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Understanding the Psychosocial Aspects of Waterpipe Smoking Among College Students

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Understanding the Psychosocial Aspects of Waterpipe Smoking Among College Students

by

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DEDICATION

This dissertation is dedicated in memory of my father, Dr. E. E. Pautler, who would be so very proud and possibly surprised that I am following in his footsteps in the academic arena. He set a model example of what a professor, educator, physician, and father should be.

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ABSTRACT

Waterpipe tobacco smoking has migrated from being a custom of some cultures to becoming a staple around college campuses. The social nature and flavored tobacco encourage initiation in this tobacco naïve age group.

The study was a sequential mixed method design, employing primary data collection and analysis of a random sample of university students who live on campus at a single university. The study involved observations (N=6), intercept interviews with smokers and nonsmokers (N=63), three focus groups (N=31), and an online survey (N=288).

Findings were centered on the constructs of the Theory of Reasoned Action by Ajzen and Fishbein (1975), who propose there are specific precursors that lead to intention to perform a behavior. The data suggested that attitudes were more positively correlated with intention to smoke waterpipe tobacco than subjective norm. Attitude is influenced by outcome expectancies. The data suggest that positive outcome expectancies are influenced primarily by the social nature of hookah smoking and other perceived positive benefits. Negative health effects and family/culture were also influential, albeit to a lesser extent. Development of interventions focused on an attitudinal shift may help to decrease uptake and continuation of waterpipe tobacco smoking in this population.

CHAPTER 1: STATEMENT OF THE PROBLEM

Introduction

College life is associated with greater freedom and less parental constraints, allowing young adults to explore many types of behaviors in which they might not normally engage. Some of these behaviors have the potential to impose a health risk to the individual. More specifically, this life transition period correlates with initiation and escalation of current usage of tobacco product(Schane, Glantz, & Ling, 2009). Tobacco use is a common practice among college students (Clarkin, Tisch, & Glicksman, 2008). The term *social smoking* is often used by college students to describe their tobacco smoking behavior as occurring more often with others than in isolation (Moran, Wechsler, & Rigotti, 2004). With cigarette smoking, this concept of social smoking was found to be inversely associated with the intention to quit smoking in college students, indicating that although people characterize themselves as social smokers, the practice may be occurring more frequently and perhaps in isolation (Moran, et al., 2004). Tobacco use, in general, has the propensity to lead to lifelong nicotine dependence and to the development of health risks such as cardiovascular disease, cancers, and chronic obstructive pulmonary disease (Roskin & Aveyard, 2009; Tavafian, Aghamolaei, & Zare, 2009).

In the past decade, waterpipe tobacco smoking has become a popular social event among college students. Campus activities and clubs have utilized waterpipe smoking to

encourage students to attend and participate in a variety of other social functions (DeCouteau, 2009; Hookahlover, 2008; Kinman, 2010; SouthSmoke, n.d.). Perceived as having a lower health risk than cigarette smoking, waterpipe smoking may be on the rise among college students (Eissenberg, Ward, Smith-Simone, & Maziak, 2008; Primack, Walsh, Bryce, & Eissenberg, 2009).Waterpipe smoking involves a combination of tobacco, water, wood charcoal and a device known as a waterpipe, *goza, shisha*, or hookah. A waterpipe can have one or multiple hoses attached to the body allowing multiple persons to smoke from the same source. Charcoal is utilized in the process of waterpipe smoking to heat the tobacco to temperatures close to 450 °C, whereas, cigarette tobacco is burned at temperatures of close to 900 °C(Bacha, Salameh, & Waked, 2007). By creating negative pressure generated on inspiration through the hose, both the charcoal's emitted chemicals and the tobacco smoke produced are passed through a water bowl component of the waterpipe where it is believed by some that the nicotine and chemicals, such as arsenic, chromium and lead are filtered (Grekin & Ayna, 2008). From the water bowl, the smoke continues through the hose and into the mouth and lungs of the smoker.

The typical course of smoke in a waterpipe during inhalation is through a tube traveling from the top of the waterpipe, where the burning tobacco is located, descending into a bowl of water where it bubbles through the water after which it is inhaled through a tube attached to a mouthpiece. Figure 1.1 illustrates a waterpipe device and parts.

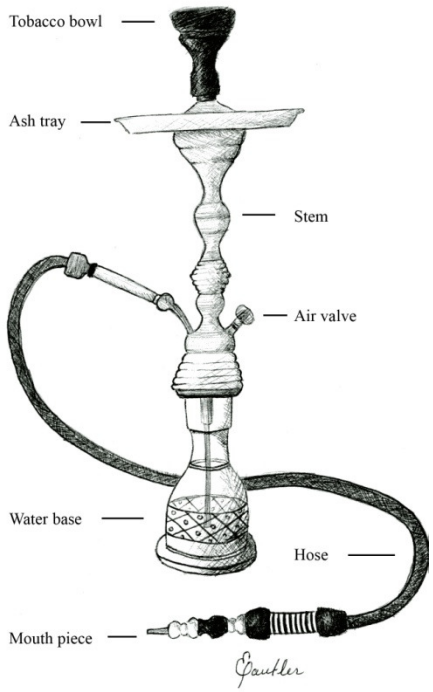

Figure 1: Waterpipe and Parts

Source: Picture courtesy of Elise Pautler

Although many young adults are aware of the risks of cigarette smoking, studies have found that young adults do not perceive waterpipe smoking as being harmful or addictive when compared with cigarettes and other forms of tobacco smoking (Eissenberg, et al., 2008; Smith, Curbow, & Stillman, 2007). Research now confirms that waterpipe smoking carries risks as great, if not greater than cigarettes (Mohammad & Kakah, 2008; Monzer, Sepetdjian, Saliba, & Shihadeh, 2008; Neergaard, Singh, Job, & Montgomery, 2007). This misperception of safety is believed to have contributed to the initiation and continued use among college students (Roskin & Aveyard, 2009).

Waterpipe smoking has been a common cafe staple in other countries for many years, providing men the opportunity to socialize(Maziak, Rastam, Ibrahim, Ward, &

Eissenberg, 2008). Smoking, in general, is customary in many countries. In some case, it may exhibit more than just a personal habit, but rather an important aspect of culture.The social acceptability and togetherness that waterpipe smoking invites has extended beyond the boundaries of the Eastern Mediterranean Region (EMR) and on to college campuses and surrounding hookah bars (Lenney & Enderby, 2008; Lyon, 2008; Primack, et al., 2008).

Waterpipe smoking has been described by users as providing a sense of sharing and belonging through passing the pipe from one person to another (Prignot, Sasco, Poulet, Gupta, & Aditama, 2008). This social acceptance and the ubiquitous availability of waterpipe lounges/stores has contributed to its use in college students (Primack, et al., 2008). The thriving café culture and media acceptance of waterpipe tobacco is ahead of public health efforts to educate the public and deter the behavior.

In addition to the social nature of waterpipe smoking, there are several other influential factors that contribute to the adoption of waterpipe tobacco smoking among college students. These factors include a mystical and exotic appeal, a perceived cultural experience, its affordability and popularity, the taste of flavored tobacco, a novel experience, and the perceptions of being a less harmful mechanism of smoking. From a cultural perspective, Roskin et al. (2009) reported that students who were of Arabic origin found waterpipe smoking to be a natural expression of their heritage and students who were not Arabic viewed waterpipe tobacco smoking as an alternative cultural view. Some of these non-Arabic students had discovered waterpipe tobacco while visiting the EMR and sought a reminder of a culture different from their own. From the college student's perspective, these factors mentioned above are all positive attributes of

waterpipe smoking and encourage continued use (Grekin & Ayna, 2008; Primack, et al., 2008; Rastam, Ward, Eissenberg, & Maziak, 2004; Roskin & Aveyard, 2009). The factors that draw college students to waterpipe smoking appear to be both personal and social in nature.

