

Abstract

Objective: The aim of the present study was to investigate the differences in the scores relating to brain/behavioral systems in two groups of narcotic and stimulant abusers. **Method:** An Ex post Facto research design was used in this study. The study sample consisted of 200 drug-dependent male participants who were selected from the addicts referring to authorized treatment centers and inpatient rehab camps in Tabriz through convenience sampling method. The researcher used behavioral activation system (BAS) and behavioral inhibition system (BIS) scales developed by Carver and White (1994). **Results:** The results revealed that behavioral activation system scores were different between narcotic and stimulant abusers and stimulant abusers outperformed their narcotic counterparts in BAS. However, there was no significant difference between the two groups in BIS scores. **Conclusion:** The results enjoy practical implications.

Keywords: Addiction, Stimulant, Narcotic Substance, Brain/Behavioral Systems

The Investigation of Brain/ Behavioral Systems in Narcotic Abusers in Comparison with Those in Stimulant Abusers

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Introduction

Drug dependence is a disease. Substance dependence disorder is a very complex enigma with multifaceted global dimensions (Nabdel, 2010). There are various aspects for this disorder such as security, political, economic, and cultural aspects and medical, physiological, and psychological dimensions (cited in Nabdel, 2010). By this dimension, it is meant that drug consumption brings about physiological changes and even irreversible tissue changes in the brain in the long run. Substance abuse is a specific topic of interest to clinical psychologists and psychiatrists since this issue gives rise to negative consequences in various societal strata (Jazayeri, Hajir, Pourshahbazi & Rezayi, 2004). In recent years, the study of the biological foundations underlying addiction has attracted the attention of many researchers. In the meantime, some researchers have opted for Gray's brain/behavioral systems to explain the fundamentals of addiction and investigate the cause of this phenomenon. Gray assumed that personality is founded upon the interaction of two major systems of the brain. The first one is behavioral activation system (henceforth referred to as BAS) which is thought to be related to the brain areas that affect one's sensitivity to reward. High activity and sensitivity of this system cause the activation of the positive emotions and behaviors and also active avoidance (Gray & McNaughton, 2000). The second one is behavioral inhibition system (BIS) which is referred to as avoidance motivation. It includes the areas of the brain that affect the person's sensitivity to punishment. Different sensitivities to reward and punishment stimuli in different individuals bring into existence the assumption that drug-dependent people either suffer from inhibition system or hold such a performance in behavioral activation system that disrupts the sensitivity of inhibition system (Azadfallah, 2000).

Recently, the change of drug trend patterns from traditional narcotic to industrial stimulants has raised this question that what factors can account for this change in consumption. Narcotic drugs are defined as the substances that slow down the functioning of central nervous and respiratory systems (Danesh & Azadi, 2006). Elsewhere, they are referred to as the substances that exude lethargic feelings and cause chemical sleep (Pourafkari, 2007). Stimulants are used as a general term for a group of psychoactive drugs that create some stimulating effect and some type of awakening, such as amphetamines, methylphenidate, and cocaine and weaker drugs such as caffeine and nicotine. They all somewhat occasion dependency. In terms of the reasons for choosing a particular type of substance, some studies are worth mentioning in which it is attempted to investigate the relationship between personality disorders and the type of drug for consumption. In a study of 325 participants addicted to various drugs, including opiates, cocaine, marijuana, and alcohol; Conway, Kane, Ball, Poling, & Rounsaville (2003) concluded that understanding the relationship between personality and choice of the type of drug is required for the prediction

of drug use and its treatment. In their study on the identification of the relationship between personality disorders and substance use, Sussman, McCuller & Dent (2003) showed that the type of drug is correlated with personality disorders. Aghabakhshi, Sedighi, & Eskandari (2009) enumerated the causes of youths' inclination to drug use as follows: encouragement on the part of friends, lifestyle, lack of formal and informal control and supervision, and deprivation from right facilities for spending leisure time. Kirkcaldy, Siefen, Sura & Bischoff (2004) conducted a survey on the predictors of drug and alcohol abuse among children and adolescents and they obtained considerable results in terms of the relationship between personality structure and the choice of drug type. In terms of addiction, most attention has been focused on the activities of BAS and the majority of findings on this system activity in humans are derived from the studies pertinent to neurotransmitter (dopamine). Dopamine's release into dopaminergic directions of BAS is followed by the initiation of the motor programs of the system (Feldon et al., 1991, cited in Azadfallah, 2000). From the behavioral perspective, evidence suggests that the release of dopamine into the normal process of strengthening leads to the establishment, retention, and flow of the specific chain responses that are related to food, water, etc. (Fibiger & Phillips, 1988, cited in Azadfallah, 2000). On the other hand, this point has been confirmed that the consumption of such drugs as heroin, cocaine, amphetamines, alcohol, and nicotine leads to the release of dopamine into the mentioned nerve pathways (Mitchell et al., 1989, cited in Azadfallah, 2000). Thus, it can be assumed that the release of dopamine into the nerve pathways of BAS is closely related to the emotional states resulting from the use of such drugs. Franken, Muris, & Georgieva (2006) investigated the relationship between Gray's model of personality and substance abuse and found that substance abuse is strongly associated with the high activity of BAS. It was the first study that explored the relationship between substance abuse and BAS in clinical samples. These findings confirm Gray's model (Franken et al., 2006). Given the above-mentioned points, the present study is an attempt to answer two questions as follows:

1. Is there any significant difference between the users of narcotic drugs and stimulant users in their BAS scores?
2. Is there any significant difference between the users of narcotic drugs and stimulant users in their BIS scores?

