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Examining Hookah Use among U.S. College Students

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Examining Hookah Use among U.S. College Students

by

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Abstract

Examining Hookah Use among U.S. College Students Yen

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Hookah smoking has become a popular form of tobacco use among college students. However, there is limited research exploring the risk factors associated with hookah use among this population. This study examined two risk factors, harm perceptions and beliefs about government evaluation of hookah, associated with current use of hookah among 18-24 year old college students, and looked at differences between current hookah users and non-users on cigarette smoking status, various demographic characteristics, and the two risk factors (harm perceptions and beliefs). Participants were 5,028 university students aged 18-24 (*M* age = 20.5 years; 59.6% female) from seven public universities within a larger university system. Students completed an online survey, which assessed their knowledge, beliefs, and behaviors related to hookah use. In this sample, 10.8% of participants reported current or past 30-day hookah use. There were differences between current hookah users and non-users on cigarette smoking status, gender, race/ethnicity, harm perceptions, as well as beliefs about government evaluation of hookah. Cigarette smokers, males, non-Hispanic White students, students reporting lower harm perceptions regarding hookah use, and those who believed the government evaluates hookah for safety were significantly more likely than their peers to be current hookah users. Results from a logistic regression analysis indicated that after controlling for cigarette smoking status, gender, and race/ethnicity, harm perceptions of hookah use, but not beliefs about government safety evaluation of hookah, was associated with an increased likelihood of

current hookah use. Cigarette smoking was the strongest correlate of current hookah use; current cigarette smokers were seven times more likely than non-smokers to have used hookah in the past 30 days. Findings point to the necessity of educating college students, particularly cigarette smokers, about the dangers of hookah use. Additionally, tobacco prevention and cessation programs should be implemented in order to reduce initiation and continued use, and it is important to educate college student smokers about the dangers of dual use of this product with cigarettes.

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Introduction

While cigarette smoking has declined since 2005, an alternative form of tobacco use known as hookah or water pipe has rapidly become popular among college students across the United States (U.S.) (Centers for Disease Control and Prevention., 2014; Cobb et al., 2010; Eissenberg, Ward, Smith-Simone, & Maziak, 2008; Maziak, 2008; Primack et al., 2008). Research indicates that approximately 40% of college students have ever smoked hookah, and between 9.5% and 22% smoked it within the past 30 days (Ahmed et al., 2011; Heinz et al., 2013; Latimer, Batanova, & Loukas, 2014; Primack et al., 2008; Sutfin et al., 2011). College students may be particularly vulnerable to hookah initiation and use because of permissive social norms, reduced parental supervision, and identity exploration that are characteristic of this population (Arnett, 2005). Despite the high rates of hookah use among college students, relatively little research examines factors associated with the use of this tobacco product. The purpose of this study was to examine the role of two risk factors (harm perceptions regarding hookah use and beliefs about government evaluation of hookah) in current or past 30-day use of hookah among 18-24 year old college students. We also explored differences between hookah users and non-users on current cigarette smoking status, various demographic characteristics, and the aforementioned risk factors.

Although college students are at elevated risk for hookah use, certain students are more likely than their peers to use this tobacco product. Non-Hispanic White students and freshmen are significantly more likely than their counterparts to have tried hookah in the past 30 days (Aljarrah, Ababneh, & Al-Delaimy, 2009; Dugas et al. 2010; Fielder, Carey, & Carey, 2012; Sutfin et al., 2011). Aljarrah and colleagues (2009) found that non-Hispanic White students are more likely than other racial/ethnic students to be current hookah users. Eissenberg et al. (2008)

reported similar findings, which indicated that African American students had a lower likelihood of past-year hookah smoking than non-Hispanic White students. Freshmen may be at higher risk than their older peers to smoke hookah because most of them are not old enough to drink alcohol legally. Therefore hookah, commonly used in social settings called hookah bars or lounges, may be an appealing tool for socialization in public with friends among these youngest college students (Sharma, Beck, & Clark, 2013). Fielder, Carey, and Carey (2012) found that the highest rates of hookah initiation occurred during the first two months of students' first semester of college. Results from another study showed that 60% of adult hookah users reported first-time hookah use at or before age 18 (Smith-Simone et al., 2008). Cigarette smokers are also more likely than non-smokers to be current hookah users (Eissenberg et al., 2008; Sterling & Mermelstein, 2011). Heinz and colleagues (2013) found that life-time hookah use was associated with a greater likelihood of having smoked cigarettes, and cigarette smoking is one of the strongest predictors of current hookah use (Grekin & Ayna, 2008; Primack et al., 2008; Sutfin et al., 2011; Sterling & Mermelstein, 2011).

