Journal of
Research in Psychopathology
https://dx.doi.org/10.22098/jrp.2022.10367.1068

2022; Vol. 3, No. 7
Pages: 35 - 46

Original Article

The effectiveness of emotion regulation training and acceptance and commitment therapy (ACT) on psychological pain in patients with multiple sclerosis (MS)

Taktam Dehghani Bidgoli[1] , Hossein Mehdian[2*] and Abolghasem Shakiba[3]

1. PhD Student in Educational Psychology, Department of Psychological Counseling, Bojnourd Branch, Islamic Azad University of Bojnourd, Bojnourd, Iran.
2. Assistant Professor of Psychology, Department of Counseling and Psychology, Bojnourd Branch, Islamic Azad University of Bojnourd, Bojnourd, Iran.
3. Assistant Professor of Psychology, Farhangian University, Sabzevar, Iran.

Abstract

Multiple sclerosis is a chronic progressive disease of the central nervous system and its symptoms include pain and decreased functional capacity. The aim of this study was to compare the effectiveness of emotion regulation training and acceptance and commitment therapy on psychological pain in patients with MS. This research was a quasi-experimental study with pretest-posttest design and follow-up. The participants had an age range of 20-40 years and with a scale of physical disability (EDSS) of one to 5.5 and purposefully and voluntarily selected and randomly divided into experimental and control groups. Both groups answered the psychological pain questionnaires of Orbach et al. (2003) in the pre-test-post-test and 2-month follow-up stages. The experimental groups received 10 sessions of training on emotion regulation strategies and acceptance and commitment therapy once a week for 1.5 hours. The data were analyzed using SPSS software version 23 and multivariate analysis of covariance by repeated measures. The results of multivariate analysis of covariance with repeated measures showed that teaching emotion regulation and acceptance and commitment therapy is effective in reducing psychological pain in patients with multiple sclerosis ($p < .001$). The harm was also expressed as a significant reduction in significant psychological pain scores after the experiments of the experimental groups and these results were maintained in the follow-up phase. Based on the results of this study, it is possible to teach the strategies of emotional regulation and acceptance and commitment therapy along with drug interventions to reduce physical and psychological pain of multiple sclerosis patients in medical centers.

Keywords

Pain, emotional regulation strategies, acceptance and commitment therapy, multiple sclerosis.

Received: 2022/02/07
Accepted: 2022/02/23
Available Online: 2022/03/03

Introduction

Multiple sclerosis is a myelogenous disease of the central nervous system which is one of the most common neurological diseases in humans and is the most debilitating disease of young age. This disease has a negative impact on quality of life and physical and psychological functions (Berard et al., 2019). The most common course of the disease is between the ages of twenty and thirty-five, and its prevalence in women is twice as high as in men. In this disease, the myelin sheath of the central nervous system, such as the brain, optic nerve, and spinal cord, is damaged. Physicians consider factors such as immunodeficiency, genetic predisposition, family background, geographical area, viral infections and stress to contribute to its occurrence (Solaro, et al,. 2018). The disease affects approximately 1 in 1,000 people and its prevalence is about 2.5 million people worldwide (Briones et al., 2015). It is very debilitating, with social and economic consequences (Vosoughi & Friedman, 2008). Informal care shows a heavy burden for the families of people with disabilities (Jandaghi et al., 2012) and most of this heavy burden is tolerated by patients themselves (Vosoughi & Freedman, 2008). The most common age of onset is 20 to 40 years (Dennison et al.,

Corresponding author: Assistant Professor of Psychology, Department of Counseling and Psychology, Bojnourd Branch, Islamic Azad University of Bojnourd, Bojnourd, Iran. Email: **Mahdian_hossein@yahoo.com**

2009) and patients with multiple sclerosis have much higher levels of mental disorders such as depression, stress and anxiety than healthy people (Bruce & Lynch, 2011). Studies show symptoms such as visual disturbances, difficulty walking / balancing, urinary incontinence and some psychological problems including depression, fatigue and cognitive impairment (Tröster & Arnett, 2006), anxiety, paranoia and bipolar disorder is common in this population (Thomas et al., 2006).

To improve psychological and physical pain in patients with MS, limited therapies have been introduced. Psychological pain in these patients manifests itself in the form of emptiness and worthlessness, confusion and emotional turmoil, inability to control, immutability of living conditions, isolation and social distance (Foley et al., 2013); and leads to a negative impact on the social functioning and mental health of patients. Therefore, according to studies, about sixty-four percent of patients have used medication to relieve pain and twenty-eight percent of them have used behavioral techniques and mindfulness and rest (Ehde et al., 2015). Phrases such as mental pain, psychic pain, psychache, psychological pain, emptiness, confusion and internal perturbation have been used in the literature to refer to a common construct (Tossani, 2013). Baumeister (1990) considered mental pain as an unpleasant state of high self-awareness about inadequacy.

When the negative consequences and the consequences that play a role in oneself are far below the standards of the individual about his or her ideal and aspirations, the person experiences mental pain; thus, the basic emotion in mental pain is self-despair (Tusani, 2013). Orbach, Mikollinser, Sirota, Gilboa-Schettman (2003) have described mental pain as a wide range of mental experiences characterized by the perception of negative changes in oneself and its function, which is accompanied by strong negative emotions (Karami et al., 2019). A review of texts and psychological studies shows that emotion regulation is an important factor in determining health and successful functioning in social interactions and its deficiency is associated with internal and external disorders (Saber et al. 2010). Emotional responses provide important information about one's experience with others. With this information, people learn how to behave in the face of emotions, how to express emotional experiences verbally, what strategies to use in response to emotions, and how to deal with others in specific emotional cases. Many scholars consider excitement management as a combination of physiological, behavioral and cognitive processes which enable the person to moderate his/her experiences and negative and positive emotions (Cole et al., 2004).

Acceptance and commitment therapy (ACT) is one of the treatment models that can affect cognitive impairment, psychological pain and emotional avoidance and its negative consequences (Amir et al., 2017).Over the past 10-15 years, a number of new therapies or extended forms of cognitive-behavioral therapy (CBT) have been introduced in the field of psychotherapy (Ost, 2008).

