

Prediction of Social Anxiety Based on Mindfulness and Bias in Facial Emotion Processing

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Social anxiety is a fundamental problem in interpersonal relationships that causes many problems for people with this disorder. The present study aimed to predict social anxiety based on mindfulness, and bias in facial emotion processing. The statistical population of research included all of the female students of Shahid Chamran University of Ahvaz in 2023, and a sample of 200 people was selected from among them, using a random sampling method. The research method in this research is a predictive correlation, and due to the goal, it is applied research. To collect data, two social phobia questionnaires were used by Kanwar (2000), and Bauer's Mindfulness Questionnaire (2006), and a computerized facial emotion recognition task was designed by Nazari et al. (2015). The stepwise regression method was used to analyze the data. The results indicated the correlation of the components of description and non-judgment ($p < .001$) and bias in processing anger and fear emotions ($p < .001$) with social anxiety. The study revealed a statistically significant negative association between the variables of description and non-judgment with social anxiety. Additionally, a statistically significant positive link was seen among the variables of bias in anger and fear processing and social anxiety. Consequently, based on the findings of the current research, it seems that the lack of

mindfulness in the components of description, and judgment plays a role in the biased processing of negative emotions, such as anger and fear, and such a process causes the continuation of social anxiety.

Keywords: social anxiety, mindfulness, facial emotion processing

The most important and basic human need is the ability to communicate socially. By knowing and understanding the needs of others, a person can provide a basis for the growth and flourishing of his/her talents. Some evidence shows that people with high levels of social anxiety do not have the necessary ability, and skills to establish and maintain this communication (Felmingham et al., 2016). This disorder is associated with significant emotional disturbance and functional impairment in work and social spheres (Tolman et al., 2009). Social anxiety is distinguished by a substantial, enduring, and irrational apprehension of being scrutinized or assessed negatively by others, accompanied by both physiological and psychological manifestations of anxiety. Individuals diagnosed with social anxiety disorder either avoid or experience intense distress in the face of difficult circumstances (Baldwin et al., 2016). Field research, as well as laboratory research showed that human psychological abilities have a positive correlation with the reduction of physical and psychological symptoms of stress, and these abilities have a positive effect on mental health (Ryff and Singer, 1996; Taylor, 2003). One of these capabilities is mindfulness. Mindfulness is defined as a state of non-judgmental awareness and focuses on one's self and the world around. This state is in contrast to the rumination of the past, especially in the patients suffering from depression and fear of the future in those suffering from anxiety. Mindfulness involves training people to acquire a new attitude, and acceptance without judgment, processing emotions, thoughts, and bodily sensations to observe

negative mood states (Eisendrath, Chartier & Mclane, 2012). In other words, it is believed that the experiences of the conscious mind can cause changes in a person's thought patterns or attitudes about their thoughts (Guendelman, Medeiros & Rampes, 2017). Empirical evidence suggests that mindfulness leads to a more balanced emotional life (Brown & Ryan, 2003), and can help improve performance by reducing emotional arousal (Toniolo-Barrios & Pitt, 2021). In this regard, Makadi and Koszycki (2019) found in research that aspects of mindfulness are related to less social anxiety, as well as better performance, self-esteem, and life satisfaction. Moreover, mediation analysis showed that the descriptive aspect of mindfulness explained the relationship between self-compassion and social anxiety severity.

On the other hand, based on the Clark and Wells model, people with high levels of social anxiety tend to selectively process negative information in social situations. During social interactions, facial expressions, as one of the most important components of social cognition, provide us with very important information about people's feelings, and intentions (Gutierrez-García and Calvo, 2016). Several neurological processes facilitate facial emotion recognition. Discrete movements of facial muscles are visually represented (Ekman and Friesen, 1978), and are represented by specialized and integrated neural systems associated with emotion (Sabatini et al., 2009), including the inferior parietal cortex (Adolphs, 1996). Additionally, processing occurs in the occipital and orbitofrontal hemispheres (Sabatini et al., 2011). Activation of the frontal lobe grants access to emotionally encoded signals that were previously associated with facial muscle movements that conveyed similar sentiments. This process allows a person to accept emotions that are considered socially acceptable and process information visually to increase