Hookah smoking poses several health risks, many of which are similar to cigarette smoking (Bedwani, El-Kwbsky, & Renganathan, 1997; Boffetta et al., 1999; Cobb et al., 2010; Eissenberg & Shihadeh, 2009; Maziak et al., 2009; Maziak, 2011). Hookah tobacco contains many of the same toxic chemicals that are found in cigarettes, such as carbon monoxide, tar, and heavy metals (i.e., arsenic, chromium, cobalt, cadmium, nickel, lead). However, hookah tobacco contains more nicotine than cigarettes (Shafagoj, Mohammed, & Hadidi, 2002; Shihadeh, 2003; Shihadeh & Saleh, 2005). Compared to smoking a single cigarette, a single hookah tobacco session of 45 minutes or more exposes users to a higher dosage of nicotine, greater levels of carbon monoxide, and more than 40 times the smoke volume (Eissenberg & Shihadeh, 2009). Furthermore, continued hookah use has been shown to lead to subsequent tobacco addiction,

tobacco-related cancers (e.g., lung and oral cancers), cardiovascular diseases, certain infectious diseases (e.g., hepatitis, tuberculosis), and respiratory illnesses (Blachman-Brauna et al, 2014).

Despite evidence demonstrating the potential health risks of hookah smoking, many college students—particularly hookah users—perceive hookah as less harmful than other tobacco products (Cobb et al., 2010; Eissenberg et al., 2008; Heinz et al., 2013; Jackson & Aveyard, 2008; Primack et al., 2008; Smith-Simone, Curbow, & Stillman, 2007; Sutfin et al., 2011). College students (hookah users and non-users) reported hookah use was less harmful than cigarette smoking (Heinz et al., 2013; Noonan et al., 2013; Sutfin et al., 2011). College hookah users tend to underestimate the health risks of hookah use, largely because of its aesthetic appeal, including the sweet smell and taste of flavored tobacco, and the belief that water “filters” smoke, thereby reducing toxicant exposure (Aljarrah, Ababneh, & Al-Delaimy, 2009; Maziak et al., 2004; Smith-Simone, Curbow, & Stillman, 2008). According to several theories, such as the Health Belief Model (Rosenstock, 1974), Theory of Reasoned Action (Fishbein & Ajzen, 1975), and Theory of Planned Behavior (Ajzen, 1985), individuals’ perceptions of the consequences of their behaviors and their vulnerability to those consequences, play a key role in their behaviors. Although few studies have examined predictors of hookah use, research by Primack and colleagues (2008) as well as Sutfin and her colleagues (2011), indicates that college students who perceive less harm associated with using this product have a higher likelihood of hookah use. However, Primack et al. (2008) drew their conclusions based on a survey collected from one college and while Sutfin et al. (2011) was based on data from multiple institutions, it was limited to college students in North Carolina. Data from larger samples at multiple colleges in different parts of the country are needed to better understand the association between harm perceptions and hookah smoking among college students.

Investigations on the relationship between harm perceptions of tobacco products and tobacco use have extended to individuals' beliefs about government safety evaluation. Limited research indicates that incorrect beliefs about existing government safety evaluation of tobacco products have been associated with tobacco use. For example, Kaufman and colleagues (2011) found that cigarette smokers who believed the Food and Drug Administration evaluates cigarettes for safety have lower intentions of quitting cigarette smoking. According to the Theory of Planned Behavior (Ajzen, 1985), individuals' intention to engage in a behavior is predicted by their subjective evaluation of the benefits and risks of that outcome. If people believe the government regulates hookah, this false sense of safety may be associated with the outcome of hookah use. Latimer, Batanova, and Loukas (2014) assessed college students' beliefs of government evaluation of hookah. The results showed that cigarette smokers were more likely than non-smokers to have the misconception that the government evaluates hookah for safety. However, this study did not examine if current hookah users are more likely than non-users to believe that the government evaluates hookah for safety. Moreover, the authors did not explore whether beliefs about government evaluation of hookah can contribute to the likelihood of hookah use.