Acceptance-based therapies are based on the hypothesis that psychological harm is associated with trying to control or avoid negative thoughts and emotions. The results of analysis of variance of Pak, Abdi and Chalabianlu (2017) study entitled the effectiveness of acceptance and commitment therapy (ACT) on experimental avoidance and acceptance of the disease in people with multiple sclerosis showed that the acceptance score in the two post-test stages and follow-up in the experimental group increased significantly. Also, the findings of Sadeghi (2013) analysis of covariance in a study entitled "Evaluation of the effectiveness of emotional regulation on improving quality of life, disease perception, and reducing cognitive emotion regulation problems in MS patients showed that emotion regulation training reduces cognitive emotion regulation and perception problems and improves the quality of life in patients with multiple sclerosis. The results of Phillips, Henry, Nouzova, Cooper, Radlak & Summers (2014) with the aim of emotional cognitive regulation strategies in patients with multiple sclerosis: The relationship between executive functions, mood and quality of life showed that people with MS have more problems in regulating emotions compared to healthy people and this problem of emotional regulation in people with MS predicts lower quality of life.

In another study by Kemani, Hesser, Olsson, Lekander, & Wicksell (2016) compared the effectiveness of relaxation and ACT in a randomized controlled clinical trial with a sample size of 60 patients with MS. The results showed that the ACT approach, considering its role of psychological flexibility as a mediating factor in reducing the severity of physical pain and emotional disturbance in patients with MS. is more effective than relaxation. Amir, Ahadi, Nikkhah and Sirafi (2017) in a study entitled the effectiveness of treatment based on acceptance and commitment and group therapy on reducing stress in patients with MS showed that both treatment groups lead to reducing stress in patients with MS. The results of post hoc tests showed that acceptance and commitment therapy was more effective than group meaning therapy.

Due to the effectiveness of these therapies in reducing psychological and social problems, according to the findings of these studies, it is expected that this treatment can be effective in reducing cognitive and emotional problems in patients with MS. Therefore, this study sought to answer the question of whether emotion regulation training and treatment models based on acceptance and commitment are effective in reducing psychological pain in patients with MS.

Method

Participants

This research was an experimental study with pre-test and post-test design with a control group which included the following implementation steps: 1- Purposeful selection of the research sample, 2- Random replacement of subjects, 3- Performing pre-test and collecting data; 4- Performing independent variable on experimental groups, 5- Performing post-test and follow-up with an interval of 2 months and data collection.

The statistical population of this study consists of all patients with multiple sclerosis who referred to neurologists and specialized and sub-specialized polyclinics of Ghaem Hospital (Comprehensive Care Center for MS Services) in Mashhad. The sample consisted of 45 patients with MS who were purposefully selected and randomly assigned to one of the experimental groups (15 patients with emotional regulation therapy and 15 patients with acceptance and commitment therapy) and a control group (15 patients). Regarding the sample selection, it should be noted that in the experimental method, each subgroup had to be at least 15 people, and in order for the selected sample to be a true representative of the community and the research to have a high external validity, the sample size was 45 people (15 people per group) (Delavar, 2011). The following tools were used to collect data:

Instrument

Extended Disability Status Scale (EDSS):

The Extended Disability Status Scale is a global standard scale first used by Kurtzke to assess the severity of physical and neurological disabilities in MS patients.

Orbach & Mikulincer Mental Pain Scale (OMMP):

This scale was developed to measure the severity of mental pain by Orbach et al. (2003). This scale has 44 items of questions and its initial validation was performed on 255 students. Analyzing the Exploratory Factors of Orbach et al. (2003) has identified 9 subscales to measure various aspects of mental pain including immutability, lack of control, narcissism / worthlessness, emotional turmoil, dryness (astonishment), alienation, confusion, social distancing and absurdity (meaninglessness). In a study by Orbach et al. (2003), the Cronbach's alpha coefficient of this questionnaire in the subscales of immutability 0.95, lack of control 0.95, narcissism / devaluation 0.93, emotional turmoil 0.93, astonishment was 0.85, alienation was 0.79, confusion was 0.80, social distancing was 0.80 and absurdity (meaninglessness) was 0.75. It should be noted that in this scale, items 25 and 42 are scored in reverse. Using factor analysis, Karami et al. (2015) reported that the value of Kaiser. Meyer. Olkin KAMO is equal to 0.942 and the square of the transferred chi-square of Bartlett sphericity test is equal to 989/11127. They also stated that this was significant with a degree of freedom of 946 ($P \leq 0.001$). Also, the total table of total variance revealed that 6 factors in total explain 66.404% of the total variance. The reliability coefficient of the questionnaire using Cronbach's alpha method for the whole mental pain questionnaire was 0.966 and for the factor of emptiness (meaninglessness) and worthlessness 0.952, the factor of confusion and emotional turmoil was 0.893, the factor of lack of control was 0.877, the factor of immutability was 0.872, social distance / alienation factor was 0.869 and fear of loneliness factor was 0.617 (Karami et al., 2018).

Teaching emotion regulation strategies:

This intervention is applied in the target community with a technical eclecticism (in terms of therapeutic techniques) in accordance with emotion regulation strategies in dialectical behavioral therapy of Linehan (1993) and emotion regulation techniques of Leahy et al. (2014) after clinical competence interventions.

Sessions	Teaching emotion regulation strategies
Session 1	Execution of pre-tests, general explanation and description of the goals and programs of the training course.
Session 2	Describing emotion and teaching emotion awareness.
Session 3	Describing emotion regulation, recognizing cognitive techniques and strategies in regulating positive emotions.
Session 4	Strategies for changing thinking (re-evaluating) and accepting the situation.
Session 5	Training and implementing the technique of contrastive thinking. Strategies for changing thinking (re-evaluating).
Session 6	Strategies for planning activities and seeing the facts pleasantly.
Session 7	Training and implementation of emotional awareness enhancement techniques.
Session 8	Training and implementation of disaster relief techniques. Strategies for relaxation and meditation.
Session 9	Strategies for cognitive framing and problem solving.
Session 10	Summarizing training sessions and conducting post-test.

The Acceptance and Commitment Therapy Session Protocol:

Acceptance and commitment therapy (ACT) was taught in 10 90-minute sessions according to Hayes acceptance and commitment herapy (2008).

