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Ellen Meier

*University of North Dakota*

Jeffrey N. Weatherly

*University of North Dakota, jeffrey\_weatherly@und.nodak.edu*

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## *THE EFFECTS OF NICOTINE ON GAMBLING BEHAVIOR OF SMOKING AND NONSMOKING UNDERGRADUATE STUDENTS*

Ellen Meier and Jeffrey N. Weatherly  
University of North Dakota

Gambling and smoking have been linked in the literature. The present study recruited smokers and nonsmokers to gamble on a slot machine after they chewed nicotine or non-nicotine gum. Results showed that gambling behavior, both in terms of persistence and risk taking, did not differ as a function of either smoking status or type of gum the participants chewed. Although the present study has a number of limitations, the results highlight that factors correlated with gambling do not necessarily lead to differences in gambling behavior when people actually gamble.

*Keywords:* smoking, nicotine, slot machine, non-pathological gamblers

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Gambling and smoking are similar behaviors in that people can develop a dependency for either. The prevalence rate of pathological gamblers is 1-2% (Petry, 2005) and the prevalence rate of smokers is 22% (Petry & Oncken, 2002). Interestingly, Petry, Stinson, and Grant (2005) found 60.4% of pathological gamblers smoke.

Research suggests that smoking may be related to severe gambling problems. For instance, Petry and Oncken (2002) administered the Addiction Severity Index (McLellan et al., 1985) and the Southern Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) to problem gamblers. Severity of psychosocial problems, such as taking psychiatric medications or displaying symptoms of mental illness, were higher in treatment-seeking gamblers who smoked than in those who did not. Further, 62% of the sample smoked,

compared to the 22% prevalence rate in the general population.

Research also suggests that smokers tend to display more impulsive behaviors than nonsmokers (Mitchell, 1999). Other research (Krishnan-Sarin et al., 2007) has shown that smokers who were unable to become smoke free after receiving treatment for smoking cessation displayed more impulsivity than those who were able to become smoke free. Both of these studies, as well as others (e.g., Petry, 2001), supported the idea that smokers show more discounting of delayed rewards than nonsmokers, a finding also seen in problem gamblers (e.g., Dixon, Marley, & Jacobs, 2003).

The present study was a initial test of whether smokers might gamble differently than nonsmokers and whether such a difference could possibly be attributed to nicotine. Smokers and nonsmokers were recruited to

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Address Correspondence to:

Jeffrey N. Weatherly

Department of Psychology

University of North Dakota

Grand Forks, ND 58202-8380

E-mail: jeffrey\_weatherly@und.nodak.edu

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gamble on a slot machine. Half of the participants chewed nicotine gum prior to the gambling session while the other half chewed sugarless, nicotine-free gum. If smoking and problem gambling are influenced by the same underlying causal mechanism, then you would predict greater gambling in smokers than nonsmokers. If this potential difference is related to the presence of nicotine, then you would predict that gambling would be greater when participants received nicotine than when they did not, even among the non-smoking participants.

## METHOD

### *Participants*

Participants were 20 undergraduate students, ten (5 female) who were smokers and 10 (5 female) who were nonsmokers. All participants were 21 years of age or older and scored below a 5 on the SOGS (Lesieur & Blume, 1987). Participants ranged from 21 to 41 years old ( $M = 24.15$  years old,  $SD = 5.01$  years). The range of SOGS scores was 0 to 4 ( $M = 1.55$ ,  $SD = 1.43$ ).

### *Materials and Apparatus*

Participants completed several measures. One was an informed consent form. They also completed a demographic questionnaire that asked about their age, gender, marital status, ethnicity, and annual income. Information on these factors was collected because each factor is related to pathological gambling (Petry, 2005).

The next questionnaire was the SOGS (Lesieur & Blume, 1987). The SOGS is a widely used screening tool utilized to detect the potential presence of pathological gambling (see Petry, 2005). It contains 20 items that pertain to the person's gambling experience and history. A score of 5 or more on the SOGS is indicative of the potential presence of pathology.

Participants completed the Fagerstrom Test for Nicotine Dependence (FTND; Hea-

therton, Kozlowski, Frecker, & Fagerstrom, 1991) as a test for nicotine dependence. The FTND consists of six questions on smoking behaviors and their frequency. Participants scoring above seven have a high level of addiction to nicotine. A score between four and six indicates a medium level of addiction while a score of three or less indicates a low level of (or no) addiction to nicotine. The FTND has been shown to have good reliability and validity (Buckley et al., 2005).

The nicotine gum (Nicorette, GlaxoSmithKline) contained 2 mg of nicotine. The level of nicotine in the gum is lower than the level in cigarettes and is released more slowly than cigarettes (GlaxoSmithKline Consumer Healthcare, 2007). The gum is designed to keep nicotine in the nervous system for a total of 30 minutes. The non-nicotine gum was a sugarless gum of similar flavor to the nicotine gum (i.e., Dentyne Ice, Cadbury Adams USA).

Participants completed the surveys and gambling sessions in a windowless room containing three slot machines. Only one machine was used in the present study, which was a Triple Diamond (International Gaming Technology). The machine allowed up to two tokens to be bet at one time and was programmed at an 87% payback rate. The slot machine recorded the total number of coins inserted into the machine and the total number of coins paid out. The number of trials played was recorded by hand.