Method

A Causal-comparative research design was used in this study. All the male addicts referring to addiction treatment centers in Tabriz constituted the population of the study. Participants for the study were selected through convenience sampling method in the following rehab centers: Aria, Ariana, Bozorgmehr, Ayineh, Shahed, Roozbeh, Sahel, Paradise, and Roshd. In the first

stage, the number of 217 male addicts referring to the authorized treatment centers and inpatient rehabilitation camps in Tabriz responded to the questionnaires. Due to the type of substance used by the participants, they were divided into two groups, namely stimulant users ($n = 81$) and narcotic drug users ($n = 102$) which totally amounted to 183 persons. The remaining individuals were not categorized into any of the groups. The participants in the stimulant users lay in the 18-48 age range while narcotic drug users ranged in the 20-80 age group and independent t test results were indicative of no significant difference in the age of both groups.

Instrument

Behavioral activation system (BAS) and behavioral inhibition system (BIS) scales developed by Carver and White were used in this study (1994). It contains 24 items which are scored via Likert scale. Among the items, 4 items are neutral, 7 items evaluate the inhibition system (the sensitivity of BIS or response to threat and anxiety encounters) and the remaining 13 questions evaluate BAS (including the sub-scales, namely reward responsiveness, drive, and fun seeking). These items evaluate the extent to which rewards lead to positive emotions, one's willingness to actively pursue the desired goals, one's inclination to new reward, and one's tendency to the potential rewarding approaches to immediate stimulation. The number of 4 additional questions is available in the whole scale as neutral ones and plays no role in the evaluation. Internal consistency has been reported to be .74 for BIS and .73, .66, and .76 for the sub-scales of BAS, namely reward responsiveness, drive and fun seeking, respectively (Carver & White, 1994). Evaluating the internal consistency of BIS and BAS, Atrifard, Azadfallah, & Ejeheh (2006) obtained .47 for BIS and .47, .73, and .60 for the three subscales of BAS, namely reward responsiveness, drive and fun seeking, respectively. In addition, the results of Chi-square analysis indicated no significant difference between the two groups in terms of education.

Results

Descriptive statistics of the research variables are presented for separate groups in the table below.

Table 1: Descriptive statistics of the studied variables for separate groups

<i>Variables</i>	<i>Groups</i>	<i>Mean</i>	<i>SD</i>	<i>N</i>
BAS	Stimulant users	28.50	3.20	81
	Narcotic drug users	16.50	2.80	102
BIS	Stimulant users	17.50	4.27	81
	Narcotic drug users	19.00	4.58	102

Multivariate analysis of variance should be used to examine the differences between the two groups in terms of BAS and BIS. The application of this parametric test will be allowed if some assumptions are satisfied, one of which is the equality of error variances which is evaluated by Leven's test. This assumption was investigated in this study and the results suggested the satisfaction of it. The equality of the covariance matrices is another assumption for this test. The results of Box's test showed that this assumption has also been met ($P > .05$, $F = 1.21$, $M \text{ Box} = 10.21$). Due to the satisfaction of the assumptions, MANOVA was conducted and the results indicated the existence of a significant difference between the groups ($P < .001$, $F = 27.50$, Wilks Lambda = .89). Univariate analysis of variance was used to examine differences in patterns as follows.

Table 2: Univariate analysis of variance representing differences in patterns

<i>Variables</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>
BAS	2374.50	19.70	.0005
BIS	2268.40	2.40	.51

As it can be observed in the table above, there is a significant difference between the two groups (stimulant users and narcotic drug users) in terms of BAS ($P < .05$), while no significant difference was found between the two groups in BIS ($P > .05$).

Discussion and Conclusion

In recent years, the youths' strong proneness to narcotic drugs and industrial stimulants has raised the question that what factors underlie this trend. In separate studies, it was revealed that 1.5% of 15-25-year old persons in Tehran take ecstasies (Barouni, Mehrdad & Akbari, 2008) and the consumption of these drugs was reported to be 4.3% among the students in Birjand and Gilan (Moasheri, 2006; Mohtasham, Amiri, Jafari Shakib & Mousavi, 2011; cited in Barati, Allahverdipour & Jalilain, 2011). In general, several studies have explored the correlates of drug addiction and proneness. During the past three decades, Gray has provided a model of personality in which anxiety and impulsivity are viewed as basic dimensions of human beings. Individual differences in these two dimensions represent a differing response pattern or the sensitivity of the two fundamental brain systems to internal stimuli. Both BAS and BIS respond to different secondary stimuli. BIS is stimulated by the conditioning signals of punishment or lack of reward and also new inherently frightening stimuli. BAS is activated by means of the conditional signs of reward or release from punishment. In the context of psychopathology, Gray also proposes the theory of brain/behavioral systems and considers disorders as the reflection of high or low reactions in one of the two systems, dysfunction in a system, combinations of high or low reactions and dysfunction in more than one

