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## Waterpipe Tobacco Warnings Need to Inform Users of Harm

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### Abstract

**Objectives:** Health warning messages could be an effective means of communicating the health risks associated with waterpipe (WP) smoking. The objective of this study was to select a message that conveyed the risks associated with WP smoking.

**Methods:** A mixed-methods approach was used to explore the effectiveness of the Food and Drug Administration's (FDA's) mandated message, and others, among young adults using focus groups and surveys. Two focus group studies and one convenience survey were conducted to examine the FDA's mandated message and 11 other WP warning messages. The final study, conducted with a random sample of first-year university students, examined the effectiveness and reactance of the chosen message using previously validated items (scored on a 1-5 scale).

**Results:** The FDA's mandated message did not resonate well with focus group participants. In the random sample of students, the top message (*WARNING: Hookah smoke contains poisons that cause lung and oral cancers*) had high effectiveness ( $M = 4.49$ ) and a low reactance ( $M = 2.12$ ).

**Conclusions:** Our studies suggest that other messages are more effective for communicating the risks associated with WP smoking than the FDA's message for WP tobacco.

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Human Subjects Approval Statement

The studies were approved by the Institutional Review Board of the Ohio State University. All participants completed a consent form prior to initiating the research.

Conflict of Interest Disclosure Statement

No conflicts to report.

## Keywords

hookah; health warning; tobacco regulation; waterpipe; young adult

Young adults are highly susceptible to waterpipe (WP) tobacco smoking. The proximity of WP cafés to college campuses<sup>1</sup> and the availability of fragrant, sweet-flavored tobaccos that mask harshness and enhance the taste of WP smoke<sup>2-4</sup> have resulted in dramatic increases in the prevalence of WP use since the product was first introduced in the United States (US) in the early 2000s.<sup>3</sup> National WP smoking estimates suggest that approximately 13% of young adults age 18-24 years<sup>5</sup> and 4% of high school students<sup>6</sup> were past-month WP smokers.

Young adults have a misconception that WP smoking is less harmful than cigarette smoking.<sup>7-12</sup> To the contrary, WP smoke contains addictive levels of nicotine,<sup>13</sup> and levels of harmful and potentially harmful constituents that are 10-3900 times higher than those in cigarette smoke.<sup>14,15</sup> To curb this growing threat, communications regarding the harm of WP use must be developed and evaluated.

Health warning messages have been used historically to communicate risks associated with cigarette smoking,<sup>16</sup> in text only and text + graphic forms. Surveys from 4 English-speaking countries suggest that large warnings with graphics increase smokers' intentions to quit cigarette smoking.<sup>16,17</sup> Other research suggests that when large health warning labels are introduced into a population, calls to national quit lines increase.<sup>18-21</sup> Importantly, population-level studies show that when smokers think about health warning messages, they are more likely to engage in cessation behaviors, such as attempting to quit or quitting altogether.<sup>21-23</sup> To promote behavior change, though, health warnings must be perceived as effective and credible.<sup>24,25</sup>

The US Food and Drug Administration (FDA) currently mandates that all packages of WP tobacco include the following warning message:<sup>26</sup> *'WARNING: This product contains nicotine. Nicotine is an addictive chemical.'* Although it is true that WP tobacco contains nicotine, knowledge of the role it plays in addiction is generally lacking among young adults.<sup>27</sup> Additionally, this message is not specific to the longer-term health risks associated with WP smoking, such as lung, neck, head, and esophageal cancers and respiratory disease.<sup>28,29</sup> Indeed, an international panel of WP researchers concluded that the most effective WP warnings were those focused on oral health, heart disease, comparisons to cigarettes, and effects on newborns.<sup>30</sup>

