Research article
Ερευνητική εργασία

Film clips smoking behavior and nicotine craving: The interrelationship between stress, smoking cues and craving

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An abundance of research has demonstrated that substance addicted individuals, when they are exposed to a substance related stimulus, show a positive correlation between physiological measurements, such as an increase in heart rate and sweating, and behavioral reactions, that include craving and substance use or consumption. Films depicting smoking behavior are regarded as cues to induce smoking behavior. The current study aimed to investigate the effects of smoking behavior portrayed in movies on actual craving experienced by smokers who watch on screen actors consume tobacco products. In addition, the effects of receiving orally administered nicotine (chewing gum), a regular chewing gum or no additional intervention were examined. In particular, the study aimed to investigate how these factors impact nicotine craving as well as the heart rate and sweating. The majority of the participants were University of Bedfordshire students and staff. Thirty smokers (12 males and 18 females) having received a nicotine gum, a regular chewing gum or no gum, were exposed to a digital video clip showing actors smoking. The participants chose the type of chewing gum they wanted. Heart rate (HR) and galvanic skin response (GSR) were measured during the course of the experiment. Prior to and after watching the movie clip participants completed the Brief Questionnaire of Smoking Urges (QSU-Brief) and the Perceived Stress Scale (PSS). According to the results, the craving was increased when compared to the baseline score ($t=-3.76$, $p<0.001$). Additionally, a correlation was found between the baseline level of craving and perceived stress before and after the movie ($r=0.39$). Nicotine chewing gum was found to have a significant impact on participants' heart rate ($p<0.05$) but not on GSR. A significant difference was found in participants in the normal chewing gum condition reporting higher levels of craving than the other two groups ($p<0.05$). Age was found to positively related to post-measures of nicotine craving which was found to be higher for young respondents ($r=-0.47$, $p<0.01$). The data further show that the depiction of smoking behavior in the media is likely to have a significant im-

pact on smoking craving, smoking behavior and nicotine consumption. The current study confirms and replicates some of the previous findings within the field of smoking behavior and nicotine craving such as high susceptibility of younger adults to media influence.

Key words: Film clips, galvanic skin response, heart rate, smoking craving, stress.

Introduction

Tobacco consumption is frequently depicted by the media in one form or another, in both grown-ups and adolescents of both gender and varied ethnicity, occupational and socio-economic status.[1] There is little evidence of whether and how movies may be experienced as cue exposure stimuli for smokers and whether they could be a factor in smoking relapse, resulting from individuals observing the actors smoke.[2] Specific behaviours, attitudes, cue exposure, and social norms influence the behavioural status of the individual, which may be related to smoking initiation. Smoking cues and smoking-influential stimuli, which are movie-related, are underlying different cognitive mechanisms, which can greatly influence an individual's smoking behaviour.[3] This can imply that an individual is attracted subconsciously to the smoking character, which in turn can lead the smoker to experience episodic craving levels, which accordingly will lead the individual to light a cigarette.[3]

A study adopting an experimental design examined a total of 65 young participants who smoked daily and were shown a 41-minute clip movie (with or without smoking cue stimuli); the results suggested that there is no effect of smoking cues in movies on craving.[4] Another experimental study suggested that males had a significantly higher increase in the levels of craving than females when exposed to smoking cues by watching six different popular movie clips.[5] Both studies took craving measurements after the exposure but did not assess baseline scores. A school-based longitudinal study focusing on examining the relationship between the time spent exposed to movies and smoking onset, reported that 1,697 of the 9,987 adolescents started to smoke due to the exposure.[6] It is worth noting that the authors took into consideration factors such as age, gender, family influence, school performance, TV screen time and peer pressure. Furthermore, in a similar study it was found that individuals were experiencing a minimum of three cue encounters each week.[7] Taking the previous study into consideration it can be a valuable tool in order to understand that the environment of today's society is filled with cues that even if an individual wished to abstain or succeeded in smoking cessation it can make it difficult to maintain continued abstinence.

