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The Efficacy of Group Cognitive Behavioral Therapy versus Group Acceptance and Commitment Therapy in the Treatment of Panic Disorder of Multiple Sclerosis Patients: Considering Revised Sensitivity Theory of Brain-Behavioral System

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Quantitative Study

Abstract

Background: Physical and psychological problems are common among individuals with multiple sclerosis (MS), thus emphasizing the need for the evaluation of the effectiveness of different psychological therapies for these patients. Thus, this study aimed to compare the efficacy of group cognitive behavioral therapy (GCBT) with group acceptance and commitment therapy (GACT) in the treatment of fear beliefs related to panic disorder in MS patients, focusing on the revised sensitivity theory of brain-behavioral systems.

Methods: This experimental study was conducted employing a pretest-posttest design with a control group. The statistical population consisted of MS patients with panic disorder who sought treatment at the Khorasan MS Association in Mashhad, Iran. Through the convenience sampling method, 36 women who met the inclusion criteria were selected from among 3200 patients. The participants were randomly divided into 3 groups: GCBT (N = 12), GACT (N = 12), and the control group (N = 12). Pretest and posttest intervention assessments were conducted using Jackson's five-factor questionnaire and the Panic Belief Inventory (PBI). Descriptive methods and repeated measures analysis of variance were utilized for data analysis.

Results: The results revealed a significant reduction in fear beliefs among participants in the intervention groups compared to the control group ($P < 0.05$). Furthermore, significant changes were observed in the behavioral-brain systems of the participants in the intervention group compared to the control group ($P < 0.05$). Comparing the intervention groups revealed that the impact of GACT is higher than GCBT on the behavioral activation system (BAS) and panic beliefs ($P = 0.04$).

Conclusion: It can be concluded that GCBT and GACT were effective in improving the fear beliefs of patient and changing their brain-behavioral systems. Comparing two interventions showed higher efficacy of GACT.

Keywords: Cognitive behavioral therapy; Acceptance and commitment therapy; Panic; Multiple sclerosis; Gray theory

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Introduction

Multiple sclerosis (MS) is a chronic, progressive and inflammatory disease in the central nervous system (Fritzsche, Monsalve, Zanjani, Goli, & Dobos, 2020), which leads to a gradual decrease in the ability of muscles (Omranifard, Mansoorzadeh, Asgari, Sayar, Saeidi & Babakhanian, 2023). It is estimated that 57 in 100,000 people have MS in Iran (Pouramiri, Azimian, Akbarfahimi, Pishyareh, & Hossienzadeh, 2019). This disease is associated with depression, stress, and anxiety through the reduction of health and quality of life (QOL) (Strober, 2018). One of the anxiety disorders in MS patients is panic. Panic disorder, as a kind of anxiety disorder, has many emotional, physical, and cognitive symptoms and includes periods of intense fear and discomfort (Na, Cho, & Cho, 2021). Individuals with panic disorder present with a variety of psychological and social conditions. The frontline therapies of panic disorder are pharmacological therapy and psychological treatments such as cognitive behavioral therapy (CBT) (Müller-Tasch et al., 2008; Salkovskis, 2007). Group CBT (GCBT) changes people's cognitive processing style and as a result creates new strategies to solve problems through logical analysis methods (Meliani, Shaeeri, Ghaedi, Bakhtiari, & Tavoli, 2009). Moreover, hyperventilation has been considered as a cause, a correlate, and a consequence of panic attacks. Stress-induced hyperventilation produces symptoms that people tend to misinterpret as life threatening (Nardi, Valença, Nascimento, Mezzasalma, Lopes, & Zin, 2000). Diaphragmatic breathing training and relaxation training target the physical component and physiology of anxiety. These techniques help individuals cope with the symptoms of anxiety appropriately (Efron & Wootton, 2021). GCBT helps clients to modify and correct their interpretations and incorrect perceptions of environmental events and create new perspectives. Clients learn to tolerate ambiguity and uncertainty and have more cognitive flexibility through visualization (Caetano et al., 2018). Finally, patients use these new cognitive perspectives as a different coping response to anxiety events. Identification of safe behaviors of worry, elimination of avoidance behaviors, mental exposure, and coping training are techniques that reduce the behavioral components of anxiety (O'Toole, Watson, Rosenberg, & Berntsen, 2018). These distinct features in CBT help to successfully treat patients with panic disorder and return them to life.

