Accuracy and reaction time in recognition of facial emotions in people with multiple sclerosis

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Introduction. Facial emotional expression constitutes a basic guide in the social interaction and, thus, the alterations in its expression or recognition imply an important limitation for the communication. On the other hand, cognitive impairment and the presence of depressive symptoms, which are commonly found in patients with multiple sclerosis, it is unknown how they influence cognitive function and depression on emotional recognition.

Aims. To consider the evaluation of time reaction and response accuracy of facial expression recognition in people affected by multiple sclerosis, and to assess the possible variables that may be modulating the emotion recognition, such as depression and cognitive functions.

Subjects and methods. The study has a cross-sectional non-experimental design with a single measurement. The sample is compound by 85 participants, 45 diagnosed as multiple sclerosis and 40 control subjects.

Results. Multiple sclerosis subjects reveal significant differences in both reaction time and response accuracy in neuropsychological tests in comparison to the control group. Explanatory models were identified in the emotional recognition.

Conclusion. Multiple sclerosis subjects face difficulties at recognising facial emotions; and differences at attention memory, processing speed and depressive symptomatology were observed in regard to the control group.

Key words. Cognitive functions. Depression. Reaction time. Recognition facial emotion. Response accuracy.

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Introduction

Emotions let us approach the world we are immersed in and, mainly, they enable us to mix with the social environment in an efficient way. Emotional content recognition experience or emotional cues can be found in all sort of situations, and even in the new projects we embark; until we recognise the emotions a theatre play provoke us or the day to day situations that encourage us to express emotions. In addition, emotions supply us with abilities that would help us to safe our life in dangerous and daily situations [1].

The robust evidence found by Ekman studies [2-4] has enabled the understanding of aspects that were unknown at the moment; as the fact that emotions are universal and that the recognition of facial expression does not depend on the particular culture the person is in. Ekman described six basic emotions that are: anger, disgust, fear, happiness, sadness and surprise. Each emotion represents a concrete physiological response pattern [1]. The human being has the ability to recognise facial emotions and he accounts for a rigid, fast and automatic attentional strategy. This strategy is sensitive to little changes in expression, which likewise are involuntary. Microexpressions can be displayed in milisenconds, they are extremely fast and it is just needed to detect an emotional cue in order to correctly distinguish an emotion [1,3].

Some pathologies and disorders are characterised by a dysfunction in the facial recognition of emotions [5]. The presence of disturbances in the emotional functions is the major cause of functional inability, due to the fact that the existence of difficulties in the recognition of facial emotions implies an impaired relationship with the social environment [6].

Found that people affected by multiple sclerosis had an inferior performance on the emotion recognition on prosodic signals, and it suggested that individuals affected by multiple sclerosis could face difficulties at maintaining social interactions due to a deficit in the understanding of emotional information [7]. We are going to study the cognitive functioning and the factors that may be modulating the facial emotions recognition in multiple sclerosis. This study has a cross-sectional character with a single measurement and it is targeting the measurement of the facial emotion recognition type

and the identification of the variables that can exert an influence on the emotion recognition of people affected by multiple sclerosis, such as depression and cognitive functions.

Subjects and methods

Participants

A total amount of 85 subjects participated in the study. From the multiple sclerosis group, 45, the 35.6% corresponds to men and the 64.4% to women, whose age was comprised between 33 and 72 years with a mean of 49.44 ± 9.44. In the control group the 50% were women and the 50% men, whose age was comprised between 30 and 69 years with a mean of 50.78 ± 10.08. This study encompasses participants affected by relapsing-remitting multiple sclerosis (53.3%), primary progressive multiple sclerosis (22.2%), secondary progressive multiple sclerosis (13.3%) and recurrent progressive multiple sclerosis (11.1%). The selection criteria for participants were that the participants had a multiple sclerosis diagnosis without visual impairment that would prevent them from making the tests. It was checked the absence of visual difficulties, the fact that they knew how to read and write and the lack of motor difficulties that would impede the participation in the execution of different tasks developed in the study (Table I).