This dissertation study examined the degree to which personal factors (attitudes) and social factors (subjective norms) influence intention to smoke waterpipe tobacco and the strength of these relationships. This study was conducted with college students from the University of South Florida. Understanding these different factors of influence between waterpipe smokers and nonsmokers will help guide future interventions as well as add to the current body of literature on smoker's attitudes and beliefs about waterpipe smoking.

Statement of the Problem

Tobacco smoking is responsible for 440,000 deaths each year in the United States and 5.6 million years of potential life lost (ACS, 2010; Fromme, et al., 2009). Because tobacco is utilized in waterpipe smoking, the same carcinogens (polyaromatic hydrocarbons, and volatile aldehydes) that are in cigarette tobacco are also found in waterpipe tobacco (Monzer, et al., 2008). These carcinogens are the main components in mainstream smoke (smoke inhaled/exhaled by the smoker) and the side-stream smoke (smoke emitted into the atmosphere from burning cigarettes and tobacco) (Daher, et al., 2010). Additionally, these carcinogens are the precursors to lung cancer and other respiratory ailments (Prignot, et al., 2008).

Use of tobacco products, in any form, has the ability to cause health problems and lead to dependency on nicotine. Marketing of tobacco products during college activities and events is common and college students are viewed as an ideal target audience for tobacco companies to promote their products. College students constitute the youngest group that tobacco companies can legally target in their marketing strategies. Tobacco company documents indicate the company's intention to promote smoking during this vulnerable life stage (Ling & Glantz, 2002).

Along with the excitement and exploration that college affords, college life produces stressors and uncertainties. Students utilize and develop a myriad of tactics to deal with their individual stress: some are healthy and others are not. Common health risk behaviors adopted by college students to combat the stressors that college invokes are tobacco smoking, alcohol consumption, and prescription and illegal drug use (Naquin & Gilbert, 1996; Patterson, Lerman, Kaufmann, Neuner, & Audrain-McGovern, 2004). It has been estimated that one in four college students smoke and of these, seventy-five percent will continue to smoke into adulthood (Von Ah, Ebert, Ngamvitroj, Park, & Kang, 2004). Physiologically, the biphasic qualities of nicotine (excitation and relaxation) drive the desire, need, and continuation of smoking. Because waterpipe smoking contains nicotine, the World Health Organization (WHO) has declared it an emerging global public health problem (WHO, 2007).

According to Maziak et al. (2004), the initiation of waterpipe smoking in the U.S. occurs most often in college age students. Reasons cited for uptake have included the novelty of waterpipe, the ease of access, and the low cost of smoking. Eissenberg et al. (2008) reported that 20% of college students who responded to a questionnaire had tried

waterpipe tobacco in the past 30 days. Similarly, Smith et al. (2007) found nearly 16% of college freshmen participating in an Internet survey responded to having smoked waterpipe tobacco in the past 30 days. The Global Youth tobacco survey indicated that ten to twenty percent of college students had smoked hookah within the past month (Maziak, 2008).

In addition to the potential for nicotine addiction, waterpipe smoking has been shown to lead to infectious diseases and may be a gateway to the usage of psychoactive substances, such as cannabis (Eissenberg, et al., 2008; Prignot, et al., 2008). The health consequences of waterpipe smoking are becoming more evident as research is focusing on the health aspects and outcomes related to both casual and continual smokers.

Transitioning from a social smoker to a lone smoker has been suggested as a sign of dependence (Maziak, Eissenberg, & Ward, 2005; Salameh, Waked, & Aoun, 2008). The lone smokers were noted to have a more intense smoking habit than a social smoker, suggesting that greater intensity may lead to addiction (Eissenberg, et al., 2008; Maziak, Eissenberg, et al., 2005; Ward, et al., 2005). Asfar et al. (2005) found that two-thirds of the waterpipe smokers in his study were willing to quit, but failed to do so. This failure to quit may represent a tobacco dependence issue. The addictive potential of waterpipe smoking is still being investigated and includes factors such as duration and frequency of smoking, smoke chemical properties, type of tobacco, type of charcoal and volume of inhaled smoke (Maziak, 2008).

Purpose of the study

The purpose of this study was to identify the behavioral determinants of intention to smoke waterpipe tobacco. Theoretically based research exploring these constructs among waterpipe smokers in the U.S. and particularly among college campuses is limited (Eissenberg, et al., 2008; Grekin & Ayna, 2008; Smith-Simone, Curbow, & Stillman, 2008; Ward, et al., 2007). Furthermore, there is little research on the specific social influences of waterpipe smoking as determinants of intention among U. S. public university students.

In this study, Fishbein and Ajzen's Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) was used to investigate the impact of intrapersonal and interpersonal factors on waterpipe smoking intention among college students. Fishbein and Ajzen's TRA (Fishbein & Ajzen, 1975) views a person's intention as the immediate determinant of performing or not performing a behavior. The model also assumes that intentions will reflect rational and systematic decisions based on both social and personal influences. These determinants correspond with a person's attitude towards the behavior. Social determinants consist of an individual's perception of surrounding significant people that influences the performance of a behavior and the individual's motivation to comply with these perceptions. Social influences are known as subjective norms (Ajzen & Fishbein, 1980a). Personal determinants include individual's beliefs and the personal evaluation of the behavior. Fishbein and Ajzen (1975) argue that the relationship of variables determines intention, and intention predicts behavior.

The TRA has been used to predict and understand a variety of health-related behaviors in university students, for example, AIDS prevention(Fisher, Fisher, & Rye, 1995), cigarette smoking(Rhodes & Ewoldsen, 2009), and drug and alcohol use. One study utilized this theory to understand the influences of waterpipe smoking among college students in the U.S. (Primack, et al., 2008). Primack et al. (2008)examined the association between harm perception, dependence, peer acceptance and popularity as associated with the commonness of waterpipe smoking. Although not using the TRA, Smith-Simone et al. (2008) explored psychosocial risk profiles of waterpipe smoking using attitudes and beliefs derived from cigarette smokers.

The TRA was selected as the theoretical framework for guiding this research based on the combination of intrapersonal constructs (e.g., attitudes) and interpersonal constructs (e.g., peer/other influencers), both of which influence the intention for waterpipe smoking, albeit in probable varying degrees. This study differed from Primack's study in two important ways. First, this study provided a measure of the individual's motivation to comply with significant others. Second, it provided more measures in assessing individual beliefs. Primack et al. (2008) did not provide a measure of individual's motivation to comply and provided only one item to measure harm perception.

Need for the Study

Prevention of lung disease and promotion of lung health has been one of the primary overall goals of public health since its inception in dealing with tuberculosis years ago. Because smoking is a preventable cause of death, efforts to deter young

people from smoking and educate the public on the deleterious effects of secondhand smoke have charged both public health practitioners and research institutions to fund and conduct research to curb the morbidity and mortality related to smoking. The tobacco industry continues to develop and distribute a plethora of nicotine products to maintain addiction in smokers. With the U.S. Food and Drug Administration (FDA) now having control over tobacco products(FDA, 2009) we may find ourselves in a position to help those with addictions as opposed to constantly reacting to the marketing tactics of *Big Tobacco.* In the meantime, we must develop grassroots interventions based on research with the priority population.

In a press release issued March 8, 2007, the American Lung Association recommended "… increased research on all aspects of hookah use." Despite this push to increase research in this tobacco arena, only a few articles have been published in the United States. The American Lung Association (ALA) release also mentions that "hookah bars are growing in popularity in the U.S. especially among 18-to 24-year-olds, becoming the first new tobacco use trend of the twenty-first century" (Association, 2007). These national recommendations align with this research study aimed at college students who partake in waterpipe smoking.

> A 2007 trend report(ALA, 2007) issued on the emerging deadly trend of waterpipe smoking stated:
>
> More research is needed into the health effects of waterpipe use, and the patterns and process of beginning to use waterpipes amongst various populations. Since little data exist on prevalence

> of hookah use in the United States, national surveys on youth and adult tobacco use should consider adding a question on this topic. There also is virtually no research on the risks of secondhand smoke from waterpipe use. (p. 6)

It is evident that waterpipe tobacco research is at the forefront of research topics for the public health practitioners.