To date, limited research has examined the use of WP warning messages to communicate risk information to young adults in the US. However, some studies have made important contributions to the literature. Data from young adults enrolled in the Population Assessment of Tobacco and Health (PATH) study suggest that exposure to WP warnings increases future WP risk perceptions.<sup>31</sup> In another study, university students who were WP smokers reported that warning messages specific to the risks of WP smoking, particularly messages that mentioned harm to children, motivated them to consider quitting.<sup>27</sup> In a small cross-over study, WP smoking in the presence of the warning message resulted in a reduction in puffing

intensity and consequent expired carbon monoxide concentration compared to smoking without a warning label.<sup>32</sup>

These studies provide some evidence that warning messages can be effective at changing WP smoking behavior among US young adults. However, it is unclear whether the FDA's mandated nicotine message is ideal for WP smoking. One thorough review of non-cigarette product tobacco warning label research concluded that research on newly deemed tobacco products is needed to assist the FDA in its regulatory work related to health communications.<sup>33</sup> The research presented below can be considered a response to that call, as we explored the perceived effectiveness and credibility of WP warning messages among young adults using a series of focus groups and surveys. The objective of these studies was to employ an evidence-based approach to select a message that both conveyed the risks associated with WP smoking and was perceived as credible.

## METHODS AND RESULTS FOR 4 STUDIES

Four studies with different objectives and methods were performed, starting with an initial question about the meaning of the FDA warning message (*"WARNING: This product contains nicotine. Nicotine is an addictive chemical."*) with focus group participants and ending with a final survey that tested the effectiveness of our selected warning message. Below, each study is described separately to illustrate the progression in our methodology of selecting a warning message that effectively conveys the risks of WP smoking. All participants were asked to provide consent; focus group participants signed a consent form and survey participants read a consent script prior to starting the questionnaire and continuing to the survey implied consent. Data on demographics, WP smoking history, and other tobacco product use was collected from all participants.

### Study 1: Focus Groups to Explore FDA's Nicotine Warning

**Overview.**—The objective of the first study was to explore how young adults perceive the FDA's nicotine warning message for WP tobacco. We sought to improve our understanding of what each key word in the messages means to them and whether they believe the message effectively conveys WP smoking risks.

**Methods.**—We conducted 3 focus groups with young adult (ages 18-29) WP ever users, meaning they had smoked a WP at least once in their lifetime. Recruitment occurred through social media posts, emails to student organizations on our campus, flyers on campus, and word-of-mouth. Individuals who were interested in participating in the study completed a phone screening to determine eligibility and availability for the discussion. Focus group discussions lasted about 60 minutes and participants received \$35 for their time.

Guided by semi-structured questions and an experienced facilitator, participants were asked to discuss their experience smoking WP (*What influences a person's decision to smoke hookah?*), knowledge of WP risks (*Do you think hookah smoking is harmful to your health? Do you think hookah smoking is less harmful than cigarette smoking?*), awareness of warnings (*"Have you ever seen any warnings about the dangers of hookah smoking? What type of person do you think looks at the warnings?"*) and thoughts about the FDA's nicotine

warning message. Participants were first asked what the words “nicotine,” “addictive,” and “chemical” meant to them individually. Next, they were presented with the FDA’s warning message for WP tobacco and asked their opinions of it (*What are your thoughts about this warning?*). Participants were also asked: *What kind of image might pair well with this warning about nicotine and addiction?* We finished the discussion by asking participants: *If a warning was required on a hookah pipe, where do you think the label should be placed?*

All focus group discussions were audio-recorded, transcribed, and checked by an independent transcriptionist for accuracy. The transcripts were independently coded for major themes by 2 research assistants. Consensus meetings were held to review coding and reach agreement in places of initial disagreement. Focus group discussions were coded for themes related to how participants perceived the FDA’s mandated warning for WP tobacco.

**Results.**—Because of the overlap of participants in Studies 1 and 3, characteristics for the 14 unique participants across Studies 1 and 3 are presented in Table 1. The average age of focus group participants was 22.8 years, 42.9% were female, and 35.7% were non-Hispanic Whites. Because we sampled by WP use status, all had tried WP in the past and 57.1% had smoked WP in the past 30 days. Most participants had used other tobacco products in the past 30 days, with the most common product being cigarettes (Table 1).