the probability of correct classification of facial expressions (Pollak and Kistler, 1995). Biases and deficiencies in the processing and interpretation of faces may be the basis for maintaining and intensifying negative emotional states in social anxiety (Bourke, Douglas & Porter, 2010). Besides, disturbances within the amygdala and its abnormal connectivity during emotional face processing were reported in these patients (Liu et al., 2020; Xu et al., 2021). In general, based on the mentioned research literature on the role of mindfulness in human health (Brown & Ryan, 2003; Toniolo-Barrios & Pitt, 2021; Makadi & Koszycki, 2019) and the correct processing of emotions in social relationships, on the one hand, and the other hand, the lack of research of this kind that examines the relationship between mindfulness, and the processing of facial emotions with social anxiety, these questions are raised: Is there a relationship between mindfulness and facial emotion processing with social anxiety? And can the aforementioned variables be a suitable predictor for social anxiety?

Method

The research method is a predictive correlation, and in terms of the goal, it is applied research. The statistical population of the research included all of the female students of Shahid Chamran University of Ahvaz in 2023. Out of this number, 200 people were selected by random sampling and the research tool was presented to them for completion. The ethical considerations observed in this research are 1. Compliance with the principle of confidentiality-2. Permission not to answer the questionnaires and computer test - 3. A full explanation of the research tools.

Instruments

Kanver Social Phobia Inventory (2000)

This questionnaire was designed by Kanver et al. (2000) to evaluate social anxiety. Kanver's social phobia questionnaire is a self-measurement scale that includes 17 items and consists of three subscales: fear, avoidance, and physiological discomfort. Each item is scored based on a five-point Likert scale from not at all (zero scores) to very much (4 scores). The creators of this scale calculated its reliability based on the retest method at a two-week interval of .78, which was significant at the .001 level. They calculated the Cronbach's alpha of scale items as 0.94 in general and for the three components of fear, avoidance, and physiological discomfort as .89, .91, and 0.80 respectively, which was at a very favorable level. Hassanvand Amozadeh (2007) found the internal consistency of this questionnaire with a non-clinical sample to be .82 in the first half of the test and .86 in the second half of the test, the correlation between the two halves of the test was .76, and the Spearman-Brown correlation coefficient was .91. Furthermore, the internal consistency of the subscales of fear, avoidance, and physiological discomfort was obtained as .74, .75, and .75, respectively (Hasanvand Amouzadeh, 2007). This questionnaire was measured by Abdi (2008) due to the psychometric characteristics in three groups (SAD patients, anxiety patients, and normal subjects) by helping one-way variance analysis and the obtained findings showed significant differences among the groups. In another study, Momeni (2004) Cronbach's alpha of the whole questionnaire was .88, the alpha of the first and second half of the questionnaire was .81 and .77 respectively, the correlation between the two halves was .77 and its reliability coefficient was Spearman-Brown test reported equal to .87 (Meliani et al, 2008). Also, the reliability of this

questionnaire with the clinical retest method was reported by Fathi Ashtiani (2012) in groups diagnosed with social anxiety disorder equal to .78 to .89 and its Cronbach's alpha was .94 in a normal group. In order to determine the construct's validity, a comparison was made between the test scores of two groups: those of subjects diagnosed with social anxiety disorder, and those of normal subjects without psychiatric diagnosis; the results revealed a statistically significant distinction. Cronbach's alpha of this questionnaire is equal to .9 in the research conducted by Zavareh, Golparvar, and Aghaei (2017). In the study of Douglas et al (2002), its internal convergence was 0.98, which is significant at the .001 level.

Five-factor questionnaire of mindfulness (FFQM) (2006)

This questionnaire is a 39-item self-assessment scale developed by Baer et al. (2006) by combining items from the Freiberg Mindfulness Questionnaire, Mindfulness Awareness and Attention Scale, Kentucky Mindfulness Scale, Revised Cognitive and Affective Mindfulness Scale, it was expanded using the factor analysis approach (Baer et al, 2006). Each item is scored on a five-point Likert scale from never (1 score) to always (5 scores). The range of scores on this scale is from 39 to 195. A total score is obtained from the sum of the scores of the items, which shows that the higher the score, the higher the mindfulness (Baer et al., 2006). In a study conducted by Heydari Nesab, Ahmadvand, and Shouri (2013) on the validation and reliability of this questionnaire in Iran, the retest correlation coefficient of the mindfulness questionnaire was calculated as 0.84 in the Iranian sample. Furthermore, Cronbach's alpha coefficients of 0.83, which is an acceptable level, were obtained. Based on the findings of Bruin et al. (2012), the factors exhibited satisfactory

