

Response Inhibition and Cognitive Appraisal in Clients with Acute Stress Disorder and Posttraumatic Stress Disorder

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Objective: The purpose of the present study was to compare response inhibition and cognitive appraisal in clients with acute stress disorder, clients with posttraumatic stress disorder, and normal individuals .

Method: This was a comparative study. The sample consisted of 40 clients with acute stress disorder, 40 patients with posttraumatic stress disorder, and 40 normal individuals from Mazandaran province selected through convenience sampling method. Data were collected using Composite International Diagnostic Interview, Stroop Color-Word Test, Posttraumatic Cognitions Inventory, and the Impact of Event Scale.

Results: Results showed that individuals with acute stress disorder are less able to inhibit inappropriate responses and have more impaired cognitive appraisals compared to those with posttraumatic stress disorder. Moreover, results showed that response inhibition and cognitive appraisal explain 75% of the variance in posttraumatic stress disorder symptoms and 38% of the variance in posttraumatic stress disorder symptoms .

Conclusion: The findings suggest that response inhibition and cognitive appraisal are two variables that influence the severity of posttraumatic stress disorder and acute stress disorder symptoms. Also, these results have important implications for pathology, prevention, and treatment of posttraumatic stress disorder and acute stress disorder.

Key words: *Cognitive appraisal, response inhibition, acute stress disorder, posttraumatic stress disorder*

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Acute stress disorder(ASD) is a response to an acute trauma which is characterized by dissociative symptoms, subjective re-experiencing, avoidance, and hyper arousal symptoms (1) and is the predictor of Posttraumatic Stress Disorder (PTSD) (2). According to DSM IV-TR, posttraumatic stress disorder is a set of symptoms that develop after exposure to an "extreme traumatic stressor." The individual responds to this experience in the form of fear and helplessness, persistently re-experiencing the event in mind while at the same time wants to avoid recalling it. This disorder influences significantly important areas of the patient's life such as familial and occupational areas (3).

One of the important variables that would be impaired in patients with ASD and PTSD is response inhibition. Response inhibition is a central element of executive control that is critical for adaptive behaviors in a dynamic and unpredictable environment. Response inhibition, a major component of executive function, has been reported as being impaired in adult PTSD patients for both the Haying sentence completion task and the Go/No Go task (4). Also, the inability to inhibit inappropriate responses has been linked to several prevalent disorders including compulsions, autism, posttraumatic disorders, and attention-deficit/hyperactivity disorder (5).

Response inhibition is a process that demands quite large amount of cognitive control and requires preparation for responses and monitoring performance. The process is performed through coordination between different areas like lumbar cortex, frontal and parietal lobes (6). Weiss & Marmar (7) and Constans et al. (8) in a study on individuals with PTSD found that the response time in these people is longer than in normal ones; that is, they act slower than normal people do, and also have difficulty concentrating. Rieger & Gauggle (2002) compared inhibition of ongoing responses in patients with brain injury and patients with orthopedic problems (9). Unexpectedly, individuals with brain injury displayed not poorer performance than the compared group. In another study, VanHoff, Bowman, Diets & Sharma (2007) investigated reaction time in individuals using Stroop test. Subjects had longer reaction times when being exposed to negative words. It seems that it is very difficult for them to ignore negative stimuli; and that longer reaction time is associated with the individual's effort to suppress the meaning of representations (10). In Shucard et al.'s (2008) event-related potentials study, the response inhibition in adult PTSD patients was explored with the A-X continuous performance task. Their behavioral results, however, did not show significant differences in commission errors between PTSD and non-PTSD groups (11). Wu et al. (2010)

showed that the PTSD group responded faster to go trials and there was a significant negative correlation between their reaction time and commission/omission errors, reflecting a speed-accuracy tradeoff for the PTSD group. The PTSD group exhibited a shorter NoGo-N2 latency than the non-PTSD group, suggesting faster monitoring or detection of the response conflict (4).

Another variable which is impaired in patients with posttraumatic disorders is cognitive appraisal. Foa&Rothbaum (1998) believed that there probably are two cognitions involved in the development of PTSD; namely, that "the world is very dangerous" and "the self is completely incompetent to confront with the consequences of trauma (12)." Similarly, Ehlers & Clark (2000) suggest that PTSD becomes persistent when the trauma or its sequels are processed in a way that leads to a sense of serious threat (13). Ehlers & Clark (2000) introduced the two processes that lead to such a sense of serious, current threat as: 1) excessively negative appraisal of the trauma and/or its sequels, and 2) a disturbance of autobiographical memory (13). Recent studies have shown a significant relationship between negative appraisals (of the self, the world and the future) and severity of PTSD symptoms following traumatic events (14, 15).