When we asked participants specifically about the meanings of *nicotine*, *addictive*, and *chemical*, different interpretations emerged. The word nicotine made several participants think of cigarettes whereas others discussed what they experienced (eg, headrush) after consuming products with nicotine. The word addictive was equated to “abuse” and “loss of control” in one’s actions. Overall, participants had negative perceptions of the term “addiction,” but it was discussed in the context of other products, such as coffee and cigarettes. When asked about the meaning of “chemical,” the conversation was neutral overall. Some participants stated that the term was negative because it could be equated with harm, whereas others felt it was neutral, stating that everything in life is a chemical compound.

Next, participants were shown the FDA’s mandated warning message which ties together the terms they had just discussed. Overall, participants in the first round of focus groups expressed little enthusiasm about the FDA’s mandated warning for WP tobacco. A few participants stated that the warning was appropriate because it was accurate and did not try to scare WP users.

However, most participants stated that the warning would not be effective long-term because it was too vague, did not represent how most WP smokers use the product (infrequently) and did not convey risks specific to nicotine addiction/WP smoking.

I’m not going to get addicted Yeah if I smoke this all the time maybe I would be but I’m just doing this for fun with my friends on the weekends so that might not be the biggest deterrence.

Even though it’s an addictive substance maybe I have enough of it, so I can still operate in my life.

## Study 2: Young Adult Warning Rating Survey

**Overview.**—Participants in Study 1 were in agreement that the FDA’s message about nicotine addiction was not effective at conveying risks associated with WP smoking. In response, our research team reviewed the literature and selected 11 warning messages that accurately summarized the risks associated with WP smoking and might be effective for preventing smoking among young adults (Table 2 and Table 3). The objective of the second study was to examine quantitatively how young adults rated the 12 warning messages (the new 11 messages and the FDA’s message) for perceived effectiveness and reactance.

**Methods.**—We conducted a survey with a convenience sample of 144 young adults (ages 18-29 years) who were not necessarily WP smokers. To recruit participants, our team used a similar approach to inviting individuals to complete the short survey, as in Study 1. We hung flyers on campus, used social media, sent messages to student organizations on our campus, and made announcements in classes. Whereas there were respondents from many states, most lived in one midwestern state in the US. Individuals who completed this survey were not given an incentive.

The survey was delivered through Qualtrics. After reading the verbal consent on the first screen, participants who agreed to participate continued on to the survey. To reduce the burden on survey participants, each person was asked to view a random sample of 5 messages (of the 12) and rate them for their effectiveness and reactance. After viewing each potential WP warning message, participants were asked to rate the message for effectiveness and reactance using a 5-point Likert Scale ranging from strongly agree (5) to strongly disagree (1). Effectiveness was measured by level of health concern (*The warning makes me concerned about the health effects of hookah smoking*), unpleasantness (*The warning makes hookah smoking seem unpleasant to me*), and smoking discouragement (*The warning discourages me from wanting to smoke hookah*) of the message.<sup>24</sup> Reactance was measured by level of perceived manipulation (*This warning is trying to manipulate me*), annoyance (*This warning annoys me*), and how overblown the message was perceived to be (*The health effect on this warning is overblown*).<sup>34</sup> For each scale, individual items were scored so that the ideal label would have high effectiveness and low reactance.

Descriptive statistics for each message were calculated. In addition, we calculated the percent of participants who agreed or strongly agreed with each separate item in each scale. In exploratory analyses, we compared mean effectiveness and reactance scores by sex (male/female) and ever WP smoking status using Wilcoxon Rank-Sum tests. To account for multiple testing, a Bonferroni correction was applied to each set of tests (12 comparisons within each set). Each test was performed at the alpha = .004 level.

**Results.**—A total of 144 young adults completed the survey. The average age of participants was 20.6 years, 70.4% were female, and 57.0% were non-Hispanic Whites. Close to half (45.1%) had tried WP in the past and 11.8% had smoked WP in the past 30 days. Less than one-third of participants had used other tobacco products in the past 30 days, with the most common products being cigars/cigarillos and cigarettes (Table 1).

