Decoding and Reasoning Mental States in Major Depression and Social Anxiety Disorder

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Abstract

Background: Major depression (MDD) and social anxiety (SAD) disorders are debilitating psychiatric conditions characterized by disturbed interpersonal relationships. Despite these impairments in social interaction, little research has simultaneously evaluated the dysfunction in two aspects of theory of mind (ToM) in these disorders: Affective ToM or decoding mental states and cognitive ToM or reasoning mental states. Taking this into consideration, the current study attempts to compare both decoding and reasoning abilities in MDD, SAD, and healthy controls (HC).

Methods: Subjects were 37 patients with MDD, 35 patients with SAD, and 35 HCs. ToM was measured with the Reading the Mind in the Eyes Test (RMET) and the Faux Pas Task, which assessed decoding skills and reasoning mental states, respectively.

Results: Results showed that in decoding mental states, both the SAD and MDD groups achieved lower scores than HC group; moreover, there was no significant difference between SAD and MDD groups in decoding mental states. However, in reasoning mental states, SAD and HC groups had higher scores than the MDD group and no differences observed between SAD and HC groups in reasoning ability.

Conclusions: Results of this study are discussed on generalized impairment in ToM or dysfunction in both decoding and reasoning mental states in MDD and only reasoning dysfunction in SAD.

1. Background

Theory of mind (ToM) is considered to be one of the most important dimensions of social cognition,which refers to the ability to discriminate and judge mental states (i.e., wants, needs, beliefs, knowledge, emotions, etc.) of oneself and others.[1–3] Research has found that in order to modify behavior in accordance with others, it is important to understand others' mental states.[4] Hence, ToM ability, as a specific human skill, plays a vital role in interaction and everyday functioning.[5–7] In other words, this ability facilitates social interaction of humans through understanding mental and emotional states of others.[8] There are many studies that have found ToM deficits in psychological and neurological disorders such as mood disorders[9 – 11], personality disorders[7], anxiety disorders[12], psychotic disorders[13,14], Alzheimer disease[15].

Theoretical frameworks of ToM categorize this ability into affective and cognitive aspects. According to Singer[16], affective ToM refers to attribution of emotional states to others and cognitive ToM involves realization intentions of others. Recent theories have referred to affective and cognitive aspects as social-perceptual and social-cognitive components of ToM.[17–19] The social-perceptual aspect, also known as the “affective aspect” of ToM, is the ability to decode and discriminate mental states of others based on available information, which can be recognized by the observer in the immediate environment.[18] The social-cognitive aspect, known as the “cognitive aspect” of ToM, refers to ability to reason about the mental states through interpretation or prediction the behavior of others.[17,18] The neurobiological

substrates for the decoding phase or the affective aspect of ToM is the amygdala, the medial temporal structures, and the frontal lobe[18,20], while the medial frontal area of brain identified as the most significant region corresponding with reasoning phase or cognitive aspect of ToM.[21,22] In accordance with these differences in the affective and cognitive aspects of ToM, recent studies have simultaneously evaluated dysfunction in both aspects of ToM in particular psychological disorders (de la Osa et al., 2016; Zabihzadeh et al., 2017; Liu et al., 2017).[4,7,23] For example, Zabihzadeh et al.[7] takes this into consideration by considering the evaluation of ToM in patients with borderline personality disorder as indicated by their normal ability in affective aspects and deficits in cognitive aspects.

Affective disorders are a set of psychiatric conditions such as depression, bipolar, and anxiety disorders.[24] Considering the high prevalence of affective disorders and dysfunction in the social interactions of patients with these disorders[11,25,26,27], the evaluation of social cognition is a common subject throughout the literature[28]. An overview of literature has shown that among all affective disorders, the study of ToM in Major Depressive Disorder (MDD) has come to focus as compared to the other affective disorders.

