Comparing Sensory Information Processing and Alexithymia between People with Substance Dependency and Normal

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Abstract

Background: Sensory information processing and alexithymia are two important factors in determining behavioral reactions. Some studies explain the effect of the sensitivity of sensory processing and alexithymia in the tendency to substance abuse. Giving that, the aim of the current study was to compare the styles of sensory information processing and alexithymia between substance-dependent people and normal ones.

Methods: The research method was cross-sectional and the statistical population of the current study comprised of all substance-dependent men who are present in substance quitting camps of Masal, Iran, in October 2013 (n = 78). 36 persons were selected randomly by simple randomly sampling method from this population as the study group, and 36 persons were also selected among the normal population in the same way as the comparison group. Both groups was evaluated by using Toronto alexithymia scale (TAS) and adult sensory profile, and the multivariate analysis of variance (MANOVA) test was applied to analyze data.

Findings: The results showed that there are significance differences between two groups in low registration (P < 0.020, F = 5.66), sensation seeking (P < 0.050, F = 1.92), and sensory avoidance (P < 0.008, F = 7.52) as a components of sensory processing and difficulty in describing emotions (P < 0.001, F = 15.01) and difficulty in identifying emotions (P < 0.002, F = 10.54) as a components of alexithymia. However, no significant difference were found between two groups in components of sensory sensitivity (P < 0.170, F = 1.92) and external oriented thinking style (P < 0.060, F = 3.60).

Conclusion: These results showed that substance-dependent people process sensory information in a different way than normal people and show more alexithymia features than them.

Keywords: Sensory information processing, Alexithymia, Substance dependent people

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Substance-dependency is an important problem of general health. Based on available estimates, there are 22/6 million people abusing stimulants in the USA.\(^1\) The number of substance abusers is about 190 million people in the world, and according to official statistics, there are 2 million people with substance-dependency in Iran that the number is increasing, and the mean age of this population is also reported about 18 years old. Evidence show that about 11 million people of Iran population are grappling with their own or their relative’s addiction problem.\(^2\)

Substance-dependency can be defined as a steady-state in which individual capability for regulating the compulsive behavior of substance seeking is decreasing without considering the risk of serious negative consequences of this behavior.\(^3\) Factors associated with substance abuse are different and numerous. One of the models which explain the etiology of addiction is the bio-psycho-social model. In this model, addiction has been introduced as a disease with multifactorial etiology, and a set of risk factors has been presented as the predisposing factor of substance abuse initiation and persistent of it. It is worth noting that the importance of these risk factors in substance consuming initiation varies based on individual age, environment and many other agents.\(^4\)

Addiction is a complex disease with some features such as compulsive behaviors, irresistible temptation, substance seeking behavior and its continuous consumption even in situations that the negative consequences of its consumption on brain function causes a wide range of behavioral, psychological, social, and physiological dysfunction, which prevents physical and mental natural behavior and performance in substance-dependent people.\(^5\)

According to clinical experiences and research evidence, it seems that people with substance use disorders process sensory information different from normal ones. Sensory processing can be the main psychological element, which shows the base of people way of perception and reaction toward environmental stimuli. Sensory processing refers to the way that central and peripheral nervous systems manage the incoming sensory information.\(^6\)

Research on responses to environmental changes has shown that, when faced with a new stimulus, individuals adopt one of two strategies: approach and exploration, or cautious attentiveness that may lead to avoidance. Aron and Aron\(^7\) suggest that one’s choice of strategy is related to the manner in which sensory information is transmitted to, and processed in the brain, which they refer to as sensory-processing sensitivity (SPS). According to the definition, SPS is the tendency to the deep and strong processing of different sensory stimuli. They considered the SPS as a coherent structure whereas recent studies show that this structure is made of some other structures.

Smolewska et al.\(^8\) in their study discover and validate a three-factor model of sensory processing style (ease of stimulation), low sensory threshold, and aesthetic sensibility. Recently, a four-factor model of sensory processing has gained a growing popularity, especially in the field of professional treatment; this model which is developed by Dunn,\(^6\) has put the sensory processing in four categories of low registration, sensory sensitivity, sensory avoidance, and sensory seeking. Dunn\(^6\) assumed that sensory processing is dependent to two main factors: 1. individual sensory threshold that can be high or low (how much stimulation is needed for the individual to respond to the stimulus), 2. Individual response strategy that can be active or passive. Having a high sensory threshold and passive response style are categorized as low registration (e.g., those who report that they do not respond to sensory information), while having high sensory threshold and active responding are categorized as sensory seeking (e.g., those who report that are looking for sensory information). Having low threshold and passive responding mode are categorized as sensory sensitivity (e.g., these people report that are strongly influenced by sensory stimuli), While having a low sensory threshold and active responding are categorized as sensory avoidance (e.g., those who report that they severely avoid sensory experiences which are potentially strong).