Although, authors could not find a study aimed to compare CBT and ACT in panic disorder patients. The ranking of GCBT compared to standard treatment for panic disorder is established through indirect evidence. Thus, there is a need for future studies to address this relevant knowledge gap (Papola et al., 2023). Moreover, third wave therapies have emerged in recent years, and one of these therapies is acceptance and commitment therapy (ACT), which was formed from the expansion of CBT. The main goal of ACT is creating psychological flexibility in the sense of creating a practical choice (Ito & Muto, 2020). In ACT, psychological flexibility occurs by using different techniques and paying attention to concepts such as acceptance, mindfulness, living in the present moment, dissociation or cognitive dissonance, values, and committed action (Abow et al., 2023). Mindfulness as fundamental technique in ACT moderates panic attacks through shifting attention from catastrophizing thoughts to bodily sensations (Givehki, Afshar, Goli, Scheidt, Omidi, & Davoudi, 2018; Goli, 2023).

In ACT, the emphasis on functional cycles and consideration of motivational aspects along with cognitive aspects leads to the stability of its effectiveness compared to other treatments (Wynne et al., 2019). This method of treatment changes

the relationship between problematic thoughts and feelings so patients find thoughts to be harmless (Wynne et al., 2019). Studies have shown a higher efficacy for group ACT (GACT) compared with individual therapy in panic patients (Dousti, Ghodrati, & Ebrahimi, 2019).

Unlike CBT, in ACT, instead of changing cognitions, the individual's psychological connection with thoughts changes (Roditi & Robinson, 2011). The goal of this therapy is to help clients achieve a more valuable and satisfying life by increasing psychological flexibility, which is associated with 6 main processes (acceptance, cognitive dissonance, self as context, connection with the present, values, and committed action). However, in CBT, the correction of cognitive errors and the changing of beliefs are first addressed, and then, attention is paid to maintaining and stabilizing new beliefs by determining targeted exercises. The therapist tries to create cognitive change in different ways. This means to correct the way of thinking and the belief system of a person so that there is a change in feelings and behaviors (Beltman, Voshaar, & Speckens, 2010).

In addition to the therapeutic debates in the treatment of MS patients with panic disorder and their effectiveness, another variable is also discussed in this research. Many people with panic disorder have panic attacks as a result of changes in their body's sensations, and MS can cause changes in sensations that trigger panic attacks. While MS is not directly causing the panic attacks, it is creating an environment that makes them far more likely (Šilić, Motl, & Duffecy, 2023). However, genetic factors, personality traits, and various cognitive-behavioral components play a role in panic disorder. The outcome of these factors is important in predicting the incidence and severity of this disorder. In general, this type of behavior and emotion formation in a person can have another purpose, that is, based on the biological-neural program, people eliminate some behaviors over time and predict a long-term program for others. This type of behavior formation should be investigated in biological theories of personality; one of the most prominent approaches in this field is the theory of neuropsychological structures of personality or the brain-behavioral systems theory of Gray.

Gary (1991), by reviewing the animal research literature, presented a biological model that includes 3 brain-behavioral systems in the Reinforcement Sensitivity Theory (RST) of personality. According to Gray (1990), these brain-behavioral systems are the basis of individual differences and the activity of each of them leads to different emotional reactions such as fear and anxiety. The first system is the behavioral activation system (BAS) which responds to the conditioned stimuli of reward and lack of punishment; the activity and increased sensitivity of the BAS causes positive emotions and active coping.