As Table 2 and Table 3 indicate, mean reactance and effectiveness estimates were based on 56 to 66 independent responses (recall, Study 2 participants received a random sample of 5 messages to rate; thus, the number of times a message was rated varied). The most effective messages noted the risks of lung and oral cancer, followed by other diseases and a comparison to chemical exposures from cigarette smoking. The least effective message was the FDA's mandated nicotine addiction message. There was overlap between the messages that had high effectiveness and low reactance, although it is important to note that the FDA's message was low on the reactance scale. For the 5 most effective messages, more than 75% of participants agreed or strongly agreed with each individual scale item. For the 5 messages with the lowest reactance scores, less than 25% of participants agreed or strongly agreed with each of the scale items.

Our exploratory analyses examining differences in reactance and effectiveness by sex and WP smoking status revealed that there were no statistically significant differences in reactance. Additionally, there were no statistically significant differences in effectiveness scores between males and females, but there was one significant difference in effectiveness score by WP smoking status – for one message (*Hookah smoking can kill you*), effectiveness scores were higher for never WP smokers ( $p < .001$ ).

### Study 3: Focus Groups on 12 Text-based WP Warnings

**Overview.**—The Study 2 messages were explored in-depth with focus group participants because this methodology allows researchers to have deeper discussions about a specific topic. The objective of the third study was to explore qualitatively how young adults perceive these 12 warning messages and examine the rationale for their top 5 selected messages.

**Methods.**—We conducted 3 focus groups with young adult (ages 18–29) WP ever users. They occurred about 4 months after the Study 1 focus groups, although we had some overlap in participants. Our recruitment methods were identical to those used in Study 1; we recruited by posting on social media sites, sending emails to student organizations on our campus, hanging flyers on campus, and relying on word-of-mouth. Focus group discussions lasted around 60 minutes and participants received \$35 for their time.

Guided by semi-structured questions and an experienced facilitator, participants were asked to rank their top 5 in terms of effectiveness at preventing WP smoking and describe their rationale for the ranking. The focus group discussions were transcribed and analyzed, as described in Study 1. Discussions from Study 3 focus groups were coded for themes related to the rationale participants provided when stating their top 5 WP warning messages.

**Results.**—The characteristics of the focus group participants have been described above, in the Study 1 results. Study 3 focus group participants further elaborated on each of the 12 messages. The 2 most effective messages from the survey (*Hookah smoke contains poisons that can cause lung, bladder, and oral cancers* and *Hookah smoking can cause mouth and lung cancers*) were also among the top 5 chosen by nearly all focus group participants. The rationale for these rankings was primarily because these cancers can be linked to WP smoking and that messages should be specific about the diseases caused by the behavior.

Also, participants noted that cancer is “scary” and that they know what it is and what causes it (ie, smoking). Participants also noted that these messages would be easy to pair with images, and the suggested images included diseased lung, mouth cancer, the mouth in general, and a person in a hospital. However, participants could not come up with an effective image to depict bladder cancer because they did not know how it affects the body.

#### Study 4: First Year University Student Survey

**Overview.**—The objective of Study 4 was to assess quantitatively how first-year university students perceive the final WP warning message that was developed from Studies 2 and 3. The message selected for final testing was *WARNING: Hookah smoke contains poisons that cause lung and oral cancers*. This message was a variation of the one that had the highest effectiveness score and a fairly low reactance score. We removed “bladder” from the message that was originally tested because literature suggested that the link between WP smoking and bladder cancer was not strong.<sup>28</sup>

**Methods.**—Using a Qualtrics online survey format, the questionnaire was delivered to a random sample of first-year students at a large midwestern university in the US. These students were already participating in a longitudinal study, led by one of our team members. Prior to the 2018 academic year, a random sample of student names was given to the team by the University Registrar. Stratified sampling was performed so that there was representation according to sex, in-state versus out-of-state residence, and first-generation student status. Prior to enrolling in the study, individuals had to provide consent (online) to participate in a longitudinal cohort study that would involve completing surveys every 3 months. The WP warning label questions were embedded in one round of the cohort study, during spring semester 2019. Students in the longitudinal cohort study were given a \$10 gift card for their time.