Deficits in social functioning are some of the most well-known features of MDD.[10] This dysfunction is also important in the onset and in maintaining depressive symptoms.[26,29] Considering the importance of ToM in the social interactions, the evaluation of ToM ability in patients with MDD has been widely used in research.[9–11,28–31] The results of these studies are consistent to a high extent and represent a dysfunction in ToM ability of depressed patients. Also, these findings have been repeated in other psychiatric conditions accompanied by the comorbid depression. According to Zabihzadeh et al.[7], patients with borderline personality disorder with comorbid MDD had decreased ToM skills in comparison with other patients without comorbid MDD. This shortage of ToM ability in depressed patients correlates strongly with their impaired social abilities.[8,10] Since interpersonal conflict is an important element in recurrence of depression[29], ToM impairment seems to be a suitable predictor of depression reappearance along with the malfunction of these patients in their social interactions. Despite the fact that many studies have evaluated ToM in patients with MDD, only two studies by Wang et al.[8] and Wolkenstein et al.[9] have been conducted to simultaneously investigate the affective and cognitive aspects of ToM in these patients; however, their results are inconsistent. According to Wang et al.[8], the MDD patients represented lower performance in both affective and cognitive dimensions of ToM in comparison with the healthy group. On the other hand, the results of Wolkenstein et al.[9] indicate that MDD patients have lower performance only in cognitive ToM in comparison to the healthy group, while the performance of these patients in affective ToM is normal. Both studies used the Reading in the Mind of the Eyes Test (RMET)[32] for measuring the affective ToM. Based on these inconsistencies, it seems that this subject requires further studies regarding the simultaneous measurement of affective and cognitive aspects of ToM in MDD patients.

Anxiety disorders are another type of affective disorders that is are highly prevalent. Despite the considerable studies on ToM in patients with depression, little research has been done on the ability of ToM in anxiety disorders, specifically in social anxiety disorder (SAD). SAD is known to be a common psychiatric disorder characterized by a persistent, excessive fear, and avoidance of social and performance situations[24] and is a chronic and debilitating psychiatric condition, leading to social and interpersonal impairments[27]. Previous studies have proposed that high levels of social anxiety may partly be attributed to social cognition deficits, which are manifested as a tendency toward inaccurate and distorted appraisals of the beliefs and intentions of others during interpersonal interactions.[33,34] Despite social and interpersonal dysfunction as a marked symptom in SAD, only three studies have assessed ToM ability in this disorder. According to Samson et al.[35], the high scores in the social anxiety scale are associated with decreased ToM ability. This study had a predominant limitation, which is that it was conducted in individuals with social anxiety in the non-clinical range. Furthermore, in this study, ToM ability evaluated only with cartoons that involved the interpretation of others' mental states. This task is most common for the measurement of cognitive ToM but not for the affective aspect. According to the results of Hezel & McNally[36], SAD patients compared to the healthy group had a lower performance in ToM tasks, particularly in RMET, and within that the eyes depicted mental states of a negative valence.

The study of Washburn et al.[27] is the only study that has considered ToM ability in the clinical case of SAD patients. The results of this study which had aimed to compare ToM in SAD and MDD patients with and without comorbid depression, demonstrated that the group of non-comorbid SAD had significantly lower performance in comparison with the healthy, and non-comorbid MDD groups. Further, both the comorbid and non-comorbid SAD groups made significantly more 'excessive' ToM reasoning errors than the non-comorbid MDD group, suggesting a pattern of over-mentalizing. Although in this study for evaluation of ToM ability both RMET[32] and movie for the assessment of cognition (MASC)[37] were used, but the main goal of research was not to differentiate the performance of patients in affective and cognitive aspect of ToM. For this reason, the results of this study had not discussed based on relationship between the performance of patients in ToM tasks with the affective and cognitive aspects.

Considering the limitations of the previous studies, the major purpose of our study is to a simultaneous comparison of the decoding and reasoning mental state or affective and cognitive aspects of ToM in MDD and SAD patients, and healthy controls (HC). According to the results of previous studies, we expect that the impairment of mind theory in MDD is more severe than SAD. Furthermore, we expect the HC group in both decoding and reasoning mental states to be better than MDD and SAD groups.

2. Method

2.1. Participants

The participants included three groups: patients with MDD (n = 37, 54.05% females, mean age: 28.17, SD: 2.27), patients with SAD (n = 35, 54.28% females, mean age: 27.49, SD: 2.06) and HC group (n = 35,

48.57% females, mean age: 28.38, SD: 3.41). Patients with MDD and SAD were recruited from four psychological services clinics in Sari, Iran. Patients were diagnosed with MDD or SAD according to the Structure Clinical Interview for DSM-IV Axis I Disorders (SCID-I)[38].

Exclusion criteria for two patient groups were the following: a) any current or past diagnosis of a psychotic disorder, and/or b) autism spectrum or any developmental disorders, and/or c) bipolar disorder and/or d) any neurological diseases such as epilepsy, parkinson's disease, or severe head injury. In addition, they were excluded if they had any substance abuse issues during the preceding six months. Moreover, patients in the SAD group were excluded if they had any history of major depression.