Studies have shown that different aspects of sensory processing are associated with negative clinical consequences. Sensory processing style is correlated with structures of behavioral inhibition,\(^9\) introversion\(^10-12\) and shyness.\(^13\) There
is a correlation between sensory processing style with introversion and sensation seeking in Aron and Aron study. It is known that low sensory threshold and sensory sensitivity are correlated with social phobia, avoidant personality disorder, anxiety, and depression, perceived stress and less mental health. LaBrie et al. have shown that sensation seeking is the predictor of alcohol consumption. Franklin et al. came to the conclusion that children with fetal alcohol syndrome show more problematic behaviors and sensory processing disorders, and sensory processing deficits along with problematic behaviors occur in a high proportion in this group.

Research background shows that there is a positive relationship between sensation seeking and problematic alcohol consumption. Dervaux et al. result have also shown that the high level of sensation seeking is related to substance abuse in people with schizophrenia. Yalachkov et al. showed that activations of sensory and motor brain regions in response to substance-associated cues in addicted people could predict relapse and correlate with craving, the severity of dependence and automatized behavioral reactions towards substance-related stimuli. The results of Nguyen et al. showed that while some of the sensory perceptual metrics, which are normally impacted in chronic alcoholism (e.g., reaction time and threshold detection) were relatively insensitive to change with increased alcohol consumption in young non-alcoholic individuals.

Evidence shows that substance-dependent people have inadequacy in emotional information processing and also have a high level of alexithymia. Alexithymia, which was discussed by Taylor and Bagby, and Sifneos et al. for the first time is the inability in cognitive processing of emotional information and emotional regulation and difficulty in identifying feelings and external orientation thinking. There are specific characteristics for describing this structure features: a person suffering from alexithymia manifest poverty of ideas and associations in his dreams. In an emotional aspect, lack of this capacity results in failure in identifying and describing internal emotions and bringing them into words and the language is also devoid of emotional colors. The level of alexithymia is reported in normal population about 9-17% for men and about 5-10% for women, while this statistic reaches more than 70% in some clinical groups. Many of researchers express that alexithymia expose people to higher risk of psychiatric and medical disorders.

In this context, some studies have been performed that examined this structure in clinical samples and manifested its significance in a range of diseases, and among these we can mention the prevalence of alexithymia in substance and alcohol abusers. Other studies reported the high rate and level of alexithymia in adult substance abusers and some other studies have also shown that substance abusers take substance to compensate their emotional awareness deficits. de Berardis et al. found that people with alexithymia are exposed to a higher risk of internet addiction. Hamidi et al. in their study on comparing alexithymia between people with substance use disorder and normal ones came to this conclusion that there is a significant difference in alexithymia overall score between people with substance use disorder and normal ones.

The findings of de Haan et al. suggested that alexithymia in substance use disorder patients as measured using the Toronto alexithymia scale-20 (TAS-20) is both a state and trait phenomenon. Coriale et al. found that alexithymic alcoholics consumed significantly more alcohol and were less abstinent than non-alexithymic alcoholics. Results of Lyvers et al. in study among patients undergoing treatment for alcohol dependence showed that predicted TAS-20 scores were significantly and positively correlated with scores on alcohol use disorders, cognitive-emotional preoccupation with alcohol, anxiety, sensitivity to punishment, and frontal functions.

The existent findings have showed the relations of sensory processing and alexithymia with some variables related to addiction such as extraversion, behavioral activation system, etc.; but these variables did not compare between substance dependent people and normal. Because of the manner of sensory and emotional information processing affect in determining the type of people’s reaction toward environmental stimuli; based on present findings, it can be assumed that substance-dependent people process environmental information in different way which makes them vulnerable to the arousal
stimuli associated with substance consumption. To examine this assumption the current study was performed in order to compare alexithymia and sensory information processing styles in substance-dependent people with normal ones. The current study was performed to compare alexithymia and sensory information processing styles in people with substance-dependency with normal ones.

