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Facial emotion recognition in patients with relapsing-remitting multiple sclerosis

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Abstract

Objective: Multiple sclerosis (MS) is an autoimmune disease of the central nervous system and the most common cause of disability among young adults. In addition to physical and cognitive disturbances, MS patients also have emotional processing deficits. Despite the rich knowledge available about cognitive impairments, little is known about emotion recognition in patients with relapsing-remitting MS (RRMS), despite the fact that it plays a key role in social behavior. The aim of our study was to investigate facial emotion recognition in patients with RRMS, compared with healthy controls. *Methods:* Facial emotion recognition abilities were studied in a homogeneous group of 51 RRMS patients and 51 healthy controls, using the Persian version of the Florida Affect Battery. We controlled both groups for physical symptoms, anxiety, depression and social dysfunction, using general health questionnaire (GHQ-28). Patients and healthy controls were matched according to age and gender. Early stage of the disease was defined as being diagnosed with RRMS and having an EDSS of 4 or lower. *Results:* MS patients performed as well as healthy controls in facial identity discrimination and facial emotion discrimination tasks, but showed significantly less performance in other subtests that required emotion recognition in comparison with healthy controls.
Conclusions: Facial emotion recognition is impaired at early stages of MS. MS patients have problems in their emotional processing system. Deficits in facial emotion recognition merit attention because they might negatively influence interpersonal relationships and quality of life in MS patients.

Keywords: Multiple sclerosis, social cognition, facial emotion recognition, relapsing-remitting multiple sclerosis

INTRODUCTION

Multiple sclerosis (MS) is a chronic inflammatory disease, affecting principally the central nervous system (CNS). It causes damage to the myelin sheath and the oligodendrocytes, which results in various signs and symptoms.[1] In addition to sensory symptoms, pain, walking difficulties, depression and cognitive problems (e.g., memory, attention and information processing speed impairments), emotional abnormalities are common in this disease and add considerably to the distress and disability of the patient.[2,3] In contrary to a wealth of research into the neurological and cognitive manifestations of MS, little attention has been paid to social cognition.[4]

Social cognition describes cognitive processes related to the perception, understanding and implementation of linguistic, auditory, visual and physical cues that communicate emotional and interpersonal information.[5] It enables us to interact in complex social environments and to engage in the activities that we value most, such as family, friendship, love and cooperation. Accordingly, impairments in social cognition can have a devastating impact on social interactions, interpersonal relationships, employment and experiential activities which are identified as key factors for subjective wellbeing.[6] Deficits in psychosocial functioning have long been described in patients with MS: they have fewer social activities, a higher risk of divorce and are more often unemployed.[7] Several studies have shown that various aspects of health-related quality of life in patients with MS are significantly lower than that of the normal population especially with respect to the mental domain (e.g., social functioning, general mental health and emotional problems).[8,9]

Emotion recognition is a core aspect of social cognition. Faces are privileged stimuli for studying

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multiple aspects of emotion perception in relation to social cognition. Facial emotion recognition refers to an individual's ability to identify and discriminate between the emotional states of others, based on their facial expressions. Emotion perception from faces is essential for adaptive behavior and interpersonal skills such as empathy, and serve many social regulatory functions.[10]

To date, social cognitive studies has suggested that emotion recognition is impaired in patients with MS.[11-21] However, these results vary relating to the assumed influence of anxiety, depression and cognitive impairment on emotion recognition. Moreover, some studies did not consider facial identity recognition and other influential factors such as disability.[10,18] Some researches proposed that elusive problems in emotion recognition could be partly responsible for interpersonal problems observed in MS patients.[18] Recently, neuropsychological studies on social cognitive deficits in MS suggested that white and gray matter pathology disturbs various brain areas and interrupts a number of neural networks that play significant roles in social cognition.[12,14,17-18,22]

Earlier researchers have also documented the impact of depression and anxiety on social cognition. Furthermore, psychological problems such as depression and anxiety are common among patients with MS.[23] Depression and anxiety could be expected responses to the unpredictable course of this disabling and chronic disease. Several psychosocial risk factors such as inadequate coping behavior, unsatisfactory social support or MS-related structural brain changes could predispose MS patients to depression and anxiety. Depression and anxiety in MS patients are associated with deficits in emotional processing, which may lead to unsuitable reaction to others' emotions and interfering with successful social dealings.[24]

The aim of the present study was to investigate facial emotion recognition in patients with RRMS, by comparing facial identity discrimination and four aspects of facial emotion recognition (discrimination, naming, selection and matching) of a homogeneous cohort of relapsing–remitting MS (RRMS) patients with those of healthy controls.