The healthy control (HC) group was recruited from the Islamic Azad University in Sari, Iran. None of the participants in HC group had a history of any DSM-IV Axis I or Axis II disorders, a brain injury, neurological diseases, and/or evidence of current or past substance abuse.

All participants satisfied the following criteria: they all were a) at least 20 years old, b) capable of understanding the experimental procedure, and c) had normal visual and auditory senses. The ethics committee of the Faculty of Psychology and Education of Shahid Beheshti University approved the procedure. All of participants gave written informed consent.

2.2. Clinical assessment

For both patient groups, diagnoses were established by the Persian version of Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I)[38]. All participants completed the Persian version of Beck Depression Inventory-II (BDI-II)[39] and the Persian version of Beck Anxiety Inventory (BAI)[40] to assess severity of depression and anxiety symptoms, respectively. The BDI is a 21-item self-report measure developed to assess the attitudes and clinical symptoms in both depressed and non-depressed psychiatric patients.[41] The BAI is a 21-item self-report measure, which evaluates the severity of anxiety symptoms and can differentiate between anxiety and depression.[42] In previous studies, the Persian versions of the BDI-II and the BAI had good psychometric properties.[39,40] In addition, we also employed the Wechsler Adult Intelligence Scale-Revised Version (WAIS-R)[43] in order to assess overall intellectual functioning.

2.3. TOM tasks

2.3.1. Reading in the mind of the eyes Task

To measure the decoding of mental states (i.e., affective aspect) of ToM, we utilized the Reading in the Mind of the Eyes test (RMET)[32] translated into Persian[44]. This test consists of 36 black-and-white photographs of the same size (15cm × 6 cm) from the eyes area of confederate actors. Three mental states are presented (i.e., neutral, negative, and positive), and the participant is asked to select the option which could best represent the mental state of the picture. Moreover, as a control task, volunteers were required to express their opinions on the gender of each picture (i.e., gender recognition). There was no

time limit for answering questions. The total score of each participant in the two tasks was calculated based on the total participant's correct response to each picture; the highest score a participant can acquire is 36. In addition to the two above-mentioned scores, in agreement with the Harkness et al.[45] study and the Richman & Unoka[31] pattern, three subscales were also calculated based upon the value of each mental state. In accordance with this pattern, the 36 photographs fit into three separate categories depending on the positive, negative, and neutral values of each mental state (i.e., 8 positive, 12 negative, and 16 neutral). Previous studies have indicated the attentional bias to negative stimuli in depressed individuals[46,47]; therefore, in this study we used such scoring for accurate differentiation of three groups in discrimination of positive and negative mental states.

2.3.2. Faux Pas Task

The faux pas task was used to assess the reasoning mental states (i.e., cognitive aspect) of ToM. This test composed of 20 short stories; half of them included a faux pas while the other half excluded a faux pas, considered as control stories. According to Baron-Cohen et al.[48], the Faux Pas occurs when a speaker says something without considering if it is something that listener might not want to hear or know; it typically has negative consequences that speaker never intended (See Appendix 1). There were no time limits, and therefore, to understand the story entirely, volunteers could read it repeatedly. At the end of every story, there were two faux pas questions together with two control ones. The faux pas questions were about the main character's intentions and were designed to assess the participant's thorough understanding as to whether or not they could recognize that a faux pas had occurred in the story.

The control questions aimed to check the reader's full comprehension of the story. In the Faux Pas Task, participants who answered "yes" to the first question (In the story you just read, has there been a faux pas and/or an embarrassing mistake in a social situation?) were required to answer the next faux pas question; meanwhile, in the stories involving a faux pas, one score was saved for each correct response. In case the subject's answer to the first question was "no", they were not asked the consequent question; however, all participants were required to answer the two control questions, even if their answers to the first question had been negative. Ultimately, 20 was the maximum score a participant could achieve on the Faux Pas Questions, and 40 on the control ones.

2.4. Statistical analysis

All statistical analyses were performed using SPSS 23. In data analysis, we compared the affective and cognitive dimensions of the theory of mind in the three groups of MDD, SAD and HC by a Multivariate analyze of variance (MANOVA).

