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The influence of drinking motives on hookah use frequency among young multi-substance users

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Abstract

Purpose—The present work examined the influence of drinking motives on hookah use frequency among individuals reporting both alcohol and hookah use (multi-substance users). Despite growing documentation of cross-substance effects between motives and substance use, limited research has examined these relationships specifically with respect to hookah use.

Methods—Participants were 134 (75.37% female) hookah and alcohol users, aged 18–47 years ($M = 22.17$, $SD = 3.66$) who completed measures of substance use, drinking motives, and reported demographic information. Structural equation modeling (SEM) was employed to investigate the predictive value of drinking motives on hookah use frequency, age taken into account.

Results—Findings showed that hookah use was negatively associated with age ($\beta = -.22$, $p = .01$). The model regressing hookah use on the four drinking motives provided adequate fit ($\chi^2 = 314.31$, $df = 180$, $p < .05$, CFI = .92, RMSEA = .075 [95% CI, .06–.09]). Hookah use was associated negatively with social motives ($\beta = -.43$, $p < .001$) and positively with conformity motives ($\beta = .24$, $p = .05$).

Conclusions—These findings are consistent with multi-substance use literature suggesting that drinking motives are associated with the use of other substances, including increased hookah use frequency. Additional examinations of cross-substance cognitive processes are needed, particularly with respect to understanding whether hookah use among multi-substance users may be contingent in part on individual factors including negative affectivity.

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Contributors

The first, second, and third authors conceptualized and conducted statistical analyses. The fourth author supported drafts of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

Keywords

motives; hookah; alcohol; motivation

Introduction

The smoking of hookah (also known as waterpipe, narghile or shisha) amongst high school and university students in North America has been increasing over the last decade (Goodwin et al., 2014; Grekin & Ayna, 2012; Lee, Hebert, Nonnemaker, & Kim, 2015; Minaker, Shuh, Burkhalter, & Manske, 2015; Rahman, Chang, Hadgu, Salinas-Miranda, & Corvin, 2014) with approximately one in five college students in the United States (US) reporting hookah use in the past one year (Grekin & Ayna, 2012). The reasons for this increase in hookah smoking are likely to be multifactorial in nature and may well include the frequently reported perceived lower health risk from smoking hookah compared to cigarettes (Grekin & Ayna, 2012). Hookah use, however, poses significant health risks with studies finding that hookah smoking is associated with nicotine dependence (Aboaziza & Eissenberg, 2015), and seems to present many of the deleterious health effects associated with tobacco smoking (Aslam, Saleem, German, & Qureshi, 2014; Maziak, 2014).

While multi-substance use is common amongst university students in general, hookah smokers are particularly likely to also use other substances, especially alcohol, cigarettes, and cannabis (Goodwin et al., 2014; Heinz et al., 2013; Rahman et al., 2014). The immediate relevance of this finding for substance use reduction efforts is to not target hookah smoking in isolation from the likely concurrent use of other substances. However, the understanding of the underlying reasons and motives for this relationship between multi-substance use and hookah smoking is still weak. Further studies in this comparatively scarce area of research hold the potential to provide important insights for both substance use prevention and reduction efforts.

Given the strong association between hookah smoking and the use of other substances, individuals' motives for using hookah may well be the same as, or at least related to, their motives to use other substances. Indeed, our group has found that motives for cannabis use were related to cigarette smoking and alcohol consumption (Foster, Allan, Zvolensky, & Schmidt, 2015), and that drinking motives were associated with cigarette smoking expectancies (Foster, Zvolensky, Garey, Ditre, & Schmidt, 2014). Studies consistently report a higher use of alcohol among those who smoke hookah compared to those who do not (Braun, Glassman, Wohlwend, Whewell, & Reindl, 2012; Heinz et al., 2013; Sutfin et al., 2011). Heinz et al., for example, found that 77.9% of hookah smokers drank in the last two months compared to 34.7% among those who do not smoke hookah (Heinz et al., 2013). Given this high concurrent use of alcohol and hookah, and the increasing prevalence rate of use of both substances at US universities (Grekin & Ayna, 2012; Mitka, 2009), it is critical to understand whether and how the reasons for drinking relate to hookah smoking.