Instruments

All participants were individually tested in a classroom. Clinical evaluation was measured using the Hospital Anxiety and Depression Scale (HAD) [8]. This scale assesses the anxiety and depression responses of people with physical or mental diseases and it can also be used in general population. It consists of 14 items, each one showing four Likert-style response options.

Neuropsychological evaluation was measured using different tests: Stroop Color and Word Test (Stroop) [9], which measures divided attention and resistance to interference. Stroke Test or Trail Making Test [9] evaluates cognitive flexibility, divided visual attention, visual tracking, graphomotor skills and processing speed. Symbol and Digit Modalities Test (SDMT) [10] primarily evaluates attention, visual tracking, processing speed and visuo-motor speed. Finally, it is used Complutense Verbal Learning Test (TAVEC) [11], which evaluates short and long term memory.

The emotion evaluation was measured using: Facial Recognition Test [12]. It assesses the ability to discriminate faces without the interference of a mnemonic component. Eye Task [13], evaluating complex mental states, consists of 36 photographs of men and women's eyes who express a feeling or thought. Finally, Facially Expressed Emotion Labeling (FEEL) [14] measured the ability to recognize basic emotions (anger, disgust, fear, happiness, surprise and sadness) in facial expressions, evaluating the reaction time and the accuracy of the response given.

Statistical analysis

The analysis of quantitative clinical and demographic variables was made through descriptive statistics (frequency, mean, median and standard deviation) while nominal and categorical variables were analysed through their frequency and percentage.

Student *t*-test was applied to the mean comparison. In turn, in order to test the influence of the distinct independent variables, it was made an analysis of covariance (ANCOVA).

Finally, a stepwise multiple regression analysis was made as a means of providing the variables with an equation which relates one to each other, in a way that the values which represent a given variable can be predicted by other variables.

It was established a statistical significance value (p) of 0.05 at a 95% confidence level, and SSPS version 2.0 was used in order to conduct the described analyses.

Results

Clinical evaluation

There were observed statistically significant differences when anxiety and depression indexes were compared between clinical and control group: anxiety (t = 2.875; $p < 0.05$) and depression (t = 6.543; $p < 0.05$). Both showed a higher mean among the clinical sample, presenting the anxiety index a mean of 7.84 ± 4.29 (5.03 ± 4.75 for the control group) and revealing the depression index a mean of 7.07 ± 3.58 (2.43 ± 2.86 for the control group)

Neuropsychological assessment

Student *t*-test for independent samples was used in order to examine the presence of statistically significant differences between the control group and

Table I. Demographic characteristics.

		Multiple sclerosis (n = 45)	Control (n = 40)
Gender	Male	16 (35.6%)	20 (50%)
	Female	29 (64.4%)	20 (50%)
Civil state	Married	25 (55.6%)	27 (67.5%)
	Living in union	1 (2.2%)	–
	Divorced	4 (8.9%)	1 (2.5%)
	Separated	2 (2.2%)	–
	Single	13 (28.9%)	8 (20%)
	Widowed	1 (2.2%)	4 (10%)
Years of schooling	6 years	14 (31.1%)	9 (22.5%)
	12 years	16 (35.6%)	13 (32.5%)
	14 years	6 (13.3%)	5 (12.5%)
	15 years	4 (8.9%)	9 (22.5%)
	17 years	5 (11.1%)	4 (10%)
Occupation	Salaried	7 (15.6%)	22 (55%)
	Self-employed	–	2 (5%)
	Unemployed	–	7 (17.5%)
	Jubilee	5 (11.1%)	7 (17.5%)
	Housework	3 (6.7%)	1 (2.5%)
	Students	–	1 (2.5%)
	Disabled	30 (66.7%)	–
Psychological support	Yes	31 (68.9%)	–
	No	14 (31.1%)	–

Figure 1. Response accuracy in facial emotional recognition.