Sessions	Acceptance and Commitment Therapy (ACT)
Session 1	Introducing the group members and performing the pre-test
Session 2	Introduction to ACT Therapeutic Concepts.
Session 3	Responding to individuals in the way of their control strategies, control as a problem.
Session 4	Performance evaluation; Examining the person's experiences from the previous session until now and practicing mindfulness.
Session 5	Performance Evaluation; Differentiation of self-conceptualization versus self-observation.
Session 6	Demonstrating the importance of values and explaining to people how to understand values "tendency / acceptance."
Session 7	Helping group members to continually identify areas of life that are not in line with individual values.
Session 8	Discovering the connection between goals and activities and strengthening the factors of tendency and defusion.
Session 9	Mindfulness training
Session 10	Evaluating Commitment

Procedure

After coordination and obtaining permission from the officials of medical centers and by observing ethical considerations and receiving the code of ethics with the number IR.IAU.BOUJNOURD.REC.1398.020 and stating the objectives of the research, the consent of the research sample for Participation in this study was drawn by informing the officials and obtaining permission from them. Then, after reviewing the files of patients referred to the specialized and sub-specialized polyclinic of Ghaem Hospital (Comprehensive Center for MS Patients) by completing the informed consent form and access to the subjects, they were invited to participate in this educational program along with drug interventions. Among the research sample, 45 people who had entry and exit criteria and were physically able to participate in training sessions were purposefully selected and randomly assigned to two experimental groups and one control group. Before starting the educational method, both groups were pre-tested and asked to complete the questionnaires in accordance with their characteristics and not leave a question unanswered as much as possible. The experimental groups were then trained in emotion regulation and acceptance and commitment therapy strategies and the control group did not receive any intervention. The duration of treatment sessions consisted of 10 sessions of 90 minutes and was performed in groups once a week. During these sessions and after the training, post-test and follow-up were performed from all three groups with an interval of 2 months. In addition to obtaining written consent from the subjects and families of all three groups, respecting the rights of the subjects in relation to termination or continuation of cooperation at any stage of the research, not mentioning the names of the subjects in the information form for confidentiality and reassurance to individuals and preparing the sample of the research mentally and psychologically to participate in the research and that at the end of the research, and at the end of the study, the group of researchers undertook to teach the control group the subjects of emotional regulation and treatment strategies based on acceptance and commitment after the end of the study, which was one of the ethical points of this study. Data were analyzed using SPSS software version 23 with an error of 0.05. Frequency, percentage, mean and standard deviation indices were used to describe and analyze the data, and multivariate analysis of covariance was used to test statistical hypotheses.

Results

Before analyzing the data related to the hypotheses, they were reviewed to ensure that the data of this study estimate the underlying assumptions of multivariate analysis of covariance by repeated measures. For this purpose, six assumptions of analysis of covariance with repeated measures including the normality of variances (Shapiro-Wilk Test results indicated that the default of the normal sample distribution of data in the psychological pain variable in three positions pre-test, post-test and follow-up. ($p \leq .05$). Linearity (results of scatter diagram showed that the assumption of linearity is established between pre-test, post-test and follow-up of the studied variables), multiple alignment (according to the coefficient results of correlation between auxiliary variables (covariates) and its post-test, which did not have a high correlation with each other, and according to the obtained correlations, almost the assumption of multiple alignment between auxiliary variables (covariates) has been avoided. Analyzing the outliers(Stem & leaf diagram showed that in the pre-test, post-test and follow-up stages in the upper and lower shore, subjects 26 and 31 of the experimental groups of emotional regulation and the control group were in the follow-up stage in the infimum which were not removed) due to the small sample size, generalizability, and increased external

validity. Levene 's test and box corrections were used to evaluate the homogeneity of variance of the variables, the results of which are shown in Table 3. It should be noted that in this study, post-tests of psychological pain were considered as dependent variables and pre-tests were considered as auxiliary variables (covariates).

Therefore, there was equality between auxiliary variables (in this study, pre-test) and dependent variables (in this study, post-test) at all levels of the factor (i.e., experimental and control groups) and a non-significant interaction between dependent and auxiliary variables (covariates) was observed. Therefore, the homogeneity of regression slopes is assumed. Finally, the results of t-test showed that pre-test of experimental and control groups was not significant in dependent variables (psychological pain) ($P \leq 0.05$). Now the results of inferential tables are presented.

Table 1. Mean (and standard deviation) of psychological pain in pre-test-post-test and follow-up of experimental and control groups

		ACT		Emotional regulation strategies		Control	
variable	**Position**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Absurdity / worthlessness	Pre-test	38	2.17	38.40	1.72	38.33	1.71
	Post-test	32.86	1.68	33.60	2.26	37.26	1.98
	Follow up	32.86	1.80	32.20	1.85	36.13	2.09
Emotional confusion	Pre-test	19.73	1.75	19.60	1.54	20.06	1.70
	Post-test	16.26	1.98	16.20	1.69	19.20	1.56
	Follow up	14.86	1.99	16.33	1.63	18.60	1.05
Lack of control	Pre-test	18.26	1.27	18.20	1.01	18.20	1.01
	Post-test	14.80	1.47	15.06	1.43	17.33	0.975
	Follow up	13.46	1.72	14.73	1.43	16.46	1.45
Immutability	Pre-test	20.46	1.95	19.33	1.87	19	1.92
	Post-test	17.06	2.68	15.86	1.55	18	2
	Follow up	16.86	2.50	14.20	1.56	16.93	2.05
Social distancing	Pre-test	18.06	1.22	17.73	1.16	18.66	1.44
	Post-test	14.73	1.16	14.13	1.30	17.66	1.63
	Follow up	14.60	1.24	12.26	1.38	16.46	1.68
Fear of loneliness	Pre-test	13.40	1.24	12.93	1.09	12.86	1.35
	Post-test	10.46	0.990	10.06	1.03	11.93	1.48
	Follow up	10	1.25	9.66	1.54	10.93	1.53
Psychological pain	Pre-test	128.33	1.54	125.73	3.19	127.13	3.13
	Post-test	105.86	1.95	104.66	1.63	122.80	1.26
	Follow up	102.86	2.84	100	2.77	115.86	3.22

As can be seen in Table 1, the descriptive findings of psychological (mental) pain include mean and standard deviation. According to the results of the mean table (and standard deviation), the psychological pain score (mental pain) of the experimental group based on acceptance and commitment therapy in the pre-test of 128.33 (and 1.54), in the post-test of 105.86 (and 1.95) and in follow-up is 66/102 (and 2.84). The mean (and standard deviation) of the emotion regulation treatment group was 125.73 (and 3.19) in the pre-test, 10.64 (and 1.63) in the post-test, and 100 (and 2.77) in the follow-up. Also, the mean (and standard deviation) of the control group in the pre-test was 127.13 (and 3.13), in the post-test was 122.80 (1.26) and in the follow-up stage was 115.86 (3.22). In other words, the experimental groups had lower psychological pain after receiving treatment based on acceptance and commitment and emotional regulation strategies. The results of Box and Leven test in three positions of pre-test, post-test and follow up and the score of psychological pain components are shown in Table 3.