In summary, college students are at elevated risk for hookah use, yet little research examines the risk factors associated with current hookah use, and explores the differences between hookah users and non-users on various variables among this population. To address the current gaps in the literature, this study: 1) examined differences between hookah users and non-users on cigarette smoking status, various demographic characteristics, and two risk factors, and 2) assessed the roles of current cigarette smoking, various demographic variables, harm perceptions and beliefs about government evaluation of hookah in current hookah use among 18-24 year old college students. In particular, four hypotheses were tested: 1) Cigarette smokers,

males, non-Hispanic White students, and freshmen would be more likely than their counterparts to be hookah users; 2) Hookah users would report lower harm perceptions regarding hookah use than non-users; 3) Hookah users would be more likely than non-users to report the government evaluates hookah for safety; and 4) After controlling for cigarette smoking status, gender, and race/ethnicity, college students' harm perceptions and beliefs about government safety evaluation of hookah would be uniquely associated with current hookah use.

Methods

PARTICIPANTS

This study included 5,028 college students (59.8% females) aged 18 to 24 years old ($M = 20.53$; $SD = 1.71$), attending one of seven universities in a large southwestern university system during the spring of 2012. The sample was ethnically diverse with 54.6% Hispanic students, 31.8% non-Hispanic White students, 3.5% African American students, and 10.1% who reported another race/ethnicity. The demographics of the current sample closely matched the most recent demographic data for all enrolled undergraduates in the system, with the exception of females and Hispanics/Latinos, who were overrepresented. College classification of the sample was 21.8% freshmen, 20.8% sophomores, 26.9% juniors, and 30.6% seniors or greater.

PROCEDURE

The Institutional Review Board from the University leading the study gave approval to collect data in the spring of 2012. Upon this approval, open records requests through the Public Information Act were submitted for the provision of student e-mail addresses from the seven universities. In fall 2011, undergraduate enrollment at the seven universities ranged from 3,094 to 38,437, summing to a total of 120,280 students. Almost 86,000 (85,659) student emails were provided through the open records request. After removal of 871 bounce-backs and 604 unsubscribed students, the adjusted sampling frame was 84,184 students. In early spring 2012, students received an introductory email explaining the purpose of the study and indicating that an electronic survey invitation would be distributed two to three days later. The invitation provided a brief survey description and the hyperlink to the survey. Interested students followed a link embedded in the invitation e-mail that led to the online survey. Students who did not participate in the survey were sent a reminder 10 days after the initial survey invitation and a final reminder

nine days later. The survey was closed four days after the final reminder. To motivate student participation, participants who completed the online survey had the opportunity to enter into a prize drawing to win one of fifty \$20 gift certificates. Upon completion of the survey, students were asked if they would be willing to participate in the second wave of the study. Of the 84,184 students who received an e-mail invitation, 8,904 agreed to participate, but after excluding those who were graduate students ($n = 1,080$), and those who were not 18-24 years of age ($n = 2,796$), the final sample was 5,028.

The online survey consisted of 30 items assessing students' knowledge, beliefs, and behaviors related to traditional and alternative tobacco products, tobacco product marketing, and campus tobacco policies. Students were asked to complete the survey at their own convenience, but to allow themselves at least 15 minutes of free, uninterrupted time. Students could skip any question and they could end the survey at any time. For the purposes of this study, only prevalence of hookah use, harm perceptions of hookah, and beliefs about government safety evaluation of hookah were examined.

MEASURES

Current Cigarette and Hookah Use

Current cigarette and hookah use were assessed with a question modeled after an item developed by the Centers for Disease Control and Prevention (Starr et al., 2005), asking students, "During the past 30 days, on how many days did you use _____?" Participants selected the number of days, '0 days', '1-2 days', '3-5 days', '6-9 days', '10-19 days', '20-29 days', and 'all 30 days'. The items were recoded into dichotomous variables, with '0' indicating that participants did not use the product on any of the previous 30 days and '1' that participants used

the product at least once in the previous 30 days. Overall, 18.6% of the participants reported current cigarette use and 10.8% reported current hookah use.