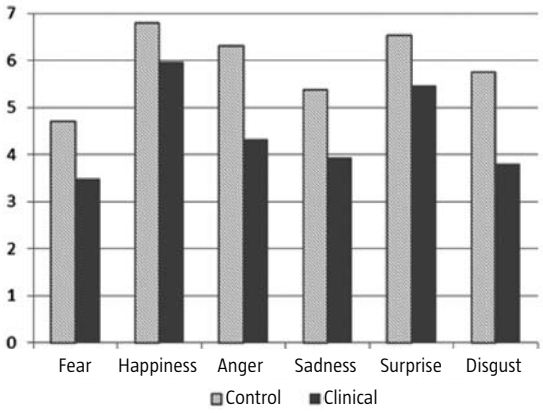
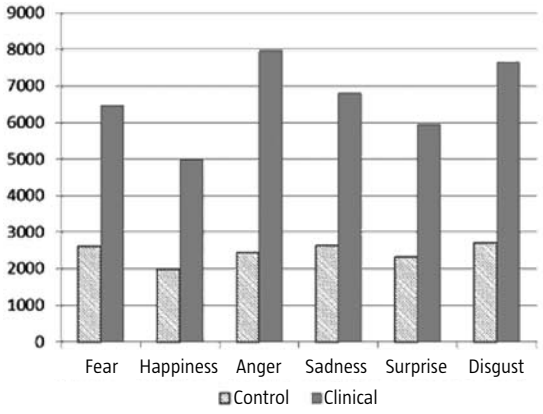


Figure 2. Response time in facial emotional recognition.



the clinical one in the array of assessed neuropsychological variables. As it can be observed in the table II, statistically significant differences were presented in reading speed without interference effect, divided attention and resistance to interference. Multiple sclerosis participants proved to be slower than control subjects.

On the other hand, statistically significant differences were presented in visual search, motor and visuospatial skills and maintained attention; being the clinical group slower and presenting a higher degree of difficulties on these areas than the control group.

Finally, memory related variables indicated statistically significant divergences in the following indexes: immediate recall, free recall, semantic strategy, serial strategy and intrusion.

Emotion evaluation test

Face discrimination ability without the interference of a mnemonic component presented statistically significant differences (t = 0.124; p < 0.000). Clinical participants displayed a high error rate (46.95 ± 3.24), so it can be deduced that they found greater

Table II. Mean differences between multiple sclerosis and control subjects regarding the neuropsychological variables.

	Multiple sclerosis		Control		*t*-Student	*p*
	Mean	SD	Mean	SD		
Read word	83.33	24.65	116.03	14.44	–7.555	< 0.000 [b]
Read color	53.98	18.38	82.08	15.02	–7.745	< 0.000 [b]
Word color	31.09	23.73	56.35	18.27	–7.307	< 0.000 [b]
Word color Prima	34.00	18.36	48.16	6.73	–4.589	< 0.000 [b]
Trail Making Test A	91.47	60.20	36.73	11.16	5.985	< 0.000 [b]
Trail Making Test B	169.80	114.85	53.20	18.64	6.711	< 0.000 [b]
Symbol and Digit Modalities Test	25.78	13.21	48.65	13.26	–7.948	< 0.000 [b]
First trial immediate recall	4.80	1.32	7.93	2.74	–6.545	< 0.000 [b]
Fifth trial immediate recall	9.00	2.62	12.63	3.19	–5.680	<0.003 [a]
Five trials total words	37.49	9.00	53.73	15.80	–5.722	< 0.000 [b]
Free recall list B	4.51	1.56	8.38	3.69	–6.150	< 0.000 [b]
Middle region	16.73	12.84	26.25	8.65	–3.955	< 0.000 [b]
Immediate recall semantic strategy list A	6.60	5.87	22.60	15.15	–6.271	< 0.000 [b]
Immediate recall semantic strategy list B	0.87	1.17	2.23	2.60	–3.153	< 0.000 [b]
Short term free recall semantic strategy	2.38	2.48	5.90	4.05	–5.157	< 0.000 [b]
Immediate recall serial strategy A	3.02	3.95	3.53	4.52	–0.542	< 0.000 [b]
Immediate recall serial strategy B	0.47	0.72	0.83	1.10	–1.741	< 0.000 [b]
Short term free recall serial strategy	0.27	5.80	0.50	1.53	–0.947	< 0.000 [b]
Free recall intrusion	1.59	1.88	5.70	1.24	1.824	< 0.001 [b]