We asked survey participants to rate the final message on effectiveness and reactance, using the items described in Study 2.<sup>24,34</sup> We calculated descriptive statistics. We compared scores for males and females and by ever WP smoking status using Wilcoxon Rank Sum tests.

**Results.**—A total of 376 individuals completed the survey. As Table 1 shows, the average age of participants was 19.2 years, 58% were female, and 71.8% were non-Hispanic Whites. Just under 10% had tried WP in the past and few (1.9%) had smoked WP in the past 30 days. The most common tobacco product used in the past 30 days was e-cigarettes, at 22.1%.

In the random sample of first-year university students, our chosen message had a high effectiveness score ( $M = 4.49$ ) and a low reactance score ( $M = 2.12$ ). It is notable that this message had a slightly higher mean effectiveness score and a lower mean reactance score than when the message tested with the Study 2 and Study 3 participants. Effectiveness scores were significantly higher for never WP smokers compared to ever smokers ( $M = 4.55$  vs  $M = 3.93$ ,  $p < .001$ ).

## DISCUSSION

Using a series of studies that involved both qualitative and quantitative methods, we explored the perceived effectiveness of the FDA's mandated message for WP, along with several others, with young adults. The message that had the highest effectiveness rating was: *WARNING: Hookah smoke contains poisons that cause lung and oral cancers.* Testing a random sample of university students shows that this message was similarly effective for males and females, but young adults who have never tried WP smoking found the message to be more effective than their peers who had ever tried WP. This indicates that the message may be more effective in reducing waterpipe initiation among US college freshmen. Importantly, this message is accurate because WP smoking is associated with both lung and oral cavity cancers.<sup>28</sup>

For several reasons, the FDA should consider alternatives to its mandated message for WP tobacco: *"WARNING: this product contains nicotine. Nicotine is an addictive chemical."* First, our results, as well as those reported by Islam et al,<sup>27</sup> suggest that messages focusing on WP addiction do not resonate well with young adults. In their study, only 14%-17% of respondents said that the "hookah smoking is addictive" message very much motivated them to quit or reduce smoking. Of the 9 messages viewed, the addiction message resulted in the lowest percentage of respondents who indicated that it motivated them to quit smoking. In our focus group discussions, many participants noted that WP is not smoked as frequently as cigarettes are, and therefore, addiction is not a concern for those who want to go to the café occasionally with friends or smoke at a party. Second, there is a great deal of misunderstanding about nicotine and the role it plays in addiction and disease in the general population. In a large survey of young adults in the US, Villanti et al<sup>35</sup> reported that over half of respondents incorrectly stated that nicotine causes cancer and over two-thirds attributed a large part of the health risks associated with smoking to nicotine. Thus, it is not clear how a message that warns of the risks of nicotine addiction will impact WP smoking behavior or understanding about the risks of WP smoking. Third, like Islam et al<sup>27</sup> who reported that messages that are focused on lung diseases and cancer in general are effective for discouraging WP smoking, our message about lung and oral cancer ranked higher in terms of effectiveness and reactance than the FDA's nicotine message. In fact, all of the messages we tested were perceived to be more effective, as evidenced by a higher effectiveness score, than the FDA's nicotine addiction message.