Table 2. Box and Levin test results for observance of covariance analysis assumptions with repeated measurements on psychological pain components

BOX'SM	DF_1	DF_2	F	P
Psychological pain (943/131)	105	2442.470	1.396	0.061
Levene's	**Levin**			
	DF_1	DF_2	F	P
Absurdity / worthlessness pretest	2	42	0.494	0.614
Absurdity / worthlessness posttest	2	42	0.390	0.680
Absurdity / worthlessness follow up	2	42	0.574	0.567
Pre-test of confusion / emotional turmoil	2	42	0.340	0.714
Post-test of confusion / emotional turmoil	2	42	0.263	0.770
Follow up on emotional confusion	2	42	2.031	0.144
Lack of control pre-test	2	42	1.141	0.329
Lack of control post-test	2	42	1.068	0.353
Lack of control follow up	2	42	0.687	0.509
Immutability pre-test	2	42	0.119	0.888
Immutability post-test	2	42	3.686	0.034
Immutability follow up	2	42	2.805	0.072
Pre-test of social distance / alienation	2	42	0.343	0.712
Post-test of social distance / alienation	2	42	1.524	0.230
Follow up of social distance / alienation	2	42	0.916	0.408
Pre-test of fear of loneliness	2	42	0.307	0.737
Post-test of fear of loneliness	2	42	1.218	0.306
Follow up of fear of loneliness	2	42	0.641	0.532
Pre-test for psychological pain	2	42	5.980	0.005
Post-test for psychological pain	2	42	0.834	0.441
Follow up for psychological pain	2	42	0.036	0.964

Before using the parametric test of analysis of covariance, Box and Levine tests were used with repeated measurements to observe the assumption of homogeneity of variance / covariance matrices. Based on the box test, which was not significant for the psychological pain variable (Box=131/943 and F=1/396 ,P≤ 0.061) the condition of homogeneity of variance / covariance matrices was correctly observed. Based on Levin test and its non-significance for the components of psychological pain in the three situations of pre-test, post-test and follow-up, the condition of equality of intergroup variances was also observed in the post-test stage. Also, the results of Mauchly's sphericity test including Mauchly's coefficient and its amount and level were not significant for the components of psychological pain. Therefore, the hypothesized sphericity test was used to examine in-subject comparisons.

Table 3. Summary of the results of multivariate analysis of covariance with repeated measures on pre-test, post-test and follow-up scores of psychological pain components

effect	test	value	F	df hypothesis	df error	P	Effect size
In-subject (group)	Pillais Trace	1.234	8.517	14	74	≤0.001P	0.617
	Wilks Lambda	0.037	21.601	14	72	≤0.001P	0.808
	Hoteling effect	18.711	46.778	14	70	≤0.001P	0.903
	The largest root of surface	18.311	96.786	7	37	≤0.001P	0.948
In-subject (time)	Pillais Trace	0.992	256.302	14	29	≤0.001P	0.992
	Wilks Lambda	0.008	256.302	14	29	≤0.001P	0.992
	Hoteling effect	123.732	256.302	14	29	≤0.001P	0.992
	The largest root of surface	123.732	256.302	14	29	≤0.001P	0.992
Interaction (group× time)	Pillais Trace	1.688	11.576	28	60	≤0.001P	0.844
	Wilks Lambda	0.012	16.679	2828	58	≤0.001P	0.890
	Hoteling effect	23.596	23.596	28	56	≤0.001P	0.922
	The largest root of surface	20.845	44.668	14	30	≤0.001P	0.954

The contents of Table 4 show that in experimental and control groups and interaction (time× group), there is a significant difference between self-alienation, fear of loneliness and the total score of psychological pain in terms of at least one of the components of absurdity / meaninglessness, confusion and emotional turmoil, lack of control, immutability, and social distance. There is also a significant difference between assessment times (post-test and follow-up). Since there is a difference between the groups (experimental and control) and the interaction

(time × group) in terms of at least one of the dependent variables, to investigate the point of difference, one-way analysis of covariances is performed in the text of duplicate mancoe on each of the dependent variables.

Table 4. Results of one-way analysis of covariance with repeated measures in the text of duplicate mancoe on pre-test, post-test and follow-up scores of psychological pain components in experimental and control groups

Source of changes	Dependent variable	SS	DF	MS	F	P	Eta
In-subject (group)	Absurdity	201.615	2	100.708	10.671	P≤0.001	0.337
	Confusion/emotional turmoil	139.126	2	69.563	9.494	P≤0.001	0.311
	Lack of control	80.059	2	40.030	9.934	P≤0.001	0.321
	Immutability	76.281	2	38.141	3.398	P≤0.05	0.139
	Distance from alienation	191.570	2	95.785	20.675	P≤0.001	0.496
	Fear of loneliness	23.881	2	11.941	3.515	P≤0.05	0.143
	Psychological pain	3553.526	2	1776.763	169.378	P≤0.001	0.890
In-subject (time)	Absurdity	517.615	2	258.807	292.551	P ≤0.001	0.874
	Confusion/emotional turmoil	259.081	2	129.541	226.068	P≤0.001	0.843
	Lack of control	270.281	2	135.141	204.33	P≤0.001	0.829
	Immutability	311.881	2	155.941	236.350	P≤0.001	0.849
	Distance from alienation	328.548	2	164.274	321.739	P≤0.001	0.885
	Fear of loneliness	204.637	2	102.319	123.725	P≤0.001	0.747
	Psychological pain	10728.948	2	5364.474	1273.086	P≤0.001	0.968
(group × time) Interaction:	Absurdity	99.407	4	24.852	28.092	P≤0.001	0.572
	Confusion/emotional turmoil	56.785	4	14.196	24.755	P≤0.001	0.541
	Lack of control	46.163	4	11.541	17.450	P≤0.001	0.454
	Immutability	48.696	4	12.174	18.451	P≤0.001	0.468
	Distance from alienation	55.230	4	13.807	27.042	P≤0.001	0.563
	Fear of loneliness	20.536	4	5.141	6.216	P≤0.001	0.228
	Psychological pain	1747.763	4	436.941	103.694	P≤0.001	0.832
The effect size of emotional regulation therapy is 0.85	The effect size of treatment based on acceptance and commitment is 0.85						Post-test
The effect of emotional regulation therapy is 0.83	The effect size of treatment based on acceptance and commitment is 0.78						Follow-up