METHODS

Fifty one patients were recruited from the medical clinic at Shiraz University of Medical Sciences using convenience sampling method. We enrolled patients with clinically definite RRMS who met the following criteria: 1. Expanded Disability Status Scale (EDSS), according to 2010 McDonald criteria, ranging from 0 to 4, affirmed by neurological examination; 2. No administration of high doses of methylprednisolone as pulse therapy during the past 3 months; 3. No chronic diseases other than MS such as cancer, or major psychological problems such as psychosis, depression and anxiety; 4. No history of substance abuse; 5. No severe auditory or visual impairment that would interfere with the test. The results were compared to a group of 51 healthy controls, with no history of neurological or psychiatric illness, no history of substance addiction and no severe auditory or visual disabilities. Healthy controls were selected by means of written and oral announcements.

We collected information about demographic aspects (age and gender) for all participants. Depression, anxiety, somatic symptoms and social dysfunction were assessed using the self-administered general health questionnaire (GHQ-28), developed by Goldberg in 1978. The GHQ-28 is a rapid screening tool to detect those likely to have or to be at risk of developing psychiatric disorders. It includes four subscales: somatic symptoms; anxiety; social dysfunction and depression. Scores less than 23 are considered as normal.[25]

After carrying out the above test, we used the Persian version of the Florida Affect Battery to examine emotion recognition. The facial affect tasks include different men and women, displaying one of 7 different facial expressions (happiness, sadness, anger, fear, disgust, surprise and neutral), across 5 subtests. The formats of subtests are as follows: In the first task, subjects should determine whether the pairs of faces are same or different. Subtest 2 requires facial emotion discrimination, in which subjects determine whether two faces depict the same or different emotional expressions. Subtest 3 involves facial emotion naming; it requires subjects to verbally label facial expressions. Subtest 4 comprises a facial emotion selection task; assessing the ability to select target facial expressions named by the examiner. Subtest 5 demands facial emotion matching; subjects are asked to match the picture of an emotional face to another face with the same emotional expression. In each assignment, one score is given to each correct answer and a zero to the wrong one.[26]

Data collection was undertaken between April 2016 and August 2016. Testing lasted approximately 1 hour in one session, at the medical

Table 1: Sample characteristics of the study patients and controls

Characteristics	MS	Healthy controls	t/ x^2
Demographics			
Men/Women	9/42	7/44	0.30(NS)
Age in years (Range)	34.86(20-58)	31.78(20-53)	1.79(NS)
Course (RRMS)	51		
Time since diagnosis (years)	6(0-15)		
EDSS (Range)	<4		

MS: multiple sclerosis, RRMS: relapsing-remitting multiple sclerosis, EDSS: expanded disability status scale, NS: not significant

clinic at Shiraz University of Medical Sciences for MS patients and department of Clinical Psychology at Shiraz University for healthy controls. The confidentiality, aims and procedures of the study was explained to participants before they obtaining their consent to be involved in the study. The study was approved by the Psychology and Counseling Organization of the Islamic Republic of Iran.

Statistical analyses

Statistical analysis was performed in SPSS 24. Descriptive statistics were used to summarize the basic features of the collected data. Group differences were assessed using multivariate analysis of variance (MANOVA), and independent t-test. The Pearson correlation was done to check the relationships between variables. All P values less than 0.05 were considered statistically significant.

RESULTS

The 51 study patients' details are given in Table 1. MS participants were 82.4% female and 17.6% men, ranging in age from 20 to 58 years with a mean age of 34.86 ± 7.85 years. Healthy controls were 86.3% female and 13.7% men, ranging in age from 20 to 53 years with a mean age of 31.78 ± 9.44 years. The groups did not significantly differ in age or gender.

To control factors such as depression, anxiety, social dysfunction and physical symptoms we assessed them using the GHQ questionnaire. The results are demonstrated in Table 2. All subjects received normal scores in all 4 subscales and there are no significant differences between the two groups. The other factor, cognitive impairment, was controlled by restricting patients to those who were in the early stage of the disease, whose cognition were less impaired. Early stage of the disease was defined as being diagnosed with RRMS and having an EDSS of 4 or lower.

The means and standard deviations for facial identity discrimination, facial emotion discrimination, facial emotion naming, facial emotion selection and facial emotion matching are shown in Table 3.

