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SPORTS & EXERCISE | RESEARCH ARTICLE

An initial investigation of smokers' urges to smoke and their exercise intensity preference: A mixed-methods approach

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Abstract: The purpose of this study was to examine whether smokers preferred a "self-selected" form of physical activity (PA) in which they were allowed to determine themselves the intensity of PA or preferred a "set" form of PA in which the instructor chose the exercise intensity for them. In addition, we examined effects of 'set" and "self-selected" intensity exercise, on urges to smoke. Participants were 20 (mean age = 27.10 ± 7.37) adults, non-physically active, heavy smokers. Four of them were also interviewed. Results demonstrated that smokers exhibited an enhanced preference for "self-selected" forms of PA as opposed to "set" forms of PA. Smoking urge was significantly lower immediately after exercise in both conditions, returned to baseline levels at 30 min post-exercise, and increased further at 60 min post-exercise. Qualitative data supported the quantitative findings and gave insight to dimensions that needs to be taken under account when we design exercise programs for smokers. The implication of the overall findings is that smoking cessation and motivation for PA participation can be increased by allowing smokers to select intensity of PA programs.

Subjects: Health and Social Care; Social Sciences; Sports and Leisure

Keywords: self-selected exercise; smoking cessation; urge to smoke

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Nikos Zourbanos is an assistant professor of psychology of sport and physical education in the School of Physical Education and Sport Science at the University of Thessaly in Greece. His research focuses on self-talk, motivation and health psychology using psychological skills training. The present study is a part of a bigger project aiming to smoking cessation and alcohol consumption through the use of psychological skills training and exercise. This research has been co-financed by the European Union (European Social Fund—ESF) and Greek national funds through the Operational Program "Education and Lifelong Learning" of the National Strategic Reference Framework (NSRF)—Research Funding Program: THALES. Investing in knowledge society through the European Social Fund.

PUBLIC INTEREST STATEMENT

While 70% of current smokers indicate a desire to quit, the success rate (6–12 months prolonged abstinence) is around 3–5%. Exercise appears to be an effective non-pharmacological method of reducing cigarette cravings. The purpose of this study was to examine whether smokers preferred a "self-selected" form of physical activity (PA) in which they were allowed to determine themselves the intensity of PA or preferred a "set" form of PA in which the instructor chose the exercise intensity for them. Results demonstrated that smokers exhibited an enhanced preference for "self-selected" forms of PA as opposed to "set" forms of PA. The implication of the overall findings is that smoking cessation and motivation for PA participation can be increased by allowing smokers select intensity of PA programs.

1. Introduction

In the twentieth century, "the tobacco epidemic" killed 100 million people worldwide with an annual economic cost for Europe of approximately 97.7–130.3 billion Euros (The ASPECT Consortium, 2004). In the European Union (EU25) more than one-third of the male population smokes (37.0%), whereas the average prevalence of current smoking among the female population is 26.9% (Zatoński, Przewoźniak, Sulkowska, West, & Wojtyła, 2012). While 70% of current smokers indicate a desire to quit, the success rate (6–12 months prolonged abstinence) is around 3–5% (Hughes, Keely, & Naud, 2004). Different treatments have been designed to aid smoking cessation using a combination of psychological support and pharmaceutical aids. Exercise appears to be an effective non-pharmacological method of reducing cigarette cravings (Haasova et al., 2013; Ussher, Taylor, & Faulkner, 2012a, 2012b). Research has shown that acute moderate intensity and high-intensity exercise reduce cigarette craving and tobacco withdrawal symptoms for up to 40 min post-exercise periods. However, approximately 40 min after termination of exercise session, cigarette craving gradually reverts back to levels observed during pre-exercise periods (Roberts, Maddison, Simpson, Bullen, & Prapavessis, 2012; Picavet, Wendel-vos, Vreeken, Schuit, & Verschuren, 2010; Taylor, Ussher, & Faulkner, 2007). In general, in the first review for the effects of exercise on smoking cessation the findings revealed a moderate to large acute effect of exercise on smoking cravings (Taylor et al., 2007), whereas on a more recent the review the magnitude of effect sizes for "desire to smoke" and "strength of desire to smoke" ranged from 0.4 to 1.98 in favor of exercise compared to control conditions (Roberts et al., 2012). Researchers claim that although there is strong evidence that exercise sessions have an acute effect on cigarette cravings, it remains unclear which is the most effective exercise intensity to reduce cravings, as well as, what are the underlying mechanisms associated with these effects.