U.S. college students have a higher prevalence of waterpipe smoking as compared to the general population(Smith-Simone, et al., 2008). Given the increase in hookah lounges, advertisement, and percentage of waterpipe smokers around college campuses, college students are considered a vulnerable population for increased marketing and promotion efforts aimed to increase waterpipe smoking (Moran, et al., 2004). To develop strategies that educate and promote healthy behavioral alternatives and decrease waterpipe smoking, it is necessary to investigate the personal and social influences of waterpipe smoking from the priority population.

This research focused on the population of college students at the University of South Florida(USF) and included a survey that obtained a large sample of students from the university. In addition, qualitative data was collected through intercept interviews, focus groups, and observational studies.

Research Questions

Six research questions guided the proposed research:

Research Question #1:

What is the relationship between attitudes and intention to smoke waterpipe tobacco?

Research Question #2:

What is the relationship between subjective norms and the intention to smoke waterpipe tobacco?

Research Question #3:

What is the relationship between beliefs of important others and subjective norms?

Research Question #4:

What is the relationship between motivation to comply and subjective norms?

Research Question #5:

What is the relationship between outcome expectancies and attitudes?

Research Question #6:

What is the relationship between evaluation of outcome expectancies and attitudes?

Delimitations

This research was conducted with students who reside in university housing and were 18 years of age or older.

Limitations

There are known limitations to this research that deserves mentioning. The study sample was drawn only from students who reside in university housing at the University of South Florida thereby limiting its generalizability. Of these individuals, only those

who were at the Marshall Center (student center) during recruitment for the qualitative portion were recruited. Those students who may be living within university housing, but are not at the Marshall Center or notice the focus group flyers did not have an opportunity to participate in the qualitative research. Additionally, any other students who attend the university, such as graduate students, commuter students, distance learning students, or students who attend the other university campuses were excluded from participating in the study.

Other limitations to the study included students who may be unaware of waterpipe smoking. Of the participants who did choose to participate, there remains the limitation of social desirability and self-reporting, both of which have the propensity to alter the results. Because this study is cross-sectional in design, it does not provide directionality or causality claims.

Rationale

The rationale for selecting students who live in University housing is two-fold. First, this sample of students is closer in age to the age of initiation found in the literature and may highlight whether initiation in this sample of college students is greater in high school years or college years. Barnett et al. (2009) found in a sample of Florida high school students that 11% of students had first tried waterpipe tobacco during their high school years. Grekin et al. (2008) found that 58% of the Michigan college sample they surveyed had initiated waterpipe smoking after the age of 17 years, suggesting college years as the time to begin experiencing waterpipe tobacco. Secondly, the study may

provide USF with more focused information to better equip the Student Health Services for campus-based prevention programs and health literature.

Terms

1. *Ajami* (Ajamy) – Also known as *tumbak*, plain tobacco made of moistened shredded leaves, soaked for hours in water before being squeezed and packed in the bowl of the hookah (Chaouachi, 2009).
2. *Arghileh* – A type of waterpipe used in Easter Mediterranean Region(Shihadeh, 2003)
3. Attitude – A person's negative or positive judgment of a behavior(Ajzen & Fishbein, 1980a)
4. Behavioral beliefs – the beliefs that underlie a person's attitude (toward a behavior) (Ajzen & Fishbein, 1980a).
5. Carbon monoxide – An odorless, colorless, toxic gas found in tobacco smoke(*An introduction to indoor air quality*, 2009).
6. *Goza* – An apparatus used to smoke tobacco, similar in structure to a waterpipe(Khater, Abd El-Aziz, Al-Sewaidan, & Chaouachi, 2008).
7. Hookah – An apparatus or ancient pipe traditionally used in Africa and Asia (Chaouachi, 2009).
8. Hubble Bubble – A method of smoking through a waterpipe, whereby, the sound of the air flowing through the water bowl produces a sound described as such
9. Important (significant) others – People who influence a decision to behave a certain way (e.g., spouse, parents, friends)(Ajzen & Fishbein, 1980a).

10. *Jurak* – A mixture of about 30% tobacco and 70% molasses/honey/glucose syrup and minced fruits. It does not contain glycerin as in *maassel* (Chaouachi, 2009).

11. *Maassel (Mo'assel*) – Also known as *tobamel* (tob stands for tobacco and mel for honey, in latin). A mixture of about 30% tobacco and 70% molasses/honey/glucose syrup plus glycerol and essences(Chaouachi, 2009).

12. *Narghile* – A Persian/Iranian and Turkish word to describe a water pipe or apparatus, typically based on a coconut as the vessel (Chaouachi, 2009).

13. Normative beliefs – the beliefs that underlie a person's subjective norm (Ajzen & Fishbein, 1980a).

14. Polyaromatic hydrocarbons (PAHs) –A group of over 100 different chemicals that are formed from incomplete combustion. Some of which are known carcinogens (*ToxFAQs*, 2010)

15. Psychoactive substances –A drug that can produce mood changes and distorted perceptions (FreeDictionary, 2010)

16. *Shisha* – Of Persian origin, bottle (recipient) of water made of glass with a typical flask/vial form (Chaouachi, 2009).

17. Subjective norm – a person's belief that specific individuals or groups think he should or should not perform (a particular behavior) (Ajzen & Fishbein, 1980a).

18. *Tumbak* –Also known as *ajami*, plain tobacco made of moistened shredded leaves, soaked for hours in water before being squeezed and packed in the bowl of the hookah(Chaouachi, 2009).

19. Waterpipe – also referred to as hookah or *shisha* has a mouthpiece, hose, water bowl, body, and a head that is filled with tobacco and then heated with charcoal (Eissenberg, et al., 2008).

CHAPTER 2: LITERATURE REVIEW

Introduction

Waterpipe smoking has obtained popularity among college students in the U.S., partly due to its exotic appeal, social nature, and perceived harmlessness. Waterpipe smoking differs from other health risk behaviors among young adults in that it is novel, lacks policy control, lacks uniform health messaging, and holds diverse variations in its practice. For example, smokers can add alternative liquids into the water bowl as well as additional substances into the tobacco for varying degrees of effects. More studies are confirming waterpipe smoking as a health risk behavior needing immediate attention both from the realm of health messages and overarching policy; however, more information is still needed to determine how best to align policy and messages to achieve behavior reduction.

Health Consequences

As mentioned previously, tobacco smoking is responsible for 440,000 deaths each year in the United States and 5.6 million years of potential life lost (ACS, 2010; Fromme, et al., 2009). It has been determined that smoking causes coronary artery disease, stroke, and lung disease, however, due to the highly addictive nature of nicotine many people continue to smoke (Roskin & Aveyard, 2009; Tavafian, et al., 2009). Waterpipe smoking is an emerging problem from a public health perspective. Although waterpipe smoking is

perceived as being less harmful than cigarettes, more evidence is suggesting that it contains more harmful agents and has similar addictive potential as cigarettes (Bacha, et al., 2007; El-Nachef & Hammond, 2008; Neergaard, et al., 2007; Shihadeh, 2003). Unlike cigarette smoking, waterpipe smoking has been shown to lead to infectious diseases, low birth weight infants, and possibly the use of psychoactive substances (Eissenberg, et al., 2008; Prignot, et al., 2008; Tamim, et al., 2007). The health consequences of waterpipe smoking are becoming more evident as research is increasing.