3. Results

3.1 Demographic and clinical data

The demographic characteristics of three groups can be seen in Table 1. According to the results shown in Table 1, there was no significant difference between the participants of the three groups in mean age, educational level, and IQ; however, when comparing the clinical data and with respect to BDI-II scores, difference between groups was significant ($F(2, 104) = 40.36$, $p < 0.001$). Post hoc comparison shows that MDD and SAD groups had higher scores than the HC in BDI-II scores. Moreover, the SAD group had lower scores than MDD group in BDI-II. In BAI, three groups had also significant difference ($F(2, 104) = 38.12$, $p < 0.001$). Two groups of patients had higher scores than HC in BAI. In addition, the MDD group had lower scores than SAD group in BAI (table 1).

3.2. Comparisons of Decoding Ability among three groups

Multivariate analyze of variance (MANOVA) revealed a significant difference between the three groups in total score of ToM ($F(2, 104) = 11.27$, $p < 0.001$). Tukey post-hoc comparisons indicated that the HC group performed better than the SAD and MDD groups; moreover, there was no significant difference between the SAD and MDD groups in total score of ToM. In ToM subscales, the difference between the three groups was significant. In positive ($F(2, 104) = 8.19$, $p < 0.001$) and neutral ($F(2, 104) = 13.71$, $p < 0.001$) items, the HC group got higher scores than the SAD and MDD groups. For the negative items, the HC group got lower scores compared to the SAD and MDD groups ($F(2, 104) = 7.48$, $p < 0.001$). Moreover, there was no significant difference between the two groups of patients in ToM subscales. In gender recognition, no significant difference was found between three groups ($F(2, 104) = 0.24$, $p < 0.84$) (table 2).

3.3. Comparisons of Reasoning Ability among three groups

Results of the MANOVA indicated significant difference between groups in Faux pas test. The Tukey Post hoc comparison showed that, the SAD group had higher scores than the MDD group ($F(2, 104) = 23.16$, $p < 0.001$). Furthermore, there was no significant difference between the three groups in the control questions ($F(2, 104) = 0.48$, $p < 0.61$) (table 2). Figure 1 illustrates the performance of the three groups on the RMET and Faux Pas tests.

Table 1

Comparisons of demographic data and clinical data among groups.

	HC (n = 35)	MDD (n = 37)	SAD (n = 35)	Statistics
Sex ratio (M: F)	20:17	17:20	16:19	$\chi 2 = 0.58$, P = 0.37, n.s.
Index age (years)	28.38 ± 3.41	28.17 ± 2.27	27.49 ± 2.06	F = 1.39, P = 0.11, n.s.
Education levels (years)	16.21 ± 2.09	14.78 ± 2.35	14.36 ± 1.70	F = 1.08, P = 0.61, n.s.
IQ	110.48 ± 5.80	107.29 ± 7.61	108.52 ± 5.20	F = 1.46, P = 0.41, n.s.
BDI-II	8.11 ± 3.28	38.12 ± 3.84	20.36 ± 5.11	F = 40.36, P = 0.001 MDD > HC, MDD > SAD, SAD > HC
BAI	7.62 ± 3.39	19.71 ± 4.27	41.59 ± 6.13	F = 38.12, P = 0.001 MDD > HC, MDD < SAD, SAD > HC

Notes. HC: Healthy Controls; MDD: Major Depression Disorder; SAD: Social Anxiety Disorder; BDI-II: Beck; Depression Inventory; BAI: Beck Depression Inventory; n.s.: not significant difference.

Table 2
Comparisons of affective and cognitive ToM among groups.

Measures	MDD (n = 37)		SAD (n = 35)		HC (n = 35)		F	P	Partial η2	Post hoc
	M	SD	M	SD	M	SD				
Total ToM	23.81	3.29	24.94	3.11	27.60	3.74	11.72	0.001	0.18	HC > SAD & MDD
Positive ToM	5.32	1.49	5.71	1.21	7.37	2.09	8.19	0.001	0.16	HC > SAD & MDD
Negative ToM	9.15	2.39	8.92	1.83	6.10	1.69	7.48	0.001	0.15	HC < SAD & MDD
Neutral ToM	9.34	2.54	10.31	2.47	14.13	3.28	13.71	0.001	0.22	HC > SAD & MDD
Gender Recognition	32.37	2.39	31.54	2.31	32.45	2.63	0.24	0.84	0.002	n.s
Faux pas	13.45	2.51	16.02	2.09	16.71	1.74	23.16	0.001	0.30	MDD < SAD & HC
Control	37.16	2.03	36.74	1.96	36.77	2.08	0.48	0.61	0.009	n.s

Figure 1. Mean of accurate responses of RMET and Faux Pas test in three groups.