internal consistency, as evidenced by an alpha coefficient ranging from .75 to .91. In every instance, the correlation between the variables was significant and moderate, ranging from .15 to .34. Thus, in a study conducted on the validity and reliability of this questionnaire in Iran, the test-retest correlation coefficients of this questionnaire were observed between .57 and .84 in the Iranian sample. Besides, the alpha coefficients were acceptable (between .55 and .83) (Isenberg, 2008). In Neuser's (2010) research, the internal consistency of the factors was appropriate and the alpha coefficient was in the range of .75 to .91. The correlation between the factors was moderate and significant in all cases and was in a range between .15 and .34. Also, the test-retest validity of the five-factor mindfulness questionnaire in the research of Tamanai Far et al (2016) showed that the range of correlation between retests is between .76 and .86, and the test-retest validity of the total score of the questionnaire was also .89.

Facial emotion recognition computer assignment (2016)

This scale was designed by Nazari et al. (2016) and from emotionally charged images and standardized by Longer et al. (2010) which was prepared at the University of Nijmegen in the Netherlands and is available which was used in the Radboud image database. This scale was prepared by adapting the tasks used in similar studies to measure the recognition of the emotional load of the face and has good validity and reliability (Nazari et al., 2017). The tool utilizes a collection of twenty images, including full-face portraits of a child, adolescent boy, two female children, and neutral features, each of which embodies a distinct emotional charge such as pleasure, wrath, dread, or sorrow. There is every solitary visage in the image. The primary task requires 100 attempts. The task implementation process includes two

practice and the main parts, and the reason for using the practice part is to familiarize the participants with the test procedure.

Results

The present research was conducted on 200 female students of Shahid Chamran University of Ahvaz among the ages of 18 and 33. 84% of the participants were single people. Also, the percentage of people with bachelor's, master's, and doctorate degrees is 54.7%, 36.8%, and 8.5% respectively. Descriptive indices of research variables are reported in Table 1.

Table 1
Descriptive Information Related to Research Variables

Research Variables	Minimal	Maximum	Average	Standard Deviation	
Social Anxiety	0	59	18.21	11.86	
Mindfulness	Observation	12	34	25.30	4.29
	Description	11	35	25.01	4.80
	Action with Awareness	12	40	27.24	5.35
	Non-judgment	10	38	22.54	5.22
	Non-reaction	14	30	21.58	3.32
	Total score	90	175	130.27	14.73
Facial emotion processing	Anger	.30	1	.839	.136
	Fear	.30	1	.834	.134
	Happiness	.45	1	.95	.07
	Sadness	.30	1	.79	.15
	Neutral	.35	1	.84	.14
	Total score	.36	1	.85	.09

For the validity of data analysis with the regression method, the assumptions of this method were checked. Given that the study

variables' skewness and kurtosis values fell between +1 and -1, the findings demonstrated that the assumption of normalcy had been verified. The rejection of the residuals' correlation assumption was also brought about by Durbin-Watson's 1.5-2.5 range. To check the assumption of non-collinearity, tolerance, and inflation indices were used, and based on the obtained values ($TOI > 1.0$) and ($VIF < 10$), this assumption was confirmed. The results of Table 2 shows that between the total score of mindfulness and social anxiety ($r=.51$) and its subscales, including description ($r=-.56$), action with awareness ($r=-.37$), lack of judgment ($r=-.41$) and lack of reaction ($r=-.11$) have a negative and significant relationship. There was no significant relationship between the observation subscale and social anxiety ($r = .004$). Thus, there is a positive and significant relationship between the total score of facial emotion processing with social anxiety ($r=.21$), and bias in processing the emotions of anger ($r=.26$), fear ($r=.17$), and sadness ($r=.12$), but no significant relationship was found between happy emotions and recognition of neutral faces with social anxiety.