In the present study, we address the issue of exercise motivation by examining preferences for two forms of PA, namely "self-selected" and "set" forms of PA. In previous randomized trials where participants are assigned to different exercise intensities their preferences towards exercise intensity is not taking into account and we assume that their preferences might have an effect not only to cigarette cravings but also to their mood and adherence to exercise. In general, a PA program is said to be "self-selected" (or chosen) when the actor regulates exercise intensity. In contrast, a PA program is "set" when the instructor selects the exercise intensity (Ekkekakis, Parfitt, & Petruzzello, 2011). This distinction between "self-selected" and "set" intensity is important to be made because individuals usually exhibit more positive attitudes towards "self-selected" than "set" exercise programs. Indeed, based on tenets of Deci and Ryan (1985) self-determination theory it is possible to predict that individuals would prefer "self-selected" forms of PA because the process of self-selection and choice satisfies the psychological need for autonomy by leading individuals feel like the authors and origins of their own behaviors. In contrast, according to tenets of self-determination theory, individuals show a much weaker preference for "set" forms of PA because they feel compelled to engage in exercise programs when somebody else is choosing the intensity of exercise for them. These feelings of control undermine preference for "set" exercise programs because perceptions of control thwart the psychological need for self-determination (Deci & Ryan, 1985). In accordance with these propositions a number of studies targeting non-smokers have documented that individuals are more likely to adhere to "self-selected" exercise programs than set exercise programs (Teixeira, Carraça, Markland, Silva, & Ryan, 2012).

The present study extends previous research by examining whether smokers also display preference for "self-selected" exercise. This extension is important because it has the potential to reveal strategies that are effective in promoting PA participation among smokers and shed more light to the underlying mechanisms of how exercise affects cigarette cravings. Overall the primary purpose of the current study was to examine preferences for "self- selected" or "set" forms of exercise among smokers. In addition, interviews immediately after the exercise sessions aimed to explore how participants explain their preference and how they perceive the effects of the post-exercise session on their urge to smoke.

2. Materials and methods

To answer the research questions both quantitative and qualitative data were collected at the same time (during the experiment) and the information from both has been integrated at the end to interpret the overall results.

2.1. Participants

Participants were 20 adults (9 males and 11 females; mean age 27.10 ± 7.37 years, mean BMI of 23.30 ± 3.82), heavy smokers (mean cigarettes per day 16.03 ± 8.75; mean Fagerstrom nicotine dependence score 5.50 ± 2.48), and physically inactive (as assessed through the International Physical activity Questionnaire [Craig et al., 2003]—short form; IPAQ, www.ipaq.ki.se). Participants were asked to abstain from smoking the night before. Carbon monoxide (CO) levels of participants revealed that they indeed followed instructions and abstained from smoking. (<15 ppm, mean = 8.96 ± 3.98 and 7.90 ± 3.24 for the two conditions; PICO Smokerlyser; Bedfont, Rochester, UK).

Four of the participants have been interviewed to clarify their preference of the exercise condition and intensity (self-selected vs. set) based on Deci and Ryan (1985) self-determination theory (challenge and feeling of competence, sense of self-control and self-regulation of mood/feelings and body condition, and familiarity with the experimental procedure the second time).

2.2. Procedure and materials

After gaining institutional ethics approval and obtaining assent and written informed consent from them, smokers were informed about the confidentiality of the data and their rights to refuse participation. We adopted a repeated measures design in which participants exercised on a cycle ergometer (Monark874E, Sweden) for 30 min at two different occasions. In one occasion, the exercise intensity was "self-selected" because the participant chose the intensity of PA. In contrast, in another occasion the exercise intensity was "set" because the instructors chose the exercise intensity. There was one-week interval separating the two different exercise sessions. The order of "self-selected" and "set" forms of PA was counterbalanced across participants.