Harm Perceptions of Hookah Use

One item adapted from the Texas Youth Tobacco Survey assessed participants' perceptions of the harm associated with hookah use. Participants were asked, "How dangerous do you think each of the following tobacco products is?" Participants reported how dangerous they thought hookah was on a scale ranging from 1 ('Not dangerous at all') to 4 ('Very dangerous'), with higher scores reflecting more perceived harm.

Beliefs about Government Safety Evaluation

An item adapted from the Beliefs About Alternative Nicotine Delivery Devices (BAND) questionnaire (Kaufman et al., 2011) assessed participants' beliefs about government safety evaluation of hookah. Students were asked, "Indicate which of the following products you think the government evaluates for safety before they are sold to consumers." Response options were 'yes,' 'no,' or 'don't know.' This variable was recoded into a dichotomous variable (0 = No, 1 = Yes) and participants who indicated 'don't know' (27.9%) were removed from the analyses.

Results

Chi-square analyses were conducted to test the first study hypothesis and determine if there were differences among hookah users on current cigarette smoking status and various demographic characteristics (see Table 1). Chi-square analyses indicated that cigarette smokers were more likely than non-smokers to report current, or past 30 day, hookah use, and males were more likely than females to report current hookah use. Regarding race/ethnicity, there were overall differences between the four groups (see Table 1). A series of chi-square analyses were conducted to determine differences between White students and three other groups, African American students, Hispanic students, and Other race/ethnicity students (see Table 2). Results indicated that non-Hispanic White students were significantly more likely than Hispanic students to report current hookah use, but there were no differences in current hookah use between non-Hispanic White students and African American students or between non-Hispanic White students and Others. Finally, chi-square analyses indicated that there were no significant differences in hookah use across the four college classifications (i.e., freshman, sophomore, junior, and senior or greater).

The second and third study hypotheses, regarding differences between current hookah users and non-users on harm perceptions and beliefs about government safety evaluation of hookah, were examined. Results from an independent samples t-test indicated that compared to hookah non-users ($M = 3.00$; $SD = 0.91$), current hookah users ($M = 2.37$; $SD = 0.86$) reported lower levels of harm associated with hookah ($t(4258) = 13.75$, $p < .001$). Regarding students' beliefs about government evaluation of hookah, nearly 40% (37.9%) of college students from this sample believed that hookah was evaluated. A chi-square analysis indicated that current hookah

users were more likely than nonusers (43.9% versus 37.0%) to believe that the government evaluates hookah for safety ($\chi^2(1) = 7.64, p < .01$).

Logistic regression analyses were conducted to test the fourth study hypothesis and examine if harm perceptions and beliefs about government safety evaluation of hookah were associated with current hookah use. Two models were developed to address this hypothesis. Model 1 included current cigarette smoking status and the demographic variables of gender and race/ethnicity, and Model 2 added harm perceptions and beliefs about government safety evaluation of hookah (see Table 3). Results from Model 1 indicated that current cigarette smokers were more likely than non-smokers to be current hookah users. In fact, the odds of reporting current hookah use for cigarette smokers were 8.15 times higher than for non-smokers. There were no differences on hookah use by gender. Students who reported as Other race/ethnicity were more likely than non-Hispanic White students to report hookah use and no additional race/ethnicity differences were observed. After controlling for cigarette smoking status and the demographic variables, Model 2 showed that students' harm perceptions of hookah was significantly associated with current hookah use, but their beliefs about government safety evaluation of hookah was not. Students who held lower harm perceptions associated with hookah use had a higher likelihood of current hookah use than their peers. Finally, current cigarette use was the strongest correlate of current hookah use. Cigarette smokers were seven times more likely than non-smokers to have used hookah in the past 30 days.