Methods

The research method was cross-sectional. The statistical population of the current study comprised of all substance-dependent men who are present in substance quitting camps of Masal, Iran, in October 2013 (n = 78). 36 persons were selected from this population by simple randomly sampling method. Furthermore, 36 persons were also selected among the normal population as the comparison group, and both groups participated in the survey. For collecting information, the following tools were used.

Adult sensory profile

Adult and adolescence sensory profile was developed by Brown et al. based on Dunn sensory profile for children. This is a 60 items self-report scale that measure sensory processing style. Scale questions measure 4 levels of sensory processing, including sensory sensitivity, low registration, sensory avoidance, and sensory seeking. In this questionnaire, subjects are asked to respond the questions in a 5-point Likert scale (never, rarely, sometimes, often, and always). On the validity of the scale, Brown et al. showed that physiological response is matched with scores of people in these 4 scales by using skin conductance measurements. People with high scores in sensory sensitivity respond stronger to primary drivers and act slowly in habituation while those with high scores respond stronger in sensory avoidance and habituate rapidly. Response range for people in low sensory registration and sensory seeking tend to be poor, and the habituation for low sensory registration is rapid. The ability to distinguish these four levels by measuring skin conductivity and the range and effort of habituation provide the construct validity of this instrument. Brown et al. reported the subscales internal consistency of the questionnaire in the range of 0.60-0.78. Coefficient α of the current study for the whole scale was 0.87, and for subscales of low registration, sensory seeking, sensory sensitivity and sensory avoidance were 0.72, 0.65, 0.75, and 0.71, respectively.

TAS-20

It is developed by Taylor and Bagby and is a self-evaluating with 20 items, which is applied to evaluate alexithymia. The questionnaire includes three aspects of difficulty in identifying feelings (7 items), difficulty in describing feeling (5 items) and external orientation thinking (8 items). Items are rated on a 5-point Likert scale from completely agree (1) to completely disagree (5) and the score 60 or higher is considered as the alexithymia with high intensity and score of 52 and lower is considered as alexithymia with low rate. In Persian version of the scale coefficient α was 0.85 for the whole scale and for subscales of difficulty in identifying feelings, difficulty in describing feelings and external orientation thinking were 0.82, 0.75, and 0.72, respectively.

Data collection began after having secured permission from the well-being department of the city of Masal and coordinating with substance quitting camp of this city. It is noted that there was only one camp in this city. Then, the list of all people, who present in the camp in October 2013 (n = 78), was provided. Afterward, a sample of 36 subjects was selected among them by simple sampling method. After describing study goals for them, they were asked to respond to the questionnaires of TAS-20 and adult sensory profile individually and in the camp place. In the next stage, 36 persons selected by using multistage cluster sampling method among normal people as a normal group. The statistic method used in the study was multivariate variance analysis test (MANOVA), and data were analyzed by SPSS software (version 16, SPSS Inc., Chicago, IL, USA).

Results

36 people with substance-dependency and 36 normal ones participated in the study. Some of their demographical characteristics have been presented below. Table 1 results show the mean and standard deviation of the age and the frequency distribution of the subjects based on their employment status. Table 2 results show that the difference between substance-dependent people and normal people was significant in alexithymia and sensory
processing styles and the difference is also 78%, which means that 78% of the variance or the difference between these two groups is related to substance abuse effects. Box test results showed that the assumption of homogeneity of variance-covariance is established between group (F = 1.40, P < 0.080). Levin test results in checking group’s variances equality also showed that the variances of all dependent variables between groups are equal to each other.

The results of table 3 show that there are significant differences between the mean scores of two groups in items of low registration (P < 0.008, F = 5.66), sensory seeking (P < 0.050, F = 3.81), sensory avoidance (P < 0.008, F = 7.52), as a sensory processing styles and difficulty in describing feelings (P < 0.01, F = 15.01), difficulty in identifying feelings (P < 0.02, F = 10.54) as a components of alexithymia. However, there are not any significant differences between two groups in items of sensory sensitivity (P < 0.170, F = 1.92) and external orientated thinking (P < 0.060, F = 3.60).