In the "set" condition, participants were required to keep their HR at an estimated 55% of their HR reserve. In contrast, in the "self-selected" condition participants could choose and alter the cycling load according to their preferences. During the cycling task, the following variables were monitored every 5 min: Heart Rate (HR; Sports Tester PE 3000, Polar Electro, Kempele, Finland), Rate of Perceived Exertion (RPE; Borg Scale), and power output in Watts (PO; calculated based on revolutions per minute, distance per revolution in meters, and resistance in kilograms). These variables were measured for descriptive purposes, but also to control the effect of exercise intensity on preference for exercise protocol.

Two items drawn from the Questionnaire of Smoking Urges-Brief (QSU-brief; Cox, Tiffany, & Christen, 2001) were used to assess smoking urge (e.g. I have an urge for a cigarette), before, immediately after, 30 min after and 60 min after the completion of the cycling. These items were measured on a seven-point scales ranging from 1 (not at all) to 7 (very much). Participants' preference regarding the two exercise protocols was assessed through a self-report instrument including two items that measured relative preference between the two exercise protocols (*I liked more the exercise program … It is more likely to follow an exercise program like the one …*). These items were measured on a seven-point scale ranging from -3 (of my first exercise session) to 3 (of my second exercise session).

Interviews took place immediately after the second condition and interviewed participants were selected based on their preference of the exercise condition and the order of execution. Main interview questions were: "Why you prefer this exercise condition compared to the other one?" Why you think urge to smoke decreased immediately after exercise?" "Why you think urge gradually

increased after an hour?" Probes were used based on their answers to get more information regarding their perceptions, feelings, thoughts, interpretations, etc.

3. Results

3.1. Quantitative analyses

One-way repeated measures MANOVA was conducted to test for differences in heart rate, exhale CO levels, and urge for smoking at baseline for the two conditions. The analysis showed a non-significant multivariate effect, F (3, 17) = 0.92, p = .451. Descriptive statistics for the baseline measures are presented in Table 1.

One-way repeated measures MANOVA was conducted to test for differences in heart rate, perceived exertion, and power output in the two exercise conditions. The analysis showed a significant multivariate effect, F (3, 17) = 3.64, p = .034. Examination of the univariate statistics showed that the difference was significant for all variables; for rate, F (1, 19) = 5.14, p = .035; for perceived exertion, F (1, 19) = 5.38, p = .032; and for output, F (1, 19) = 9.71, p = .006. Mean scores for the three variables were higher in the set intensity condition. Descriptive statistics for the exercise measures are presented in Table 1.

Two-way (2 × 4) ANOVA with two repeated factors (condition, time) was conducted to test for differences in urge for smoking for the two conditions. The analysis showed a significant main effect for time, F (3, 17) = 17.27, p = .000, partial η^2 = .75, and a non-significant condition by time interaction, F (3, 17) = 1.49, p = .253. Examination of the pairwise comparisons showed urge decreased from pre- to post-exercise (p = *.005*), returned to baseline levels at 30 min post-exercise (p = *.595*), and increased further at 60 min post-exercise (p = *.008*). Fluctuations in smoking urge for the two groups are presented in Figure 1.

Table 1. Means and standard deviations for all the examined variables

	Set intensity		Self-selected intensity	
	M	**SD**	**M**	**SD**
Baseline				
HR	70.00	9.55	71.05	8.39
CO	8.96	3.98	7.90	3.24
Urge	3.78	2.02	3.73	2.06
Exercise				
HR	139.07	7.90	131.72	17.05
RPE	12.03	1.95	11.16	1.66
Output	84.58	23.55	75.50	19.77

Notes: HR: heart rate in beats per minute; CO: carbon monoxide; RPE: rate of perceived exertion; Output: output in watts.

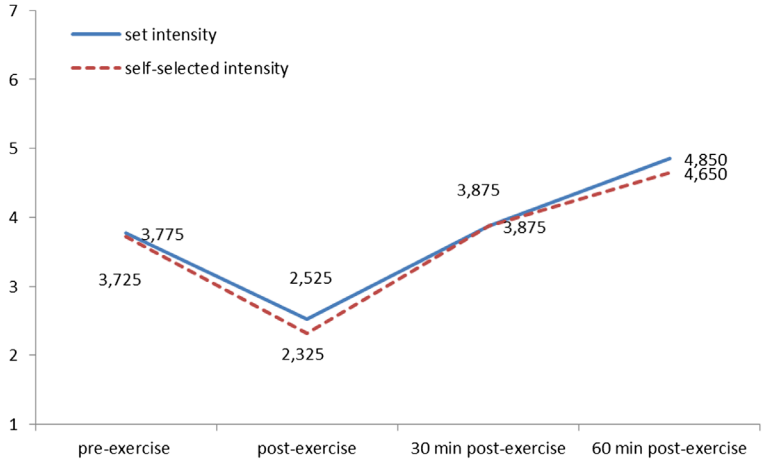

Figure 1. Smoking urges following "set" and "self-selected" intensity exercise.