An abundance of research has demonstrated that individuals who are addicted to substance show an increase in heart rate and sweating as well as behavioural reactions, which include craving and substance use or consumption.[8–10] When an experiment is conducted, craving is measured by means of self-report and physiological measurements, which are commonly taken in the form of heart rate (HR), galvanic skin response (GSR) and, in some cases, by taking an electroencephalogram.[11] Studies support that an individual who smokes and is exposed to smoking-relating-cue, report an increase in cardiovascular reactivity and in episodic craving levels rather than the one exposed to neutral-related-cues.[12,13] Physiologically, tobacco consumption increases stress hormones and cortisol levels. Long-term use of smoking has an effect on hypothalamic pituitary adrenal axis, stress hormones resulting in secretions of cortisol which is higher than normal in individuals who smoke than those who don't.[14]

Intervations using virtual reality suggest that smoking cues lead to a significant increase in tobacco consumption. However, this does not provide us with enough evidence in order to suggest that those cues will have the same effect in real life scenarios.[15,16]

The aim of this study was to examine the effect of smoking behaviour portrayed in movies on actual craving experienced by smokers who watch actors

to consume tobacco products. In addition, the effect of receiving orally administered nicotine (chewing gum), a regular chewing gum or no additional intervention was examined. In particular, the study aimed to investigate how these factors may impact physiological measurements such as HR and GSR. It was expected that significant correlations would be found between physiological measurements and self-reported measures of stress, between stress and smoking craving measures, between pre- and post-measures of the smoking craving, while younger participants would be more susceptible to smoking cues shown in movies.

Material and method

Design

The current research project used an experimental design, employing a number of quantitative measures. There were three independent variables: (1) viewing of a movie clip depicting scenes involving smoking, which are shown to all participants, (2) the level of current smoking behaviour, as assessed by self-report (participants were asked to categorise themselves as low, medium or heavy smokers based on their personal perception of their level of nicotine consumption), and (3) the influence of nicotine gum, a normal chewing gum or no gum on cigarette craving when watching others smoking on TV. Four dependent measures are recorded: (1) heart rate, (2) galvanic skin response while smoking craving, (3) stress levels, and (4) smoking craving.

Participants

The participants were a convenience sampling of totally 30 smokers (12 males and 18 females), students from the University of Bedfordshire (United Kingdom) or staff. Participants had to be at least 18 years.

The procedure:

1. Allocation to conditions

At the beginning of the experiment, participants were given a choice between receiving nicotine chewing gum (Nicorette icy white, 2 mg gum nicotine), regular chewing gum or no chewing gum.

Five respondents classified themselves with self-assessment as low smokers, thirteen as medium smokers and twelve reported being heavy smokers. This classification was based on their own subjective perception of their level of cigarette consumption.

2. Baseline measurement of nicotine craving and stress

Subsequently, participants were asked to complete the Brief Questionnaire of Smoking Urges (QSU-Brief) in order to take a baseline for smoking craving. The QSU-Brief[17] is composed of 10 items measuring smoking craving levels experienced in a particular moment by individuals. The answers are given on a 7-point Likert scale (1=strongly disagree to 7=strongly agree). The scale consists of two subscales; (i) Cigarette Craving (positive reinforcement of smoking, Factor 1, Items 1, 3, 6, 7, 10) and (ii) Coping Difficulties (negative reinforcement properties of smoking, Factor 2, Items 2, 4, 5, 8, 9).[17] Internal consistency of the QSU-brief has previously been reported to be very high with a Cronbach's alpha=0.97.[18]

Participants, also, completed the Perceived Stress Scale in order to control the initial stress level. The Perceived Stress Scale[19] (PSS) is widely used for the measurement of the perception of stress. It measures the extent of stress felt in situations that are regarded as stressful by individuals. The PSS is composed of 10 items evaluating the responses from the last month. The scoring is ranged from 0 (Never) to 4 (Fairly Often). Internal consistency has been found to be high.[20]

3. Galvanic skin response and heart rate

The materials used included an IBM compatible computer with a Power Lab 26T data acquisition system, running chart 5.5.1 software used with a finger pulse transducer to measure the participant's HR and finger electrodes to measure GSR. Subjects were linked with Powerlab whilst they were watching a short video clip, which lasted 1:18 minutes showing a number of actors consuming tobacco products. HR and GSR were measured during the course of the experiment.

Following the movie clips, participants once again completed the QSU-Brief as a post measure.

All questionnaires, as well as the consent form, were completed online via Qualtrix software.