The second system is the behavioral inhibition system (BIS), which responds to conditioned stimuli of punishment and lack of reward, and innate fearful stimuli cause the emotional state of anxiety and behavioral inhibition (Gray, 1982). The third system is the fight-flight system (FFS), which is sensitive to annoying stimuli. The behavioral components of FFS, whose high activity is related to psychoticism, are defensive aggression (fight) and quick escape from the source of punishment (escape) (Corr, Pickering, & Gray, 1995). Based on the RST Gray (1990) assumed that psychiatric disorders are caused by dysfunction of one of these systems or their interactions with each other. Researchers hypothesized that the abnormal sensitivity of these systems indicates the readiness and aptitude for many forms of psychopathology (Corr et al., 1995; Keiser & Ross, 2011), so that BAS and BIS can explain a wide range of disorders.

Gray (1997) acknowledged that neurotic anxiety and depression result from higher BIS activity, while psychotic depression results from low BAS activity (Vermeersch, T'Sjoen, Kaufman, & Vincke, 2009). In the revised theory of Gray and McNaughton (1983), the fight, flight, and freezing system (rFFFS) refers to real threats that cannot be avoided. The authors found no research on MS patients with panic disorder and its relationship with brain-behavioral systems. The present study compared the efficacy of GCBT and GACT on the panic beliefs of MS patients with panic disorder.

Methods

The current research was an experimental study with a pretest-posttest design and control group. The statistical population of the current study included all women with MS and panic disorder referred to Khorasan MS Association in Mashhad, Iran. From among all the patients (3200 people), 39 women were selected using the convenience sampling method based on the study inclusion criteria and psychiatric and psychological evaluations. The inclusion criteria were first stage MS patients, no other physical diseases, diagnosed with panic disorder based on the diagnostic criteria of the DSM-5, and no other psychiatric disorders. The exclusion criteria were absence from more than 2 sessions, lack of interest in participating in the research, and pregnancy.

The sample size was determined to be 11 patients in each group using the formula presented below. Predicting 10 percent drop, 13 cases were included in each group (Ashayri, Goodarzi, Peimani, Mashchi, Sabet, & Akbari, 2021).

$$n = \frac{(Z_{0.975} + Z_{(1-\beta)})^2 (\sigma_1^2 + \sigma_2^2)}{(\mu_1 - \mu_2)^2} = 11$$

The participants were allocated to the GCBT, GACT, and control groups by someone who was blinded to the aims of the study through simple randomization (the dice throwing method). The final sample included 36 participants; 12 participants in GCBT, 13 in GACT, and 11 in the control group. Two individuals did not participate in the follow-up stage, and 1 participant did not complete the GCBT sessions. The demographic questionnaire used to collect data included items on age, education and marital status, medical history and drug use, absence of other anxiety disorders, smoking, and physical activity.

Jackson's five-factor questionnaire: This 30-item scale was designed by Jackson (2006) and is used to measure systems of the revised theory of sensitivity to reinforcement (Jackson, Paunonen, Fraboni, & Goffin, 1996). Participants respond to the items based on a 5-point Likert scale, where 1 indicates complete agreement (always) and 5 indicates strong disagreement (never). Each factor (BAS, BIS, and rFFFS) includes 6 questions. Jackson calculated its reliability using Cronbach's alpha method for each of these systems, which was 0.83 for BAS, 0.76 for BIS, and 0.74 for rFFFS (0.78, 0.74, and 0.70 for each of the subsystems, respectively). The validity of Iranian version of this test confirmed through criterion validity. Result of Cronbach alpha (0.72-0.88) showed acceptable reliability (Habibi, Alahdadi, Mohammadi, & Ghanbari, 2019).

Panic Belief Inventory: The Panic Belief Inventory (PBI) was developed by Greenberg (1989) to evaluate beliefs that increase the probability of catastrophic reactions to physical and emotional experiences in panic disorders (Wenzel, Sharp,

Brown, Greenberg, & Beck, 2006). The PBI includes 42 items and 4 subscales, i.e., anxiety of waiting, physical distress, emotional distress, and self-dissatisfaction. The Cronbach's alpha of this inventory was 0.95. Moreover, the Cronbach's alpha for the subscales of this questionnaire have been reported in the range of 0.82 to 0.91 (Wenzel, Sharp, Brown, Greenberg, & Beck, 2006). In Iran, this questionnaire has been translated by Afshari, Neshat Doost, Bahrami, and Afshar (2010), and its formal validity has been approved by the professors. A reliability coefficient of 0.89 has been reported for this questionnaire (Afshari, Neshat Doost, Bahrami, & Afshar, 2010).