Because tobacco is utilized in waterpipe smoking, the same carcinogens (polyaromatic hydrocarbons, and carbon monoxide) that are in cigarette tobacco are also found in waterpipe tobacco (Barnett, Curbow, Soule, Tomar, & Thombs, 2011; Monzer, et al., 2008). These carcinogens are the main components in mainstream smoke (smoke inhaled/exhaled by the smoker) and are the precursors to lung cancer and other respiratory ailments (Prignot, et al., 2008). Waterpipe smoking requires larger inhaled respiratory volumes which exposes the smoker to more carcinogens than during cigarette smoking (Fromme, et al., 2009). In a single study looking at heavy metals, Shihadeh (2003) found that waterpipe smoke contained an increased amount of nickel, arsenic, and cobalt. Although waterpipes do not emit as much second hand smoke as cigarettes, the large volumes of mainstream smoke exhaled expose others to these hazardous chemical components. Another concern surrounding waterpipe smoking in the U.S. is the use of plastic hoses versus the permeable leather hoses used in the Eastern Mediterranean Region (EMR). The plastic hoses lead to significantly increased levels of toxins, such as carbon monoxide and particulate matter(Saleh & Shihadeh, 2008).

Because tobacco leaf combustion is an incomplete process and produces both gaseous and particulate matter, the waterpipe tobacco smoking does not minimize the health effects of the components (Al Mutairi, Shihab-Eldeen, Mojiminiyi, & Anwar, 2006). Waterpipe and cigarette smoke contain similar toxic agents and due to the longer inhalational puffs required to generate the smoke with waterpipe smoking it is believed that up to 100 times more smoke is inhaled with waterpipe than with cigarettes (Eissenberg, et al., 2008).

The belief that waterpipe smoking is less harmful than cigarette smoking is shared by physicians as well as users. Waterpipe smoking is perceived to be less harmful and less addicting because water filtration is thought to deliver less nicotine than cigarette smoking (Chaaya, et al., 2004; Shihadeh, 2003; Ward, et al., 2007). This view is based on the fact that nicotine is water soluble and the belief that not only nicotine but other toxic substances will be filtered out prior to the smoke being inhaled (Neergaard, et al., 2007). In contrast to this view, research has shown that only five percent or so of the nicotine is dissolved in the water and waterpipe smokers increase the duration of smoking and the volume of puffs to titrate the necessary nicotine to meet the pleasurable or dependent effects that they may need or desire (Ward, et al., 2007).

Polyaromatic hydrocarbons (PAH) and carbon monoxide (CO) are the main components of the mainstream tobacco smoke that cause cancers and lung health issues (Monzer, et al., 2008). El Nachef (2008) conducted carbon monoxide measurements during waterpipe smoking sessions. The carbon monoxide levels exceeded environmental protection standards (O'Rourke, Hatcher, & Stepanski) levels of greater than 35 parts per million averaged over an hour (El-Nachef & Hammond, 2008). Other

researchers found some of the more carcinogenic PAHs to be as much as 50 times greater in waterpipe smoke as compared to cigarette smoke (Sepetdjian, Shihadeh, & Saliba, 2008). Comparing cigarette smoke carcinogens to those produced by hookah in side stream smoke, Daher et al. (2010) found that the amount of toxicants and ambient carcinogens in a single session of waterpipe smoking equals that produced by two to ten cigarette smokers. A more recent study by Barnett et al. (2011) found exhaled CO to be much higher in patrons exiting hookah bars compared to patrons exiting regular bars that allow cigarette smoking.

It is important to note that CO has a 200-300 times greater affinity for hemoglobin than does oxygen. In the presence of high CO levels individuals are at risk for hypoxemia (low level of oxygen in the bloodstream) and the side effects of carbon monoxide poisoning (Pierson & Kacmarek, 1992). CO poisoning is witnessed by nausea, headaches and blurred vision initially and depending on the level of exposure; it can lead to coma. Tufts University reported a student who smoked hookah for two hours straight and then vomited immediately after she left the lounge (Wolf, 2010). Incidences such as these are not well documented, and may be common in rooms with little or no ventilation. Additionally, the same article reported a dormitory fire from an unattended waterpipe. Fires have the potential to lead to even greater levels of CO exposure. Carbon monoxide has a six hour half-life in room air, indicating the potential for greater deleterious effects on the human body (Walsh, Czervinske, & DiBlas, 2010). Lim et al. (2010) reported a hospital case of a young man who fell and injured his head after smoking shisha (Hookahlover). His CO level in his bloodstream on hospital admission was nearly twenty-eight percent; normal levels are less than two percent. Two other

emergency room cases also reported similarly high CO levels in waterpipe smokers (Cavus, Rehber, Ozeke, & Ilkay, 2010; Uyamk, Arslan, Akay, Ercelik, & Tez, 2009). CO results in cellular poisoning and is often difficult to diagnose without a patient history of some type of exposure.

Because tobacco leaf combustion is an incomplete process, it yields both gas and particulate matter. The gas composition consists of nitrogen, carbon dioxide, carbon monoxide, nitrosamine, acetaldehyde, formaldehyde, hydrocarbons and hydrogen cyanide. The particulate matter is composed of tar and nicotine (Al Mutairi, et al., 2006). It is the nicotine that leads to the cigarette addiction and there is emerging evidence that waterpipe smoking also may lead to dependence (Jackson & Aveyard, 2008). Ward et al. (2007) found a strong association between cigarette smoking and waterpipe smoking suggesting that cigarette smoking may be a gateway to the use of waterpipe smoking and also that frequent use of waterpipe smoking may lead to cigarette consumption. Asfar et al. (2005) found that men who routinely smoked waterpipe tobacco in a social setting became lone smokers as time passed.

Transitioning from a social smoker to a lone smoker has been suggested as a sign of dependence (Maziak, Eissenberg, et al., 2005; Salameh, et al., 2008). The lone smokers were noted to have a more intense smoking habit than a social smoker, suggesting that greater intensity may lead to addiction (Eissenberg, et al., 2008; Maziak, Eissenberg, et al., 2005; Ward, et al., 2005). Asfar et al. (2005) found that two-thirds of the smokers in his study were willing to quit, but failed to do so. This inability to quit may represent a tobacco dependence issue. In a U.S. study of two campuses, thirteen percent of students said stated they were “hooked on hookah” (S. Smith-Simone, Maziak,

Ward, & Eissenberg, 2008). The addictive potential is still being investigated and includes factors such as duration and frequency of smoking, smoke chemical properties, type of tobacco, type of charcoal and volume of inhaled smoke (Maziak, 2008).

According to DiClemente (2010), addiction begins with experimentation, followed by casual use, regular use, abuse and then dependence (DiClemente, 2010). Experimentation with tobacco products is common among young adults (Moran, et al., 2004). The college years provide a prime opportunity to implement programs focused on both helping individuals quit smoking and prevent those who are experimenters from becoming regular smokers (Wechsler, Rigotti, Gledhill-Hoyt, & Lee, 1998). However, before programs can be implemented effectively, a more complete understanding of the drivers and the behavior from the perspective of the consumer is needed.

The potential for acquiring an infectious disease is another public health concern with waterpipe smoking. Prignot et al. (2008) noted that waterpipe smoking was a contributor to the spread of tuberculosis by infected persons who shared a mouthpiece with non-infected individuals during a smoking session. This discovery highlights the concern over viruses and bacteria that may be transmitted through oral secretions. Due to lack of public health oversight, poor sanitation and cleaning procedures of waterpipes raise concern of infectious disease spread. In India, if a person does not share the mouthpiece it is considered an offense (Maziak, Ward, Afifi Soweid, & Eissenberg, 2004).

Untreated infectious diseases can lead to chronic diseases, and thus, pose a long term public health problem. An early sign of chronic lung disease can be noted in

pulmonary function testing, specifically the forced expiratory volume in one second (FEV_1). Two separate studies conducted pulmonary function tests on waterpipe smokers and found not only their FEV_1 was decreased, but also that they showed decreased values in their peak flow rates and the forced expiratory flow (Kiter, Ucan, Ceylan, & Kilinc, 2000; Mohammad & Kakah, 2008). These measurements reflect stricture in bronchial diameter resulting from either inflammatory responses or immune responses.