Reasons for drinking can be studied from a motivational perspective through the use of a motive framework, which posits that people drink to enhance favorable outcomes and/or to assuage unfavorable outcomes (Cooper, 1994; Cooper, Frone, Russell, & Mudar, 1995;

Kuntsche, Knibbe, Gmel, & Engels, 2005; Read, Wood, Kahler, Maddock, & Palfai, 2003; Stewart & Devine, 2000). Thus, drinking motives lie on a pathway between the individual and his/her environment, and alcohol consumption. Such motive frameworks have been used by behavioral scientists for more than two decades to help shed light on the reasons for drinking (Cooper, 1994). Specifically with respect to alcohol consumption, Cooper has suggested four main drinking motives: 1) social motives (i.e., drinking to achieve a favorable social outcome, such as enjoying a social gathering); 2) conformity (i.e., drinking to not be rejected from, or to be accepted in a social group); 3) coping (i.e., drinking to alleviate negative affect); and 4) enhancement (i.e., drinking to enhance positive affect; Cooper, 1994). Numerous studies suggest that a drinking motive framework is also useful for studying alcohol consumption in university students (Abbey, Smith, & Scott, 1993; Foster, Young, et al., 2014; Kuntsche et al., 2005). This research has, for example, led to the finding that while university students most frequently name social and enhancement motives for drinking (Kuntsche et al., 2005; LaBrie, Hummer, & Pedersen, 2007; Lewis, Phillippi, & Neighbors, 2007), conformity and coping motives have been found to be more strongly associated with alcohol-related problems than other drinking motives (Kuntsche et al., 2005).

To our knowledge, no one has yet examined the relationships between drinking motives and hookah use behavior. This study, therefore, aims to assess the usefulness of the drinking motives framework for understanding and studying hookah smoking. More specifically, we aim to determine the associations between drinking motives and hookah use behaviors. Our hypotheses were based on similar cross-substance research wherein drinking motives were shown to have detrimental effects on smoking outcomes (Foster, Zvolensky, et al., 2014) in that drinking motives were hypothesized to positively associate with hookah use frequency. In other words, we expected that individuals endorsing a higher number of reasons for consuming alcohol would be more likely to smoke hookah more frequently.

Method

Participants

Participants were alcohol users who reported having engaged in hookah use at least once in the past year (12 months) and were recruited from a large urban public university in the Southern United States. Recruitment procedures included placing flyers containing study information around campus and visiting classrooms to provide information on how to sign up for the study. Those interested in participating provide informed consent and completed study materials online. Eligibility criteria included being at least 18 years of age, reporting having used alcohol and cigarettes in the previous month, and having engaged in hookah use at least once in the past year. Participants were provided compensation of extra course credit in exchange for their time. The study protocol received Institutional Review Board approval at the study site, and participants provided informed consent prior to any data collection.

The present sample consisted of 134 (75.37% female) drinkers and hookah users at least 18 years of age ($M = 22.17$, $SD = 3.66$). The racial composition for the present sample was 52.67% Caucasian (of these, 65.22% identified as non-Hispanic), 9.16% African American,

1.53% Native American, 9.92% Asian, 9.92% mixed, and 16.79% other. Further, 40.30% of the overall sample identified as Hispanic/Latino.

Measures

Descriptive data—Participants provided demographic information including gender, race, and age.

Hookah use—Hookah behaviors were assessed using the Hookah Use Questionnaire. The item “Please think about the past year. About how often have you smoked hookah?” was used to indicate hookah use frequency. Respondents were asked to indicate their frequency of use on a scale ranging from 1 = *Never*, 2 = *About once a year*, 3 = *About once every 6 months*, 4 = *Once every other month*, 5 = *About once a month*, 6 = *Every other week*, 7 = *1–2 times per week*, 8 = *Daily*. Those indicating having never used hookah in the past year were not included in the analyses. Additionally, participants were also asked to report other hookah-related behaviors including age of onset, how many hours were spent smoking hookah, how harmful they believed hookah to be for their health in comparison to alcohol and cigarettes, and whether they smoked cigarettes and/or consumed alcohol at the same time as using hookah.