SD: standard deviation. [a] $p \leq 0.05$; [b] $p \leq 0.01$.

difficulties at recognising faces. They incurred in more errors when they gave a correct response, in comparison to the control group (49.20 ± 3.10).

The evaluation of facial expression recognition through eye gaze shows statistically significant differences in correct responses ($t = -6.254$; $p < 0.000$), presenting the control group a higher degree of this kind of responses (25.05 ± 3.42) than the clinical group (19.20 ± 5.11).

Statistically significant differences were also exhibited in response accuracy when the facial recognition of static emotions was considered: fear ($t = -2.523$; $p < 0.000$), happiness ($t = -2.726$; $p < 0.000$), surprise ($t = -3{,}591$; $p < 0.000$), disgust ($t = -4.403$; $p < 0.000$), sadness ($t = -3.103$; $p < 0.000$), and anger ($t = -4.942$; $p < 0.000$) (Fig. 1).

Reaction times did also show statistically significant divergences between clinical and control groups among the following basic emotions: fear ($t = 3.817$; $p < 0.000$), happiness ($t = 3.213$; $p = 0.001$), surprise ($t = 3.802$; $p < 0.000$), disgust ($t = 3.508$; $p = 0.001$), sadness ($t = 3.777$; $p < 0.00$) and anger ($t = 5.062$; $p < 0.00$). Control subjects proved to be much faster than multiple sclerosis participants in the facial emotion recognition test by static photographs (Fig. 2).

In order to confirm that age and gender did not have an effect on emotion recognition scores, the analysis was repeated including verbal ability and age as covariates. Firth, using age as covariate result revealed that age were not significant predictor of emotion recognition scores and it did not moderate the effects. So, differences are found in the same variables (Table III).

Secondly, using gender as covariate result revealed that gender were not significant predictor of emotion recognition scores and it did not moderate the effects. So, differences are found in the same variables (Table IV).

In order to identify the variables that may be exerting an influence in the facial emotional recognition of people diagnosed as multiple sclerosis it was considered to made a stepwise multiple linear regression analysis; there were regarded the variables used in the multiple sclerosis clinical group (depression, anxiety, gender, academic level, number of years since the disease was first diagnosed, words and colours naming ability, divided attention, resistance to interference, cognitive flexibility, visual attention, visual tracking, processing speed, eye-hand speed, short term memory, complex mental states and face discrimination without a mnesic component). The variables that had a lower weight in accordance to its variance were eliminated so as to define the most appropriate model to explain the existent relationship between the studied variables. Distinct models which try to explain the equation were identified; being the first one read colour ($F_{(1,43)} = 49.776$; $p < 0.001$), types of multiple sclerosis ($F_{(2,42)} = 32.968$; $p < 0.001$), short term free recall ($F_{(3,41)} = 25.731$; $p < 0.001$) and middle region the third ($F_{(4,40)} = 22.497$; $p < 0.001$). The best explanatory model is the latter, as read colour, types of scle-

rosis, short term free recall and middle region explains a percentage of 69.2%.

As it can be observed in table V, standard coefficients point that read colour increases 0.526 for each unit of the independent variable, while types sclerosis one of 0.298. On the contrary, short term free recall offers a score of 0.285 for each unit, and middle region one of –0.207.