Statistical analysis

A number of correlations were run to investigate relationships between the dependent measures. Pre and post comparisons were used to determine the effect of watching the movie clips of actors consuming tobacco products. More specifically, t-test was used in order to compare the mean scores on the variables for the different groups of participants. Correlational analyses were used in order to explore the relationships between the pre and post measurement of smoking craving. A repeated measures t-test was used in order to determine whether there is statistical significance between pre and post measurements of the QSU-Brief. Two-way ANOVA was used in order to investigate the effect on the type of gum on the physiological and psychological measures (GSR, HR, craving). All data was parametric (GSR, HR and QSU-Brief), and as a result, parametric test was used.

Ethics

The study followed the British Psychological Society ethical guidelines and was approved by the Ethics Committee of the Department of Psychology, University of Bedfordshire. Conditions were allocated on a voluntary basis of participant choice. Individuals were given the option to choose if they wished to receive the nicotine chewing gum, the no-nicotine gum (normal gum) or no chewing gum at all. Participants were informed both verbally and on the consent form that: (i) they can withdraw anytime they wish without any penalty, (ii) they may experience high level of smoking craving and (iii) about the effects of watching smoking clips on nicotine craving as well as the effect of nicotine gum. For ethical reasons, participants were asked to create their unique identification code, which was composed by their age (e.g.: 25) followed by their date of birth (e.g.: 24/07/1988), followed by their initials (e.g.: PK.), overall a normal code would look like 25-24/07/1988/PK.

Results

Descriptive characteristics

Participants were aged between 20 and 54 (Mean= 26.2, SD=7.1). Means and standard deviations for the dependent variables were calculated for the dependent variables. The smoking craving levels were higher after the intervention than prior to the experiment. Perceived Stress scores produced an average of 18.6 out of 40 suggesting intermediate stress levels. HR was overall normal. An independent measures t-test showed that an overall increase of smoking craving (QSU-Brief) was found between pre and post measures. This increase could be observed for both the Cigarette Craving factor and the Coping Difficulties factor (table 1).

Table 2 displays means and standard deviations for the dependent measures across the three experimental conditions. HR was high in the nicotine

Table 1. Means and standard deviations for dependent measures and pre versus post comparisons.

		Mean	SD	t	p
QSU-Brief Total	Pre	30.0	10.4	–3.76	<0.001
	Post	46.5	17.0		
Cigarette Craving (Factor 1)	Pre	27.1	9.2	–3.58	<0.001
	Post	30.5	12.8		
Coping Difficulties (Factor 2)	Pre	7.9	3.1	–3.57	<0.001
	Post	11.6	5.3		
Perceived Stress Scale		18.6	4.4		
HR		80.4	15.3		
GSR		4.1	8.3		

Notes: SD=Standard Deviation; QSU-Brief=Brief Questionnaire of Smoking Urges; HR=Heart Rate; GSR= Galvanic Skin Response

Table 2. Comparisons between the three study conditions.

		Nicotine gum			Normal gum			No gum		
		Mean	SD	p	Mean	SD	p	Mean	SD	p
HR		89.3	17.6	<0.05	80.1	11.8		71.8	11.8	
GSR		2.03	4.89		6.71	13.3		3.72	3.29	
Perceived Stress Scale		18.2	3.43		20.2	5.57		17.4	3.71	
QSU-Brief Total	Pre	31.5	10.7		42.2	4.92	<0.05	31.4	11.1	
	Post	49.3	13.9		52.8	13.1		37.5	20.7	
Cigarette Craving (Factor 1)	Pre	14.0	2.9		20.4	3.1		13.2	2.5	
	Post	23.5	3.8	<0.05	22.8	3.6		16.0	2.3	
Coping Difficulties (Factor 2)	Pre	17.5	2.9		21.8	1.9		18.2	2.1	<0.05
	Post	25.8	2.1	<0.05	30.0	1.9	<0.05	21.5	1.9	

Notes: SD= Standard Deviation; HR=Heart Rate; GSR= Galvanic Skin Response; QSU-Brief=Brief Questionnaire of Smoking Urges; ANOVA Test was applied

gum condition and low in the regular gum condition. Conversely, GSR was found to be high in the normal gum group and low in the nicotine gum condition. Perceived stress level was high for the normal gum group and low for those who had not taken any gum. Nicotine craving was found to be increased after the intervention for all groups; however, the largest increase was observed for the nicotine gum group. Moreover, craving scores were found to be more wide spread after the intervention.