Intervention: Each treatment group received a psychotherapy session according to the proposed models, and the control group was placed on the waiting list for treatment. The questionnaires were completed as a posttest on the final session and 1 month after. The GCBT protocol was used based on Judith Beck's treatment protocol (Beck, 2020), which is available in Beck's Cognitive Therapy book (Table 1).

The GACT program desighned based on the protocol of Hayes, Levin, Plumb-Vilardaga, Villatte, and Pistorello (2013) and Hayes (2005) was used. Psychotherapy sessions were conducted at Sib counseling center in Mashahd city, Iran, with the following protocols (Table 2).

Ethical considerations: The informed consent form of the treatment protocol was explained for all 3 groups, and all participants were assured that they would enjoy the results of the research and the possible benefit of the treatment. In each of the treatment stages, people could leave the treatment sessions freely. All treatment steps were explained to the participants and misunderstandings were cleared in all treatment steps so that the patient could do his/her work in the treatment process in a problem-free environment. This study was approved with the code of ethics IR.MUMS.MEDICAL.REC.1401.469**.**

Descriptive data were analyzed using mean and standard deviation, and multivariate analysis of variance (MANOVA) method was used for data analysis, along with repeated measures analysis of variance (ANOVA), and post hoc and Tukey's tests. The data were analyzed using SPSS software (version 20; IBM Corp., Armonk, NY, USA). In all calculations, p-value = 0.05 was considered as the level of statistical significance**.**

Results

Examining the demographic variables showed that the average age of the participants in the research was 43.8 ± 4.44 years. All participants had high school education or higher. Before implementing the repeated measures ANOVA, in order to check the assumptions of this type of analysis, the Shapiro-Wilk test showed that the data distribution is normal in the 3 stages of pretest, posttest, and follow-up ($P < 0.05$), Levene's test showed the equality of error variance between the 2 research groups ($P < 0.05$). The assumption of sphericity was not confirmed by Mauchly's test (0.92; $P = 0.39$). The results related to the Greenhouse-Geisser row were checked. Then, in the comparison of the two groups, the result of Pillai's Trace test was significant for both variables ($P < 0.05$).

In table 3, the mean and standard deviation of the 2 groups are presented in the 3 measurement periods. The scores in the intervention groups show an increase, while the changes in the control group are slight.

Table 1. Cognitive-behavioral therapy package

Session	Objectives	Techniques and methods
1-2	Introduction	interview and cognitive-behavioral evaluation, great attention is paid to the identification of underlying, predisposing, and maintaining problems 1-Structured clinical interview; 2- Preparing a list of the patient's problems that exist in addition to the main problem that is diagnosed and 3- Determining the antecedents and consequences of the main problem
3	Introduction of cognitive-behavioral therapy	explanation about the theories of origin, characteristics of treatment, level of expectations from treatment and types of techniques that are used in treatment, raising awareness about cognitive-behavioral therapy, modifying the level of patient's expectations from the treatment process, explanation of the relationship between knowledge and behavior and the contrast between the two
4	Treatment planning	creating a cognitive file for the patient, in which the following contents are classified: the types of symptoms that the patient experiences, the list of his problems, the types of his ineffective cognitions such as ineffective thoughts and cognitions, strengths such as receiving support from family members or high level of education and weaknesses such as not receiving enough support from the family or being involved or economic crises and behavioral and cognitive techniques that have been selected for treatment using direct and indirect questions and interaction with the patient is presented with a sheet of the list of problems and types of recognition to be confirmed or not confirmed
5-6	Training and implementation of behavioral techniques	the main goal of training and implementation of behavioral techniques is to empower the patient to be aware of the role of ineffective negative thoughts in the beginning and continuation of the symptoms of the disease, using different behavioral techniques including returning attention, focusing on the object, awareness, mental exercises, pleasant imagination, interesting activities, and counting thoughts
7	Identifying automatic thoughts	the seventh session of identifying automatic thoughts with the aim of main roots of emotions and the presence of mind, and explaining
8-9	Identifying negative automatic thoughts	identifying negative automatic thoughts with the aim of recognizing common cognitive errors in the patient, explaining and describing cognitive errors, helping the patient to recognize his cognitive errors from negative automatic thoughts, and giving related homework
10	Changing negative automatic thoughts	changing negative automatic thoughts with the aim of reducing mental and emotional pressure, the most used techniques were: 1- Identifying my cognitive errors and checking the extent of their effects on my daily emotions and behaviors, 2- Examining what other attitudes exist and the merits and demerits of this way of thinking, and 3- Finding evidence to confirm or reject mental perceptions, explaining basic thoughts, their role, and how to identify them from automatic thoughts through
11-12	Diagnosing dysfunctional fundamental thoughts	Changing dysfunctional fundamental thoughts using third person techniques, downward arrow, three questions, Socratic technique, and the like