To assess group differences, a 2×5 factorial design was used with group (MS patients vs. controls) as the between-group variable and recognition task (neutral identity and 4 emotion

Table 2: Descriptive statistics of neuropsychological factors

Neuropsychological factors (GHQ score)	Group								t	df	P
	MS				Healthy controls						
	Mean	SD	Range	n	Mean	SD	Range	n			
Depression	9.75	4.07	7-23	51	9.88	3.92	7-23	51	-0.17	99.85	NS
Anxiety	13.64	4.25	7-23	51	12.87	3.89	7-23	51	0.96	99.24	NS
Social dysfunction	13.63	2.89	8-23	51	13.93	2.60	8-20	51	-0.56	98.86	NS
Physical symptoms	13.65	3.84	7-23	51	12.45	3.67	7-23	51	1.61	99.80	NS

MS: multiple sclerosis; GHQ: general health questionnaire, SD: standard deviation, NS: not significant

Table 3: Mean (SD) of current samples for facial emotion recognition tasks

Measure	Group					
	MS			Healthy controls		
	Mean	SD	n	Mean	SD	n
Facial identity discrimination	7.92	±0.27	51	7.92	±0.27	51
Facial emotion discrimination	13.80	±1.64	51	14.51	±1.42	51
Facial emotion naming	16.29	±2.96	51	18.22	±2.16	51
Facial emotion selection	12.35	±1.96	51	13.60	±1.15	51
Facial emotion matching	12.43	±2.01	51	13.35	±0.89	51

SD: standard deviation

recognition tasks) as the dependent variable. The results from the MANOVA analyzing the five subscales of recognition task were statistically significant (Wilkes's lambda = 0.84, F (5, 96) = 3.60, P = 0.005, Partial eta = 0.16). The analysis of each dependent variable through tests of between-subject effects (0.01) showed that recognition of facial identity by MS patients was not impaired compared to healthy controls (F (1,100) = 0.00, P = 1.000, Partial eta = 0.00). Also, the groups did not significantly differ on the facial emotion discrimination (F (1,100) = 5.41, P = 0.022, Partial eta = 0.05). But the MS compared to the control group performed more poorly on the facial emotion naming (F (1,100) = 14.03, P = 0.000, Partial eta = 0.12); facial emotion selection (F (1,100) = 14.60, P = 0.000, Partial eta = 0.13) and facial emotion matching (F (1,100) = 8.94, P = 0.004, Partial eta = 0.08) (Figure 1).

To further explore the relationship between emotion recognition tasks and neuropsychological variables, including depression, anxiety, social dysfunction and physical symptoms that may have an effect on emotion recognition performance, we performed a Pearson correlation analysis. There was a significant negative correlation between facial affect matching and physical symptoms ($r=0.30, p<0.05$) in MS patients and a negative relationship between facial affect selection and anxiety ($r=0.30, p<0.05$) in healthy controls (Table 4).

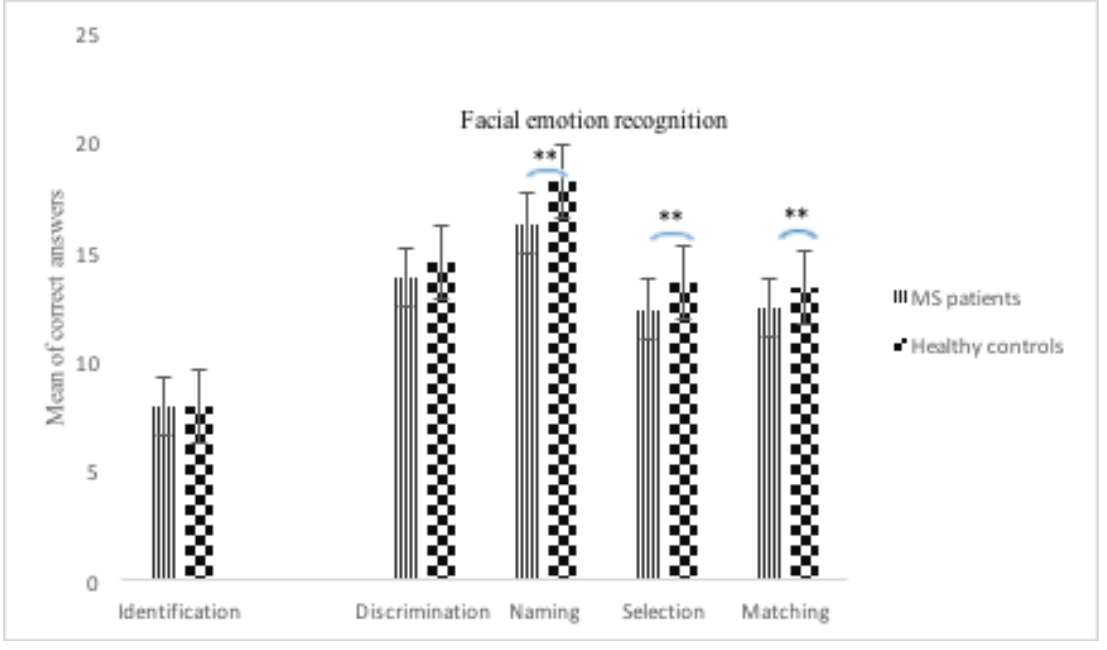

Figure 1: Recognition of facial emotion expressions. (** = p<0.01)