Associated drug use is yet another public health concern with the epidemic of waterpipe smoking. In a qualitative study conducted with Palestinian youth, Makhoul and Nakkash (2007) found that youth added crushed hallucinogenic pills to their waterpipe tobacco and smoked the combination. There are concerning anecdotal reports of waterpipe smokers adding wine and other alcoholic beverages to the water bowl of the pipe to experiment for different effects and flavors. Waterpipes have been used for smoking hashish and marijuana (Maziak, Ward, Afifi Soweid, & Eissenberg, 2005).

Waterpipe smoking has been shown to predispose individuals to additional negative health consequences that are of public health concern. Tavafian et al. (2009) conducted a survey among waterpipe smokers and found that waterpipe smoking was associated with a lower quality of life, poor health conditions, and increased physical limitations. These individuals generally reported suffering more depression and anxiety than nonsmokers (Tavafian, et al., 2009). These findings correlate with the literature of depression associated with smoking cigarettes (Schleicher, Harris, Catley, & Nazir, 2009). College students in the U.S. gave symptoms of depression as a reason they choose to smoke waterpipe (Grekin & Ayna, 2008). Depression and the risk of suicide in college students should be a major mental health and public health concern. Al Mutari et al.

(2006) found that waterpipe smokers have a higher incidence of chronic bronchitis than did cigarette smokers and that waterpipe smoking can lead to oral cancers. El-Hakim et al. (1999) reported two initial cases of lip carcinoma associated with waterpipe smoking. Waterpipe smoking has been linked to bronchial cancers, atherosclerosis, and low birth weight infants (Ashmawi, 2003; Gupta, Boffetta, Gaborieau, & Jindal, 2001; Nuwayhid, Yamout, Azar, & Kambris, 1998).

Growing Use

Worldwide there are estimated to be 100 million daily waterpipe smokers (Ward, et al., 2005). Depending on the country of origin, waterpipe smoking may be referred to as *shisha, boory* or *goza* (Egypt and Saudi Arabia) hookah (Africa and the Indian subcontinent), hubble bubble (many regions), *narghile, argileh or nargile* (Israel, Jordan, Lebanon and Syria) (Chaaya, et al., 2004; Neergaard, et al., 2007). Current studies demonstrate that twenty percent of the population in the Eastern Mediterranean Region (EMR) smoke waterpipe tobacco (Tavafian, et al., 2009). In Israel, approximately twenty-two percent of youth 12 to 18 years of age smoke waterpipe every weekend (Tavafian, et al., 2009). Some individuals in the EMR do not even consider waterpipe smoking a form of tobacco smoking, consider it natural, and harmless (WHO, 2006).

History of use in Middle Eastern Countries

Waterpipe smoking has been around for centuries with one of the earliest recordings of its use in 1616 in India (Goodman, 1993). Identifying the actual country from which waterpipes were invented is less clear, however, most research agreement centers on the Persians for invention and the Muslims for the spread of its use (Goodman, 1993). Even in the early years of waterpipe usage for tobacco consumption, waterpipe

tobacco smoking was the centerpiece of social interaction among coffeehouses (Goodman, 1993). Its use in coffeehouses has transcended many centuries and remains customary with elder men in the Eastern Mediterranean Region (EMR). These coffeehouses are still prevalent in the EMR and continue to encourage socialization.

The Middle East experienced a resurgence of waterpipe smoking in the 1990s with the introduction of flavored tobacco, known as *maassel*(Maziak, 2008; Rastam, et al., 2004). The practice of waterpipe tobacco smoking has spread to women and children in the EMR (Salameh, et al., 2008). In the EMR, cigarette smoking in women is considered taboo, however, waterpipe smoking is not (Maziak, Hammal, et al., 2004). This acceptance has prompted women to take up the practice at an alarming rate partly due to the misperception that it is safe and supported by increased family tolerance (Al Mutairi, et al., 2006; Asfar, Ward, Eissenberg, & Maziak, 2005). Waterpipe smoking by some women in Syria has been described as "a harmless toy" (Mohammad & Kakah, 2008). In 2005, the Lebanon Global Youth Tobacco Survey (GYTS) indicated that 33.9% of school children were current waterpipe smokers surpassing the number of cigarette smokers (Khalil, Heath, Nakkash, & Afifi, 2009; Maziak, 2008). It is not uncommon for a child to smoke with their parents in the Middle East.

Dissemination to the United States

The spread of waterpipe lounges/restaurants and other social places to smoke are beginning to take hold in the U.S., especially among college students. It is not certain if this smoking trend reflects students' desires to experience practices from another culture or just an opportunity to relax and socialize.

The introduction of flavored tobacco is believed to have made waterpipe smoking more popular among youth. Called *maassel*, flavored tobacco was introduced in the 1990s and currently accounts for ninety percent of waterpipe tobacco sales. *Maassel*provides tobacco with a fruity flavor. It also has less nicotine-rich tobacco due to added stems and glycerin to aid in fermentation. When burned, flavored tobacco produces a caramelized smell similar to cotton candy (Shihadeh, 2003). The lure of fruit flavored smoke, the associated social aspect of waterpipe smoking, and added misperception of water filtering properties of a waterpipe have led smokers to believe that waterpipe smoking is a safer alternative to tobacco consumption than traditional cigarette smoking, cigars, and chewing tobacco (Maziak, 2008; Smith, et al., 2007).

Although Primack et al. (2008) reported that nearly 300 cafes opened in the U.S. between 1999 and 2004, investigation into the socio-demographic characteristics of individuals who frequent hookah bars and the derived benefits/barriers need to be explored. Nationwide, it is estimated that on average five new hookah bars open each month ("Hookah bars," 2009). These cafes are spreading into malls, hotels, and even into residential neighborhoods (Neergaard, et al., 2007). This increased availability of waterpipe tobacco, through both bars and Internet sites, has been an added contribution to its increased use among college students, aside from the perceived psychological and physiological benefits cited in the literature (Maziak, et al., 2008).

Factors Influencing Waterpipe Adoption in the U.S.

Reasons for waterpipe smoking's adoption in the United States can be attributed to several possible factors including immigration, marketing, ease of access, lack of regulations, and appeal among youth.

Throughout history, the U.S. has become culturally enriched with traditions and values from around the world. Despite terrorist events from 2001, the United States has seen an increase in persons obtaining their legal permanent residence during the past several years (Security, 2009). Immigrants from Syria, India, Egypt, Iran, Iraq, Israel, Lebanon, Saudi Arabia, and Turkey have introduced Middle Eastern cultural traditions such as waterpipe smoking to the U.S. With continued influx of persons from the EMR, the prevalence of waterpipe smoking is likely to increase. According to a study by the Center for Immigration Studies, Middle Easterners represent one of the fastest growing segment to the US, with one-third the total living in California, New York, and Michigan (Camarota, 2007). Weglicki et al. (2008) conducted a study among a community sample of Arab-American and non-Arab-American high school students. The study concluded that the Arab-American youth had a higher prevalence of ever waterpipe smoking and current waterpipe smoking than non-Arab-Americans, respectively (38% vs. 21% ever smokers; 17% vs. 11% current smokers) (Weglicki, Templin, Rice, Jamil, & Hammad, 2008). This may be attributed to waterpipe tobacco smoking being more customary in families of Middle Eastern descent. Jamil et al. (2011) did find a positive correlation between having a father, mother, or sibling smoking waterpipe tobacco at home and an individual smoking waterpipe tobacco ($OR = 9.5$, $p < 0.01$). This study suggests that familial social norms and customs of Arab-Americans may contribute to initiation and continuation of smoking waterpipe tobacco in younger adult males (Jamil, et al., 2011).

Along with the practice of waterpipe smoking, college students may have acquired their perception of the habit as safe from Middle Eastern Immigrants. These beliefs, knowledge, and attitudes are often shaped by cultural attributes and may vary

among residents as the U.S. becomes more ethnically diverse (Asfar, et al., 2005). Research among U.S. college students has shown that they also share the inaccurate belief that waterpipe smoking is less harmful than cigarettes (Grekin & Ayna, 2008; Roskin & Aveyard, 2009; Smith, et al., 2007). Another factor contributing to the increased popularity of waterpipe smoking is the availability of hookah bars. Currently there are five hookah bars/restaurants around the University of South Florida (USF) located in Tampa, Florida and visible on the World Wide Web.

