



Original Article

Attentional bias in dieters and non-dieters

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Abstract

Introduction: Obesity is one of the diseases in modern and industrial life which is increasing with the rise of social facilities. Considering the previous studies, cognitive factors (attentional bias) play major role in the failure of dieting people. The present study investigates the subliminal attentional bias in dieters compared to nondieters.

Materials and Methods: This causal-comparative study conducted clinics of Ghaem and Imam Reza hospitals and the clinic of faculty of Education Sciences and Psychology of Ferdowsi University of Mashhad in 2011. Participants were dieters (n=30) and nondieters (n=30) in which the ratio of genders are the same. Individuals, between 20 to 50 years old, were categorized into two groups of dieters and nondieters. To measure the attentional bias, the combine Stroop test was done and for each participant, two versions of pictorial and lexical stroop test were used. Data analyzed by MANCOVA and SPSS software version 20.

Results: The results showed that there are not any significant differences between the interference mean scores of low-calorie ($P=0.28$)/high-calorie ($P=0.57$) food images and the low-calorie ($P=0.307$)/high-calorie ($P=0.202$) food names in the two groups.

Conclusion: It seems that subliminal food stimuli may not cause attentional bias in dieters in comparison with non-dieters.

Keywords: Attention, Bias, Combine Stroop, Diet, Obesity

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Introduction

Overweight (more than standard weight) and obesity (more body fat) are main problems of nutrition and public health that it attracts more researchers and nutritionists' attention. Based on the report of WHO (2009) the high prevalence of overweight and obesity in recent decades is a problem that threatens world health. Overweight and high body fats are associated with physiological and psychological risks. The psychological complications are more awful in short-time. It is clear that prevention of obesity has more priority than its treatment (1). Failure of nutritional regime and relapse of weight are threatening for individuals' physical and psychological health because recurrent failures in regime lead to problems such as moreover mental involvement with physical condition, depressed mood and low self-esteem (2).

The main problems among people with regime are their inability to commitment to appropriate regime, regular physical activity and control of appetite. The basic question is that what factor inhibits people to commitment to these behaviors? The conducted researches introduce cognitive components as craving factors in regimen and they emphasized on effects of these factors in obesity treatment (2). According to the role of these factors in prevention of weight gain, it seems that cognitive therapies have more consistency and they are permanent after therapy but other therapies are not effective after their regimens (3,4).

The current efforts and failures of diets encourage the researchers to research about cognitive changes among people who have diets. The cognitive treatments can play main role in destroy of non-optimal cycle (negative emotions-diet-failure-negative emotions). One of the aspects of cognition is attention which cognitive therapies focus on it. Based on the cognitive process theories, the form of

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process of environmental stimulants has a basic role in behavior formation and attention is the factor which indicates the cognitive sources specified to which goal and which behavior should be performed.

One of the theories which explain the process of attention is Schnider and Shifflin theory. According this theory, attention has to levels: automatic process and controlled process. The automatic process applied in contact to familiar stimulants otherwise controlled process applied when the stimulants are foreign and the cognitive task is difficult (5). Difficult control and far of awareness is considered as the specifics related to automatic process and one of the related concepts is attention bias. Attention bias is explained as the selective choice of some environmental information and ignore about others.

Since publication of Stroop article, many studies have been conducted on this test and various versions made by researchers to measure attention bias. The results of study on people with and without nutrition diets have been indicated that the thoughts related to enjoy active automatically through read of delicious foods compared to neutron foods in people with diet opposite to people without diet.

So, people with diet compared to people without diet, have positive attention to delicious foods. People with diet may do not have awareness about the preference of delicious foods and this ignorance can affect on their eating behavior and it may lead to unconscious overeating (6). The another study which conducted to assess the effect of enjoyable thoughts on dieters, indicated that people with diet who contact to the words related to delicious foods in sub-threshold form, act slower in knowledge of the words related to diet because the words related to delicious foods lead to inhibit of regimen goal in these individuals (7).

Some of the recent studies focused on the basic psychological mechanisms of failure in self-regulation process especially automatic cognitive processes which are active in perception of delicious foods. The award dependent mechanism plays main role in overweighed people's failure in regulation of eating. The appetite and secretions of salivary glands may be increased when people with diet see, smell or thought about the delicious foods compared to normal people (8,9). These people thought about enjoy of eating simply and this thought can affect their following behavior.

Dobson through factor analysis on Stroop test for food, body weight and the words related to body

form found that individuals with overeating compared to normal individuals show more interaction for the words related to food and body. The results of the past studies indicated that attention bias has an important role in diet failure (6,10-13).

In addition, the results of a review article (14) about the conducted studies during 2009-2011 indicated that overweighed individuals have more attention bias to food stimulants especially high-caloric foods compared to normal individuals but some studies suggested that attention bias has not differ significantly in people with and without diet (15).

The conducted studies about attention bias among dieters are little and they have controversies. The present study aimed to assess how attention bias to high-caloric foods compared to low-caloric foods even in sub-threshold level can slow function in cognitive task among people with diet. Also this study aimed to assess the effect of interaction.