The results in Table 3 show that the effect of group on absurdity / meaninglessness scores (P <0.001, F = 10.671 (2 and 42)), confusion and emotional turmoil (P <0.001, P / 494). 9 = (2 and 42) F), lack of control (P <0.001, F = 9.934 (2 and 42)), immutability (P <0.05, F = 3.398 (2 and 42)), Social distancing / from alienation (P <0.001, F = 20.675 (2 and 42)), fear of loneliness (P <0.05, F = 3.515 (2 and 42)), the total score of psychological pain was significant with (P <0.001, F = 169.378 (2 and 42)). In other words, there is a significant difference between the experimental groups and the control group in the scores of psychological pain components. Due to the lack of significance of Mauchly test for the components of psychological pain, the hypothesized sphericity test was used. Therefore, according to the results of the effect of measurement time on the scores of absurdity / meaninglessness (P <0.001, F = 258.807 (2, 84)), confusion and emotional turmoil (P <0.001, P = 0.006, 226.06) (2 and 84) F), lack of control (P <0.001, F = 203.333 (2, 84)), immutability (P <0.001, F = 236/350 (2, 84)), distance ¬Social / alienation (P <0.001, F = 321.739 (2 and 84) F), fear of loneliness (P <0.05, F = 123/725 (2 and 84)), the total score of psychological pain was significant with (P <0.001, F = 1273.086 (2 and 84)). Therefore, it can be said that regardless of the experimental groups, there is a significant difference between the mean scores of the components of psychological pain in the three positions of pre-test, post-test and follow-up. Also, the effect of time and group interaction on absurdity / meaninglessness scores (P <0.001, F = 28.092 (4, 84)), confusion and emotional turmoil (P <0.001, P = 0.775 (4). and (84) F), lack of control (P <0.001, F.17 / 450 (4 and 84) F), immutability (P <0.001, F (18.51) (F (4, 84)), Social distance / alienation (P <0.001, F = 27.04 (4, 84)), fear of loneliness (P <0.001, F = 6.216 (4, 84)), and total mental pain score of cognition is significant with (P <0.001, F = 103/694 (4, 84)). Therefore, it can be concluded that regardless of the measurement time, there is a significant difference between the mean scores of the experimental groups in the post-test and follow-up. Since the effect of interaction between intragroup factor was measured at the time and intergroup factor was significant, the simple intergroup effect was investigated according to the levels of intragroup factor using Bafreni correction. The results of Bonferroni correction level showed that in the post-test and follow-up stages, there was a significant difference in the components of psychological pain between the experimental groups based on acceptance and commitment therapy and emotional regulation therapy with the control group ($P\leq$ ۰/۰۰۱). However, there is no difference between the mean scores of the absurdity /

meaninglessness component and immutability in the post-test phase and follow-up between the experimental groups of acceptance and commitment-based therapy and emotion regulation therapy. Also in the post-test phase, there is no significant difference between the mean scores of the components of confusion and emotional turmoil, lack of control, social distance / self-alienation, fear of loneliness and the total score of psychological pain between acceptance and commitment-based therapy and emotional regulation therapy. However, in the follow-up phase, there is a significant difference between the mean scores of confusions and emotional turmoil, lack of control between acceptance and commitment-based therapy and emotional regulation therapy ($P\leq 0.005$).

This is a pairwise comparison indicating the stability of treatment based on acceptance and commitment to the components of confusion and emotional turmoil, and lack of control. Also, in the follow-up phase, there is a significant difference between the mean scores of social distance / from alienation and psychological pain between acceptance and commitment-based therapy and emotional regulation therapy ($P\leq$ 0.005) and this pairwise comparison indicates the stability of emotional regulation therapy on the components of social distance / alienation and psychological pain.

Discussion

The aim of this study was to compare the effectiveness of emotion regulation training and acceptance and commitment-based therapy on cognitive impairment, emotional avoidance and psychological pain in patients with MS. The results showed that the treatment based on acceptance and commitment reduced the psychological pain of the experimental group compared to the control group. These results are consistent with the findings of other studies for example (Sadeghi, 2013; Pak et al., 2017; Kamani et al., 2016; Phillips et al., 2016; Amiri et al., 2017). In explaining these results, it can be said that the main purpose of ACT is psychological flexibility, and this ability refers to the openness or, in other words, the receptivity of experiences to the extent that it adopts activities that lead to values (Harris, 2009). Psychological resilience leads people to adopt new behaviors in line with values, and this is done through a sense of openness, presence, and awareness (Stoddard and Afari, 2014). Psychological resilience means that one can move forward at any time, even with any personal event (Hayes, 2008). Psychological acceptance generally plays a complex, important, and unique role in people with MS. Most importantly, psychological acceptance can help to accept illness. This suggests that advances in ACT treatment in people with MS are growing as a result of an increased tendency for pain, and that a wide variety of psychological experiences, unwanted emotional experiences, memories, and thoughts about other symptoms, etc., have decreased (McCracken & Gutierrez-Matins, 2011). Hayes and Lyon (2012), on the other hand, believe that the acceptance / commitment approach to treatment, rather than focusing on eliminating harmful factors, helps clients to accept their controlled emotions and cognitions and to free themselves from the controlling of verbal rules which has caused them problems.

Acceptance and commitment therapy is essentially process-oriented and explicitly emphasizes promoting acceptance of psychological experiences and commitment by increasing valuable, committed, flexible, and adaptive activities, regardless of the content of the psychological experiences; a trait which is not present in the cognitive-behavioral approach. Overall, acceptance and commitment therapy give women with MS the opportunity to re-observe, illustrate, and describe emotional states without a judgmental perspective, and the therapist's focus is more on guiding the patient to full awareness by taking responsibility for himself or herself. The therapist encourages people to fully experience the thoughts and emotions of a thought, feeling, relationship, and behavior without suppressing, and judging and also experience the secondary emotions such as shame, guilt, distrust, blame and humiliation after experiencing this behavior, thought and feeling (Forman & Herbert, 2008). Mindfulness techniques are also defined as conscious living at any time without attachment to it, not judging it, and accepting negative feelings and emotions (Soler et al., 2009).