Drinking motives—The Drinking Motives Questionnaire (DMQ) is a 20-item measure used to assess motives for drinking (Kuntsche & Cooper, 2010). Participants rated items on a 5-point scale ranging from 1 (*Never/Almost Never*) to 5 (*Almost Always/Always*). The DMQ demonstrates adequate psychometric properties (Cooper et al., 1995). A recent cross-national evaluation of this measure demonstrated that the 4-factor motive structure was invariant across large samples of American, Canadian, and Swiss late adolescents (Kuntsche, Stewart, & Cooper, 2008) and adults (Grant, Stewart, O'Connor, Blackwell, & Conrod, 2007; Nemeth et al., 2011). The measure yields four sub-scales that reflect drinking motives, including social motives (e.g., “Because it helps you enjoy a party”; $\alpha = .91$), enhancement motives (e.g., “Because you like the feeling”; $\alpha = .89$), coping motives (e.g., “To forget your worries”; $\alpha = .90$), and conformity motives (e.g., “Because your friends pressure you to drink”; $\alpha = .87$). The individual items were entered as continuous observed indicators of the four latent drinking motives in a structural equations model (SEM). This analysis was conducted in Mplus using the MLR estimator.

Results

Descriptive data and correlations among variables

Statistical analyses were conducted using SAS 9.4 and Mplus. A majority of the sample (57.50%) reported smoking hookah for the first time at or below the age of 18, and also believed that the average college student smoked hookah at least every other month (77.40%). Further, 51.50% of respondents indicated smoking hookah every other month or more frequently, 95.5% reported spending up to 3 hours smoking hookah, and 90.90% reported spending up to \$20 per month on hookah use. Roughly a third of participants (30.10%) indicated that the hookah they smoked contained nicotine (37.60% did not know). Most of the sample (62.90%) stated that when they smoked hookah they also drank alcohol,

and a smaller proportion of respondents (28.60%) indicated that when they smoked hookah, they also smoked cigarettes. Most participants believed that smoking hookah was somewhat harmful to health (70.70%); however, only 8.30% felt that hookah use was worse for health relative to alcohol or cigarettes. Additional details regarding respondent characteristics can be found in Table 1.

Zero-order correlations were obtained to examine relationships between latent predictor variables (drinking motives), covariates (age), and criterion variables (hookah use frequency). Means, standard deviations, and correlations for study variables are presented in Table 2. All drinking motives were significantly and positively correlated with each other (p 's $\leq .001$). Age was significantly and negatively correlated with social drinking motives ($r = -.21, p = .01$), suggesting that younger individuals reported significantly higher social motives relative to older individuals. Additionally, age was also significantly and negatively correlated with hookah use ($r = -.18, p = .05$), indicating that younger individuals reported engaging in hookah use more frequently relative to older individuals.

Structural equations model examining the association between hookah use and alcohol motives

A single participant did not report age and was not included in the Structural Equations Model (SEM). There were seven cases in which a response was missing for one of the DMQ questions. Given the robustness of the MLR estimator to missing data, these individuals were included in the analysis. One item from the coping motives subscale ("...Because you feel more self-confident and sure of yourself"), was removed from the model due to poor fit. Modification indices indicated that this item would load on all other latent factors (i.e., not a good indicator of coping motives). The model regressing hookah use frequency on the four drinking motives provided adequate fit to the data ($\chi^2 = 314.31, df = 180, p < .05, CFI = .92, RMSEA = .075$ [95% CI, .06–.09]). Previous studies suggest that RMSEA of less than .05 and CFI values greater than .95 provide a good fit for the data while an RMSEA value less than .10 and CFI values greater than .90 are adequate (Hu & Bentler, 1999; Kline, 2010; Yu, 2002). Standardized model parameters are provided in Figure 1. The measurement portion of the model included high factor loadings of the indicators on drinking motives. Controlling for age, hookah use frequency was associated negatively with social motives ($\beta = -.43, p = .001$) and positively with conformity motives ($\beta = .24, p = .05$). Additionally, hookah use frequency was negatively associated with participant age ($\beta = -.22, p = .01$). The proportion of variance in hookah use accounted for by the model (R^2) was .16, $p = .05$.

