

A Comparison of Attentional Bias Towards Drug Cues in Addicts and Non-Addicts

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Received: March 5, 2014; Revised: July 14, 2014; Accepted: July 16, 2014

Background: According to recent theories on addiction, attentional bias towards drug-related stimuli plays a pivotal role in the initiation of drug abuse.

Objectives: The present study attempted to investigate attentional bias towards drug-related words in addicts and non-addicts.

Patients and Methods: To attain the objectives, following a causal-comparative study, a number of 15 addicts under treatment in anonymous groups, and 15 non-addicts from among students at Isfahan University were selected through available sampling. Both groups were evaluated through Stroop test, and the results were analyzed adopting independent t-test. Findings: as indicated by the findings, a significant difference was observed in the two groups concerning color-naming accuracy ($P < 0.05$, $X^2(1) = 3.896$) as well as reaction time ($P < 0.0001$, $X^2(1) = 17.404$). The calculated difference between accuracy and reaction time for congruent and incongruent stimuli was significant.

Results: The results showed that there was a significant difference between the average reaction time of the two groups. In terms of the number of errors, however, no significant difference was observed.

Conclusions: The attentional bias of drug addicts is associated with drug-related cues or the temptation for drug abuse.

Keywords: Stroop Test; Substance-Related Disorders; Attentional Focus

1. Background

Attention is the key principle in any successful interaction with the outside world which allows the individual to screen the environmental realities (1). Attentional bias is the automatic deviation of attention to emotionally salient stimuli in the environment, happening unintentionally and sometime automatically (2), during which the entire individual's attention turns to a specific stimulus, despite his/her attempt to ignore it (3). Individuals with alcohol, heroine, nicotine, and cocaine dependence have a tendency to process drug-related stimuli incorrectly (4).

Theories on substance abuse predict that the stimulus associated with drug abuse will grow to be desirable and tempting, and draw attention; a fact that is hugely influential in many psychopathologies (5). Any individual selectively pays attention to cues which are associated with their emotionally desirable subjects (3, 6). Drug abuse is considered a mental and emotional behavior, as it is associated with a strong urge to turn back to, subsequent to one period of withdrawal. Evidence suggests that as an action, drug abuse is induced by mental, dependency, emotional, and motivational attributes (7).

With regard to the foregone accounts, the present study aims at determining the degree of difference in attentional bias and inhibition in terms of reaction time and

the number of errors between the addict and nonaddict (control) group, using Stroop test. It, however, seems that there still is a huge gap between today's knowledge and its applications in drug abuse treatment, highlighting the significance of the subject at hand. Nonetheless, results of recent studies promise that instructing drug abusers to overcome their attentional bias towards drug-related cues would prove a useful medium to help them control their behavior (8).

2. Objectives

The present study attempted to investigate attentional bias towards drug cues in addicts and non-addicts.

3. Patients and Methods

This is a causative-comparative study. The population was comprised of all the male and female patients with a substance dependence disorder, who were under methadone maintenance treatment, at Addiction Treatment Clinics in Isfahan from March through to November 2012. Using available sampling, and considering the objectives, 15 subjects were selected as sample, and the other group was comprised of 15 non-addicts out of those accompany-

ing the substance-dependent, who were matched to the first group in terms of place of residence, age, and level of education. Despite the higher demand for control in causal-comparative studies, as well as time, manpower, and financial restrictions, and as suggested by Delavar (1999), the authors attempted to form groups of no less than 15.

3.1. Instruments

3.1.1. Stroop Test

Stroop test was first used by Stroop in his PhD dissertation used to measure how color interferes in reading words (9). Stroop test has been broadly adopted for studies addressing attention processes, and the stability of attentional bias results of Stroop test in psychopathological studies is dependent upon its reliability and validity. Fadardi and Cox calculated the reliability and validity of the said instrument in Iran on abusers under maintenance treatment and reported them at 88% and 71% respectively using Cronbach's alpha (8). Similarly, Mashhadi et al. reported a validity of 90% for this instrument (10).

3.1.2. Test Design and Procedure

The experiment was conducted using a handheld PC with a 17" and 600 × 800 resolution display. The participants took the test individually. The participant was seated on a chair 50 cm away from the display while the test instructions were presented. Then a page of names of colors were shown and he/she was asked to read the randomly ordered cues (number of words) out loud. Here it was made sure that all the participants are clear that 'error' is reading the word itself rather than the 'color' it is typed in. They were also warned that if they failed to

finish the test within the given time, points would be deducted proportional to the number of the remaining words. With the utmost speed and accuracy, ignoring the actual written words. As for grading and interpretation of the results, points were calculated for congruent and incongruent word groups separately: number of errors, number of correct answers, reaction time, and interference score, which is the difference between scores of congruent and incongruent words (interference score = reaction time for incongruent words - reaction time for congruent words). For data analysis, the assumption of normal data distribution was, initially, investigated adopting Shapiro-Wilk and Kolmogorov-Smirnov test statistics. Since the assumption was rejected, the data was analyzed using Kruskal-Wallis rank ANOVA.