Notes. HC: Healthy Controls; MDD: Major Depression Disorder; SAD: Social Anxiety Disorder.

4. Discussion

The current study aimed to compare decoding mental states (i.e., the affective aspect of ToM) and the reasoning about the mental states (i.e, the cognitive aspect of ToM) in SAD, MDD and HC groups. A major strength of this study is the dissociation of dimensions of ToM in SAD patients as it is compared to MDD patients and the healthy control group. In comparison with previous studies, another strength of this study is the inclusion of clinical cases of SAD.

The results regarding the affective aspect of ToM measured by RMET paradigm demonstrated that both groups (SAD and MDD) represented lower functioning than the healthy group, while there weren't any

significant differences between these two groups of patients. The lower function of MDD patients in the total score of RMET is consistent with previous studies.[8,10,28–31]

According to results of the current study, the MDD patients not only suffer from deficits in affective ToM; Also, in comparison to SAD, patients and healthy groups had lower performance in cognitive aspect; however, in the cognitive aspect SAD and the healthy groups had not significant differences. In fact, the low function of MDD patients, both in decoding and reasoning mental states, indicates the general impaired of ToM in these patients. The recent findings are consistent with the Wang et al.[8] in which it had demonstrated that the depressed patients are vulnerable to the impairment in affective and cognitive dimensions of ToM. While, this finding is inconsistent with the results of Wolkenstein et al.[9]. Based on Wolkenstein et al.[9], MDD patients in comparison to HC had normal functioning in RMET, however, they demonstrated lower functioning in MASC test. Healthy functioning of MDD patients in the eye test on the study of Wolkenstein et al.[9] is inconsistent with other related studies. [8,10,28–31] It seems that this discrepancy originated from methodological limitations of Wolkenstein et al.[9] in which only 24 MDD patients were compared with 20 healthy individuals. However, other studies mostly cover more than 30 clinical cases for these comparisons. Furthermore, another reason behind this inconsistency can be related to difference in severity of depression in samples of previous studies. In this regard, Lee et al.[30] concluded that without any respect to the level of general depression severity, the presence of specific affective symptoms may represent a clinical subtype of depression and can be associated with compromised mental state decoding. As mentioned above, Wolkenstein et al.[9], found that MDD patients are capable of decoding and distinguishing correct mental state of others, however, they are incapable of dealing with and reasoning about mental states. Results of the current study are inconsistent with Wolkenstein et al,[9] while are consistent with Lee et al. (2005). Lee et al.[30] indicates that the MDD patients widely suffer from the ToM impairment in case of affective and cognitive aspects. In some previous studies, it's been suggested that when depression added to another disorder, dysfunction in ToM would be increased.[7] These results demonstrate that the MDD patients undergo difficulty of reading social interactions, which would be associated with chronicity and functional decline.[49,50] These difficulties are representations of generalized impairment of ToM in MDD patients, which is highly associated with the dysfunction of social interaction skills. One of the major reasons of this association can be related to same brain structures engaged in ToM and depression. The literature suggests the crucial role of ToM regions in the pathophysiology of depression. The available studies demonstrate that the prefrontal, orbitofrontal, ventromedial prefrontal cortex are neural underpinnings of ToM.[50,51] Furthermore, the neuroimaging studies indicated that the prefrontal cortex plays a critical role in the pathophysiology of mood disorders.[50,52] Some studies have shown that MDD patients have a smaller volume of orbitofrontal cortex in comparison of normal individuals.[53–55] This finding indicates role of this brain region in pathophysiology of MDD. On the other hand, there are some findings[56] that have regarded the orbitofrontal cortex as having a role in the recognition of mental states through eyes region photographs.