Materials and Methods

This study approved by the ethical committee of Faculty of Psychology and Education Sciences of Ferdowsi University of Mashhad. The statistical community concluded all obese people who referred to nutrition and diet therapy clinic of Qaem and Imam Reza hospitals in Mashhad during April to June 2011. The participants selected via available method among volunteers.

The inclusion criteria included diet under supervision of nutritionist (n=30, mean age: 29 years). It is possible that participants had medium socioeconomic level because they referred to public clinic indeed private clinics with high costs.

The control group included all students of Ferdowsi University of Mashhad who selected via available sampling method among volunteers. The inclusion criteria were the lack of diet (n=30, mean age: 24 years). To match two groups, cases selected who had BA educational level and age between 20-40 years. The lack of color-blindness, special psychological and physical disease was assessed. Also, all participants had no special problem in use of computer. The gender ration was equal in two groups.

For admit of volunteers we used poster in information table. According that research conducted after overweight phenomenon, the method is etiological-comparative.

Research instruments

- *Combined Stroop Test*: The classical Stroop task was made by Stroop in 1935 for assessment of

human attention bias and information process. In this modified version, the various types of words in different colors are presented in monitor of computer. The participant asked to report the color of the presented words in format of verbal or press button and ignore the mean content of the words (17).

The results showed that the participants act slower significantly in condition of non-accordance of stimulants (for example the red word was written with blue ink). Stroop resulted that this delay caused by the phenomenon which named "interaction" (18). The longer reaction time for report of threatening words compared to neutron words is used as attention bias index (17). Salehi Fadardi and Ziaee in their review article (19) resulted that Stroop test has acceptable internal consistency (Cronbach alpha=0.80) and there are adequate evidences for its validity.

- *Pictorial Version:* This test is the same of Stroop test but in this version before presentation of each color, a picture related to the foods (for example pizza) is presented in monitor. According to the sub-threshold method was used in this study, the pictures have been presented for 28 milliseconds then following color has been shown. The total number of pictures was 48 and half of them related to high-caloric foods otherwise the others were related to low-caloric foods. It was expected that the sub-threshold presentation of pictures related to high-caloric foods interacted with attention among individuals with diet and decrease the speed rate of their reaction time.

- *Lexical Version:* This version is the same of visual test but in this version before presentation of each color, a word related to the foods (for example pizza) is presented in monitor. The total number of words was 48 and half of them related to high-caloric foods (for example kebab and rice) otherwise the others were related to low-caloric foods (such as salad). It was expected that the sub-threshold presentation of words related to high-caloric foods interacted with attention among individuals with diet and decrease the speed rate of their reaction time.

There is not available study about the comparison between the reaction time among dieters and non-dieters in words and pictures. The interval between presentation of the word and press the button related to the color of the word is estimated as the reaction time but what used in the analysis is the interaction rate.

The interaction rate related to the words= reaction time to non-concordant words - reaction time to the

concordant words

The interaction rate related to the pictures= reaction time to non-concordant pictures - reaction time to the concordant pictures

The Stroop test has acceptable validity and reliability in measuring of interaction and it is concerned as the appropriate tool for measuring attentional bias (18). The results of a review about this test indicated that Stroop test has an acceptable internal consistency (Cronbach alpha=0.80) and there are sufficient evidences about its validity (19). These researchers found that adequate accuracy of performance and scoring of Stroop led to minor doubt about the validity and reliability of classic and emotional Stroop tests. For conduction of this test, one laptop with 15" monitor and a usual keyboard were used. Each color related key was marked through a label with a same color.

Dieters participated in this research in a room in the nutrition clinic of Imam Reza and Qaem hospitals. The volunteers referred to the secretor of this clinic. Non-dieters volunteers participated in a special room in Faculty of Psychology of Ferdowsi University of Mashhad. For combined Stroop test, Super Lab software version 2 was used. All colored pictures made in TIF format and size of 300*300 megapixels. All backgrounds of pictures were excluded by Photoshop software and all pictures placed in a white background. The colored words included 24 concordant words and 24 non-concordant words to the colors (green, yellow, blue and red) and Farsi font of titer 200 chosen for the presentation. Before each word, a picture presented for 28 milliseconds as sub-threshold method and dissolved. As the participant pressed one key of the four colors button the following stimulant was presented. The background of the stimulants was black and between two presentations, a fixed white + was manifested for 500 milliseconds to participant's preparation for the followed stimulant. The participants knew that the purpose is the measuring of their reaction time to a series of stimulants. To prepare the participants for the main test, a practical stage like the main test was performed. The feedback was presented to the participants. If the participant response correctly, (+) is presented and the followed stimulant displayed. If the participant response wrongly, the word of false is presented also in delayed response the word of delay was displayed but in this phase the * was presented in red, green, blue and yellow colors so the participants trained about the colored keys. Finally, the combined Stroop test (pictorial version and lexical version) was conducted. For excluding

of the effect of consequence the picture and lexical versions were presented to participants as decussated.