Access to information about waterpipe smoking on the World Wide Web may also fuel interest. In the last decade, there has been a steady increase in the number of social internet sites, blog sites, and commercial sites related to waterpipe smoking. Most recently, a blog was posted regarding how to smoke hookah (waterpipe) in a dormitory without being caught (Whokah333, 2010). These readily available forms of communication have led to the spread of waterpipe smoking to the U.S. along with the proliferation of waterpipe cafes that have opened in the past decade (Maziak, 2008).

Social technology has drawn an increasingly large number of high school and college students, enabling individuals to share their day to day lives with others. These information highways also enable individuals to share their experiences with waterpipe smoking, as well. Hookah blog sites and websites allow discussions of favorite flavors and favorite bars. In addition, the ease of ordering waterpipes and flavored tobacco products online has led to increased waterpipe smoking on college campuses (Parna, Usin, & Ringmets, 2008; S. Smith-Simone, et al., 2008). Most recently, Tampa has experienced a new channeling of information leading to the popularity of waterpipe smoking. A shopping website called “Group On” advertised the cultural event of

hookah smoking as a venue to experience the culture of the Tampa Bay area (Reuters, 2009). In 2008, students from the University of South Florida started a *Facebook* interest group surrounding hookah. The "USF mUndays" site has current wall posts advertising hookah lounges. The current friend list is over 1000 persons (Facebook, 2010).

Increased marketing efforts have been shown to lead to initiation of smoking (Gilpin & Pierce, 1997). Marketing of waterpipe smoking through sponsorship of college activities such as music events, advertising in college papers and local bars, and provision of free samples has the propensity to lead to increased usage of waterpipes. Jewish student organizations on college campuses sponsor "Hookah in the Sukkah" events during annual Sukkot harvest festival is one example of how waterpipe has been incorporated into the college life (Kelly, 2009; Lewin, 2006). Students also use waterpipe smoking as a draw to get other students to join their organization (DeCouteau, 2009).

Additionally, through commercialization, the Internet has made waterpipe smoking appear "cool" to youth and young adults (Rastam, et al., 2004). The Internet has been suggested as the primary source for home smoker's purchases (Maziak, 2008). Smith-Simone et al. (2008) found statistically significant increases in waterpipe smoking in college students due to peer influence, appearance of being "cool", and the attractiveness of the product through marketing sources. Eissenberg et al. (2008) reported that twenty percent of college students who responded to a questionnaire had tried waterpipe tobacco in the past 30 days. Similarly, Smith et al. (2007) found sixteen percent of college freshmen participating in an internet survey responded to having smoked waterpipe tobacco in the past 30 days.

Lax regulations and no required health warnings may also contribute to the spread of waterpipe tobacco smoking. Currently there are no national tobacco control policies that address waterpipe smoking packaging or distribution (Maziak, 2008). This lax control has several effects, for instance it leads individuals to believing that lack of regulations must be an indication of safeness and it also leads to easy access through internet sales (Primack, et al., 2009; S. Smith-Simone, et al., 2008). Legislation that stymies cigarette smoking in public places often does not include waterpipe smoking (Primack, et al., 2009). Hookah bar owners argue that they are exempt from smoking laws because the laws state "the use or possession of a lighted cigarette, pipe or tobacco product" and their argument is that you do not light hookah tobacco ("Some hookah bars fighting new smoking ban," 2010). The World Health Organization Framework Convention on Tobacco Control (WHO FCTC) has called upon countries to regulate package labeling, health warnings, content, and emissions related to waterpipe tobacco smoking (WHO, 2006). On September 22, 2009 the FDA placed a ban on cigarettes containing flavored tobacco aimed at luring youth to smoke (FDA, 2009). However, because these controls do not include waterpipe smoking, it potentially gives a false sense of safety in the use of waterpipe tobacco.

Adoption of practice among college students

Perceived Benefits

Waterpipe tobacco smoking also offers college students a variety of benefits. The waterpipe's use in providing a form of socialization and relaxation among peers, the mystical and exotic appeal, its availability and popularity, the flavored tobacco attraction,

the novel experience, and the perceptions of being a less harmful mechanism of tobacco consumption have all contributed in some form to its use in college students.

Waterpipe smoking has been described by users as providing a sense of sharing and belonging through passing the pipe from one person to another (Prignot, et al., 2008). These benefits have been appreciated for centuries by elder men in the Eastern Mediterranean Region. Social acceptance of waterpipe smoking and the opportunity it provides to socialize appears to have contributed to its use in college students in the U.S. as well (Primack, et al., 2008).

It is not uncommon for waterpipe bars to also provide belly dancers and to burn incense both of which create a rather mystical atmosphere for smokers. Currently in Tampa, one hookah bar offers belly dancers and a masseuse (Hayes, 2005). When surveyed, Canadian and English students reported that they liked the exotic appeal that waterpipe smoking affords (Roskin & Aveyard, 2009). Along with the supernatural appeal, (Grekin & Ayna, 2008) found that both the low cost and the extensive availability facilitated the use of waterpipe smoking among college students. Waterpipe smoking has created a sense of smoking culture among college students, as it differs from tobacco consumption patterns of their parents (Prignot, et al., 2008). Waterpipe smoking has also given students a sense of being popular, yet another draw to incoming freshmen (Primack, et al., 2008). Popularity along with perceived peer acceptance are strong predictors of waterpipe smoking among college students (Primack, et al., 2008). The popularity of waterpipe smoking as viewed by college students is through its stress reducing and relaxing effects (Maziak, Eissenberg, et al., 2004).

As noted above, m*aassel*, the fruit flavored tobacco, has contributed to the increased prevalence of waterpipe smoking in both the EMR and the U.S. (Rastam, et al., 2004). *Maassel* is tobacco that has been combined with dried fruits, glycerin, and flavorings to deliver a fruit flavored smoke which waterpipe smokers both taste and inhale. *Maassel* flavors range from apple, bubble gum, chocolate, frappaccino, mint, orange soda, root beer to melon (Primack, et al., 2009). The formulation and distribution of *maassel* is believed to have contributed to the resurgence in the Middle East and the increased incidence of waterpipe smoking in the U.S (Shihadeh, 2003; Ward, et al., 2005). The idea of tobacco being fruit flavored has led to its acceptance as a safer form of tobacco use among college students (Grekin & Ayna, 2008). Fruit being touted as "good for you" has led waterpipe smokers to view *maassel* tobacco smoking as having natural qualities, providing a false sense of healthiness (Prignot, et al., 2008).

The perception that the water is a filtering mechanism of the harmful chemicals has led some college students to believe it is less harmful (Grekin & Ayna, 2008). The adoption of waterpipe smoking can be attributed to the harm reduction misperception (Maziak, Ward, et al., 2004). Roskin (2009) found that among Canadian and English students smoking was perceived as less harmful due to the smoothness of the smoke compared to cigarette smoking and, in addition, the majority of students felt they could quit at any time. This sense of ability to quit gives the impression that waterpipe tobacco may be seen as less addictive than the tobacco used in cigarettes. Ward (2006) surveyed U.S. Military recruits and found that they also believed waterpipe smoking to be safer than other methods of tobacco smoking (Ward, Vander Weg, Relyea, Debon, & Klesges, 2006). Eissenberg et al. (2008) also found that among cigarette smokers in a U.S.

college, students believed it to be less harmful than cigarette smoking (Eissenberg, et al., 2008). Some of the students even believed that waterpipe smoking was an avenue for cigarette smoking cessation (Makhoul & Nakkash, 2009; Roskin & Aveyard, 2009). In a study of college students at Johns Hopkins University, some students believed that nicotine replacement therapies were as harmful as cigarettes, and that waterpipe smoking was less harmful than both (Smith, et al., 2007). The proposed research will look at the applicability of using the Theory of Reasoned Action (TRA) to predict waterpipe smoking and to understand the cognitions that underlie the behavior to help design interventions designed to change the behavior.