In particular, Foa& Ehlers (1999) identified three types of appraisals that may be associated with PTSD: 1) negative cognitions about the self, 2) negative cognitions about the world, and 3) self-blame (16). Foa et al. (1999) reported a significant correlation between all the three cognitive appraisals and the severity of PTSD symptoms in a sample of survivors of trauma (including accidents, intrusions, rapes and illnesses) (16). In their research, they found that negative appraisals of the self and the world have a significant correlation with severity of PTSD symptoms in patients with spinal cord injury (15). Also, in a study conducted by Louise Field et al. (2008), a significant correlation was found between negative cognitions of the self and the world, and the severity of PTSD symptoms in patients with apoplexy during their hospital stay and three months after being discharged (15). Results from Elsisser et al.'s (2009) study showed that patients with ASD displayed more impaired cognitive appraisals in comparison with the control group (2). In another study, Karl et al. (2009) found that posttraumatic negative cognitions are significantly associated with the diagnosis of PTSD and its severity, and 45 % of the variance is explained by the severity of PTSD (17).

Charlotte et al. (2010) compared performance of individuals who were displaced after World War II with and without PTSD to a non-displaced healthy control group and their respective offspring as to their processing of trauma-related stimuli in an emotional Stroop task. Evidence for biased information processing was not found in individuals with PTSD or their offspring (18). In Shahar et al.'s (2013) study, PTSD was prospectively associated with an increase in negative cognitions regarding both the self and the

world during the T1-T2 period. Negative cognitions regarding the self were prospectively associated with an increase in PTSD symptoms during both T1-T2 and T2-T3 periods. PTSD symptoms and negative cognitions regarding the self, thus, appear to form a vicious cognitive-symptomatic cycle which might impede recovery (19).

To sum up, response inhibition and cognitive appraisals are important psychological variables that are affected by experiencing traumatic events, but very limited body of research has been carried out in this regard and the results are mixed. Therefore, the purpose of this study was to compare response inhibition and cognitive appraisal in individuals with ASD and those with PTSD.

Material and Methods

Participants

This was a cross sectional comparative study. The research sample consisted of 40 individuals with ASD who referred to forensic medicine centers of Mazandaran province and 40 individuals with war-related PTSD following displacement after Iran-Iraq War who referred to clinical centers of Mazandaran province. They were all selected through convenience sampling method. Then, 40 individuals who had the experience of trauma but were not diagnosed as patients with acute stress disorder whereas normal individuals for the study.

To ensure the correctness of psychiatrist's diagnosis, the Composite International Diagnostic Interview was utilized. Age over 25 years, minimum education level of grade 9, being married, being informed, and voluntary consent were considered as the entrance criteria. Then, subjects were asked to carefully complete the inventories. Data were analyzed using multivariate analysis of variance (MANOVA) and multivariate regression analysis.

Measures

Instruments utilized for data collection were as follows: The Composite International Diagnostic Interview (CIDI): The original version of CIDI has been edited by World Health Organization (1997). This interview is of good validity in diagnosing mental disorders. In terms of validity of CIDI, the specificity for most psychiatric disorders is high (over 0.85), but the sensitivity for diagnoses is to some extent lower, especially for severe psychiatric disorders (like schizophrenia). The instrument's reliability assessment through test-retest method showed that the reliability of diagnosis for most psychiatric disorders is within an acceptable range kappa over 0.4; however, for schizophrenia, this figure was smaller. Results obtained from the two diagnostic systems of DSM-IV and ICD were similar to a large extent (20).

Stroop Color-Word Test (SCWT): Stroop test is a classic scale for attention processing and cognitive set shifting ability. This instrument was initiated by Kettel. The test in its original form consists of four cards: word reading (first card), color naming (second card),

reading words regardless of the color (third card), and telling the color of words regardless of what is written (forth card). Each card displays 25 stimuli ordered in 5 lines and 5 columns (21).

The Impact of Event Scale – Revised (IES-R): The Impact of Event Scale – Revised (7) has 22 items graded on a 5-point scale. The scale scores consist of three subscales. In their study, Emmerik et al. came to a range of 0.76 to 0.84 for Cronbach's alpha coefficient of these scales (22). In study of Abdi, Moradi&Akramian (2008), Cronbach's alpha coefficient for this inventory was 0.79 to 0.94(23). Abolghasemi, bakhshian and Narimani(2013) showed that the Impact of Event Scale–Revised was correlated with the Thought Control Questionnaire ($r= 0.54$, $P<0.01$) (24).