Tabla III. Significant differences between control and multiple sclerosis groups when age variable is controlled.

	F	*p* [a]
Total accuracy	49.835	< 0.000
RA anger	28.169	< 0.000
RA sadness	11.902	< 0.001
RA fear	23.706	< 0.000
RA surprise	12.727	< 0.001
RA happiness	7.410	< 0.008
RA fear	9.261	< 0.003
RT anger	27.590	< 0.000
RT sadness	14.044	< 0.000
RT disgust	12.133	< 0.001
RT surprise	14.148	< 0.000
RT happiness	10.125	< 0.002
RT fear	14.180	< 0.000

RA: response accuracy; RT: reaction time. [a] $p < 0.01$.

Table IV. Significant differences between control and multiple sclerosis groups when gender variable is controlled.

	F	*p* [a]
Total accuracy	40.063	0.000
RA anger	24.654	0.000
RA sadness	10.263	0.002
RA fear	19.474	0.000
RA surprise	12.727	0.001
RA happiness	7.784	0.007
RA fear	7.208	0.009
RT anger	26.571	0.000
RT sadness	13.669	0.000
RT disgust	11.183	0.001
RT surprise	13.523	0.000
RT happiness	9.751	0.002
RT fear	13.956	0.000

RA: response accuracy; RT: reaction time. [a] $p < 0.01$.

Discussion

The objective of the present study was the identification of cognitive functioning, the variables that could be exerting an influence in the facial emotional expression recognition adequate execution and the reaction time, through static faces photographs in people diagnosed as multiple sclerosis and a control group. Because of that, the results obtained by both groups were compared.

The studies which have looked into chronic diseases relate them to a significant prevalence of depression and anxiety symptoms, especially due to the own characteristics of the diseases, its unpredictable evolution and its influence on the different subsystems; which makes them much more predominant [15]. Just as these researchers, in the present study we can observe significant differences in the obtained scores in depression and anxiety questionnaires, in comparison to the control group. So, people with multiple sclerosis are more prone to suffer from mood disorders; although it must be pointed that despite the existence of significant differences the obtained scores are not particularly high points that there is a high prevalence of depression among people diagnosed as multiple sclerosis, taking into account the huge impact the disease has on different subsystems; such as working, social, familiar or personal level [16]. The significant differences found are supported [17,18], who identified a slower pattern of response on attentional task execution in comparison to clinical subjects. There has been also supported the specific alteration of some processes presented in people with multiple sclerosis observed in the present study. People diagnosed as multiple sclerosis display a worse performance in comparison to controls in tasks which require a greater deal of effort, such as maintained attention, multiple-stimuli or multiple-response tasks [18-20]. They show difficulties for attention and concentration which favour the obtaining of worse results in memory tasks in comparison to control subjects. In addition, different cognitive functions seem to be altered in the multiple sclerosis (attention, verbal fluency, abstract reasoning, visual-spatial perception, problem solving and concept formation, working memory and data processing speed). [21]. Nieto et al [22] noted an alteration at the immediate memory level, while Rao et al [23] found short term and long term memory affection, in addition to learning alterations, affecting both verbal and nonverbal faculties.

Our study shows a significant relationship between cognitive functions and facial emotional recognition. Multiple sclerosis participants were less accurate at recognising basic emotions in comparison to the control group, taking a longer reaction time. Consequently, task accomplishment takes a longer period for them than for controls. This view is supported [24-26], who found that multiple sclerosis subjects displayed a facial emotion recognition deficit. This data is related to the processing speed. Nordahl [26] mention a relationship between white matter and facial emotion recognition deficit. According to other study [27], a great percentage of the white matter deterioration explains for the cog-

Table V. Predicting variables of the emotional recognition in people diagnosed as multiple sclerosis.