Correlations

Age was found to positively related to post-measures of nicotine craving which was found to be higher for young respondents as revealed by a bivariate correlation ($r=-0.47$, $p<0.01$). Upon closer examination of the previously identified factors, it became clear that this relationship arose from the smoking craving factor, ($r=-0.485$, $p<0.01$), while no correlation was found with the Coping Difficulties.

Self-reported classification as low, medium or heavy smokers was, also, investigated in relation to the dependent measures but was not found to have an impact on any of the variables in a series of independent measures ANOVAs. The three groups were consequently collapsed for further analyses.

A weak correlation was observed between pre and post measures of the QSU-Brief ($r=0.33$) which just failed to reach significance ($p=0.74$). This relationship was substantially stronger the smoking craving factor exhibiting a weak to a medium correlation between pre and post measurements ($r=0.44$, $p<0.01$). No relationship was found with the Coping Difficulties factor and no correlation was found with any of the post measures. A correlation was, also, found between perceived stress and pre scores of the QSU-Brief ($r=0.39$, $p<0.01$). Once more, the relationship occurred only for the pre-measure of the smoking craving factor ($r=0.42$, $p<0.05$) while no relationship was found with the post measures or either measure of the Coping Difficulties dimension. Also, while scores of the Cigarette Craving factor were found to be unrelated to Coping Difficulties prior to watching the video depicting smoking, a strong correlation was found for the post measurement following the intervention ($r=0.717$, $p<0.001$).

Two independent measures ANOVAs showed that the condition into which participants were entered (nicotine chewing gum, normal chewing gum or no chewing gum) did not have an effect on GSR but

was found to have an impact on HR with those having chosen the nicotine gum showing significantly more beats per minute than participants who did not chew any gum at all as revealed by the post-hoc analysis ($p<0.05$).

When analysing the baseline scores of the QSU-Brief in the pre condition, it was found that participants in the normal chewing gum group displayed significantly higher craving than those in the other two groups ($p<0.05$ for both) as revealed by an independent measures ANOVA. To accurately assess the post scores obtained, pre measures were controlled for in the subsequent ANOVA run on the post measures. Coping difficulties were greater for both chewing gum groups (nicotine and normal) than for the no chewing gum group ($p<0.05$ for both).

A mixed measures ANOVA was also run in order to investigate differences between participants who received nicotine gum, normal gum or no gum in both pre- and post- craving scores (QSU-Brief). No interaction was observed between pre and post measures and the three experimental conditions. However, breaking down scores for the three groups post-hoc analysis revealed that no increase in craving occurred for participants without chewing gum while an increase was observed for respondents who had received the normal chewing gum which fell just short of significance ($p=0.053$). Furthermore, a significant increase in smoking craving was found for individuals who had chosen the nicotine gum ($p<0.01$).

These effects were also investigated for the separate factors and it was found that at post measurement Cigarette Craving in participants who had received the nicotine chewing gum was higher than prior to the intervention, while no differences could be found in either of the other two groups.

Discussion

Craving was found to increase at a similar rate for both the total score of the QSU-Brief as well as the two factor dimensions, suggesting that watching the movie clips had a substantial impact on levels of smoking craving. It is interesting to note that while Cigarette Craving and Coping Difficulties measurements were not related at the start of the experiment, a strong, significant correlation emerged following the intervention. Since both dimensions also displayed a significant increase, this suggests that after watching the smoking scenes, participants were both, more likely to crave a cigarette and less able to cope with their desire.

There was expected to be a significant correlation between physiological measurements (HR and GSR) and self-reported (Perceived Stress Scale) measures of stress. Results indicate that it could not be confirmed in the experiment presented here as no correlation was found between physiological measures of stress and self-reported measures of stress although previous research has found clear links between physiological arousal and subjective perceptions of stress. Others[21] examined the hypothesis that psychological stress can induce changes in the heart rate.

A weak correlation observed between pre- and post-measures of the QSU-Brief just failed to significance, suggesting that the intervention was partly successful in altering the amount of craving experienced by the participants. Detailed examination showed that a stronger relationship existed between pre and post measures of the Cigarette Craving dimension, while no correlation could be found for the Coping Difficulties subscale. This suggests that while the overall amount of craving experienced may have been altered, the main effect was seen on how well participants could cope with their desire following exposure to the movie clips.