Discussion

The present study was designed to address a gap in knowledge related to associations between drinking motives and hookah use behavior. As the first known examination of this cross-substance association, our hypothesis was that drinking motives would be positively associated with hookah use frequency among individuals who reported using both substances. This hypothesis was partially supported. That is, we expected that individuals endorsing more reasons for consuming alcohol would be more likely to also use hookah more frequently. Results were consistent with this hypothesis for conformity drinking

motives such that young adults endorsing drinking for conformity reasons also smoked hookah more frequently. However, contrary to expectations, neither coping nor enhancement drinking motives were related to hookah use behaviors. Also contrary to what was predicted, findings revealed that social motives were *negatively* associated with hookah use frequency.

Social drinking motives are not only among the most common reasons for consuming alcohol among young adults (Cooper, 1994; Kuntsche et al., 2005), but also the most robust predictors of drinking in the university environment (Borsari & Carey, 2000; Lewis et al., 2010). It was expected that individuals who drink to enhance positive social outcomes, such as to enjoy a party, might also use hookah more frequently based on the social nature of hookah smoking (Sharma, Beck, & Clark, 2013). However, the present data did not support this hypothesis, indicating that individuals who endorse social motives for drinking actually used hookah *less* frequently relative to those who did not drink for social reasons. It is possible that social drinkers who consume alcohol as a means for social lubrication may not feel an additional need to also smoke hookah to facilitate social interactions. Thus, an individual who endorses drinking for social reasons may not view hookah as having the same social effects, and may thus be more comfortable refraining from hookah use relative to a drinker who reports drinking for to fit in or avoid rejection by the group (i.e., conformity motives).

Furthermore, findings revealed that the use of multiple substances simultaneously was prevalent in this sample. Roughly half of participants reported drinking alcohol while smoking hookah, and almost 30% reported smoking cigarettes and hookah at the same time. Previous work indicates that multi-substance use has bi-directional implications, suggesting that the use of one substance increases risk for and levels of use for other substances (Burling & Ziff, 1988; Golub & Johnson, 2001; Harrison, Hinson, & McKee, 2009; Jiang & Ling, 2013; Kessler et al., 1997; Redonnet, Chollet, Fombonne, Bowes, & Melchior, 2012; Roxburgh, Miller, & Dunn, 2013; Van Zundert, Kuntsche, & Engels, 2012). Additionally, multi-substance use has been linked to psychological distress, such as greater depression and anxiety (Caldwell et al., 2002; Milani, Parrott, Turner, & Fox, 2004). Psychological symptoms and disorders, including anxiety and depressive symptoms, have been linked independently with tobacco use (Buckner & Vinci, 2013; Leventhal, Ameringer, Osborn, Zvolensky, & Langdon, 2013) and alcohol consumption (Grant et al., 2007), however additional work is needed to understand the influence of these and other symptoms of psychological distress on hookah use behaviors.

Interestingly, our findings showed that age may be protective against drinking for social reasons and hookah use frequency. About half of participants smoked hookah for the first time before the age of 18, and age was negatively correlated with both social drinking motives and hookah use frequency. This indicates that relative to younger individuals, older individuals used hookah less frequently and were less likely to endorse drinking for social reasons. This finding may suggest that investigators implementing prevention strategies should consider intervening on hookah use behavior during early adolescence. Finally, it is worth noting that participants in the present study largely perceived that hookah use was not as harmful to health relative to alcohol or cigarettes, a misperception that echoes previous work (Aljarrah, Ababneh, & Al-Delaimy, 2009; Kakodkar & Bansal, 2013; Martinasek,

Gibson-Young, & Forrest, 2014). Such misperceptions may arise from beliefs about normative behaviors, having many friends who have tried hookah, or, based on hookah use having fewer associated restrictions, views that it is socially acceptable (Berg et al., 2015; Heinz et al., 2013). As misperceptions are associated with increased substance use (McAlaney et al., 2015), it will be important for investigators to consider best ways to correct hookah-related misperceptions and thereby reduce undesired health consequences.