	B	β	*T*	*p*
Read color	0.0521	0.526	4.876	0.001 [b]
Types of sclerosis	–5.162	–0.298	–3.154	0.003 [b]
Fifth trial immediate recall	1.562	0.285	2.748	0.009 [b]
Middle region	–0.294	–0.207	–2.257	0.030 [a]

[a] $p < 0.01$; [b] $p < 0.001$.

nitive functioning performance, primarily observed in front subcortical functions. This point is explained by Filley [28], who mentions that the damaged white matter would provoke, mainly, a slowdown in the communication between the distinct neural network areas; involving basic functions such as emotion understanding. It is known that facial emotion recognition implies a complex neural system that involves areas in the like of frontal and temporal ones [29]. Other investigators [30] refers to the existence of a neuroanatomical connection between white matter and the cerebral cortex which has such an importance that it involves the adequate recognition of facial emotional expressions. In this line, the studies [31,32] refer to the fact that people who experienced a traumatic brain injury display real difficulties at recognising facial emotions. Among multiple sclerosis patients, both cognitive impairments and emotion recognition are thought to be related to lesion distribution or brain atrophy [33]. Some studies support the hypothesis which states that the integration of frontotemporal and temporoparietal circuitries is involved in the theory of mind. Main networks were found in the superior posterior temporal sulcus, temporal parietal junction, temporal pole, medial prefrontal cortex, anterior cingulated cortex, orbitofrontal cortex and inferior parietal lobe, as well as in the amygdala. In addition, premotor and parietal regions must also be highlighted, as components of the mirror neuron system [34]. FMRI studies show that recognition of facial expression emotions is constructed by different processes: initial visual perception, emotional state activation through somatic representation, socio-environmental context evaluation, decision making on social meaning, and the adjustment of possible responses [33]. In the current study it is found that read colour, types of multiple sclerosis, short term free recall and middle region are able to modulate the emotional recognition.

It is known the existence of relevant information which points that attention, executive functioning and memory could modulate the stimuli with an emotional load. Furthermore, emotional stimuli could intervene in memory and emotional states, as well as in executive functions [35].

Finally, it must be mentioned that the present study has some limitations that have to be observed; firstly, the level of disability of the people affected by multiple sclerosis was not assessed, which could be an important variable to be taken into account by future research related to the recognition of facial emotions. Secondly, it would be advisable to test if alexithymia exerts any influence on the emotional recognition of people affected by multiple sclerosis. On the one hand, as it can be observed in several studies, the scientific literature highlights that alexithymia may have a big impact on patients self-perception, emotion regulation, behavioural control and interaction with others [36]. On the other hand, however, some studies point that there is no relationship between the pathology and the mentioned variables, and that alexithymia would not be able to predict such factors [37]. Consequently, a clear definition of these findings comes as an important factor. Thirdly, it was regarded the medication taken by the affected participants and significant differences were not found. In spite of that, we reckon that future researches should pay particular attention to the fatigue of the participants, which may exert an influence on the execution of different tasks.

References

1. Ekman P. El rostro de las emociones. Signos que revelan significado más allá de las palabras. Barcelona: RBA; 2003.
2. Ekman P, Friesen W. Unmasking the Face. A guide to recognizing emotions from facial expressions. Mountain View, CA: Consulting Psychologists Press; 1975.
3. Ekman P. Emotions Revealed. New York: Times Books; 2004.
4. LeDoux J. Emotion circuits in the brain. Annu Rev Neurosci 2000; 23: 155-84.
5. Cavieres A, Valdebenito M. Déficit en el reconocimiento de emociones faciales en la esquizofrenia. Implicaciones clínicas y neuropsicológicas. Rev Chil Neuropsiquiatr 2007; 45: 120-8.
6. Herbener E, Song W, Khine T, Sweeney J. What aspects of emotional functioning are impaired in schizophrenia? Schizophr Res 2008; 98: 239-46.
7. Beatty W, Orbelo D, Sorocco K, Ross E. Comprehension of affective prosody in multiple sclerosis. Mult Scler 2003; 9: 148-53.
8. López-Roig S, Terol M, Pastor M, Neipp M, Massutí B, Rodríguez-Marín J, et al. Ansiedad y depresión. Validación de la escala HAD en pacientes oncológicos. Rev Psicol Salud 2002; 12: 127-55.
9. Golden C. Test de colores y palabras. Madrid: TEA Ediciones; 2010.