system, or dysfunction in the interaction of these systems. The first research question was whether there is any significant difference between stimulant users and narcotic drug users in terms of BIS. Multivariate analysis of variance was used to respond to this question. Data analysis revealed that there was no significant difference between the two groups in terms of BIS. Given the dominant feature of the BIS (such as, sensitivity to punishment, anxiety, and high depression) in these participants, it was expected that the consumption of narcotic drugs would show more significant results compared to the individuals with BAS while such results were not achieved. These results are in contrast to the results obtained by Koushki (2005). She adds that the use of drugs (such as heroin and opium) is higher in depressed patients. Research has shown that depressed people turn to drug use to extricate themselves from low mood. Durand & Barlow (1996) and Weiss, Griffin, & Miriam (1992, cited in Bermas, 2004) view drug abuse as a self-treatment method in response to the signals of depression. The individuals who take narcotic drugs such as opium and heroin have higher levels of depression than the addicts to stimulants such as LSD, cocaine, and cannabis (Kaplan, 1999; cited in Koushki, 2005).

The second research question was whether there is any significant difference between the users of narcotic drugs and stimulant users in BAS scores. In the field of addiction, most attention is given to BAS and the majority of findings about the activity of this system in humans are stemmed from the studies on the neurotransmitter, dopamine. Dopamine release into dopaminergic pathways relating to BAS is accompanied by the initiation of the motor programs of the system (Azadfallah, 2000). From the behavioral perspective, evidence suggests that the release of dopamine into the normal process of reinforcement leads to the establishment, retention, and flow of the specific chain responses that are related to food, water, etc. (Azadfallah, 2000). On the other hand, this point has been emphasized that the consumption of such drugs as heroin, cocaine, amphetamines, alcohol, and nicotine leads to the release of dopamine into neural pathways (Mitchell et al., 1989, cited in Azadfallah, 2000). Thus, it can be assumed that the release of dopamine into the nerve pathways of activation system is closely related to the emotional states arising from the use of such drugs. The findings of this study indicate that there is a significant difference between the two participating groups in BAS scores. Conway et al. (2003) pointed out that theory of predetermined factors causes an individual to turn to the use of specific types of substances based on the theories and studies in line with personality differences and tendency to drug abuse. Some theories and research in the field of predetermined factors place emphasis on genetic factors (Telligent, 1998; Bouchard, 1994, cited in Koushki, 2005). Mood factors and emotional states have been mentioned in another approach to determine the cause of predetermined factors (Sher & Levenson, 1982, cited in Koushki, 2005). They assert that a variety of research in this area should be done and particularly intermediary factors should be greatly considered in them because

understanding the relationship between genetic and personality factors and substance choice is necessary in the prediction of drug use and its treatment as well. In this regard, Le Bon et al. (2003) emphasize the importance of considering genetic and biological bases of personality and their interaction with learning and the environment. Fountain et al. (1996) stated that extraverts need a larger amount of stimulants in comparison with other individuals in order for the effect of targeted drug to be the same (cited in Danesh & Azadi, 2006). Gray & Will Wright (1964, cited in Danesh & Azadi, 2006) also stated that extraverts respond to reward (pleasant stimuli) and do not show much sensitivity to punishment (unpleasant stimuli) because of excessive activity of their central nervous systems. These findings are significantly notable since Gray argues that extraverts enjoy relative hyperactivity in their BASs.

In the present study, it was found that the BAS scores are different between narcotic drug users and stimulant users in such a way that those taking stimulants have a more dominant BAS. These results are consistent with the results obtained by Conway et al (2003); Noar, Zimmerman, Palmgreen, Lustria & Horosewski (2006); Mahmood Alilou, Zeynali, Ashrafian & Samadi Rad (2009); and Danesh & Azadi (2006). However, there was not any significant difference in the BIS scores between the two aforementioned groups. Gray's theory considers BAS as a feedback system which is activated through the stimuli that are in alignment with reward or absence of punishment. The activity of BAS is in parallel with some attributes such as novelty seeking, sensation seeking and impulsivity. Novelty seeking and sensation seeking are some sort of inherited tendency to willingly start an activity in response to new stimuli. The individuals with high levels of novelty seeking are usually variety-seeker, impatient, impulsive in the achievement of reward, incapable of accepting failure, and generally chaotic. According to the explanations and descriptions of the characteristics of people with BAS and due to the nature of stimulants, the result of second question of this study is in line with the theories mentioned in this context. People with dominant BAS are in search of rewards, variety, and excitement. The moods, physiological and emotional effects of stimulants attract such individuals. The consumption of stimulants is considered as some sort of sensation seeking for such people. Drug use opens up a window to new experiences for such people, inhibits risky behaviors and is a means to escape from monotony and boredom. The major limitation of this study is that the sample just consisted of male addicts referring to rehab centers in Tabriz; therefore, other researchers interested in similar research areas are recommended to conduct this study on female addicts and in other cities, as well.

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