The strengths of the present work should be considered in light of its limitations. One limitation of this study is the suboptimal fit of the multivariate model, which, however, still provides a similar level of fit to previous publications in this research area (Foster et al., 2015; Foster, Zvolensky, et al., 2014). Further, 75.37% of the sample were female, and which is consistent with university psychology pool samples. However, no gender differences in the predictive modeling of hookah use were found. Additionally, alcohol intake variables were not available in these data, precluding examination of whether heavier drinking relative to lighter drinking may be associated with different motivations and hookah use patterns. Moreover, the cross-sectional nature of this study mitigates temporal and causal implications. Limitations to the internal validity of our findings arise from both the relatively small sample size and the possibility of selection bias as only those students who actively volunteered for the study could be included. A limitation to the study's external validity is that only university students were recruited, which restricts generalizability to non-university peers or other age groups.

In conclusion, we found that hookah use was negatively associated with social drinking motives and positively associated with conformity drinking motives in a sample of concurrent users of alcohol and hookah at a large public university. There was neither an association between coping nor enhancement drinking motives with hookah use behaviors in this sample. Overall, these findings corroborate the results of previous studies, which found that drinking motives are associated with the use of other substances. Further research is needed to shed light on the cognitive processes and other individual factors that underlie and/or moderate multi-substance use.

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Figure 1.

Standardized parameter estimates. All values are significant $p < .001$ at unless noted otherwise.

$^{**} p < .01$; $^{*} p < .05$; dashed = not significant.

Table 1

Respondent characteristics: Age of onset, hookah-related behaviors and norms.

Item	Response Options	<i>n</i>	%
At what age did you smoke hookah for the first time?	5–10 years old	2	1.5
	11–14 years old	4	3.0
	15–18 years old	71	53.0
	19–21 years old	46	34.3
	22–24 years old	8	6.0
	25–27 years old	1	0.8
	28–30 years old	1	0.8
	36–40 years old	1	0.8
How often do you smoke hookah?	Daily	3	2.2
	1–2 times per week	7	5.2
	Every other week	13	9.7
	About once a month	25	18.7
	Once every other month	21	15.7
	About once every 6 months	37	27.6
	About once a year	28	20.9
When you smoke hookah, how many hours per day (on average) do you spend doing it?	0	38	28.8
	1	51	38.6
	2	29	22.0
	3	8	6.1
	4	4	3.0
	5	2	1.5
When you smoke hookah, do you also eat food?	Rarely	41	31.1
	Sometimes	55	41.7
	Most of the time	26	19.7
	All the time	10	7.6
When you smoke hookah, do you also drink alcohol?	Rarely	49	37.1
	Sometimes	53	40.2
	Most of the time	26	19.7
	All the time	4	3.0
When you smoke hookah, do you also smoke cigarettes?	Rarely	95	71.4
	Sometimes	26	19.6
	Most of the time	10	7.5
	All the time	2	1.5
Does the hookah that you smoke contain nicotine?	Yes	40	30.1
	No	43	32.3
	I don't know	50	37.6

Item	Response Options	<i>n</i>	%
In your opinion, which is the worst for your health: Alcohol, Cigarettes, or Hookah?	Alcohol	23	17.3
	Cigarettes	99	74.4
	Hookah	11	8.3
How harmful do you think smoking hookah is to your health?	Not at all harmful	16	12.0
	Somewhat harmful	94	70.7
	Very harmful	23	17.3
How often do you think the average college student smokes hookah?	Never	2	1.5
	Once a year	9	6.8
	2–3 times per year	19	14.4
	Every other month	22	16.7
	Once a month	29	22.0
	2–3 times per month	30	22.7
	Weekly	15	11.4
	More than once per week	6	4.6
On average how much money do you spend on smoking hookah PER MONTH?	Less than \$5	84	63.6
	\$5 to \$10	16	12.1
	\$10 to \$20	20	15.2
	\$20 to \$40	3	2.3
	\$40 to \$60	6	4.6
	\$60 to \$100	3	2.3

Table 2

Means and correlations among variables.

	1.	2.	3.	4.	5.	6.
1. Social Motives	-					
2. Coping Motives	0.39**	-				
3. Enhance Motives	0.65**	0.52**	-			
4. Conform Motives	0.39**	0.32**	0.31**	-		
5. Hookah Use Frequency	-0.09	0.06	0.01	0.14	-	
6. Age (N=133)	-0.19*	-0.07	-0.13	-0.04	-0.18*	-
Mean	15.51	8.58	13.11	8.22	3.95	22.17
SD	5.33	4.39	5.13	3.94	1.59	3.66

***p* .001;**p* .05