10. Smith A. Test de símbolos y dígitos (*Symbol and digit modalities test*). Madrid: TEA Ediciones; 2002.
11. Benedit M, Alejandre M. Test de aprendizaje verbal España-Complutense (TAVEC). Madrid: TEA Ediciones; 1988.
12. Benton A, Sivan A, Hamsher K, Varney N, Spreen O. Contributions to neuropsychological assessment. New York: Oxford University Press; 1994.
13. Baron-Cohen S, Wheelwright S, Hill J, Plumb I. The reading the mind in the eyes test revised version: a study with normal adults and adults with Asperger syndrome or high-functioning autism. J Child Psychol Psychiatry 2001; 42: 241-51.
14. Kessler H, Bayerl P, Deighton R, Traue H. Facially Expressed Emotion Labeling (FEEL): PC-gestützer Test zur Emotion-serkennung. Verhaltenstherapie und Verhaltensmedizin 2002; 23: 297-306.
15. Ybarra M, Kummer A, Comini E, Oliveira J, Gómez R, Texeira A. Psychiatric disorders in myasthenia gravis. Arq Neuropsiquiatr 2011; 69: 176-9.
16. Sadovnick A, Remick R, Allen J, Swartz E, Yee M, Eisen K, et al. Depression and multiple sclerosis. Neurology 1996; 46: 628-32.
17. Grafman J, Rao S, Bernardin L, Leo G. Automatic memory processes in patients with multiple sclerosis. Arch Neurol 1991; 48: 1072-5.
18. Kujala P, Portin R, Revonsuo A, Ruutiainen J. Automatic and controlled information processing in multiple sclerosis. Brain J Neurol 1994; 117: 1115-26.
19. D'Esposito M, Onishi K, Thompson H, Robinson K, Armstrong C, Grossman M. Working memory impairments in multiple sclerosis: evidence from a dual-task paradigm. Neuropsychol 1996; 10: 51-6.
20. Comi G. Why treat early multiple sclerosis patients? Curr Opin Neurol 2000; 13: 235-40.
21. Vicens A, Iriarte J, Castro P, Castejón C, Martínez-Lage J. Funciones cognitivas en la esclerosis múltiple. Rev Neurol 1992; 7: 171-5.
22. Nieto A, Pino M, Barroso J, Olivares T, Hernández M. Alteraciones cognitivas en etapas iniciales de la esclerosis múltiple y su relación con el estado de ánimo, variables demográficas y clínicas. Psicothema 2008; 4: 583-8.
23. Rao S, Leo G, Bernardin L, Unverzagt F. Cognitive dysfunction in multiple sclerosis I Frequency, patterns, and prediction. Neurology 1991; 41: 685-91.
24. Henry J, Phillips L, Beatty W, McDonald S, Longley W, Joscelyne, et al. Evidence for deficits in facial affect recognition and theory of mind in multiple sclerosis. J Int Neuropsychol Soc 2009; 15: 277-85.
25. Berneiser J, Wendt J, Grothe M, Kessler CH, Hamm A, Dressel A. Impaired recognition of emotional facial expressions in patients with multiple sclerosis. Mult Scler Relat Disord 2014; 3: 2-7.
26. Sistiaga A, Castillo-Triviño T, Aliri J, Gaztañaga M, Acha J, Arruti M, et al. Rendimiento cognitivo y calidad de vida de la esclerosis multiple en Gipuzkoa. Rev Neurol 2014; 58: 337-44.
27. Nordahl C, Ranganath C, Yonelinas A, DeCarli C, Fletcher E, Jagust W. White matter changes com-promise prefrontal cortex function in healthy elderly individuals. J Cogn Neurosci 2006; 18: 418-29.
28. Ruffman T, Henry J, Livingstone V, Phillips, L. A meta-analytic review of emotion recognition and aging: implications for neuropsychological models of aging. Neurosci Biobehav Rev 2008; 32: 863-88.
29. Filley C. White matter and behavioral neurology. Ann N Y Acad Sci 2005; 1064: 162-83.
30. Sprengelmeyer R, Rausch M, Eysel U, Przuntek H. Neural structures associated with recognition of facial expressions of basic emotions. Proc R Soc B 1998; 265: 1927-31.
31. Adolphs R, Damasio H, Tranel D, Cooper G, Damasio A. A role for somatosensory cortices in the visual recognition of emotion as revealed by three-dimensional lesion mapping. J Neurosci 2000; 20: 2683-90.
32. Green R, Turner G, Thompson W. Deficits in facial emotion perception in adults with recent traumatic brain injury. Neuropsychology 2004; 42: 133-41.
33. Krause M, Wendt J, Dressel A, Berneiser J, Kessler C, Hamm A, et al. Prefrontal function associated with impaired emotion recognition in patients with multiple sclerosis. Behav Brain Res 2009; 205: 280-5.
34. Mike A, Strammer E, Aradi M, Orsi G, Perlaki G, Hajnal A, et al. Disconnection mechanism and regional cortical atrophy contribute to impaired processing of facial expressions and theory of mind in multiple sclerosis: a structural MRI study. PLoS One 2013; 8: e82422.
35. Stormark K, Nordby H, Hugdahl K. Attentional shifts to emotionally charged cues: behavioural and ERP data. Cogn Emot 1995; 9: 507-23.
36. Prochnow D, Donell J, Schafer R, Jorgens S, Hartung P, Franz M, et al. Alexitymia and impaired facial affect recognition in multiple sclerosis. J Neurol 2011; 258: 1683-8.
37. Cecchetto C, Aiello M, D'Amico D, Cutuli D, Cargnelutti D, Eleopra R, 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; 10: 1004-14.