Discussion

Few studies have examined risk factors associated with the current use of hookah among 18-24 year old college students. Results from this study fill a gap in the literature by examining two risk factors association with hookah use among 18-24 year old college students, and exploring differences between hookah users and non-users on various variables. In this study, 10.8% participants reported current hookah use. Results indicated that hookah users and non-users varied on cigarette smoking status, gender, racial background, harm perceptions, and beliefs about government evaluation of hookah. Finally, when examined simultaneously, results showed that current cigarette smoking status and harm perceptions were uniquely associated with current hookah use, whereas beliefs about government safety evaluation of hookah were not.

In examining the differences between college hookah users and non-users, there were several significant findings. Consistent with previous studies (Eissenberg et al., 2008; Sterling & Mermelstein, 2011; Sutfin et al., 2011), results indicated that current hookah users were more likely than non-users to be cigarette smokers. Concurrent use of two tobacco products is often referred to as dual use. College hookah users who report dual tobacco use are a cause for concern; dual use may increase college students' risk for developing nicotine dependence, thus making it less likely for them to stop using tobacco (Post et al., 2010; Tomar et al., 2010). Moreover, when considering all other variables, cigarette smoking was the strongest predictor of concurrent hookah use, with smokers seven times more likely than non-smokers to use hookah.

Also consistent with prior research (Dugas et al., 2010; Eissenberg et al., 2008; Primack et al., 2010; Smith-Simone, Curbow, & Stillman, 2008; Sutfin et al., 2011), findings indicated that compared with females, males were more likely to report current hookah use and non-Hispanic White students were more likely than Hispanic students to use hookah (Aljarrah, Ababneh, & Al-

Delaimy, 2009; Eissenberg et al., 2008; Primack et al., 2010). However, in contrast with those studies, we found no differences in university classification. Perhaps this could be attributed to the lower prevalence of college hookah users found in our sample; hookah smoking is not as widespread as cigarette smoking, making it difficult to find any significant differences between university classification and current hookah use.

Extending limited research on college students and their harm perceptions (Heinz et al., 2013; Noonan et al., 2013; Primack et al., 2008; Sutfin et al., 2011), findings indicated that hookah users reported lower harm perceptions of hookah than non-users. Moreover, even after controlling for a number of significant variables, harm perceptions of hookah was a risk factor associated with current hookah use. The perceptions that hookah smoke is filtered through water seems to be one of the main beliefs justifying the less harmful effects of hookah (Aljarrah, Ababneh, & Al-Delaimy, 2009; Maziak et al., 2004; Smith-Simone et al., 2008). According to several health behavior theories (Ajzen, 1985; Fishbein & Ajzen, 1975; Rosenstock, 1974), students' harm perceptions of hookah smoking is a major factor contributing to its initiation among college students. Given these findings, educating college students, or even younger students (e.g., high school students), about the risks associated with hookah smoking should be considered. Moreover, additional research is needed to clarify the nature of such misperceptions about hookah smoking.

Another misperception about hookah use is the government's role in evaluating its safety. Nearly 40% (37.9%) of the participants in our study believed that the government evaluated hookah, and hookah users were more likely than non-users to inaccurately believe the government evaluates this product for safety. In contrast to previous research on cigarettes (Kaufman et al., 2011), our study did not find an association between beliefs about government evaluation of hookah and current hookah use. Although we could not find a relationship between

these two variables, government evaluation of hookah may be related to other outcomes, such as the initiation of, continued use, and disinterest in quitting hookah smoking. Since this study only examined current hookah use among college students, longitudinal research is needed to see if government evaluation of hookah can affect future hookah use.

LIMITATIONS

Despite several strengths, including a large and ethnically diverse sample of 18-to-24 year old college students, some limitations of the present study should be noted. First, these findings are limited to young adults who are attending college in one state and may not generalize to larger populations of young adults, such as non-college young adults and young adults who live outside of the current sample. Second, this study uses cross-sectional data and cannot be used to draw conclusions about factors that contribute to hookah use. An issue that has received considerable attention is the temporal relationship between use of cigarettes and hookah smoking. Several studies have questioned whether hookah smoking leads to cigarette use or is a substitute behavior for those who have quit smoking cigarettes (Asfar et al., 2005; Hammal et al., 2008; Maziak, 2011). Further research on the dual use of cigarettes and hookah, and the chronological order of tobacco product initiation is warranted. Third, a low prevalence (10.8%) of hookah use was reported in this sample, and this may explain why our findings were not consistent with previous research showing higher rates of hookah use among freshmen. Future studies should obtain larger samples, non-college young adults, and young adults who live in different states, in order to obtain more representative data. Longitudinal research is also needed to better understand the patterns and trajectories of hookah use among college students.