Table 4: Correlations between facial emotion recognition tasks and neuropsychological factors

Group	Variables	Depression	Anxiety	Social dysfunction	Physical symptoms
MS patients	Facial identity discrimination	0.11	0.05	-0.06	-0.12
	Facial emotion discrimination	0.11	0.09	-0.05	-0.12
	Facial emotion naming	0.07	-0.01	0.03	-0.07
	Facial emotion selection	0.19	0.10	-0.09	-0.16
	Facial emotion matching	0.21	-0.01	0.02	-0.28*
	Total	0.17	0.04	-0.02	-0.18
Healthy controls	Facial identity discrimination	0.20	0.22	0.11	0.14
	Facial emotion discrimination	0.14	-0.02	-0.01	0.09
	Facial emotion naming	0.01	-0.09	-0.14	-0.05
	Facial emotion selection	-0.11	-0.30*	-0.07	-0.21
	Facial emotion matching	-0.01	-0.21	-0.08	-0.12
	Total	0.03	-0.15	-0.09	-0.07

* = $p<0.05$ (2-tailed)

DISCUSSION

The aim of the present study was to explore whether patients with early stage of MS have deficits in facial emotion recognition, in comparison with healthy controls. It was especially important for us to study a homogeneous group of patients with RRMS who were at early stage of illness.

The results of this study, in line with previous findings, indicate that MS patients who are at the early stage of the disease show certain deficits in recognition of emotions and these impairments are not limited to patients with progressive disease forms.[11-13,15-18] The present study provides further evidence that even in the absence of serious depression, anxiety, social dysfunction and physical symptoms, and with 100% facial identity recognition, MS patients showed impaired emotion recognition ability for facial expressions. Task difficulty might play a role in the relatively good performance in facial identity discrimination and facial emotion discrimination subtests and poor performance in the other emotion recognition tasks. Also, it seems that at the early stage of the disease, the functional reorganizations take place in the brain of the patients and minimize clinical expressions of the brain damage.[22]

Correspondingly, facial emotion recognition deficits observed in MS patients were not significantly related to depression, anxiety, social dysfunction and physical symptoms. These findings are consistent with previous findings suggesting that facial emotion recognition impairment observed in MS is not simply caused by low temperament or physical incapacity.[18]

In general, the findings show that MS patients have more specific problems in facial recognition of emotions. Abnormalities in brain regions seems to play an important role in emotion recognition impairment in MS, as reported by other studies.[12,14,22]

There are of the limitations of the current study. Firstly, this is a cross-sectional methodology. Future studies should use a longitudinal design to carefully examine changes in emotion recognition from the beginning of the disease to its more advanced stages. Another study limitation is that the sample size was rather small. Furthermore, we did not screen and recruit consecutively all

patients presenting to the MS clinic, thus a bias may have been introduced. Also, we did not use any specific test to measure cognitive impairment. We recommend that future research consider other dimensions of emotion recognition, including prosody and body movements in patients with MS. Finally, since emotion recognition is a key aspect of social cognition and can potentially have an effect on psychosocial problems observed in MS, we suggest a multidimensional therapy method, including psychological and medical interventions to enhance quality of life of patients.