Posttraumatic Cognitions Questionnaire (PCQ): This questionnaire was developed by Foa et al. (1999) to assess thoughts and ideas associated with trauma (16). The Posttraumatic Cognitions Questionnaire consists of 33 items to which the subjects should answer on a 7-point scale ranging from “fully disagree” (1) to “fully agree” (7). Cronbach's alpha coefficient for this test is 0.97. In a study by Louise Field et al., Cronbach's alpha coefficients for this test were reported as 0.83, 0.83, and 0.70 in subscales of negative self-appraisal, negative world appraisal, and self-blame respectively (15). In study of Abolghasemi, bakhshian and Narimani(2013) Cronbach's alpha coefficient for this inventory was 0.96. Bakhshian (2011) showed that this questionnaire was correlated with the Thought Control Questionnaire ($r=46$, $P<0.01$) (24).

Procedure

First, individuals encountering damaging events who were diagnosed as having acute stress disorder (in legal medical center of Sari) and posttraumatic stress disorder (veterans of Iran-Iraq War) were identified. At the next stage, to ensure the correctness of psychiatrist's diagnosis, subjects were administered the Composite International Diagnostic Interview for ASD and PTSD. After diagnosis, patients were given the research inventories and asked to carefully answer the items. Then, the collected data were analyzed using SPSS software.

Result

In ASD group, 57.5 % of subjects were male and 42.5 % were female; in PTSD group, 62.5 % of the subjects were male and 37.5 % were female; and in normal group, 50 % of the subjects were male and 50 % were female. Educational status of the subjects in ASD group was as follows: 10 % with grade 9 certificate, 37.5 % with high school diploma, 25 % with technician's degree, and 7.5 % with a bachelor's degree and higher. The mean age of the subjects was 45.20 (SD=9.29) for the PTSD group, 37.05 (SD=7.67) for the ASD group, and 39.60 (SD=7.73) for the normal group with a range of 25-40 years.

As table 1 indicates, MANOVA test results revealed a significant difference between individuals with ASD and those with PTSD considering at least one of the dependent variables (Wilks' lambda=0.748, $F=30.39$, $P=0.001$). Significant differences among the mean response inhibition scores ($F=82.82$) and negative self-appraisal ($F=230.98$) in three groups of ASD, PTSD, and normal ($P<0.001$). There were also significant differences among the mean scores obtained for the constituents of and self-blame($F=22.46$) and post-trauma symptoms ($F=264.45$) in the three groups of subjects ($P<0.001$).

As observed in table 2, the results of LSD test on comparison of the mean response time scores in Stroop test show that the mean response time in patients with ASD is significantly more than that of those with PTSD, and so it is about those with ASD compared to normal subjects, and about those with PTSD compared to normal subjects ($P<0.01$). Also, it is revealed that the mean scores for the number of errors (Stroop cards) in patients with ASD are significantly more compared to patients with PTSD, and it is the same for patients with ASD compared to normal subjects and for patients with PTSD compared to normal subjects ($P<0.01$). Moreover, the mean cognitive appraisal is significantly more in patients with ASD than in patients with PTSD and normal subjects, and similarly, it is significantly more in patients with PTSD compared to normal subjects ($P<0.001$). To determine the role of each variable, response time, number of errors, and cognitive appraisal were analyzed as predictive variables, and post-trauma symptoms were analyzed as criterion variable in regression equation. The observed F value in the table is significant and 61.4% of the variance of ASD symptoms is explained by the variables of response time, number of errors, and cognitive appraisal (adjusted $R^2 = 0.745$, $F= 42.25$, $P<0.001$). Considering beta values, response time ($\beta=0.706$), number of errors ($\beta=0.159$), and cognitive appraisal ($\beta= 0.730$) can significantly predict the changes relevant to post trauma symptoms in subjects with PTSD (Table 3). Also, 86.3 % of the variance in the symptoms of acute stress disorder is explained by the variables of response time, number of errors, and cognitive appraisal (adjusted $R^2 = 0.376$, $F= 39.71$, $P<0.001$). Considering beta values, response time ($\beta=0.409$) and cognitive appraisal ($\beta= 0.503$) can significantly predict the changes related to post-trauma symptoms in subjects with ASD (Table 3).