Table 4 shows the results of repeated measures ANOVA. It indicates that there is a significant difference between the average pretest, posttest, and follow-up scores in the intervention groups and the control group. In other words, there is a significant difference between the scores of the study stages (pretest, posttest, and follow-up) in these groups ($P < 0.001$).

Table 2. Acceptance and Commitment Therapy

Session	Objectives	Techniques and methods
1	Interview and evaluation	Explanation of conditions and treatment process Explanation of the basic model of ACT: 1- Training and implementation of mindfulness exercises that are mandatory in every session, 2- change through the use of creative frustration exercise, and 3- hard cover exercise to explain the treatment process
2	Explanation of the concept of acceptance and living in the present	Practicing the conscious mind, talking about satisfaction, primary and secondary suffering, 3- Using the metaphor of a tramp, and 4- Using the metaphor of walking in the rain
3	Explanation of the concept of self-contextuality	1- Mindfulness practice, 2- Considering oneself as a structure, 3- Parable of flowing sands, 4- finding the root of the problem, and 5- using the mixing technique
4	The initial evaluation of values and explanation of goals	1- Training of the conscious mind, 2- training of suppressing thoughts, and 3- parable of the tug-of-war competition with the monster
5	Explaining the concept of breaking away from language threats	1-Mindfulness training, 2-Considering oneself, 3- Practicing facing a giant iron man, and 4- The method of facing "Yes and Nos
6	Methodology of Values	1- Exercising the conscious mind, 2- Parable of the burial ceremony, 3- Parable of bus passengers, 4- compass of values, 5- determining the goal, 6- Activity planning
7	Explanation of the concept of committed action	1- Training of the conscious mind, 2- training of the observer, 3- Allegory of the chess board
8	Ending the meetings and concluding	With the aim of preparation for prevention 1-Practice the content on the card, 2- We live life's duty

Moreover, the significance of the interaction between the study stages in the research variables indicates that, in the posttest and follow-up stages, the experimental groups compared to the control group (Table 4).

The results of the follow-up test show that the groups had a significant difference in the 3 stages of pretest, posttest, and follow-up ($P < 0.05$) (Table 5).

Table 3. The mean and standard deviation of the pretest, posttest, and follow-up variables according to the experimental and control groups

Variable	Group	Pretest (mean ± SD)	Posttest (mean ± SD)	Follow-up (mean ± SD)
Panic belief	GCBT	97.61 ± 9.72	90.46 ± 8.60	85.53 ± 7.89
	GACT	99.36 ± 8.48	93.45 ± 9.01	88.72 ± 9.95
	Control	100.50 ± 11.24	100.83 ± 11.44	100.16 ± 11.27
BAS	GCBT	4.38 ± 1.66	7.07 ± 1.89	9.69 ± 1.84
	GACT	4.18 ± 1.40	7.90 ± 1.92	10.81 ± 1.94
	Control	4.75 ± 1.48	5.08 ± 1.16	5.75 ± 1.21
BIS	GCBT	9.60 ± 1.84	6.69 ± 1.70	5.00 ± 1.63
	GACT	7.09 ± 1.19	5.00 ± 1.67	9.90 ± 1.51
	Control	5.75 ± 1.21	6.08 ± 1.44	5.41 ± 0.99
Fight	GCBT	3.07 ± 0.95	5.41 ± 1.56	7.38 ± 1.44
	GACT	3.45 ± 0.84	6.09 ± 1.31	8.27 ± 1.27
	Control	5.75 ± 1.21	6.08 ± 1.44	5.41 ± 0.99
Flight	GCBT	3.16 ± 1.34	5.61 ± 1.70	5.46 ± 1.56
	GACT	3.45 ± 0.93	6.00 ± 1.18	6.63 ± 0.92
	Control	4.00 ± 1.34	4.66 ± 1.49	4.25 ± 1.38
Freeze	GCBT	3.38 ± 1.19	5.70 ± 1.30	8.07 ± 1.11
	GACT	3.54 ± 1.03	6.00 ± 1.09	8.27 ± 1.27
	Control	4.16 ± 1.33	4.50 ± 0.90	4.66 ± 0.88