Table 1. Demographical information of the subjects groups

| Groups            | Variables | Age (year) Mean ± SD | Employment |
|-------------------|------------|----------------------|------------|
|                   |            | State | Self-employment | Retired | Unemployed |
| Substance-dependent |            | 30.54 ± 7.58 | 1 | 22 | 1 | 12 |
| Normal            |            | 29.63 ± 6.81 | 3 | 20 | 1 | 11 |

SD: Standard deviation

Table 2. The results of multivariate analysis of variance (MANOVA) test for traces of group membership

| Test name             | Value | F | Hypothesis df | Error df | P    |
|-----------------------|-------|---|---------------|----------|------|
| Pillai’s Trace        | 0.21  | 2.44 | 7            | 64       | < 0.028 |
| Wilks’s Lambda        | 0.78  | 2.44 | 7            | 64       | < 0.028 |
| Hotelling’s Trace     | 0.26  | 2.44 | 7            | 64       | < 0.028 |
| Roy’s largest root    | 0.26  | 2.44 | 7            | 64       | < 0.028 |

df: Degree of freedom

Table 3. The results of multivariate analysis of variance (MANOVA) for comparing the significance of difference between two groups in dependent variables

| Variable               | Group               | Mean ± SD | Sum of squares | df | Mean square | F    | P    | Test potency |
|------------------------|---------------------|-----------|----------------|----|-------------|------|------|--------------|
| Low registration       | Substance-dependent | 38.05 ± 9.31 | 373.55 | 1 | 37355      | 5.66 | 0.020 | 0.65         |
|                        | Normal              | 33.50 ± 6.71 |          |    |             |      |      |              |
| Sensory sensitivity    | Substance-dependent | 47.88 ± 7.79 | 112.50 | 1 | 112.50     | 1.92 | 0.170 | 0.27         |
|                        | Normal              | 45.38 ± 7.31 |          |    |             |      |      |              |
| Sensory seeking        | Substance-dependent | 40.27 ± 9.04 | 256.88 | 1 | 256.88     | 3.81 | 0.050 | 0.48         |
|                        | Normal              | 36.50 ± 7.27 |          |    |             |      |      |              |
| Sensory avoidance      | Substance-dependent | 39.63 ± 8.91 | 539.01 | 1 | 539.01     | 7.52 | 0.008 | 0.77         |
|                        | Normal              | 34.16 ± 7.97 |          |    |             |      |      |              |
| Difficulty in describing feelings | Substance-dependent | 15.38 ± 3.57 | 62.00 | 1 | 162      | 15.01 | < 0.001 | 0.96         |
|                        | Normal              | 12.38 ± 2.96 |          |    |             |      |      |              |
| Difficulty in identifying feelings | Substance-dependent | 21 ± 5.11 | 272.22 | 1 | 272.22     | 10.54 | 0.002 | 0.89         |
|                        | Normal              | 17.11 ± 5.04 |          |    |             |      |      |              |
| External oriented thinking | Substance-dependent | 22.19 ± 4.58 | 16.12 | 1 | 16.12     | 3.60 | 0.060 | 0.46         |
|                        | Normal              | 20.27 ± 3.95 |          |    |             |      |      |              |

df: Degree of freedom; SD: Standard deviation
Discussion

Sensory and emotional information processing is the basis of how people react to environmental stimuli; considering the importance of these variables in substance-dependency, the current study was performed for two main objectives. The first one was comparing sensory information processing styles between people with substance-dependency and normal people. The results of the study showed that substance-dependent people take high scores in low registration item rather than the comparison group. This finding is congruent with Gamari-Give and Basharpoor results, which showed that there is a significant difference among people with depression, schizophrenia and normal ones in sensory processing styles.

This finding indicates that in people with substance-dependency, available sensory information in the environment are registered in sensory processing system slightly, so comparing to normal people their sensory information system is slow and this can cause them to turn to substance consumption for activating their sensory system. According to these results, it appears that low registration (not noticing stimuli) may at times be a defense against an over sensitive processing system. This issue can lead to use denying and disengaging forms of coping that are showed higher in addicted people. The study results showed that people with substance-dependency have more sensory seeking rather than normal ones. This result is also compatible with some researches results, which show that substance-dependent people have high sensation seeking. People with high sensation seeking choose active strategy to respond high neural threshold and are more likely to use substances, smoke, drink alcohol, drive fast and do more risky activities. The high sensation seeking scores in addicted people can be representations of their low brain arousal and impulsivity, which makes them vulnerable to substance abuse.

The study results showed that substance-dependent people avoid sensations in a greater extent. This finding is also consistent with the results of Carver and White, Eysenck, Gray, Kagan, and Neal et al. based on sensory processing styles relationship with introspection, shyness and social phobia. It seems that substance-dependent people choose avoidance as a way to adapt to the environment that this shows itself in social isolation, social interaction avoidance, choosing solitude etc. Furthermore, sensory avoidant individuals may avoid all situations where coping is necessary. The same may be true in relationships, as relationship avoidance was negatively correlated with adaptive coping strategies, indicating increased relationship avoidance decreases the tendency to cope adaptively. In this case, the lack of appropriate coping skills can make a person susceptible to addiction.