Unlike the generalized impairment of ToM in MDD patients, which involves both of affective and cognitive aspects, SAD patients had only difficulty in decoding mental states or the affective aspect. In other words, in case of reasoning mental states, SAD patients were similar to healthy individuals. Based on our knowledge, the current study is the first piece of research that has simultaneously differentiated function of SAD patients in both affective and cognitive aspects of ToM. The low function of SAD patients in RMET is consistent with the study of Hezel & McNally[36] as well as Washborn et al.[27]. An interesting point of this study is that unlike MDD patients, SAD patients did not have any significant difference with HCs in the faux pas test (i.e., cognitive aspect) of ToM. To make it clearer, it should be noted that SAD is generally preceded by MDD, and the clinical characteristics of MDD are more severe that of SAD.[27] Therefore, it can be expected that range of impairment of ToM in SAD is more than MDD patients. Longitudinal studies indicated that patients suffer from SAD who later diagnose MDD are characterized by higher levels of interpersonal over-sensitivity and social impairment than those who do not.[57,58] According to result of this study, impairment of ToM in SAD patients is solely representing its affective aspect or the decoding ability of mental states, and these patients are not suffering from the dysfunction in cognitive aspect or reasoning ability. Therefore, the impairment of interpersonal interaction of SAD patients has resulted from their impairment of affective aspect of ToM. According to attention control theory, the anxiety causes the impairment in the attention system and would lead to the decrease in the attention control and then excessive attention to threatening stimulants.[59] Difficulty in inhibition and shifting of attention, would probably lead to difficulty in recognition, decoding, and understanding cognitive realization of others in anxious individuals. It is interesting that the results of the current study in the subscales of RMET in both SAD and MDD patients, are align with cognitive perspectives in the attentional bias of patients to negative stimuli. In this study, MDD and SAD patients in comparison to the healthy group had lower scores in total ToM but higher scores in negative subscale. This result is consistent with findings of Wolkenstein et al.[9] in which the MDD patients represented higher function than HC in recognition of negative mental states. Cognitive models of depression emphasized that depressed individuals tend to negatively interpret the vague stimuli; these biases are crucial in the initiation and persistence of the disorder.[60] Depressed individuals tend to interpret social situation negatively and they have better memory for negative stimuli. This deficit is strongly consistent with dysfunction of social interaction skill in SAD patients.[46] Furthermore, inability to divert attention from threatening stimuli and to shift it to other stimuli[59], can also be regarded as the probable reason for the weakness of the SAD patients in decoding positive and neutral mental states. On the other hand, that inability causes high function in recognition of negative mental states. However in related previous studies[27,36] did not demonstrate a distinction between the recognition of negative, positive and neutral mental states in SAD patients. It can be said that this discrepancy is a result of subjects who participated in these studies. In current research, clinical case of SAD was studied, while in Hezel & McNally[36] relationship between the score of individuals in the self-report scale of the social anxiety evaluated along their function in RMET. Moreover, in Washborn et al.[27] participants chosen from general population of students.

The first limitation of this study is that we did not evaluate the relationship between the relapse rates of depressive and anxious symptoms and ToM performance. Investigation of this relationship seems important to achieve more additional results. Second, SAD and MDD patients were the ones seeking treatment. It would be better if a wider range of SAD and MDD patients are examined so that a more reliable conclusion can be reached regarding their ToM ability. Third, in this study the possible effects of use of medication on performance of SAD and MDD patients was not analyzed. Forth, we used a categorical approach for diagnose of SAD and MDD, whereas a dimensional model allows for varying degrees of severity that may increase the validity of a diagnosis.[24] Finally, we were limited by our small sample size.

Conclusion

Overall, the findings of this study confirmed the generalized impairment of ToM in MDD patients. Whereas, SAD group only had a deficit in the reasoning aspect of ToM. ToM impairments can contribute to dysfunction in social communication skills especially in MDD patients and have some important implications for the clinicians in the planning of psychological intervention.

Appendix 1:

Nahid had just moved into a new apartment. Nahid went shopping and bought some new curtains for her bedroom. When she had just finished decorating the apartment, her best friend, Zahra, came over. Nahid gave her a tour of the apartment and asked, "How do you like my bedroom?" "Those curtains are horrible," Zahra said. "I hope you're going to get some new ones!"

Did anyone say something they shouldn't have said or something awkward?

If yes, ask:

Who said something they shouldn't have said or something awkward?

Control question:

In the story, what had Nahid just bought?

How long had Nahid lived in this apartment?

Abbreviations

BAI
Beck Anxiety Inventory
BDI-II
Beck Depression Inventory-II
HC

healthy controls
MANOVA
Multivariate analyze of variance
MASC
movie for the assessment of cognition
MDD
Major depression
RMET
Reading the Mind in the Eyes Test
SAD
social anxiety disorders
SCID-I
Structure Clinical Interview for DSM-IV Axis I Disorders
ToM
theory of mind
WAIS-R
Wechsler Adult Intelligence Scale-Revised Version

Declarations

Ethics approval and consent to participate

The ethics committee of the Faculty of Psychology and Education of Shahid Beheshti University approved the procedure. All of participants gave written informed consent.