### *Procedure*

Smokers and nonsmokers were recruited through the psychology department's subject pool. Individuals who volunteered to participate were run individually. Prior to his/her arrival, the researcher randomly assigned the participant to either the nicotine or non-nicotine gum group. Thus, there were four groups: Smokers – nicotine gum, Nonsmokers – nicotine gum, Smokers – non-nicotine gum, and Nonsmokers, non-nicotine gum.

After completing the informed consent process, the research gave the participant the assigned piece of gum and instructor him/her to chew it (consistent with the instructions on chewing the nicotine gum). Once the participants were chewing the gum, they completed the surveys. The SOGS was the initial measure and the researcher scored it immediately after completion. Participants were excused from the study if they scored 5 or more on the SOGS. However, no participant had to be dismissed. While the researcher was scoring the SOGS, the participant completed the remaining measures. This process took 5 – 10 min to complete.

After completing the surveys, the research gave the participant 100 tokens worth five cents each. The researcher then read the following instructions:

You will now be given the opportunity to play on a slot machine. You will be given 100 tokens worth five cents each. Thus you are being given five dollars to play with. You may bet as many credits per play as the machine allows. Your goal should be to end the session with as many tokens as you can. You may end the session at anytime by informing the researcher that you would like to end the session. The session will end when a) you quit playing, b) you run out of tokens, or c) 30 minutes has elapsed. At the end of the experiment you will be paid in cash for the number of tokens you have left or have accumulated. Do you have any questions?

Questions were answered by repeating the above instructions. The participant then played the slot machine until one of the criteria for ending the session was met. At that time, the researcher debriefed the participant, paid him/her for the credits the participant had won or had remaining, and dismissed the participant.

## RESULTS AND DISCUSSION

Data from the FTND indicated that the self-reported smokers did differ from the non-

smokers. An independent-samples *t* test showed that smokers scored significantly higher ( $M = 2.60$ ,  $SD = 2.41$ ) on the FTND than did nonsmokers ( $M = .60$ ,  $SD = 1.07$ ;  $t(18) = 2.39$ ,  $p = .028$ , two tailed). These results, and those that follow, were considered significant at  $p < .05$ .

Two measures of gambling behavior were of interest in the present study. The first was the number of trials played, which is a measure of persistence. The number of trials played by individual participants were analyzed by conducting a two-way (Smoking status X Type of gum) ANOVA. The main effect of smoking status was not significant ( $F < 1$ ), indicating that the number of times participants played the slot machine did not differ as a function of whether or not the participant was a smoker. The main effect of type of gum was also not significant ( $F < 1$ ), indicating that the type of gum chewed also did not influence the number of gambles participants made. The interaction between smoking status and type of gum was also not significant ( $F < 1$ ).

The second measure of interest was the total number of credits participants bet across the session, which is a measure of risk. A two-way (Smoking status X Type of gum) ANOVA failed to find a significant main effect of smoking status ( $F < 1$ ), main effect of type of gum ( $F(1, 16) = 2.27$ ,  $p = .152$ ,  $\eta^2 = .124$ ), or interaction ( $F < 1$ ). For the main effect of type of gum, participants receiving the nicotine gum bet an average of 105.0 credits ( $SD = 50.33$ ) when gambling whereas those receiving the non-nicotine gum bet an average of 178.8 credits ( $SD = 138.75$ ).

Results of the present study do not support the idea that smokers gamble longer or more money than nonsmokers, at least in a limited laboratory gambling situation. It also failed to support the idea that nicotine influences gambling behavior. In fact, only one effect approached statistical significance, and that result suggested that, if anything, nicotine

inhibited, rather than promoted, gambling behavior. Thus, one could potentially conclude that the link between smoking and gambling reported in the literature (e.g., Mitchell, 1999) may not be a causal one and that both behaviors may be related to some other factor not investigated in the present study.

Before accepting such a conclusion, however, one needs to recognize that the present study presents only null results, at least in terms of gambling behavior. It is also the case that the present study had a number of potentially major limitations. The *n* size, for instance, was quite small and would have needed to be increased tenfold for most of the present effects to reach statistical significance. Although we were successful in recruiting smokers and nonsmokers, we did not explicitly control when the smokers had last smoked. It is possible, for instance, that some of them had smoked immediately prior to the session or, if they had, different results would have been observed. Further, the dose of nicotine provided to the participants who received the nicotine gum was small and the delivery system used in the present study (i.e., gum) is not the ideal method of nicotine administration. With that said, finding that those participants bet fewer credits than did participants who received the non-nicotine gum, albeit the difference was not significant, suggests that the nicotine gum, even at a low dose, may have been aversive.

Despite failing to find that smokers differed in their gambling from nonsmokers or that nicotine influenced gambling behavior, the present study should serve to highlight a weakness in the literature on gambling. Specifically, there are a number of reported links between gambling and other factors (e.g., smoking) that can be found in the literature. The relationship with smoking, for instance, looks quite strong (e.g., finding that 60.4% of pathological gamblers smoke; Petry et al., 2005). However, these links may not, as in the present study, produce different behaviors

when these different individuals gamble. Thus, we are left uncertain as to exactly what the relationship might be and how gambling behavior is ultimately affected by these other factors or if it is even directly affected at all. In our opinion, additional studies that employ experimental, rather than correlational, methodology will likely be required to discover the mechanisms underlying these relationships.

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