4. Results

According to Table 1, mean reaction time to drug cues was higher in addicts (SD = 4.40, M = 19.57) as compared to non-addicts (SD = 1.80, M = 12.07). Furthermore, reaction time to neutral words was a little higher in addicts (SD = 1.04, M = 7.41) than that of non-addicts (SD = 0.58, M = 6.41). Similarly, in terms of the number of errors in drug cues, addicts made more errors (SD = 0.82, M = 1.40) than non-addicts (SD = 0.63, M = 0.46), also as for the number of errors in neutral words, addicts showed a higher error rate (SD = 0.63, M = 0.60) than non-addicts (SD = 0.25, M = 0.06).

As portrayed in Table 2, there is a significant difference between the two groups in terms of color-naming accuracy ($P < 0.05$, $2(1) = 3.896$) as well as the reaction time ($P < 0.0001$, $2(1) = 17.404$). The calculated difference between scores of congruent and incongruent stimuli, as stroop effect, was significant.

Table 1. Mean and Standard Deviation of Reaction Time and Number of Errors in Different Manners of Presentation ^a

	Drug Cue (Reaction Time)	Neutral Word (Reaction Time)	Drug Cue (Number of Errors)	Neutral Words (Number of Errors)
Addict	19.75 ± 4.40	7.41 ± 1.04	1.40 ± 0.82	0.60 ± 0.63
Non-addict	12.07 ± 1.80	6.41 ± 0.58	0.46 ± 0.63	0.06 ± 0.25

^a Data are presented as Mean ± SD.

Table 2. Kruskal-Wallis Rank ANOVA for the Investigation of Attentional Bias in Addict and Non-Addict Groups (n = 15)

	Mean Rank	Kruskal-Wallis ²	Degree of Freedom	P Value
Stroop effect (accuracy)		3.896	1	0.048
Addict	18.33			
Non-addict	12.67			
Stroop effect (reaction time)		17.404	1	0.0001
Addict	22.20			
Non-addict	8.80			

5. Discussion

The present study showed that there was no significant difference between the two groups in terms of the number of errors, but as for the reaction time, the difference was significant. Results of this study are not consistent with those of MacLeod & MacDonald as attentional bias may be a certain index of anxiety disorders, simply not present in states of motivation and enthusiasm. Ehrman's theory can further justify the present findings, according to which, presence of motivational readiness for change is not vital (11, 12).

Findings of the present study are consistent with those proposed by Fadardi and Cox (8), based on the fact that attentional bias and cognitive processes are associated with drug abuse in addicts. Since cognitive bias has a role in drug dependence disorder, emphasis on cognitive processing can play as one of the foundations for therapeutic intervention. According to the results, drug dependent participants showed higher attentional bias compared to non-addicts. Attentional bias of the drug dependent towards drug-related cues was earlier predicted by Robinson and Berridge (13), which support the results of this study.

The present study showed that for all the presentation methods, the reaction time and number of errors of drug dependent participants were higher compared to non-addicts, which is consistent with the findings of Williams et al. (3) and Ryan (2). As proposed in the dual process theory by Tiffany, drug procurement and consumption are the only objectives in the initial stages of drug dependence, which can be inhibited via cognitive processing. Repeated drug use will render these behaviors habitual, which are inhibited by automatic schemas and associated with motivational processes. Increasing the drug dose results in the automatic rise of these behaviors. When the drug consumption behavior is disrupted, the individual's attention turns to drug use and avoids other activities, hence, an increased attentional bias (13).

Acknowledgements

The authors would like to appreciate the invaluable contributions of Dr. Masoud Fazilatpoor, and the esteemed personnel of Parastoo Addiction Counseling and Treatment Clinic of Isfahan who enabled us to collect the data, as well as the anonymous addict groups.

Authors' Contributions

The attentional bias of drug addicts is associated with drug-related cues or the temptation for drug abuse.

Financial Disclosure

The study and the analysis was carried out by Seyedeh Narjes Zamani, Masoud Fazilatpour conducted the review and revise, and Hourri Mansouri, Zahra Shamsai translated the study.

Funding/Support

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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