mean Scores of Group on Facial Recognition

Dependent Variable	Group	Mean	Std. Error
Shame - Male	Control	0.39	0.11
	Psychiatry	0.003	0.11
Excitement - Female	Control	0.89	0.14
	Psychiatry	0.27	0.14
Shy - Female	Control	0.69	0.12
	Psychiatry	0.20	0.12

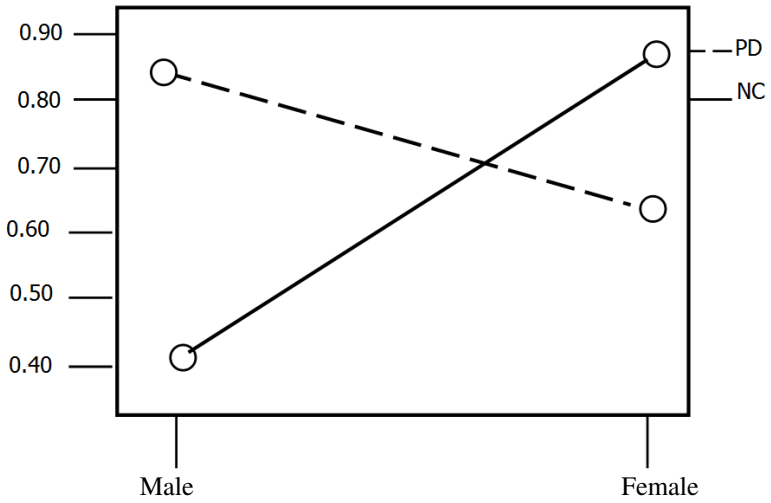

Figure 1. Plot of the interaction effect of group and gender on facial recognition of happy male

4. Discussions

The findings showed reduced affect recognition in psychotic depressives (PD) than in the normal control. However not all emotions examined showed such differences. The basic emotions as described by Ortony and Turner (1990) had no significant differences between the two groups studied. The categorical theories of emotional organization (Purves, Brannon, Cabeza, Huettel, Laber, Platt, & Woldoroff, 2008) had earlier differentiated two categories of emotions: Basic emotions and Complex emotions. Although list of basic emotions ranges from 4 to about 10 items in different theories (For example Ortony & Turner, 1990; Shaver, Schwartz, Kerson, & O'Connor, 2001) fear , anger, surprise, sadness (distress), happiness (Joy) and disgust are included in most schemes (Purves et al., 2008). Basic emotions are taken to be innate, pan -cultural, evolutionarily old, and shared with other species and expressed by particular physiological patterns and facial configuration. In contrast, Purves et al. (2008) defined complex emotions as learned, socially and culturally shaped, evolutionary new, most evident in humans and typically expressed by combination of the response patterns that characterize the basic emotions. Shaver et al. (2001) had included excitement and shame as part of secondary and tertiary emotions emanating from joy (excitement) and sadness (shame).

The present study found that the PD group was significantly poor in the affect recognition of the secondary emotions of shame, excitement and shy when compared with normal controls. Earlier studies had identified impaired recognition of both negative and positive facial emotions in major depressed patients (Mikihailova, Vladimirova, Iznak, Tsusulkovskaya, & Sushko, 1996; Rubinow & Post, 1992; Gur , Erwin, Gur, Zwil, Heimberg, & Kramer, 1992) with happy and sad affects as the most dominant. However, the present study did not find any significant differences in the basic emotions including happiness and sadness. But when the basic emotions (happiness and sadness) are broken down in line with Shaver et al. (2001), differences are seen in effects of excitement (happy), shame (sadness), and shy.

Conversely, only two emotions differed by gender in the present study. Their differences were based on stimulus (picture) gender type. The present findings showed that males identified more accurately the emotions of sadness (sad male faces) and anger (angry female faces) when compared to females. The present research results were in contradictions to existing literatures favoring less female bias and discriminating errors in face emotions than the males (Thayer & Johnson, 2000; Rahman et al., 2004; Montagne et al., 2005). However, it is important to note that the previous studies were neither of West Africa nor Nigeria origins rather those of Europe and America. Indeed, cross cultural differences have shown to explain varieties of differences in behavior and may not exclude face emotion recognition. The present study involved participants from Igbo ethic descent of Nigeria who may

show various evolution differences from the western participants hence the contradictory results. However, sufficient empirical studies of Nigeria and Africa origins are needed to support the present findings.

Furthermore, interaction effects showed that males in the PD group had significant impaired recognition of happy male affect than PD females, while the opposite was for the NC. The present findings on the interaction effects appeared to be gender regulated. This however contradicts Weiss et al. (2007) study that favored female schizophrenics on overall recognition of emotions than male schizophrenics. However, participants in the present findings were psychotic depressives thus further limiting the usability of Weiss et al. (2007) study. In addition, NC males still showed better recognition of happy male affect than their female group. This further confirms the earlier findings of the present study on gender differences in face emotion.

5. Conclusions

The abilities to produce and recognize facial expressions of emotions are an integral component of interpersonal communication in humans and primate. Significant areas of differences in affect recognition may be a problem for the individual as it regards interpersonal communications and subsequent cognitive appraisals and behaviors. It is important for an individual to be able to recognize other persons' ToM for a better social functioning. Facial affect recognition may be a good determinant of ToM and subsequent behavior functioning.

The limitations of the study are also critical for result analysis. The non-homogeneity of the groups may affect the outcome of the study. Subsequent studies balancing for age differences, educational and socio-economic statuses are needed to give further support to the present findings. The stimulus pictures used were those designed by the authors. They were not conventional commercial tests of facial emotions. This may affect the responses of the participants in relation to the conventional commercial facial emotion pictures. Nevertheless, it is good to keep in mind the major findings of the study showing that psychotic depressives showed less recognition of complex or secondary emotions than the normal controls. However no differences were found on the basic emotions. Subsequent studies validating the present findings are needed.

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