Mindfulness is the core of third-generation cognitive-behavioral therapies that facilitate the process of emotional regulation. Teaching mindfulness techniques helps people to watch their thoughts and emotions instead of controlling their attention. Compared to behavioral techniques, mindfulness requires accepting these experiences without attempting to change, interpret, deny, or modify them. The functioning of mindfulness also takes place in a context of acceptance and change (Lynch et al., 2006). These dual goals of accepting what does not change and changing what can be changed make patients' behavioral responses more flexible when experiencing emotional turmoil, confusion, lack of control, and alienation, which is justified by the underlying cognitive-behavioral perspective of third-generation cognitive-behavioral therapies: By reducing catastrophic thoughts and fears of loneliness and abandonment, psychological behaviors, including restlessness, confusion, and confusion are reduced. In fact, this result is also explained based on the fear-avoidance model. According to this model, catastrophic thoughts cause fear of pain, fear of activity, and fear of re-injury (abandonment, rejection, and loneliness), which leads to avoidance and high-pitched behaviors, and in the long run due to depression, confusion, and belief in immutability, irritability and emotional outbursts lead to social withdrawal, depression, and eventually more pain in MS patients.

The results also showed that teaching emotion regulation strategies reduced the psychological pain of the experimental group compared to the control group. These results are consistent with the findings of other studies for example (Sadeghi, 2013; Pak et al., 2017; Kamani et al., 2016; Phillips et al., 2016; Amiri et al., 2017). In other words, based on human evolutionary history and the theory of communication frameworks, individuals typically respond to unpleasant emotional experiences and painful psychological events through extreme avoidance or control efforts (Tirch et al., 2014). In such situations, the mind tells us to control the situation better and not to have unpleasant thoughts and feelings. Obviously, if this kind of attitude is harsh, critical and worthless, it is in complete contradiction with compassion.

In addition, evidence shows that the kind of self we want to become affects our quality of life and social relationships, and that compassionate identity has better results than self-blame identity (Kroger & Ganolo, 2006). Therefore, in the treatment of emotional regulation, it is not a simple and neutral state of attention alone, but the meditations and visualizations in emotional regulation training provide a special form of self-help skills and neurobehavioral exercises for people that cultivate a compassionate mind in life. (Tirch et al., 2014). Emotional naming skills, clarity and drawing emotions and arranging life stories with a variety of emotional metaphors (the metaphor of the uninvited guest, in which one learns how to have a kind attitude without judging one's disturbing thoughts and feelings) seem to be the bedrock which provide extra for gaining psychological flexibility and reducing psychological pain in MS patients. Therefore, it seems that teaching emotion regulation strategies can change the expectations, attitudes and prejudices of MS patients towards their abilities not only by reducing negative emotions but also effectively and directly by creating positive emotions, character and meaning abilities. Therefore, the ability to change these states without making value judgments about the thoughts and emotions of each of these patients reduces psychological pain (in other words, a kind of harmony is created between the abilities and expectations of the person). On the other hand, people with emotion regulation power (high emotional intelligence) can evaluate stressful events, procrastination and burnout in relation to being threatening or not, and create ways to deal with these tensions. In this way, they can also properly regulate their emotions in different situations, and resist stressful experiences and also experience happiness, which in turn reduces negative emotions and increases positive emotions. There are important clinical implications for emotion regulation. The way people manage their emotions (emotional self-regulation) affects their psychological performance. Emotion regulation also has important developmental and social implications such as the development of empathy and the improvement of social relationships with others (Boden et al., 2010). The results of Bonferroni correction level showed that in the post-test and follow-up stages in the components of confusion and emotional turmoil, lack of control, social distance / from alienation, and the total score of psychological pain, there is a significant difference between experimental groups based on acceptance and commitment therapy and emotional regulation therapy (P ≤۰/۰۰۱). These results are in line with studies (Sadeghi, 2013; Pak et al., 2017; Kamani et al., 2016; Phillips et al., 2016; Amiri et al., 2017). In explaining the effectiveness of acceptance-based therapy, there is a commitment to reduce confusion, turmoil, and lack of control. Also, mindfulness exercises will increase MS patients' ability to tolerate negative emotions and distressing physical feelings. They also help them cope with painful and distressing signs and symptoms and to get rid of unhealthy thoughts, habits and patterns of behavior and thus plays an important role in behavioral regulation (Arch & Craske, 2006).

Acceptance and commitment therapy can also play an important role in reducing depression, hopelessness, confusion, emotional turmoil, and related physical symptoms, despite such positive approaches. In this study, we noticed different dimensions of life and going beyond the limitations caused by psychological pain and suffering by teaching topics such as the power of human will, shared responsibility and human experience and non-judgment of MS patients and clarified the hidden meaning of life. We also taught them to draw attention to the limitations of life for all human beings and to learn what matters is how people view life.

Acceptance and commitment therapy were not only effective in creating the right environment to pursue personal goals in life, or in other words, in creating the desire to live in MS patients; Rather, many participants expressed that they were more determined to pursue treatment so that they could take advantage of the opportunities ahead to enrich their lives and endure acceptable mental pain. Regarding the effectiveness of emotional regulation strategies, it can be said that the method of treatment is an attempt to correct destructive beliefs that play a major role in causing anxiety and also plays an important role in treatment based on emotional regulation after expressing the psychological aspects of pain and increasing patients' knowledge of the emotional mechanism and the effect that these mechanisms have on the physiological dimension and how this mental pain persists. Cognitive therapies, for example, try to identify irrational and dysfunctional thoughts that cause illness and anxiety, and the patient gains insight into their role in the disease and replaces them with more correct thoughts. These therapies are designed and implemented with an emphasis on the specific needs of patients for a particular health condition, and will be more effective than psychological regulatory approaches in relieving the

patient's symptoms. Positive consequences of tailored treatments for a particular clinical condition such as behavioral activation and patient motivation for change, activity cycle-rest training and training of active coping strategies and attention to detail of beneficial behaviors, undoubtedly and gradually disappears the negative aspects of psychological pain and multifaceted symptoms (social distance / from alienation and psychological pain).