Theoretical Framework

The Theory of Reasoned Action (TRA) (Figure 2.1) is a theoretical framework that is used to predict behavior under the assumption that humans are rational individuals and use information in an organized fashion to inform behavioral decisions (Ajzen & Fishbein, 1980b). The TRA infers that humans consider the consequences and implications of their behavior prior to action to perform or not perform a particular behavior (Ajzen & Fishbein, 1980b). The theory assumes that behavior is volitional and intention leads directly to behavior, thereby suggesting that knowing the intention is a good predictor of the behavior occurring (Ajzen & Fishbein, 1980b). Although this intention to behavior concept seems quite simplistic in form, the theory further suggests the researcher must understand the effect the determinants have on intention if they are to inform developers of interventions. More specifically, if researchers can understand and predict the influencers on behavior then it is reasonable to think that these influences will

be a leverage point in programs and health messages to deter the behavior in the particular study sample.

Theoretical Constructs

The TRA(Glaser & Strauss, 2009) was developed in 1975 by Martin Fishbein and Icek Ajzen to examine the relationship between attitude and behavior. The TRA posits that an individual's intention to engage in or refrain from a behavior is the single best predictor that behavior. In the case of smoking, the theory predicts that an individual who has some intention to start smoking should be more likely to engage in smoking than someone who has no intention to smoke. According to the TRA, behavioral intention (main predictor of the behavior) in turn, is influenced by personal and social determinants. The personal determinant of intention is an individual's attitude toward the behavior. This attitude is influenced by two factors: (1) a person's beliefs about the behavioral outcome and (2) a person's evaluation of the relative costs and benefits of the anticipated outcome. According to the theory, attitudes are a function of personal beliefs. For example, a person who holds positive beliefs about smoking are more likely to have a positive attitude towards smoking and those with negative beliefs will more likely have negative attitudes. Under the umbrella of attitudes, the personal beliefs are referred to as behavioral beliefs.

The social determinant of intention is termed subjective norm. Subjective norm constitutes the social influences of intention. Subjective norm is influenced by two factors; (1)an individual's belief about whether important others will approve or disapprove of the behavior, and (2) the individual's motivation to comply with these beliefs. Subjective norms are also a function of beliefs, but rather than personal beliefs,

they are related to the social aspects. More specifically, beliefs about whether important others think he/she should or should not perform a particular behavior. For example, if important others believe that the person should smoke then the individual will feel greater social pressure to smoke. Underlying a person's subjective norms, these beliefs are referred to as normative beliefs(Ajzen & Fishbein, 1980a).

In review, the two main predictors of behavioral intention are subjective norms and attitude. Subjective norms and attitude can exert varying degrees of influence on behavioral intention(Ajzen & Fishbein, 1980b). When a positive attitude corresponds to a positive subjective norm then the direction of intention is more easily determined because positive predictors on both personal and social factors equal positive behavioral intention. For example, an individual will have strong intentions to smoke if they evaluate smoking favorably and if they believe important others think they should smoke. However, if attitude andsubjective norms exert competing influences (e.g., positive personal predictors and negative social predictors) then relative importance or weight of attitudesand subjective norms will determine behavioral intention. For example, if an individual evaluates smoking favorably, yet important others think they should not smoke then the intention to smoke is not as great. Therefore when assessing influences on behavioral intention, it is important to understand and determine the weight of influence of both attitudes and subjective norms especially in the case of developing interventions.

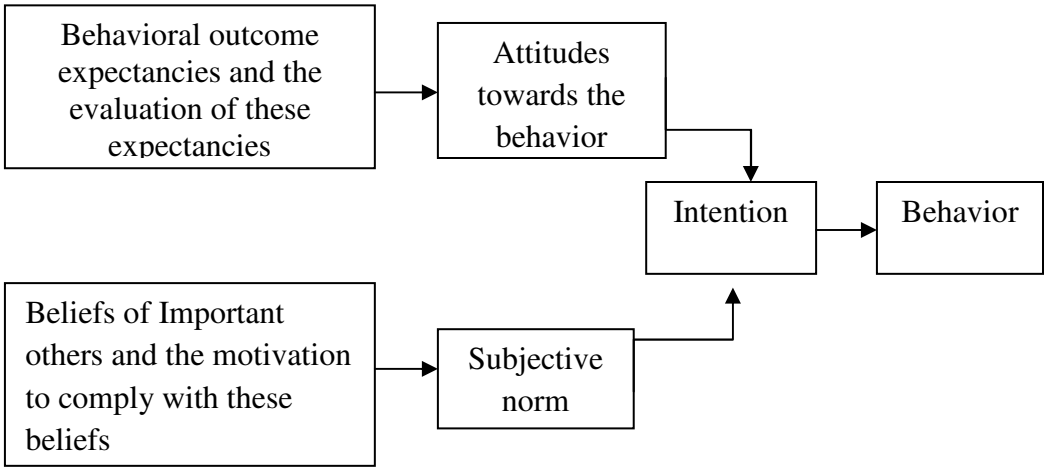

Figure 2: The Theory of Reasoned Action

Adapted from ((Ajzen & Fishbein, 1980b, p. 8)

While the authors of the TRA note that external variables, such as demographic characteristics and personality traits may be related to the behavior, they comment that these external variables are not an essential part of this theory. The external variables have no direct influence on behavior, but rather play a relational role with determinants of attitudinal and subjective norm factors (Ajzen & Fishbein, 1980b). The TRA is best used for understanding behaviors that are voluntary such as alcohol consumption and tobacco use.

Applicability of the Theory of Reasoned Action to Waterpipe Smoking

Since the introduction of the TRA in the mid-1970s, many studies have been conducted to determine its applicability in various populations and health related behaviors.

This section will discuss several research studies previously conducted utilizing the TRA and describe the samples that were utilized, the methods of data collection, and major conclusions.

Sneed et al. (1998) applied the TRA to understand condom use among Filipina commercial sex workers. Their research question was to determine whether attitudes or subjective norms contribute the most to the behavior as mediated through behavioral intention. Participants (N=1394) were recruited from four sites that were geographically dispersed in the southern Philippines. More specifically, the participants were females employed in entertainment establishments. The study method included interviews, demographic information collection, as well as information related to sex work. Overall, the results showed that individuals with more positive attitudes were more likely to report condom use, however, subjective norms were found to be a better predictor of behaviors as mediated through intention. Because the norms were operationalized through managers, a rationale was provided for targeting managers of these organizations with the interventions.

Sable et al. (2004) evaluated the intention of physicians to prescribe emergency contraception as guided by the Theory of Reasoned Action. The sample included 96 faculty physicians from four various universities. The methods included a cross-sectional 14-item survey distributed at faculty meetings. Additionally they gathered six demographical responses. The study found that attitudes and subjective norms toward prescribing contraception strongly predicted intention to do so.

In another study examining adolescent's intention to use performance enhancing substances, Dodge et al. (2008) sampled 241 adolescent athletes from two high schools. Study methods included a cross sectional 14-item questionnaire distributed by the researchers. Similar to the previous studies, demographic information was gathered on the participants. Study findings showed that attitudes and subjective norms predicted both using legal substances and abstaining from legal substances.

As related to smoking, Morrison et al. (2002) utilized the Theory of Reasoned Action as a model to examine marijuana use in high-risk young women. The study participants consisted of 230 participants in the first wave and 235 participants in the second wave. The data analyzed consisted of participants who had completed wave one and wave two (N=170). Participants were unmarried pregnant adolescents less than 17 years of age. They were recruited from three different clinics/agencies in three counties. The data collection method consisted of one-on-one interviews. Results showed that attitudes were more strongly related to intentions than were perceived norms. The authors comment that the authors of the theory state that relative weights of attitudes and subjective norms should vary depending on the behavior being studied. Intention was found to be a good predictor of marijuana use in this sample.