A correlation was also observed between baselines levels of craving and perceived stress. This is in line with previous findings showing that stress is a main mechanism in initiating smoking behaviour.[22,23] This relationship, once more emerged only between the pre measurement of Cigarette Craving, while post measures and measure of Coping Difficulties did not correlate with either physiological or self-reported measures of stress. In particular, it should be noted that the absence of a correlation between post measures of Cigarette Craving and perceived stress, suggests that craving experienced after the experiment is more likely to be due to the interven-

tion than to stress experienced before watching the movie clips.

While no overall difference in levels of craving was observed between those having received nicotine gum, normal gum or no gum, it appeared that both chewing gum groups experienced more difficulties in coping with their craving than the no gum group. This suggests that the action of chewing may have a negative impact on managing craving, possibly due to the oral involvement associated with both activities.[24]

A clearer picture could, however, be noticed when nicotine craving scores in the three conditions were compared between pre and post measures. While no difference was found between pre and post measurements for the no chewing gum group, an increase could be observed in respondents who had chosen the normal chewing gum. The difference was just above the significance level but it would be likely to become more pronounced in a larger sample.

A significant increase in craving was, also, found for the nicotine chewing gum group. In particular, it could be seen that scores increased on the Cigarette Craving dimension only for participants in the nicotine gum condition, while Coping Difficulties increased for both the nicotine gum and chewing gum group. These findings suggest that, contrary to the intended purpose of nicotine gum, nicotine gum increased cigarette craving rather than helped smokers control it.

In the current experiment chewing nicotine gum was found to have an impact on HR but not on GSR. This is likely due to the stimulating effects of nicotine, which increases blood flow and consequently leads to an increase in HR.[25] While a small increase was, also, observed for those with normal chewing gum, the difference was not significant and this may be due to the additional movement required for chewing. Others suggested that smokers reported fewer cigarette puffs and the time until they first lit their first cigarette increased significantly.[26] The chewing gum was, also, a factor that helped smokers to deal with withdrawal symptoms in relation to the control group.[27]

The current study did not find a relationship between gender and nicotine craving. Research evidence suggests that female individuals are more prone to nicotine intake than men. Furthermore, the smoking behaviour of females is influenced by a variety of different variables and not primarily related to the role of nicotine itself as it happens with males. Again, the association between gender and smoking behaviour is clouded by a variety of mixed results.[28] In general, it is suggested that, even though gender differences apply, the individual perception towards the smoking behaviour plays a vital role.

This study is subject to some limitations that need further examination. A larger group of participants would have revealed an overall statistical significance which could lead to a better explanation of the variables involved. Also, the classification of participants in the three categories (low, medium or heavy smokers) was not based on the number of cigarettes consumed per day but by the self-report method. The selection of participants to be included in the nicotine chewing gum group or in the other two groups is another limitation of this study since there is no comparison of the effect of nicotine with placebo. At the same time, it needs to be considered that each individual is adopting smoking behaviour for a variety of different factors determined by their personal life circumstances.

Conclusions

The current study built on existing research in the area but used a different approach that incorporates the effect of smoking in movies on current smokers and the effectiveness of nicotine chewing gum in regulating nicotine craving. Overall, the current study confirms and replicates some of the previous findings within the field of smoking behaviour and nicotine carving such as higher susceptibility of younger adults to media influence. Surprisingly enough, in this study, the findings that nicotine chewing gum increased the craving levels felt from the participants should be alarming to the medical community. Non-the-less, future studies and studies that can replicate those findings should be developed in order to retest the validity of the findings in a larger sample.

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Συμπεριφορά καπνίσματος στις κινηματογραφικές ταινίες και επιθυμία για νικοτίνη: Η σχέση μεταξύ στρες, ερεθισμάτων καπνίσματος και επιθυμίας