BAS: Behavioral activation system; BIS: behavioral inhibition system; SD: Standard deviation

Table 4. Comparison of within-group and between-group effects in experimental and control groups using repeated measures analysis of variance

Variable	Source	SS	df	MS	F	P	Eta
Panic belief	Time	1057.36	1	1057.36	250.90	0.001*	0.88
	Time * Groups	497.54	2	248.77	59.03	0.001*	0.78
	Groups	1933.38	2	966.69	3.73	0.030*	0.18
BAS	Time	301.55	1	301.55	252.66	0.001*	0.88
	Time * Groups	86.99	2	43.49	36.44	0.001*	0.68
	Groups	101.17	2	50.58	7.76	0.001*	0.31
BIS	Time	129.11	1	129.11	99.63	0.001*	0.75
	Time * Groups	56.84	2	28.42	21.93	0.001*	0.57
	Groups	61.02	2	30.51	5.22	0.010*	0.24
Fight	Time	194.16	1	194.16	418.01	0.001*	0.92
	Time * Groups	58.28	2	29.14	62.74	0.001*	0.79
	Groups	36.44	2	18.24	4.58	0.030*	0.21
Flight	Time	65.57	1	65.57	175.54	0.001*	0.84
	Time * Groups	26.45	2	13.22	35.40	0.001*	0.68
	Groups	36.44	2	18.24	4.58	0.030*	0.21
Freeze	Time	195.88	1	195.88	648.00	0.001*	0.95
	Time * Groups	70.84	2	35.42	117.17	0.001*	0.87
	Groups	46.98	2	23.49	6.86	0.003*	0.29

BAS: Behavioral activation system; BIS: Behavioral inhibition system; SS: Sum of square; MS: Mean of square; df: Degree of freedom

Discussion

This study aimed to survey the efficacy of GCBT versus GACT in the treatment of the panic disorder of MS patients, considering revised sensitivity theory of the brain-behavioral system. As the results show, GCBT and GACT had a positive effect on the level of panic beliefs and brain-behavioral dimensions of the participants. In line with this finding, the results obtained in the studies by Efron and Wootton (2021) and Yang et al. (2020) show that CBT was effective on panic beliefs.

Based on cognitive-behavioral perspectives, patients with panic disorder perceive disproportionate stress in relation to the situation. Therefore, efficient treatment is a treatment that changes dysfunctional cognitions and corrects false beliefs of the patient with the help of cognitive interventions (Barlow, Raffa, & Cohen, 2002).

Table 5. Bonferroni test results for pairwise comparison between study stages

Variable	Group		Mean difference	Standard error	P
Panic belief	Control	GCBT	4.24	0.5	0.001*
		GACT	7.68	0.48	0.001*
	GACT	GCBT	3.49	0.20	0.001*
BAS	Control	GCBT	1.85	0.59	0.001*
		GACT	2.23	0.61	0.001*
	GACT	GCBT	0.37	0.60	0.540
BIS	Control	GCBT	1.53	0.14	0.001*
		GACT	2.68	0.26	0.010*
	GACT	GCBT	1.15	0.23	0.001*
Fight	Control	GCBT	1.89	0.11	0.001*
		GACT	1.91	0.11	0.001*
	GACT	GCBT	0.02	0.11	0.870
Flight	Control	GCBT	2.25	0.75	0.005*
		GACT	1.44	0.75	0.040*
	GACT	GCBT	0.70	0.75	0.290
Freeze	Control	GCBT	1.72	0.11	0.001*
		GACT	3.30	0.13	0.001*
	GACT	GCBT	1.58	0.09	0.001*