Consent for publication

Not applicable.

Availability of data and materials

The study data is available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

GM and AZ conceived the study aim, analyzed and interpreted the data and drafted the article. MR and ZD conceived the study, contributed to the study design and critically revised the article for important intellectual content and the grammatical errors. FM conceived the study, she was responsible for the study design, acquisition of data and drafting the article. All authors approved the final manuscript.

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Figures

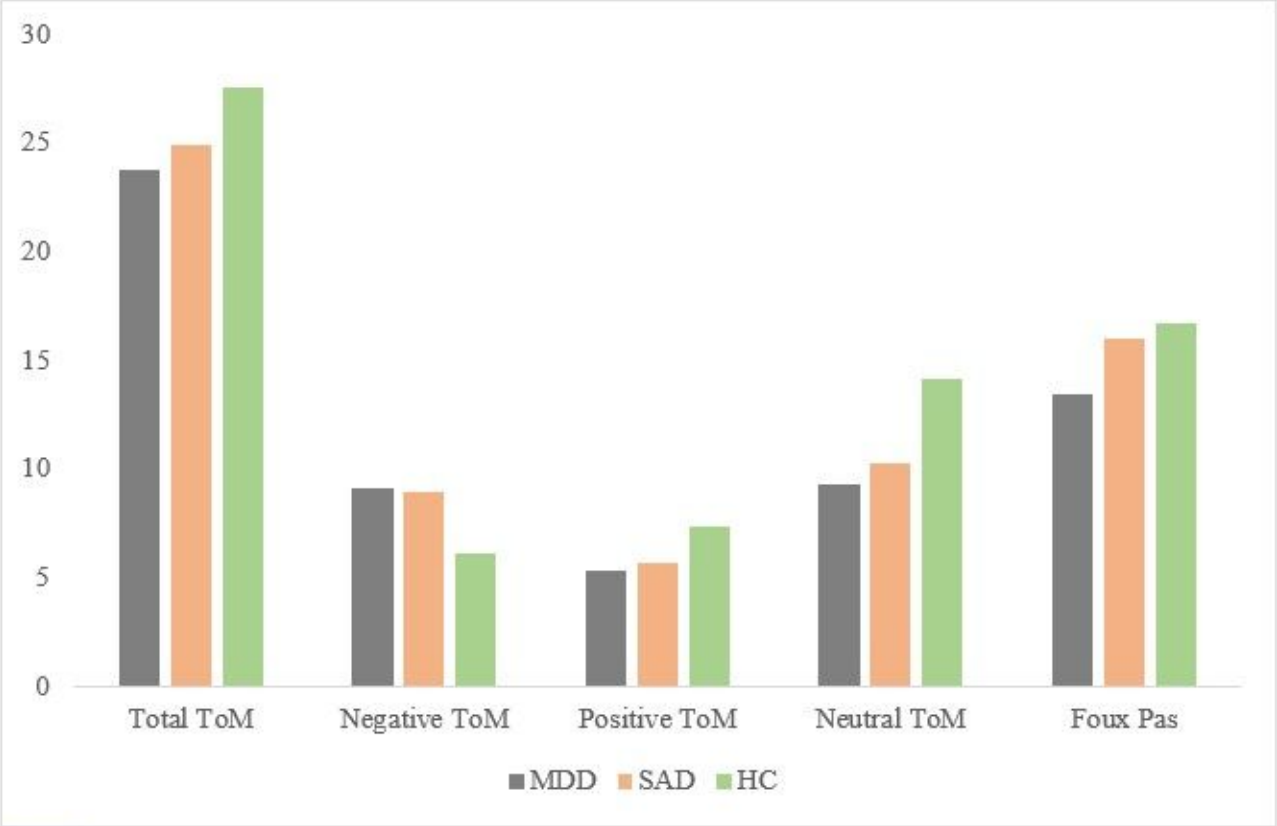

Figure 1

Mean of accurate responses of RMET and Faux Pas test in three groups. Notes. HC: Healthy Controls; MDD: Major Depression Disorder; SAD: Social Anxiety Disorder.