A one-sample *t*-test was conducted to examine participants' preferences with regard to the two protocols. The analysis showed a significant effect, t (19) = 2.56, p = .019, with participants showing preference for the condition involving the self-selected intensity [M = 1.08 ± 1.87, on a -3 (preference for "set" condition) to 3 (preference for "self-selected" condition) scale].

3.2. Qualitative analyses

Following a post-positivistic approach data were analyzed under the focus of the self-determination theory regarding participants' explanations for their preferences. Thematic analysis (Boyatzis, 1998) revealed interesting qualitative information. First and second-order themes are displayed on Table 2.

Table 2. First and second-order themes (n = 4) of thematic analysis

Questions	1st order themes	2nd order themes
Why "self-selected"?	Because you can challenge yourself as much as you want	Competence
	Because I feel more competent	
	Because it gives you a sense of self- control vs. the other condition where others tells you what to do	Autonomy
	Because I can regulate how tired I am	
	Because I can regulate how pleasant I feel	
	Because I can regulate how painful my muscles are	
	Because I can regulate the exercise intensity my self	
	Because now I am more familiar compared to the first time I exercised	Familiarity
Why "set"?	Because when I selected the intensity the first time I was very exhausted, whereas this time the researchers kept a stable medium intensity and it was easier and more pleasant for me.... (the researchers) regulated the intensity and I realized that this was closer to what my body could do and not to what I thought I wanted to do, and that's why was much more pleasant	Bad choice
Why urge decreased immediately after exercise?	Because the feeling on the lungs immediately after exercise is nice, I could breathe deep and I didn't want to destroy it by smoking	Body
	Because you feel that exercise cleans your body from toxins so you can feel the positive change	
	Because my all body was in a different and unusual condition.... I am not used to be physically active lately and I get tired easily	
	Because I know that those two behaviors (exercise and smoking) cannot be combined.... I know that exercise is beneficial for me and smoking is harmful so they do not go together...	Attitudes
Why urge was gradually increased after an hour?	The higher the exercise intensity the longer was the time that urge to smoke appeared	Exercise intensity
	Because this time the exercise intensity was lower compared to the previous time that was very hard for me	
	Because I started thinking that I was exercising and I haven't smoke all that time	Long abstinence
	Because I haven't smoke since yesterday	
	Because by smoking I would relax after the tension of the exercise session	Relax after exercise tension
	Because the researchers were asking me all the time "How much do you want to smoke now?" and that way they stimulated my urge to smoke...	Experimental procedure

Across the four interviews, interviewees' explanations of why they preferred the "self-selected" exercise condition were related to their perceived competence (challenge and feeling of competence), perceived autonomy (sense of self-control and self-regulation of mood/feelings and body condition), and the experimental condition (more familiar with the experimental procedure the second time). The one participant who preferred the "set" exercise condition attributed his choice to his negative experience on the "self-selected" condition because he overloaded himself due to his unfamiliarity with the specific exercise session.

Interviewees attributed their decreased urge immediately after exercise to the perceived beneficial effects of the exercise on their body (breathing and sweating) and to their attitude that exercise and smoking do not much together. Whereas, they attributed the gradually increased urge after an hour to the different exercise intensities conditions, to the overall prolonged abstinence, to their need to relax after exercise tension, and to the experimental procedure.

4. Discussion

The present study extended previous research by examining preferences for "self-selected" and "set" forms of PA among a sample of heavy smokers. Results demonstrated that participants exhibited a preference for "self-selected", as opposed to "set", forms of PA.

In accordance with previous research (Taylor et al., 2007) we found that effects of cycling on urges to smoke were temporary because urge to smoke increased to baseline levels at 30 and 40 min post-exercise periods (5.05 vs. 5.93 $p < .05$) (see Figure 1). The post-exercise rise of smoking urge beyond the pre-exercise levels may be attributed to the long period of smoking abstinence before the onset of the experimental procedures (e.g. Roberts et al., 2012).