A major strength of our research is the systematic approach we took to selecting this final warning message. Moreover, both qualitative and quantitative methods were used to explore the effectiveness and credibility of the FDA's mandated message, as well as a range of alternative messages that accurately describe the health effects of WP smoking. Additionally, we explored the effectiveness of the warning messages in both ever and never WP smokers, and among young adults with different intentions to use WP in the future (Table 1). The final message was tested in a random sample of first-year university students who already were participating in a longitudinal cohort study that was focused on tobacco and other substance use, which is an additional strength. The limitations of our work include a focus on young adults and not adolescents who have not yet initiated WP smoking, research participants who are largely from one state (or lived in that state at the time of the



work), and no long-term follow-up to determine if participants continued to think about the warning messages or changed their behavior in response to them. Additionally, Study 2 was limited by the lack of random selection of participants and the small sample sizes for each warning message. This was particularly relevant to the comparisons of responses between males and females and across WP use status. Finally, our 4 studies had different mixes of WP smokers; the focus groups selected individuals who had experience smoking a WP whereas the 2 surveys included WP users and never users. Future work would benefit from conducting more focused work on different groups, eg, exclusive WP versus dual- or poly-users, of adolescents and young adults.

## IMPLICATIONS FOR TOBACCO REGULATION

The FDA's nicotine message for WP tobacco was found to be inferior to other messages in our series of studies with young adults. Future work should proceed in several directions to provide the best information for tobacco regulation. First, alternative messages should be developed and tested with other groups, including adolescents and young adults who live in other regions of the US and represent other groups in terms of socioeconomic status, race/ethnicity, and cultural backgrounds. Second, graphic images should be paired and tested with warning messages for their effectiveness, reactance, and impact on short- and long-term behavior. Third, research should focus on where WP warning labels should be placed. The Tobacco Control Act allows for the warning label to be placed on WP tobacco products as well as WP components, which include the WP itself.<sup>26</sup> Limited research to date has examined warnings on WPs, yet it is critically important given that most young adults may first smoke WP in a café environment<sup>36</sup> where they do not observe the WP tobacco package.<sup>37</sup> Islam et al<sup>27</sup> asked their research participants to indicate where a warning label should be placed on a WP and the results suggest that prominent locations, like the base or mouthpiece, are good targets because they will generate the greatest attention. In another study, described above, Maziak et al<sup>32</sup> found that smoking behavior and toxicant exposure changes when a WP is smoked when a label is attached to it compared to WPs without warnings. It is critical to continue work in this area, given the legal authority to expand regulations related to WP tobacco, waterpipes, and components.

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**Table 1**

Characteristics of Participants in Focus Groups and Surveys

	Studies 1&3 Focus Groups (N = 14)			Study 2 Study 2 (N = 144)	Study 4 Study 4 (N = 376)
<b>Age in years (mean ± SD)</b>	<b>22.8 ± 2.6</b>			<b>20.6 ± 2.0</b>	<b>19.2 ± 0.4</b>
<b>Female N (%)</b>	<b>6 (42.9)</b>			<b>100 (70.4)</b>	<b>217 (58.0)</b>
<b>Race/ethnicity N (%)</b>					
Non-Hispanic White	5 (35.7)			81 (57.0)	270 (71.8)
Non-Hispanic Black	4 (28.6)			22 (15.5)	24 (6.4)
Other	5 (35.7)			39 (27.5)	82 (21.8)
<b>Ever tried WP N (%)</b>	14 (100)			65 (45.1)	35 (9.3)
<b>Past 30-day WP N (%)</b>	8 (57.1)			17 (11.8)	7 (1.9)
<b>Willingness to... (mean ± SD)<sup>†</sup></b>					
Go to café and watch friends smoke	5.5 ± 1.9			3.7 ± 2.1	2.70 ± 1.79
Go to café and try a few puffs	5.8 ± 1.5			3.5 ± 2.3	2.07 ± 1.64
Smoke hookah for an hour	5.1 ± 2.0			2.8 ± 2.3	1.60 ± 1.29
<b>Past 30-day tobacco use N (%)</b>					
Cigarettes	9 (64.3)			41 (28.5)	10 (2.7)
E-cigarettes	5 (35.7)			26 (18.1)	83 (22.1)
Smokeless tobacco	6 (42.9)			16 (11.1)	5 (1.3)
Cigars/cigarillos	7 (50.0)			44 (30.6)	14 (3.7)

Note.

N = 190 individuals consented and started the survey in Study 2; only 144 answered the demographic and WP questions at the end of the survey.