Table 2
Correlation Coefficients of Research Variables

Variable	Mindfulness												
	Total score	Neutral	Sadness	Happiness	Fear	Anger	Total score	Non-reaction	Non-judgement	Action with	Description	Observation	
1													1
2	.004	-.022	-.012	-.043	.022	-.043	.453**	.34**	-.09**	.105*	.227**		
3	-.561**	.039	.064	.153*	.046	-.04	.784**	.304**	.239**	.48**			1
4	-.379**	.017	.014	.067	.14	-.047	.734**	.054	.356**				1
5	-.41**	-.005	-.045	-.002	.11	-.112*	.534**	-.119*					1
6	-.112*	.067	.113*	.092	.091	-.008	.397**						1
7	-.518**	.042	.045	.112*	.102	-.076							1
8	.263*	.81**	.548**	.573*	.412**	.484**							1
9	.172*	.741**	.528**	.42**	.378**								1
10	.09	.624**	.412**	.439*									1
11	.128*	.795**	.48**										1
12	.141*	.787											1
13	.214*												1

P<0.05*

P<0.01**

To study the predictive role of independent variables, step-by-step multiple regression analysis was used. The results of the model analysis are reported in Tables 3 to 5. Based on Table 3 and based on the adjusted R^2 value obtained, the results of the analysis show that, in general, about .449 percent of the total changes in the dependent variable (social anxiety) can be predicted by the components of the independent variables of the research, including description, non-judgment, fear, and anger.

Table 3
Summary of Simultaneous Linear Machine Model

Model	R	R^2	Adjusted R^2
1	.561 ^a	.315	.311
2	.629 ^b	.395	.389
3	.669 ^c	.447	.439
4	.678 ^d	.460	.449

- a. Description
- b. Description, non-judgment
- c. Description, non-judgment, fear
- d. Description, non-judgment, fear, anger
- e. Dependent variable: social anxiety

Table 4
F Value and Significance

Model		Sum of squares	D.F.	Mean square	F	P
1	Regression	8866.035	1	8866.035	91.434	.000 ^b
	Remainder	19296.333	199	96.966		
	Total	28162.368	200			
2	Regression	11132.207	2	5566.104	64.714	.000 ^c
	Remainder	17030.161	198	86.011		
	Total	28162.368	200			
3	Regression	12601.309	3	4200.436	53.177	.000 ^d
	Remainder	15561.059	197	78.990		
	Total	28162.368	200			
4	Regression	12955.776	4	3238.944	41.747	.000 ^e
	Remainder	15206.592	196	77.585		
	Total	28162.368	200			

- a. Dependent variable: social anxiety
- b. Description
- c. Description, non-judgement
- d. Description, non-judgement, fear
- e. Description, non-judgement, fear, anger

Based on the results of Table 4 and the obtained values, including the F value and its significance, it can be concluded that the general model proposed in the research is significant ($P < .001$). To examine the model more closely by independent variables, the results related to each independent variable are shown in Table No. 5.

Table 5
Results of Model Analysis by Independent Variables

Variable	B	β	T	P
Fixed	52.887		14.328	.000
Description	-1.385	-.561	-9.562	.000
Fixed	63.528		15.694	.000
Description	-1.213	-.491	-8.632	.000
Non-judgment	-.664	-.292	-5.133	.000
Fixed	48.138		9.133	.000
Description	-1.225	-.496	-9.092	.000
Non-judgment	-.718	-.316	-5.768	.000
Fear	20.277	.230	4.313	.000
Fixed	42.182		7.124	.000
Description	-1.214	-.493	-9.112	.000
Non-judgment	-.671	-.295	-5.346	.000
Fear	14.485	.164	2.687	.008
Anger	11.331	.131	2.137	.034

Dependent variable: social anxiety

Based on the results of Table 5 and the resulting values, including the T value and its significance, it can be concluded that in more

detail, only the subscales of description and non-judgment in the variable of mindfulness and bias in the processing of emotions of fear and anger in the variable of facial emotion processing can predict social anxiety ($P < .05$).