Results

At first, the wrong responses and the items without response were excluded and the reaction times for the correct responses were included in the accounts. Then the interference scores for each of three categories of stimulants were calculated. The interference scores were calculated for each type of antecedent stimulants (picture or word), and for each categories of food stimulants (high-caloric and low-caloric), the mean reaction time to easy categories (consonant words) was deducted from the mean reaction time to difficult categories (nonconsonant words). The mean and standard deviation of the calculated interference scores were shown in Table 1. The interference score for each category of stimulants indicates the distraction which created by seeing of each stimulants.

Table 1. The interference scores and body mass index among individuals with and without diet

	Dieteres		Non-dieters	
	Mean	Standard deviation	Mean	Standard deviation
Pictures of low-caloric foods	82.84	107.11	113.21	87.22
Pictures of high-caloric foods	19.66	118.17	35.23	89.47
Names of low-caloric foods	112.79	96.51	93.08	92.19
Names of low-caloric foods	35.23	74.16	63.52	98.70
Body Mass Index	29.54	4.82	22.18	2.90

The independent t-test indicated that there were not significant differences between the scores of two groups in the means related to high-caloric ($t(55)=-0.56$, $P=0.57$) and low-caloric ($T(56)=-1.08$, $P=0.28$) pictures and high-caloric ($t(55)=-1.290$, $P=0.202$) and low-caloric ($t(56)=1.031$, $P=0.307$) names. The dieters' body mass index was higher significantly than non-dieters' body mass index ($t(58)=7.15$, $P<0.001$). The difference of the mean BMI between two groups was 7.36 and this difference was estimated in the range of 5.29-9.41 among general population.

The MANOVA method was used to assess the effect of interference of stimulants. The dependent variable of the calculated interference score for each stimulant and the independent variable of group were entered to model. The analysis results showed that the group has not a significant effect on the interference scores of low-caloric ($F(1,55)=1.38$,

$P=0.24$) and high-caloric ($F(1,55)=0.31$, $P=0.57$) pictures and low-caloric ($F(1,55)=0.62$, $P=0.43$) and high-caloric ($F(1,55)=1.48$, $P=0.22$) names.

Discussion

Psychology especially cognitive psychology is one of the sciences which play a basic role in obesity. The conducted studies indicate that cognitive system especially attention system plays an important role in the formation of the behaviors associated with eating. The phenomenon of attentional bias among dieters causes the stimulants related to foods seem more prominent and more processing sources specified to these stimulants (13). The attentional bias is an automatic and unconscious process and it causes that people who limit their eating to reduce their weigh, unlike their awared goal (weight loss) have more preoccupation with the foods (2).

Most studies in psychology of eating behavior conducted in foreign countries and Iranian studies assessed clinical population so the assessment of attentional bias especially subliminal method seems necessary among non-clinial Iranian population. One of the noticable issues is the use of true colored images in subliminal method and combination of it with emotonal Stroop test. Also one of another innovative aspect of this study is using of word and imaged versions and comparison between two combined Stroop versions and subliminal presentation of stimulants has not been conducted.

The results of this study indicated that there is not significant difference between non-dieters and dieters function in more difficult cognitive tasks (non-consonant words). It possibly means that subliminal eating stimulants (names and images of foods) do not lead to attentional bias in dieters compared to non-dieters individuals. Although the findings of the prior study which conducted through colored images stimulants with a subliminal presentation showed that diet cause attentional bias to high-caloric foods (20).

The important point in the mentioned study was the subliminal stimulants displayed 32 miliseconds but this presentation time reduced to 28 milliseconds in the present study so this 4 milliseconds difference possibly led to non-significant difference between the means of interference scores in dieters and non-dieters groups so the attentional bias to subliminal stimulants not be concerned as a factor of prediction of loss weight failure and it is better that overlimal stimuli used to more effects of training programs of attention control, as a complementary treatments for dieters, on attentional bias about foods. The results of measuring interference related to

subliminal stimulants indicated that the effect of interference of images of high-caloric foods is more than their names. This issue suggests that images of stimulants can attract more attention than the words and the same of past studies the effect of distraction is more pronounced in such situation (2). Some researchers believe that the images of stimulants are more effective in measuring of attentional bias and they are more reliable in real life.

The present study has some limitations. First, some of the dieters evaluated in the first visit sessions and they act same to non-dieters. It is recommended that all dieter participants be evaluated in the middle of sessions in future studies. Second, non-dieters were not evaluated in the same hours of day. It is better that the test time is same in two dieter and non-dieter groups (for example in the morning or evening, two or three hours after breakfast or lunch). The available sampling method is probably one of the causes of lack of significance between two groups. In this method, only easy sampling is concerned so possible bias in findings and lack of generalization of findings can be related to errors in sampling.

It is recommended that standadr Stroop test and

combined Stroop test be compared in the future studies that their efficacy evaluated separately and the time of presentation of image and word stimulants increased to 30 milliseconds.

Conclusion

The results of the present study indicated that subliminal stimulants of food (pictures and words related to the foods) do not lead to attentional bias in dieters compared to non-dieters. Therefore, attentional bias to subliminal high-caloric stimulants cannot be considered as a contributing factor to the failure of diet. It seems more fitting that overlimal stimulants are applied for a more optimal effect of attentional bias training program as one of the complementary treatments for dieters.

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