Precisión y tiempo de reacción en el reconocimiento de emociones faciales en personas con esclerosis múltiple

Introducción. La expresión facial emocional constituye una guía básica en la interacción social y, por lo tanto, las alteraciones en su expresión o reconocimiento implican una limitación importante para la comunicación. Por otro lado, el deterioro cognitivo y la presencia de síntomas depresivos, que se encuentran comúnmente en los pacientes con esclerosis múltiple, no se sabe cómo influyen en el reconocimiento emocional.

Objetivo. Considerar la evaluación del tiempo de reacción y precisión en la respuesta de reconocimiento de expresiones faciales de las personas afectadas por esclerosis múltiple y valorar las posibles variables que pueden modular el reconocimiento de emociones, como la depresión y las funciones cognitivas.

Sujetos y métodos. El estudio tiene un diseño no experimental transversal con una sola medición. La muestra está compuesta por 85 participantes, 45 con diagnóstico de esclerosis múltiple y 40 sujetos control.

Resultados. Los sujetos con esclerosis múltiple revelaban diferencias significativas tanto en el tiempo de reacción y la precisión de respuesta en pruebas neuropsicológicas en comparación con el grupo control. Se identificaron modelos explicativos en el reconocimiento emocional.

Conclusión. Los sujetos con esclerosis múltiple se enfrentan a dificultades en el reconocimiento de emociones faciales, y se observaron diferencias en la memoria, atención, velocidad de procesamiento y sintomatología depresiva en relación con el grupo control.

Palabras clave. Depresión. Funciones cognitivas. Precisión de respuesta. Reconocimiento facial de emociones. Tiempo de reacción.