Discussion

As you pointed out, the current research found that bias in processing negative emotions like fear and anger, as well as deficits in the mindfulness components of description and non-judgment, might predict social anxiety. In other words, among the five components of mindfulness, the two factors of description and non-judgment have a prominent role in the mind of ignorance and bias in emotion processing and can predict social anxiety. This finding is in line with the research of Liu et al. (2021), Makadi & Koziki (2019), and Jianfeng et al. (2016). Mindfulness means being in the moment with everything that is now, without judgment and without commenting on what is happening. Mindfulness helps us to understand that negative emotions may occur, but they are not a fixed and permanent part of the personality. It allows a person to respond with thought and reflection instead of responding to events involuntarily (Ebrahimi, Jafari & Ranjber Sadjani, 2018). High levels of mindfulness in people are associated with positive emotional outcomes. Higher levels of mindfulness enable greater emotional clarity; hence, the distinction between emotions is made better, and a more accurate and consistent response is given to them (Keshmiri, Fathi Ashtiani & Jalali, 2019). Therefore, when people are in a favorable state of mindfulness because the capacity to accept their thoughts and emotions increases, there is not much opportunity for cognitive connection with negative and ineffective thoughts and attitudes, and their negative emotional

processing and ineffective attitudes decrease drastically (Safarzadeh & Jahangiri, 2019). Because of this, individuals are better able to provide objective accounts of their experiences rather than being influenced by their own emotions or preconceived notions. The study also found that social anxiety may be predicted by a preference for identifying the feelings of anger and fear over the processing of other emotions. This finding is consistent with the results of Goodman, Kashdan, and İmamoğlu (2021), Kim et al. (2011) and Wheaton et al. (2012). In social communication, face perception is the most important feature. Each person's face includes their physical characteristics, gender, estimated age, race, emotional state, and health status. These characteristics are largely the basis of social cognition, and interpersonal communication of people (Haxby, Hoffman & Gobbini, 2002). One of the important aspects of emotion is its effect on the selectivity of attention. Anxious people tend to pay selective attention to some stimuli around them and ignore others. If they reassure themselves with some kind of selective thinking, their anxiety may be alleviated (Sadock & Sadock, 2007). Studies have shown that the processing of happy faces and positive emotions activates the prefrontal cortex, and more activity in this area indicates a greater appreciation for positive emotions (Ebner, Johnson & Fischer, 2012; Winecoff et al., 2013) and a decrease in its activity is a sign of paying less attention to that emotion, and as a result paying more attention to negative emotions. The activation of the frontal lobe allows a person to accept socially acceptable emotions and to process information visually and to increase the probability of correct classification of facial expressions (Pollack & Kistler, 1995). Mindfulness causes people to have a non-judgmental look at the world around them and observe and describe all feelings and emotions as they exist. In

people with social anxiety disorder, the processing of anger and fear emotions from the faces around them is more than other emotions, and this will cause their anxious reactions to social situations. Therefore, people with a high level of mindfulness can pay attention to anxious thoughts with a detached view and see them only as thoughts, not as proven facts. As a consequence, they are better able to control their emotions than those with a low level of awareness. Also, living in the now and avoiding the ruminations of past failures and future fears, which is the core of mindfulness, might spare a person from the anxieties that spread with these ruminations. By the above explanations, it seems that increasing the level of mindfulness is a factor that can control anxious thoughts that lead to traumatic emotions and reactions and improve the problems of people with social anxiety disorder. In general, based on the findings of the current research, deficiency in mindfulness especially the components of description, and lack of correct judgment is the basis for bias in processing negative emotions, and recognizing anger and fear far more than other emotional effects, such as a happy and neutral face in people suffering from social anxiety. Consequently, the bias in decoding and recognizing emotions that activate the threat and escape system causes a person to refrain from being in the community, and show avoidance reactions. In this regard, some study data demonstrates that cognitive rehabilitation based on emotion recognition and memory might increase the accurate processing of facial emotional expressions in treatment seekers (Peymannia et al., 2022). This study has certain drawbacks, including a gender bias in its sample and the inability to apply the findings to male students. Furthermore, the research community is only the female students of Shahid Chamran University of Ahvaz, and it is not possible to generalize the data to other

communities. Besides, using a self-report tool to measure social anxiety and the probability of statistical return (regression) may have caused the statistical results to be inaccurate. In total, these cases, along with the small size of the sample, reduce the generalization of the data to other samples. Therefore, it is suggested that in future research, the effect of cognitive rehabilitation along with mindfulness-based treatments should be investigated as another effective modality in social anxiety

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