BAS: Behavioral activation system; BIS: Behavioral inhibition system;GACT: Group acceptance and commitment therapy

Patients with panic disorder perceived a stronger association between panic-triggering words and panic symptoms and rated them with higher negative valence. In an automatic semantic priming paradigm, faster responses to panic cue words were observed in patients with panic disorder when panic-inducing words were preceded by panic words compared to neutral words. This effect was not present in healthy subjects. According to the spreading activation theory of semantic priming, response facilitation enhances phobia-related associations, which allow the semantic activation of agoraphobic cues (e.g., "elevator") in semantic memory to automatically expand to words associated with panic symptoms (eg, "dizziness"), thus facilitating the retrieval of those concepts. Our results support the enhanced interrelationships between fear-related concepts proposed by cognitive models of fear at the levels of behavioral and neural responses. This priming effect in panic disorder was associated with the suppression of activation in the temporal cortex and lateral insula, regions often suppressed in previous priming studies with healthy subjects**.** In addtion, based on biosemiotics as a psychosomatic model for panic disorder with agoraphobia, confrontation (exposure therapy) has proven to be the most effective method. It consists of information about panic attacks and behavioral experiments (e.g., provoking the symptoms by hyperventilating)**.** As a cognitive intervention, thoughts and images are systematically workes by collecting alternative explanations for the symptoms. For the panic disorder without agoraphobia, cognitive interventions such as re-evaluation of physical symptoms, thinking through catastrophic thoughts (exposure in sensu), suppression, and behavioral medical measures such as distraction strategies in connection with a relaxation procedure are also effective (Goli, 2016).

Moreover, the findings showed that ACT is effective on fearful beliefs. This finding is in line with the results obtained in the studies by Meuret, Twohig, Rosenfield, Hayes, and Craske (2012) and Ivanova et al. (2016). In ACT, the main goal is to create mental flexibility; this means creating the ability to choose a more suitable action from among different options, it is not included simply to avoid disturbing thoughts, feelings, memories, or tendencies**.**

In this treatment, an attempt made to increase the psychological acceptance of the individual regarding mental experiences (thoughts, feelings, etc.) and, in turn, to reduce ineffective control actions. According to biosemiotics as a psychosomatic model, there is a very important balance to be kept between hope and acceptance. Hope, as positive anticipation, could promote psychoneuroimmunology (PNI)**.** Without acceptance, the anticipation could lead to an anxious and aversive attitude**.** Acceptance of the reality of a disability and the possibility of dying in the near future is a significant point in coping with cancer, but without hope the confrontation with upcoming disabilities and dying can lead to a passive and fatalistic attitude (Fritzsche, McDaniel, & Wirsching, 2019).

The patient is taught that any action to avoid or control these unwanted mental experiences is ineffective or has the opposite effect and causes them to intensify. In the second step, the psychological awareness in the present moment is explained; the individual is made aware of being connected to the formless context of the mind and made aware moment by moment of the content of the mind, bodily sensations, feelings, and thoughts (Kabat-Zinn, 1990). In the third step, they are taught to separate themselves from these mental experiences (cognitive detachment) in such a way that they can act independently of these experiences. In the fourth step, excessive focus on self-image (cognitive defusion) or the personal story (such as

being a victim) that the person has created for him/herself in his/her mind is reduced. In the fifth step, the individual is assisted until he/she knows his/her main personal values and clearly defines them and turns them into specific behavioral goals (clarification of values). Finally, motivation is created for committed action (committed action), which refers to activity directed toward the specified goals and values along with acceptance of mental experiences. These mental experiences can be depressing thoughts, obsessions, thoughts related to accidents (trauma), fears or social anxieties, etc. Consciousness training modulates brain structure. This means mind and consciousness have causal influence on body. Attention and mindfulness training influences our muscles and cognition in response to panic signals (Schmidt & Walach, 2014).