Discussion

Results showed that the mean of response inhibition(response time and error rate) scores is significantly higher in patients with ASD compared to patients with PTSD; similarly, it is higher in both groups of patients compared to the normal group ($p<0.01$). This result is consistent with other findings (7, 8).

Table 1: Comparing mean of response inhibition and cognitive appraisal scores in patients with ASD and PTSD, and normal subjects

Variable	ASD		PTSD		Normal		F	Sig
	M	SD	M	SD	M	SD		
response inhibition	230.48	27.30	212.01	42.24	143.51	20.05	82.82	0.000
negative self-appraisal	98.87	8.64	98.05	16.81	31.43	19.64	230.98	0.000
negative world appraisal	34.35	4.46	33.53	4.98	33.98	4.85	.61	0.28
self-blame	23.20	1.97	21.25	5.98	15.95	6.18	22.46	0.000
post-trauma symptoms	86.25	8.87	64.68	8.07	43.38	8.46	264.45	0.000

Acute stress disorder(ASD)
Posttraumatic Stress Disorder (PTSD)

Table 2: Mean of response inhibition and cognitive appraisal scores in subjects with ASD, PTSD, and normal individuals with LSD test

Dependent Variable	group	CBT	C
response inhibition	PTSD	-4.04*	-18.03**
	ASD	-	-13.62**
	N	13.62**	-
cognitive appraisal	PTSD	-5.79*	-25.19**
	ASD	-	-19.39**
	N	19.39**	-

Acute stress disorder(ASD)
Posttraumatic Stress Disorder (PTSD), Normal(N)

*P<0.01
**(P<0.001)

Table 3: Regression results for predictor of post trauma symptoms in PTSD and ASD

Group	Predictors	MR	RS	B	SE	B	T	t(sig)
PTSD	Constant	-	-	8.957	4.21	-	4.13	<0.01
	Time	.706	.499	.297	.028	.706	10.66	<0.001
	Error	.717	.515	.523	.297	.159	2.11	<0.01
	cognitive appraisal	.863	.745	.637	.032	.730	10.08	<0.001
ASD	Constant	-	-	47.54	6.66	-	2.73	<0.05
	Time	.409	.167	.086	.032	.409	10.67	<0.001
	Error	.411	.169	.067	.255	.111	1.25	0.32
	cognitive appraisal	.614	.376	.207	.060	.503	3.41	<0.01

Acute stress disorder (ASD)
Posttraumatic Stress Disorder(PTSD)

The mentioned studies showed that individuals with PTSD have longer reaction times in responding to Stroop test compared to normal people. It can be said that when an intrusive thought occurs, it is associated with emotional disturbance, physiological arousal, and interference in concentration or task completion which can last for a long time. Therefore, the presence of intrusive thoughts causes interference in concentration which entails occurrence of more errors and longer reaction time (25). Cognitive theories emphasize that manifestations of negative emotions, like anxiety, cause attentional biases in information processing which results in occupation of the individual's mind and response to the perceived danger (26). Thus, belief system of the individual or cognitive schemata may be an important predisposing factor in developing posttraumatic disorders. Specifically, the occurrence of intrusive and unacceptable thoughts is part of normal experience, but individuals who develop posttraumatic disorders have inflexible beliefs about personal meaning of these thoughts and their catastrophic implication. Occupation of the mind with such beliefs and thoughts causes interference in individual's concentration, and this entails psychomotor retardation which is followed by increased number of errors and

longer time responding to tasks. Therefore, it seems that the presence of bothering and intrusive thoughts produces interference in the process of individual's attention and concentration on tasks; and the effort to cope with these thoughts causes occupation of the mind and influences the individual's responding to the tasks. Thus, individuals act more slowly in responding to the tasks and display more errors. To explain the obtained results, it can be said that individuals with acute stress disorder who are in a closer time interval to the traumatic event experience more frequent and intense disturbance and intrusive thoughts.