Interestingly our results showed that in the self-selected intensity condition participants adopted a lower intensity compared to the condition where the intensity was set by the experimenters; yet both conditions could be described as within the moderate intensity range. Importantly, the difference in the intensity did not produce differences in the patterns of smoking urge following the exercise. Considering that participants expressed preference for the self-selected condition, the present findings suggest that providing individuals the comfort to select the physical load will be equally effective in terms of smoking outcome, however more motivationally effective, as it may promote a sense of autonomy, that has been linked to more adaptive motivational and behavioral outcomes in PA settings.

Interviewees' comments explaining their preference on the "self-selected" condition regarding perceived competence, autonomy and feelings of pleasure and enjoyment, support further the hypothesis that self-determination theory explains their preference. Nevertheless, the comment of the interviewee who explained his preference for the "set" condition as a result of his exertion when he had the "self-selected" exercise session implies that there is always a possibility a "self-selected" intensity being too low to be effective or too high to be safe (Lind, Joens-Matre, & Ekkekakis, 2005).

Participants' explanations on why urge decreased immediately after exercise were mainly related to the immediate effects of exercise to their body, an effect that has been also identified in a study by Hassandra, Zourbanos, Kofou, Gourgoulianis, and Theodorakis (2013). Attitudes towards exercise and smoking were also mentioned as a reason. It has been found in an earlier study that women who had higher exercise expectancy and credibility beliefs reported significantly greater reductions on craving and withdrawal following an acute bout of exercise (Harper, 2011). Most of the comments on why they thought their urge gradually increased after the exercise sessions were related to reasons of prolonged abstinence and stress release.

Finally, the experimental procedure itself, where researchers were asking from the participants to rate their urge at the end, 30 min after and 60 min after the completion of the cycling, was also reported a stimulus for their increased urge. According to an experiment of Field, Mogg, and Bradley (2004)

smokers experience increased cravings and exhibit an attentional bias towards smoking-related stimuli when compared with matched neutral stimuli. Thus, the measurement of urge itself may have stimulated implicit cognitive processes that may reflect an individual's motivation to smoke and this can have an effect on the urge measurements. This might be an implication that there is a need to develop other ways to measure urges than the ones we used.

Due to the nature of the study (initial investigation) the number of participants was limited; therefore, findings may not generalize to other subjects or other settings. Nevertheless, using a mixed methods approach helped us to cross validate the findings from both approaches and expand our understanding behind the quantitative results.

Overall, the qualitative data supported the quantitative findings and gave insight to one more dimension that needs to be taken under account when we design exercise programs for smokers. Their preferences for the exercise intensity have to be considered, because this way the needs for autonomy and competence can be met with consequent effects on their motivation and adherence to exercise. These findings give an additional hint that there is a need to move from a prescription-based to a preference-based prescription for exercise antismoking programs, as applies to other population (Ekkekakis, 2009), whereas at the same time, individuals that lack self-monitoring and self-regulatory skills might need training to avoid unwanted effects.

The fact that smokers exhibited a preference for "self-selected" forms of PA has important implications for practice. In the perspective of self-determination theory, provision of choice constitutes one strategy through which feelings of self-determination theory can be increased. According to Deci and Ryan (1985) feelings of self-determination theory can be supported more fully by (i) providing a rationale explaining why PA is important and (ii) allowing participants express their opinions about the PA programs. Hence, future PA interventions aiming to reduce smoking should implement stronger manipulations of self-determination by providing rationale and perspective-taking in addition to choice. However, the fact that smokers exhibited preference for "self-selected" forms of PA is encouraging because it shows that even a low dose intervention aiming to induce feelings of self-determination does indeed change attitudes towards PA among a sample of heavy smokers.

Overall results of the present study suggest that cycling at moderate intensity does temporarily reduce urges to smoking during post-exercise periods. Most critically the current study reveals for the first time that heavy smokers exhibit more positive attitudes towards "self-selected" than "set" forms of PA. The implication of these findings is that perceptions of autonomy should be taken into consideration when designing interventions programs aiming at smoking cessation (Ekkekakis et al., 2011).

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Competing interests
The authors declare no competing interest.

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