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DISCLOSURE

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REFERENCES

1. Schaeffer J, Cossetti C, Mallucci G, Pluchino S. Multiple sclerosis. In: Zigmond MJ, Rowland LP, Coyle JT, eds: Neurobiology of brain disorder. London: Academic Press, 2015:497-520.
2. Koriem KM. Multiple sclerosis: New insights and trends. *Asian Pac J Trop Biomed* 2016;6(5):429-40.
3. Prokopova B, Hlavacova N, Vlcek M, *et al*. Early cognitive impairment along with decreased stress-induced BDNF in male and female patients with newly diagnosed multiple sclerosis. *J Neuroimmunol* 2017;302:34-40.
4. Chalah MA, Ayache SS. Deficits in social cognition: an unveiled signature of multiple sclerosis. *J Int Neuropsychol Soc* 2017;23(3):266-86.
5. Elamin M, Pender N, Hardiman O, Abrahams S. Social cognition in neurodegenerative disorders: a systematic review. *J Neurol Neurosurg Psychiatry* 2012:83(11):1071-9.
6. Sherman EM, Griffiths SY, Akdag S, Connolly MB, Slick DJ, Wiebe S. Sociodemographic correlates of health-related quality of life in pediatric epilepsy. *Epilepsy Behav* 2008;12(1):96-101.
7. Julian LJ, Vella L, Vollmer T, Hadjimichael O, Mohr DC. Employment in multiple sclerosis. *J Neurol* 2008;255(9):1354-60.
8. Ashjazadeh N, Hadianfard H, Feridoni S, Farjam E. Assessment of health-related quality of life in patients with multiple sclerosis living in the Fars province of Iran. *Neuroimmunol Neuroinflamm* 2016;3(3):57-62.
9. Hadianfard H, Ashjazadeh N, Feridoni S, Farjam E. The role of psychological resilience, severity of disease and treatment adherence in the prediction of health-related quality of life in patients with multiple sclerosis. *Neurol Asia* 2015;20(3):263-8.
10. Cotter J, Firth J, Enzinger C, *et al*. Social cognition in multiple sclerosis: a systematic review and meta-analysis. *Neurology* 2016;87(16):1727-36.
11. Beatty WW, Goodkin DE, Weir WS, Staton RD, Monson N, Beatty PA. Affective judgments by patients with Parkinson's disease or chronic progressive multiple sclerosis. *Bull Psychon Soc* 1989;27(4):361-4.
12. Jehna M, Langkammer C, Wallner-Blazek M, *et al*. Cognitively preserved MS patients demonstrate functional differences in processing neutral and emotional faces. *Brain Imaging Behav* 2011;5(4):241-51.
13. Phillips LH, Henry JD, Scott C, Summers F, Whyte M, Cook M. Specific impairments of emotion perception in multiple sclerosis. *Neuropsychology* 2011;25(1):131-6.
14. Krause M, Wendt J, Dressel A, *et al*. Prefrontal function associated with impaired emotion recognition in patients with multiple sclerosis. *Behav Brain Res* 2009;205(1):280-5.
15. Henry A, Tourbah A, Chaunu MP, Rumbach L, Montreuil M, Bakchine S. Social cognition impairments in relapsing-remitting multiple sclerosis. *J Int Neuropsychol Soc* 2011;17(6):1122-31.
16. Henry JD, Phillips LH, Beatty WW, *et al*. Evidence for deficits in facial affect recognition and theory of mind in multiple sclerosis. *J Int Neuropsychol Soc* 2009; 15(2):277-85.
17. Berneiser J, Wendt J, Grothe M, Kessler C, Hamm AO, Dressel A. Impaired recognition of emotional facial expressions in patients with multiple sclerosis. *Mult Scler Relat Disord* 2014;3(4):482-8.
18. Bora E, Özakbaş S, Velakoulis D, Walterfang M. Social cognition in multiple sclerosis: a meta-analysis. *Neuropsychol Rev* 2016;26(2):160-72.
19. Pöttgen J, Dziobek I, Reh S, Heesen C, Gold SM. Impaired social cognition in multiple sclerosis. *J Neurol Neurosurg Psychiatry* 2013:84(5):523-8.
20. Cecchetto C, Aiello M, D'Amico D, *et al*. Facial and bodily emotion recognition in multiple sclerosis: the role of alexithymia and other characteristics of the disease. *J Int Neuropsychol Soc* 2014;20(10):1004-14.
21. Roca M, Manes F, Gleichgerrcht E, *et al*. Cognitive but not affective theory of mind deficits in mild relapsing-remitting multiple sclerosis. *Cognitive and Behavioral Neurology* 2014;27(1):25-30.
22. Passamonti L, Cerasa A, Liguori M, *et al*. Neurobiological mechanisms underlying emotional processing in relapsing-remitting multiple sclerosis. *Brain* 2009;132(12):3380-91.
23. Butler E, Matcham F, Chalder T. A systematic review of anxiety amongst people with multiple sclerosis. *Mult Scler Relat Disord* 2016;10:145-68.
24. Gay MC, Bungener C, Thomas S, *et al*. Anxiety, emotional processing and depression in people with multiple sclerosis. *BMC Neurol* 2017;17(1):43.
25. Bridges KW, Goldberg DP. The validation of the GHQ-28 and the use of the MMSE in neurological in-patients. *Br J Psychiatry* 1986;148(5):548-53.
26. Torkladani N. Making and Verifying the Validity and Reliability of Speaking and Face Detection Test for Persian Individuals. [Iran]: Iran University of Medical Sciences: 2010.