Results also showed that the mean of impaired cognitive appraisal scores(negative self-appraisal, negative world appraisal and self-blame) are significantly higher in ASD patients compared to PTSD persons, and this is also the case with the two groups of patients compared to normal individuals. This result suggests that although both groups of patients have impaired cognitive appraisals, the problem is more serious in patients with ASD. This result is congruent with the findings of Foa et al.'s (16) and Louise Field et al.'s (15) studies, which showed that individuals have more negative cognitive self-appraisals after traumatic events. Recent cognitive

theories (13) state that negative appraisal of an event and its consequences leads to the development of a sense of ongoing threat which causes the disorder to remain. Negative self-appraisals following trauma can focus on durable negative interpretations about oneself (e.g. I will never improve). According to Ehlers & Clark's model of posttraumatic disorders, these negative appraisals determine individual's emotional response to the trauma and base cognitive and behavioral strategies (e.g. thought suppression, behavioral avoidance from fearful situations, social seclusion, etc) which later on contribute to maintenance of disorder. Despite the discrepancies observed in the results, there is a consensus that self-opinion, specifically negative self-appraisal, has important roles in development and maintenance of posttraumatic reactions, and that such a negative self-view may have a central role in hindering one's natural health improvement following traumatic events. They believe that one of the sources of one's intense and constant fear is the appraisals they make of the trauma and/or its sequels based on their own traits. Negative appraisal of the trauma consists of negative appraisal of emotions appeared during a shocking event and negative appraisal of feelings and activities occurred during a shocking event, negative perception of others' responses, and perception of a permanent change in the life after the accident (26). In the present research, the significance of self-blame deference in the groups under study may be a reflection of variant nature of traumatic events that the individuals under study have experienced. In traumas like heart attack that the individual's life style, e.g. physical activity, diet, smoking, and alcohol consumption, plays an important role in the creation of trauma or in road accidents that the individual plays a role in its happening, they blame themselves more following the trauma (13). However, in traumas like war that the individual has no part in its occurrence, the amount of self-blame is smaller. Since the acute stress disorder group in this study included individuals who were selected to be studied following road accidents, intrusion, rape, and violence, and the PTSD group included war veterans; it seems that the difference found between the groups under study is justifiable.

Results of showed that response inhibition and cognitive appraisal explain 86.3% of the variance symptoms in PTSD. This result indicates that response inhibition and cognitive appraisal significantly predict changes associated with PTSD symptoms in the persons involved ($p < 0.01$). This finding implies the role of these variables in predicting PTSD. Ehlers & Clark (13) suggest that negative cognitions probably lead to different cognitive-behavioral coping strategies and end up developing or intensifying PTSD symptoms. These strategies can contribute to the development and maintenance of PTSD symptoms by directly producing PTSD symptoms, preventing negative appraisals of trauma and its sequels from alteration, and preventing the nature of incidental

memory from alteration (13). Research evidence also shows that thought suppression and selective attention are maladaptive cognitive strategies that directly predict the symptoms of PTSD (26). In addition, a number of studies have reported the power of these dysfunctional coping strategies to predict symptoms of PTSD (26, 27).

Also, results revealed that variables of response inhibition and cognitive appraisal explain 61.4% of the variance of symptoms in ASD patients. This result indicates that response inhibition and cognitive appraisal significantly predict changes associated with the symptoms of acute stress disorder in the persons involved ($p < 0.01$). Research evidence (28, 29, 30) suggests that the experience of traumatic event is in contrast with individual's previous schemata, and the disruption of individual's beliefs about the self and the world leads to the development of acute stress symptoms. This evidence predicts that experience of traumatic event leads the individual to challenge with one or more constant beliefs. Consequently, the individual's system of integrated and intact self would be under pressure and disturbed resulting in acute stress symptoms.

Limitations

The present study is not without limitations. The oldness of *Stroop Color-Word Test* may have affected the results of this study. The cross-sectional study design restricts our understanding of the relationships between the variables. Future research should investigate the temporal direction of these variables. Furthermore, longitudinal designs in particular would be able to determine the role of response inhibition and cognitive appraisal on the subsequent development of psychopathology. Collecting data on the basis of self-report scales can bring about the distortion of information because of unconscious defenses, bias in responding, and personal introducing styles. Conducting the research with adult groups restricts the generalizability of the results to different age groups. Moreover, it is recommended that tools which are not self-reporting be applied to collect the research data. These results have important implications for pathology, prevention, and treatment for PTSD patients.

These directions may provide important information about the influence of these variables on individual's perceptions and evaluations of inappropriate behaviors and symptoms which may inform our conceptualization and treatment of psychopathology.

Conclusion

To sum, the results of this study showed that response inhibition and cognitive appraisal is significantly higher in patients with ASD than in patients with PTSD. Also, the research results indicated that response inhibition and cognitive appraisal

significantly predict changes associated with PTSD symptoms in the persons involved ($p < 0.01$). In conclusion, the findings of this study are of interest to both theoretical and applied psychologists.

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