Two respondents did not report sex in Study 4. Willingness items were assessed at baseline only in Study 4, which was approximately 7 months before we assessed message effectiveness and reactance.

<sup>†</sup> 1 = not at all willing, 7 = very willing. Introduction given to the questions: Suppose that sometime in the next few months you are hanging out off campus with a group of friends. One of your friends suggests that you all go to a hookah cafe that's nearby. Your friend has been there before and says it's a good place to hang out.

SD = standard deviation

Mean Scores and Percent of Individuals who Agreed and Strongly Agreed with Individual Effectiveness Items for the 12 WP Warning Label Messages

**Table 2**

Message	N	Mean ± SD	Effectiveness		
			% Agree Concerned	% Agree Unpleasant	% Agree Discourages
Hookah smoke contains poisons that can cause lung, bladder, and oral cancers	67	<b>4.35±0.65</b>	95.5	85.1	83.6
Hookah smoking can cause mouth and lung cancer	65	<b>4.26±0.83</b>	92.3	87.7	83.1
Hookah smoke has 30 times more carbon monoxide than a cigarette	62	<b>4.19±0.92</b>	87.1	80.7	80.7
Hookah smoking can cause gum disease and tooth loss	57	<b>4.15±0.88</b>	87.7	82.5	77.2
Hookah smoking increases the risk of leukemia and other cancers	59	<b>4.14±0.91</b>	89.8	84.8	81.4
You inhale 150 times more smoke in a hookah session than from a cigarette	59	4.10±0.89	86.4	76.3	80.0
Hookah smoking increases your risk of mouth herpes	59	4.10±0.92	83.1	79.7	80.0
Hookah smoking ages your skin	63	3.76±0.87	69.8	74.6	61.9
Hookah smoking is not safer than smoking cigarettes	56	3.60±1.05	69.6	58.9	60.7
Hookah smoking can kill you	56	3.51±1.03	71.4	62.5	53.6
<b>Quitting hookah smoking now greatly reduces serious risks to your health</b>	57	<b>3.47±0.91</b>	70.2	54.4	57.9
<b>This product contains nicotine. Nicotine is an addictive chemical</b>	60	<b>3.46±0.88</b>	68.3	56.7	60.0

Note.

Bold font highlights the middle 5 rated highest effectiveness messages.

Mean Scores and Percent of Individuals who Agreed and Strongly Agreed with Individual Reactance Items for the 12 WP Warning Label Messages

**Table 3**

Message	N	Mean ± SD	Reactance		
			% Agree Manipulate	% Agree Annoys	% Agree Overblown
Hookah smoke contains poisons that can cause lung, bladder, and oral cancers	67	<b>2.31±0.74</b>	22.4	10.5	9.0
Hookah smoking can cause mouth and lung cancer	65	<b>2.14±0.76</b>	18.5	10.8	7.7
Hookah smoke has 30 times more carbon monoxide than a cigarette	62	2.46±0.91	30.7	12.9	22.6
Hookah smoking can cause gum disease and tooth loss	57	<b>2.27±0.85</b>	17.5	8.8	7.0
Hookah smoking increases the risk of leukemia and other cancers	59	<b>2.24±0.88</b>	17.0	13.6	15.3
You inhale 150 times more smoke in a hookah session than from a cigarette	59	2.39±0.90	23.7	11.9	17.0
Hookah smoking increases your risk of mouth herpes	59	2.59±0.92	28.8	18.6	22.0
Hookah smoking ages your skin	63	2.31±0.80	20.6	12.7	11.1
Hookah smoking is not safer than smoking cigarettes	56	2.40±0.85	28.6	16.1	10.7
Hookah smoking can kill you	56	3.17±0.99	48.2	44.6	51.8
Quitting hookah smoking now greatly reduces serious risks to your health	57	2.39±0.77	26.3	17.5	10.5
This product contains nicotine. Nicotine is an addictive chemical	60	<b>2.27±0.68</b>	23.3	10.0	6.7

Note.

Bold font highlights the middle 5 rated lowest reactance messages.