Conclusion

Based on the results of this study, it is possible to teach the strategies of emotional regulation and acceptance and commitment therapy along with drug interventions to reduce physical and psychological pain of multiple sclerosis patients in medical centers. Doing this research was associated with limitations, including the following: This study was performed only on patients with MS in Mashhad, so caution should be exercised to generalize the results to other communities. In addition, the 2-month follow-up period was performed due to time constraints. Also, only a questionnaire was used to measure the research variable, which seems to have some limitations in the form of self-report. Also, the problems related to the specificity of the community to patients with MS in Mashhad and the non-random (targeted) sampling method of this study are among the limitations that are prominent in this study. It is suggested that in future research, other treatment methods for patients with MS with chronic psychological and physical pain be used and this research be conducted in other communities as well to help its over-generalizability. It is also recommended to use this treatment both in clinical centers and for patients with MS. Also, the present results can be used from several angles and in different fields. These findings can be applied in the fields of psychology, counseling and education because the results of the effectiveness of teaching emotional regulation strategies and treatment based on acceptance and commitment are considered as an educational and supportive combination.

Disclosure statement

The authors state no conflict of interest in the study.

ORCID

Hossein Mehdian: https://orcid.org/0000-0001-7444-5166

References

Amir, F., Ahadi, H., Nikkhah, K., & Seirafi, M. (2017). The Effectiveness of Acceptance and Commitment Group Therapy and Group Logotherapy in Reducing Perceived Stress among MS Patients. Caspian Journal of Neurological Sciences, 3(11), 175-184. doi: 10.29252/nirp.cjns.3.11.175

Arch, J. J., & Craske, M. G. (2006). Mechanisms of mindfulness: emotion regulation following a focused breathing induction. Behaviour Research and Therapy. 44 (12), 1849-58. doi: 10.1016/j.brat.2005.12.007

Baumeister, R. F. (1990). Suicide as escape from self. Psychological Review. 97 (1), 9 0–113. doi: 10.1037/0033-295x.97.1.90

Berard, J. A., Smith, A. M., Walker, L. A. S. (2019). Predictive Models of Cognitive Fatigue in Multiple Sclerosis. Arch Clin Neuropsychol. 34(1):31-38. doi: 10.1093/arclin/acy014

Boden, J.S. Fischer, J. L. & Niehuis, S.(2010). Predicting marital adjustment from young adults initial levels and changes in emotional intimacy over time: A 25-year longitudinal study. Journal of Adult Development, 17(3), 121-134. doi: 10.1007/s10804-009-9078-7

Briones-Buixassa, L., Milà, R., Aragonès, J. M., Bufill, E., Olaya, B., & Arrufat, F. X. (2015). Stress and multiple sclerosis: A systematic review considering potential moderating and mediating factors and methods of assessing stress. Health Psychology Open, 2, 1-16. doi: 10.1177/2055102915612271

Bruce JM, Lynch SHG. (2011). Personality traits in multiple sclerosis: Association with mood and anxiety disorders: J Psychosom. (70), 479–485. doi: 10.1016/j.jpsychores.2010.12.010

Cardaciotto LA. (2005) Assessing Mindfulness: The Development of a Bi-Dimensional Measure of Awareness and Acceptance [Thesis]. Philadelphia, PA: Drexel University. doi: 10.1177/1073191107311467

Cole, P. M., Martin, S. E., & Dennis, T. A. (2004). Emotion regulation as a scientificconstruct: Methodological challenges and directions for child developmentresearch. Child Development. 75 (2), 317–333. doi: 10.1111/j.1467-8624.2004.00673.x

Dennison L, Moss-Morris R, Chalder T. (2009). A review of Psychological correlates of adjustment in oatients with multiple sclerosis. Clinacal Psychologi Review. 29, 141-153. doi: 10.1016/j.cpr.2008.12.001

Delavar, A. (2011). Theoretical and practical foundations of research in humanities and social sciences. Tehran: Roshd Publications.

Ehde, D. M., Alschuler, K. N., Osborne, T. L., Hanley, M. A., Jensen, M. P., & Kraft, G. H. (2015). Utilization and patients' perceptions of the effectiveness of pain treatments in multiple sclerosis: A cross-sectional survey. Disability and health journal, 8(3), 452-456. doi: 10.1016/j.dhjo.2015.03.001

Foley, P. L., Vesterinen, H. M., Laird, B. J., Sena, E. S., Colvin, L. A., Chandran, S., . Fallon, M. T. (2013). Prevalence and natural history of pain in adults with multiple sclerosis: systematic review and meta-analysis. PAIN®, 154(5), 632-642. https://psycnet.apa.org/doi/10.1016/j.pain.2012.12.002

Forman EM, Herbert JD. (2008). New directions in cognitive behaviortherapy: acceptance based therapies, chapter to appear in w .o'donohue, je. fisher, (eds), cognitive behavior therapy:Applyingempirically supported treatments inyour practice, 2nd ed. Hoboken ,NJ: Wiley. , 4 (1), 263-265.

Gratz, K.L., Gunderson, J.G. (2006). Preliminary data on an acceptance-based emotion regulation group intervention for deliberate self harm among women with borderline personality disorder. Journal of BehaviorTherapy, (37), 25–35. doi: 10.1016/j.beth.2005.03.002

Gross JJ, John OP. (2003). Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. J Pers Soc Psychol, 85(2), 348–62. doi: 10.1037/0022-3514.85.2.348

Gross, J. J. (1999). Emotion regulation: Past, present, future. Cogn Emot. 13(5):551-73. doi: 10.1080/026999399379186

Gross, J. J. (2013). Emotion regulation: Taking stock and moving forward. Emotion, 13 (3), 359–365. doi: 10.1037/a0032135

Harris, R. (2009). The House of ACT: Functional contextualism, ABA and RFT. Retrieved 20th December, 2010.