Conclusions

The findings in this study highlight the fact that cigarette smoking and lower harm perceptions of hookah may result in college students' increased likelihood of hookah use. More tobacco prevention and cessation programs could be implemented to reduce cigarette and hookah smoking initiation and continued use. When developing these programs, researchers and educators should take into consideration that cigarette smokers may be concurrently using other tobacco products. Findings from our study also suggest that efforts are needed on college campuses to educate students about the dangers of hookah smoking. Although we found that beliefs about government safety evaluation were not associated with current hookah use, most college students have incorrect beliefs about the government's role in evaluating hookah for safety. College students should therefore be educated about the government's role in evaluating tobacco products, and be made aware of the lack of regulations over hookah smoking. Currently, there are few intervention or cessation strategies in place for hookah use among college students. Future studies could examine other risk factors that motivate initiation and continuation of hookah use in order to better design effective intervention programs. According to many health behavior theories (e.g., Health Belief Model, Theory of Reasoned Action, and Theory of Planned Behavior), intervention programs may be more effective if they educate students about the risks of hookah use, which may modify hookah use perceptions and, ultimately, lower their intention to use this tobacco product. Based on our findings, future research and interventions should focus on targeting certain high-risk groups (i.e., cigarette smokers, male students, and non-Hispanic White students). Policy makers and tobacco researchers could address the growing hookah epidemic through continued research, educating people about the risk of hookah smoking, and policies restricting hookah use.

Table 1. Demographics and Prevalence of Current or Past 30 Days Hookah Users

	Total, N (%) (participants, descriptive) <i>n</i> = 4986-4995	Hookah Users, <i>n</i> (%)	Pearson's Chi-Square
Total	5028	538 (10.8)	
Cigarette Smoking Status			567.37***
Nonsmokers	4084 (81.8)	239 (5.2)	
Smokers	911 (18.2)	300 (32.9)	
Gender			20.42***
Female	2980 (59.8)	273 (9.2)	
Male	2006 (40.2)	265 (13.2)	
Race/Ethnicity			16.85***
Non-Hispanic White	1584 (31.8)	197 (12.4)	
African American	175 (3.5)	16 (9.1)	
Hispanic	2725 (54.6)	254 (9.3)	
Others	503 (10.1)	71 (14.1)	
University Classification			2.98
1 st	1086 (21.8)	120 (11.0)	
2 nd	1036 (20.8)	125 (12.1)	
3 rd	1343 (26.9)	142 (10.6)	
4 th	1526 (30.6)	152 (10.0)	

Note. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

Table 2. Comparison between Non-Hispanic White Students and Other Race/Ethnicity Groups

	Hookah Users (%)	Chi-Square
Race/Ethnicity		
Non-Hispanic White	12.4	
African American	9.1	1.61
Hispanic	9.3	10.38***
Others	14.1	.96

Note. Separate chi-square tests were conducted to compare non-Hispanic White students to each of three other categories.

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

Table 3. Logistic Regression Results for Predicting Hookah Use

	Model 1 <i>OR (95% CI)</i>	Model 2 <i>OR (95% CI)</i>
Cigarette Smoking Status		
Smokers	8.15*** (6.54, 10.15)	7.08*** (5.65, 8.86)
Non-smokers	ref	ref
Gender		
Male	1.22 (.98, 1.52)	1.27* (1.01, 1.59)
Female	ref	
Race/Ethnicity		
African American	1.22 (.64, 2.31)	1.13 (.59, 2.18)
Hispanic	.91 (.71, 1.16)	.93 (.73, 1.19)
Other	1.50* (1.05, 2.16)	1.48* (1.02, 2.14)
Non-Hispanic White	ref	ref
Harm Perceptions		
		.59*** (.52, .66)
Beliefs about Government		
		1.10 (.88, 1.38)

Note. Race/ethnicity was dummy coded and non-Hispanic White race/ethnicity served as a reference category.

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

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