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Μια πληθώρα ερευνών έχει δείξει ότι τα εξαρτημένα από ουσίες άτομα, όταν εκτίθενται σε ένα ερέθισμα σχετικό με την ουσία, εμφανίζουν μια θετική συσχέτιση μεταξύ των φυσιολογικών μετρήσεων, όπως η αύξηση του καρδιακού ρυθμού και της εφίδρωσης, και των αντιδράσεων συμπεριφοράς όπως είναι η επιθυμία και η χρήση ουσιών. Οι ταινίες που απεικονίζουν συμπεριφορά καπνίσματος θεωρούνται ερεθίσματα για την πρόκληση συμπεριφοράς καπνίσματος. Η τρέχουσα μελέτη είχε στόχο τη διερεύνηση των επιπτώσεων της συμπεριφοράς καπνίσματος, που απεικονίζεται στις ταινίες, στην πραγματική επιθυμία των καπνιστών που παρακολουθούν στην οθόνη τους ηθοποιούς να καταναλώνουν προϊόντα καπνού. Επιπροσθέτως, διερευνήθηκαν τα αποτελέσματα τής από του στόματος χορηγούμενης νικοτίνης (τσίχλα νικοτίνης), της χορήγησης συνήθους τσίχλας και της μη χορήγησης νικοτίνης. Ειδικότερα, η μελέτη στόχευε να διερευνήσει πώς αυτοί οι παράγοντες επηρεάζουν την επιθυμία για νικοτίνη καθώς και την καρδιακή συχνότητα και την εφίδρωση. Η πλειοψηφία των συμμετεχόντων ήταν οι φοιτητές και προσωπικό του Πανεπιστημίου του Bedfordshire. Τριάντα καπνιστές (12 άνδρες, 18 γυναίκες) παρακολούθησαν κινηματογραφική ταινία που απεικόνιζε ηθοποιούς να καπνίζουν ενώ παράλληλα ελάμβαναν τσίχλα νικοτίνης ή συνήθη τσίχλα ή καμία τσίχλα. Οι συμμετέχοντες επέλεξαν οι ίδιοι τον τύπο της τσίχλας που επιθυμούσαν. Κατά τη διάρκεια της διαδικασίας μετρήθηκε ο καρδιακός ρυθμός και η γαλβανική απόκριση του δέρματος. Πριν και μετά την παρακολούθηση της ταινίας, οι συμμετέχοντες συμπλήρωσαν τις κλίμακες Βραχύ Ερωτηματολόγιο Παρωθήσεων για Κάπνισμα (Brief Questionnaire of Smoking Urges, QSU-Brief) και Κλίμακα Προσλαμβανόμενου Στρες (Perceived Stress Scale, PSS). Σύμφωνα με τα ευρήματα, το επίπεδο επιθυμίας για νικοτίνη αυξάνεται σε σύγκριση με το επίπεδο επιθυμίας πριν την παρακολούθηση ($t=-3,76$, $p<0,001$). Επιπλέον, διαπιστώθηκε συσχέτιση μεταξύ των επιπέδων της επιθυμίας για νικοτίνη και του προσλαμβανόμενου στρες πριν και μετά την παρακολούθηση ($r=0,39$). Η τσίχλα νικοτίνης βρέθηκε να επηρεάζει σημαντικά τον καρδιακό ρυθμό των συμμετεχόντων ($p<0.05$) αλλά όχι τη γαλβανική απόκριση του δέρματος. Σημαντική διαφορά παρατηρήθηκε επίσης στους συμμετέχοντες που χρησιμοποίησαν τη συνήθη τσίχλα, καθώς διαπιστώθηκαν σε αυτούς υψηλότερα επίπεδα επιθυμίας από τις άλλες δύο ομάδες ($p<0,05$). Η ηλικία βρέθηκε να σχετίζεται θετικά με την επιθυμία για νικοτίνη η οποία βρέθηκε να είναι υψηλότερη στους νεότερους ($r=-0,47$, $p<0,01$). Τα δεδομένα δείχνουν περαιτέρω ότι η απεικόνιση της συμπεριφοράς καπνίσματος στα μέσα ενημέρωσης είναι πιθανό να έχει σημαντικό αντίκτυπο στην επιθυμία του καπνίσματος, στη συμπεριφορά του καπνίσματος και στην κατανάλωση νικοτίνης. Η τρέχουσα μελέτη επιβεβαιώνει μερικά από προηγούμενα ευρήματα στον τομέα της συμπεριφοράς καπνίσματος και της επιθυμίας για νικοτίνη όπως η υψηλή ευαισθησία των νεαρών ενηλίκων στην επιρροή των μέσων ενημέρωσης.

Λέξεις ευρετηρίου: Ταινίες, γαλβανική απόκριση δέρματος, καρδιακός ρυθμός, επιθυμία για κάπνισμα, στρες.

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