Hayes SC. (2008). Acceptance and commitment therapy, relational frame theory, and the third wave of behavioral and cognitive therapies. Behavior Therapy. 35(4): 639-65. doi: 10.1016/j.beth.2016.11.006

Hayes, SC., Levin, M. (2012). Mindfulness and Acceptance for Addictive Behaviors: Applying Contextual CBT to Substance Abuse and Behavioral Addictions. New Harbinger Publications. doi:10.1007/s12671-013-0220-z

Jandaghi, F., Neshat-Doost, H., Kalantari, M., Jabal-Ameli, S. (2012). The Effectiveness of Cognitive-Behavioral Stress Management Group Training on Anxiety and Depression of Addicts under Methadone Maintenance Therapy (MMT). *Journal of Clinical Psychology*, 4(4), 41-50. doi: 10.22075/jcp.2017.2106

Karami, J., Bagian, M., Momeni, K., Elahi, A. (2018). Measurement of mental pain: Psychometric properties and confirmatory factor analysis of multidimensional mental pain questionnaire. *QUARTERLY JOURNAL OF HEALTH PSYCHOLOGY*, 7(25), 146-172. https://hpj.journals.pnu.ac.ir/article_4765.html?lang=fa

Kemani, M., Hesser, H., Olsson, G., Lekander, M., & Wicksell, R. (2016). Processes of change in Acceptance and Commitment Therapy and Applied Relaxation for long- standing pain. European Journal of Pain, 20(4), 521-531. doi: 10.1002/ejp.754

Kroger, C., Schweiger, U.S., Valerija, A., Ruediger, K., Rudolf, S., & Reinecker, H. (2006). Effectiveness of dialectical behavior therapy for borderline personality disorder in an inpatient setting. *Behaviour Research and therapy*, 44(9), 1211-1217. doi: 10.1016/j.brat.2005.08.012

Leahy, R.L., Tirch, D., & Napolitano, LA. (2014). Emotion regulation in psychotherapy. Mansouri Rad A. Tehran: Arjmand. doi:10.5901/mjss.2016.v7n4p412

Linehan, M. M. (1993b). Skills training manual for treating borderline personality disorder. New York: Guilford Press

Luoma, J. B., Hayes, S. C., & Walser, R. D. (2007). Learning ACT: An acceptance & commitment therapy skills-training manual for therapists. New Harbinger Publications. https://link.springer.com/article/10.1007/BF03395728

Lynch, T. R., Chapman, A. L., Rosental, M. Z., Kuo, J. R., Linehan, M.M. (2006). Mechanisms of change in dialectical behavior therapy: Theoretical and empirical observations. *Journal of Clinical Psychology*. 62 (4), 459-80. doi: 10.1002/jclp.20243

McCracken, L. M., & Gutiérrez-Martínez, O. (2011). Processes of change in psychological flexibility in an interdisciplinary group-based treatment for chronic pain based on Acceptance and Commitment Therapy. Behaviour research and therapy. 49, 267-274. doi: 10.1016/j.brat.2011.02.004

Mee, S; Bunney, B. G., Bunney, W. E., Hetrick, W., Potkin, S. G., Reist, C. (2011). Assessment of psychological pain in major depressive episodes. Journal of Psychiatric Research 45:1504–1510. doi:10.1016/j.jpsychires.2011.06.011

Meerwijk, E. L, Ford, J. M, Weiss, S. J. (2015). Resting-state EEG delta power is associated with psychological pain in adults with a history of depression. Biological Psychology. 105, 106–114. doi:10.1016/j.biopsycho.2015.01.003

Orbach, I., Mikulincer, M., Sirota, P., Gilboa-Schechtman, E. (2003). Mental pain: A multidimensional operationalization and definition. Suicide Life Threatment Behavior. 33(3), 219–30. doi:10.1521/suli.33.3.219.23219

Ost LG.(2008). Efficacy of the third wave of behavioral therapies: a systematic review and meta-analysis. Behav Res Ther . 46(3): 296-321. doi:10.1016/j.brat.2007.12.005

Pak, S; Abdi, R and Chalbianloo, Gh.R. (2017). The effectiveness of acceptance and commitment-based therapy (ACT) on experiential avoidance and acceptance of the disease in people with multiple sclerosis (MS). Bi-Quarterly Journal of Contemporary Psychology, 12 (1), 72-63. https://www.sid.ir/en/journal/ViewPaper.aspx?ID=606123

Phillips LH, Henry JD, Nouzova E, Cooper C, Radlak B, Summers F. (2014). Difficulties with emotion regulation in multiple sclerosis: Links to executive function, mood, and quality of life. J Clin Exp Neuropsychol. 36(8): 831-42. doi:10.1080/13803395.2014.946891

Saber, M; Tehrani, H; Shojaeizadeh, R; Maleki, Z. and Esfandiarpour, Roya (2013). Evaluation of mental health status and the rate of exposure to stressful life events in nurses working in the emergency room 115. Journal of Health System Research, 9 (3), 294-300. http://hsr.mui.ac.ir/article-1-610-fa.html

Sadeghi, M. (2013). Evaluation of the effectiveness of emotional regulation on improving quality of life, disease perception, and reducing cognitive emotion regulation problems in my patients. Master Thesis in Psychology, University of Guilan, Faculty of Literature and Humanities.

Solaro, C., Cella, M., Signori, A., Martinelli, V., Radaelli, M., Centonze, D., Bonavita, S. (2018). Identifying neuropathic pain in patients with multiple sclerosis: a crosssectional multicenter study using highly specific criteria. Journal of Neurology, 265(4), 828-835. doi: 10.1007/s00415-018-8758-2

Soler, J., Pascual, J. C., Tiana, T., et al. (2009). Dialectical behaviour therapy skills training compared to standard group therapy in borderline personality disorder: A 3-month randomised controlled clinical trial. *Behaviour Research and Therapy*. 47, 353–358. doi:10.1016/j.brat.2009.01.013

Stoddard, J. A., & Afari, N. (2014). The Big Book of ACT Metaphors: A Practitioner's Guide to Experiential Exercises and Metaphors in Acceptance and Commitment Therapy. New Harbinger Publications. https://www.newharbinger.com/9781608825295/the-big-book-of-act-metaphors/

Thomas, P. W., Thomas, S., Hillier, C., Galvin, K., & Baker, R. (2006). Psychological interventions for multiple sclerosis. Cochrane Database Syst Rev, 1. doi:10.1002/14651858.cd004431.pub2

Tirch, D., Schoendorff, B., & Silberstein, R. L. (2014). *The ACT Practitioner's Guide to the Science of Compassion: Tools for Fostering Psychological Flexibility*. New Harbinger Publications. https://www.newharbinger.com/9781626250550/the-act-practitioners-guide-to-the-science-of-compassion/

Tossani, E. (2013). The Concept of Mental Pain. Psychother Psychosom. 82 (2), 67–73. doi:10.1159/000343003

Tröster, A. I., & Arnett, P. A. (2006). Assessment of Movement and Demyelinating Disorders. https://psycnet.apa.org/doi/10.1037/11299-010

Vosoughi R. (2008). Freedman MS. Therapy of MS. J Neurol neuros: Atlas multiple. (112), 365-85.