In explanation, it can be said that ACT and CBT interventions as supportive therapy that require a strong relationship between the patient and the therapist can develop skills such as tolerance of helplessness, mindfulness, emotional regulation, and effective interpersonal skills in subjects. In explaining these results, it can be said that in ACT, thoughts are the result of a natural mind, and beliefs are the result of the process of cognitive fusion. What turns thoughts into beliefs is a person's immersion in the content of thoughts. When a person suffering from social anxiety panics due to a thought related to the fear of negative evaluation, it means that it is mixed with its content and the result of this mixing is the beliefs related to the person's social anxiety disorder. ACT techniques place great emphasis on reducing cognitive distress. In fact, when cognitive decreases, the individual is disconnected from the content of thoughts. When ACT is applied to the symptoms of anxiety, instead of trying to change the form and content of fearful psychological events, the treatment tries to change the contexts and focus on response actions that maintain the cycle of disruption. It seems that the more a person has symptoms related to fear and judgment and the more he/she emphasizes on escaping or avoiding unpleasant internal experiences, the more he/she provides the grounds for experiential avoidance, and thus, aggravation of his/her problem. Regarding the fear of negative evaluation, emotional control strategies (such as avoidance and relaxation) that people use actually increase anxiety. The therapist tries to make the client experience acceptance instead of avoidance.

Of course, due to the novelty of ACT method, there are no more research sources that compare the results with CBT regarding panic belifes or the brain-behavioural system. As mentioned in the introduction, in this treatment method, instead of intellectually and practically avoiding anxiety-causing thoughts and situations, by increasing psychological and mental acceptance towards internal experiences such as thoughts and feelings that are related to fearful beliefs, individuals learn to deal with this disorder by creating goals related to the issue of fear and committing to them. In fact, active and effective confrontation with thoughts and feelings, avoiding avoidance, changing the way of looking at oneself and the story in which one has imposed the role of a victim on oneself, reconsidering the values and goals of life, and commitment to the goal of treatment ACT included.

Although traditional cognitive and behavioral treatments are effective in treating this disorder, some people do not respond well to these treatments. In addition, the majority of people who respond to these treatments also experience residual symptoms and related disorders after the treatment. For this approach, in which creating clinical progress requires a direct change in the content of thoughts, feelings, and physical symptoms, parallel theories have emerged, and ACT is one of them.

This finding can also be justified based on the Gray's Reinforcement Sensitivity Theory. Based on this, the fight and flight system was changed to the fight, flight, and freezing system (rFFFS), which in the new theory of freezing or bewilderment refers to real threats that cannot be avoided (Alimoradi & Nejat, 2019). In treatments based on acceptance and commitment, emphasis is placed on increasing acceptance and reducing avoidance; therefore, in behavioral-brain systems under the influence of therapy based on acceptance and commitment, the activation system increases and the inhibition system decreases**.**

Unlike ACT, instead of changing cognitions, it tries to increase the psychological connection of a person with his thoughts and feelings. For this reason, it seems that therapy based on acceptance and recognition has had a good effect on panic beliefs. Findings of this study, in terms of results and implementation, can lead to the creation of a suitable research field for planning therapeutic interventions to treat MS patients with panic disorder. On the other hand, panic beliefs investigated in this research are the main cause of panic disorder in patients with MS, and the results are an important achievement in terms of presentation of the mentioned treatments to patients. Finally, the comparison of the second and third wave treatments used in this research in the effectiveness of the mentioned treatment models in MS patients with panic disorder.

Conclusion

According results there is a significant difference between the average pretest, posttest, and follow-up scores in the GCBT and GACT groups with the control group. There is a significant difference between the scores of the study stages (pretest, posttest, and follow-up) in GCBT and GACT groups. Significance of the interaction between the study stages in the research variables indicates that, in the posttest and follow-up stages, the average of panic belifes, BIS and BAS improved in the experimental groups compared to the control group.

Conflict of Interests

Authors have no conflict of interests.

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