The second objective of the current study was the comparison of alexithymia between people with substance-dependency and normal ones. Results showed that there is a significant difference in items of difficulty in describing feelings and difficulty in identifying feelings between two groups. These results are compatible with the results of Cleland et al., Hamidi et al., Rybakowski and Ziolkowski, El Rasheed, Pinard et al., Uzun et al., Thorberg et al. and Bagby et al. Recent researches show that alexithymia is an etiological factor in substance abuse, as patients with substance use disorders turn to substance consumption to deal with the unpleasant states, which is directly because of alexithymia and try to free themselves by the substances. Compatible with the current study results, Gamari-Give and Basharpoor also showed that substance-dependent people are suffering from alexithymia more than others.

In this context, the family history of alcohol abuse and the alexithymic character are two underlying factors in alcohol dependency. Difficulty in identifying and describing feelings results in experiencing undifferentiated feelings in people suffering from alexithymia. Although these feelings are along with a physiological arousal; because of difficulty in emotional regulation, this arousal remains active and would not disappear. This cycle can play role in symptoms such as impulsivity, emotional instability, thought of suicide, identity confusion etc., that can prone the person to substance use.

Conclusion

The study results showed that substance dependent people process sensory information in a different way from normal people and have more alexithymia rather than them. Inability in
controlling some confounding variables especially the type of substance used and addiction severity and the limited sample of addicted people referring to substance quitting centers were the main limitations of the current study. So, it is recommended that similar researches would be performed by controlling the type of substance used and the addiction severity. Also, because of this study was conducted in addict people who are present in comp, the results of this study do not apply for substance dependent outpatients. Therefore, repeating this study in substance dependent outpatients is suggested. Furthermore, the self-reports questionnaires were used to gather the data of this study, then, additional studies using objective measures of this variables, such as neuropsychological indices (e.g., reaction time) and behavioral measures (e.g., interpersonal relationships) are necessary to corroborate the present findings. Despite these limitations, the current study provides important preliminary information about the possible influence of SPS on physical health.

According to the study results, training the strengthening skills of sensory processing for optimizing the activity of two systems of inhibition and excitation and also training the skills of emotion regulation are recommended to people with substance-dependency as a psychological intervention method. Given this, future research may benefit from including these factors, when planning the new therapeutic programs for substance dependency.

**Conflict of Interests**

The Authors have no conflict of interest.

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مقایسه پردازش اطلاعات حسی و ناگویی خلقی بین افراد وابسته به مواد و افراد عادی

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چکیده

مقیده: پردازش اطلاعات حسی و ناگویی خلقی دو عامل مهم در تعیین واکنش‌های رفتاری هستند. برخی مطالعات بانگر تأثیر حساسیت پردازش حسی و ناگویی خلقی در گرافی به سوء مصرف مواد را یافته‌اند. بنابراین این پژوهش حاکی بر هدف مقایسه سیک‌ها پردازش اطلاعات حسی و ناگویی خلقی بین افراد وابسته به مواد و افراد عادی انجام گرفت.

روش‌ها: روش این پژوهش، داده‌هایی از پرسشنامه‌های مختلف و جامعه‌ای آموزشی را انجام دادند. در این پژوهش، سه گروه از افراد عادی، افراد وابسته به مواد و افراد وابسته به مواد از کشور ایران به عنوان گروه مقایسه انتخاب شدند. هدف این پژوهش از پرسشنامه‌های مورد استفاده از پرسشنامه‌های تورنتو alexithymia scale (Toronto alexithymia scale) استفاده گردید.

بافت‌ها: بر اساس پاسخ‌های داده شده، دو گروه در نتیجه نابرابری بین گروه در نتیجه نابرابری بین گروه در نتیجه نابرابری بین گروه در نتیجه نابرابری بین گروه در نتیجه نابرابری بین گروه در نتیجه نابرابری بین گروه در نتیجه نابرابری بین گروه در نتیجه نابرابری بین گروه در نتیجه نابرابری بین گروه در نتیجه N=36

نتایج گامی: نتایج نشان داد که افراد وابسته به مواد اطلاعات حسی را با شیوع متغیری از افراد عادی پردازش می‌کنند و ناگویی خلقی پیشتری

واژگان کلیدی: پردازش اطلاعات حسی، ناگویی خلقی، افراد وابسته به مواد

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