Kaplan et al. (2001) examined the role of socio-environmental and personal factors on smoking acquisition among adolescents and young Latinas. The sample included 1411 participants from two federally funded family planning clinics. Participants were randomly assigned to either face-to-face interviews or telephone interviews. The 105 item questionnaire was guided by previous focus groups, interviews, and existing surveys. Intention to smoke was the strongest predictor of experimentation

and regular smoking. Peer smoking behavior predicted intention to smoke as well as general risk attitudes. The transition from experimental to regular smoking was associated with peer smoking.

In another study examining smoking behavior among adolescents, Qian Guo et al. (2007) used the TRA and the Theory of Planned Behavior to predict adolescent smoking in China. The secondary data set was part of the China Seven Cities Study. Participants in the study were recruited from 147 schools in the seven cities. The data was retrieved from the initial survey administered at the various schools. Overall, the mediation effects of intention to smoke were supported by both models. The results supported the hypothesis that attitudes and perceived norms on smoking behavior were mediated by intention. The proportion of variance in smoking explained by attitudes, subjective norm, and perceived behavioral control were found to be substantial.

Primack et al. (2008) conducted a study to assess the prevalence of and associations with waterpipe smoking among U.S. university students. The purpose of their study was to determine prevalence rates in a random sample of students along with determining associations between outcome variables, socio-demographic variables, and predictors (based on the TRA). The study involved a cross-sectional online survey of students at a large urban university. The survey was the American College Health Association's National College Health Assessment (Nehl, et al.), which is conducted each semester at selected universities. Items for this study were added to the survey for a fee. The sample population included 3600 students randomly selected using email addresses and key demographic data accessed through the university, of which 660 completed the

questionnaire. Survey items that were added to the NCHA included behavioral questions with three dichotomous smoking behavior responses.

Based on the TRA, two items were included to measure students' expectancies and relative harm and addictiveness. Normative beliefs were measured with two items. First, among your peers, how socially acceptable is it to smoke tobacco from a waterpipe? Second, what percentage of college students do you think has ever smoked tobacco form a waterpipe? Findings from the study suggest that perceived harm was less strongly related to waterpipe use than perceived addictiveness. Primack et al. (2008) suggest further research on these two personal factors is warranted in determining a student's decision to smoke waterpipe. Perceived peer acceptability and perceived popularity were found to be strong predictors of use.

Using the TRA for explaining waterpipe use among college students is a viable theoretical framework given previous studies on smoking and other high risk behaviors have found it to be a reliable guide. Waterpipe smoking, like alcohol intake and cigarette smoking, is a volitional behavior, further supporting the use of the theory(Guo, et al., 2007; Lafflin, Moore-Hirschi, Weis, & Hayes, 1994).

Purpose of the Study

Because of the newness of waterpipe smoking in the U.S. there are only a handful of published reports, however, the research and these reports may increase in the future as funding agencies are becoming aware this new phenomenon and the impact waterpipe smoking may have among young people.The literature that is available on waterpipe smoking among U.S. college students lacks a qualitative approach to understanding the

meaning behind the behavior and the context or setting of the behavior among college students. This research employs both qualitative inquiry and observations of the behavior of interest. This qualitative information was used to reinforce what the quantitative data reports. Furthermore, these qualitative data have helped to inform the quantitative survey and ensure that the survey adequately assessed the behavioral constructs in terms that are understood by the research participants.

As noted previously, college age is a vulnerable time in a young person's life. More specifically, health risk behaviors are common during this time period. To encourage more immediate action from decision makers, college authorities, and funding agencies to the waterpipe phenomenon, researchers have cited the need for prevalence rates(Barnett, Curbow, Weitz, Johnson, & Smith-Simone, 2009). Although this research is college specific, the findings may encourage other universities to utilize the survey or a similar survey to assess the prevalence in their individual colleges, giving a broader understanding of the problem from a statewide perspective. This information may then prompt current tobacco control activities to include waterpipe smoking. This study included an online survey with students housed at USF and includes socio-demographic characteristics of both those who smoke waterpipe tobacco and those who do not.

Primack et al. (2008) cite in their research in the U.S. that greater socio-demographic information is needed. This information would help to determine differences between smokers and nonsmokers of waterpipe tobacco. To the best of my knowledge, there are no interventions, and the need for social marketing or other programs is being called for in the literature (Cobb, Ward, Maziak, Shihadeh, &

Eissenberg, 2010). With the information gained, this research may set the stage for a social marketing campaign at USF.

Additionally, Primack et al. (2008) cited the need for more information on belief factors. The proposed research is guided by the TRA, which evaluates both the personal and social beliefs associated with intention to perform a behavior. The TRA has demonstrated appropriate applicability to predicting and understanding marijuana use among college students (Morrison, Golder, Keller, & Gillmore, 2002) and smoking among teenagers (Hanson, 2005)

This research employed the TRA to understand the determinants of subjective norm, attitude, and intention and to better understand the relationship of the theoretical constructs specific to waterpipe tobacco smoking.

Significance

Waterpipe smoking differs greatly from cigarette smoking in many aspects and has not been in the spotlight of policy and public health messaging. Because it is an entirely different mechanism of smoking tobacco, there needs to be selectively developed programs aimed at curbing its use. Garnering a better understanding of predictors of waterpipe smoking from the priority population will aid in developing and tailoring programs and health messages. Gathering qualitative data to improve understanding of this phenomenon could help to determine what draws individuals or groups of young people to partake in smoking. It is clear that a better understanding of the characteristics of smokers may help to both educate public health workers, but also USF authorities.

To the best of my knowledge, this study is the first study to use the TRAin its entirety, measuring all constructs, thereby, both adding to previously studied constructs and providing new insight to other measurable constructs. Additionally, the survey has allowed for comparisons between attitudinal and subjective norm measurements to assess their independent influence on behavioral intention.

As mentioned previously, waterpipe smoking has already been deemed a public health problem, and this study may sharpen the focus on potential interventions to reduce its growth in popularity based on the information that is gained. This study has the ability to provide insight into designing a USF based program aimed at decreasing waterpipe smoking among college students living in housing at the University of South Florida. Finally, the information gained in this study could illuminate the perceived benefits and barriers to waterpipe smoking and add to the current limited body of literature in this arena.

Researchers have indicated that college age students are more vulnerable to waterpipe smoking behaviors (Barnett, et al., 2009). Barnett et al. have conducted waterpipe studies among Florida youth and seek more prevalence rates state-wide (Barnett, et al., 2009). Understanding the prevalence rates will help to elucidate the seriousness of this problem and better equip public health workers to seek local changes and statewide policy change.

CHAPTER 3: METHODS

This chapter describes the methods that were used in this study. The chapter is organized into six sections: (a) the purpose of the study, (b) the research questions, (c) study design, (d) study population and sample, (e) methodology,and (f) data analysis.

Purpose of the Study

This study was designed to provide an understanding of the factors that influence waterpipe smoking intention among college students. The purpose of the study was to gather quantitative data to explore six research questions related to waterpipe smoking and to provide contextual rich qualitative data to allow for greater depth and elaboration in responses. Although knowledge of the prevalence of waterpipe smoking among young adults has recently been gathered, relatively little is known about the factors that influence university students' smoking decisions or intention. This study explored the relationship between predictors of waterpipe smoking intention in a sample of students at the University of South Florida (USF) who have primary residence in university housing. The Theory of Reasoned Action (TRA) served as a guide to the investigation. The research questions are outlined below.

Research Question #1:

What is the relationship between attitudes and intention to smoke waterpipe tobacco?

Research Question #2:

What is the relationship between subjective norms and the intention to smoke waterpipe tobacco?

Research Question #3:

What is the relationship between beliefs of important others and subjective norms?

Research Question #4:

What is the relationship between motivation to comply and subjective norms?

Research Question #5:

What is the relationship between outcome expectancies and attitudes?

Research Question #6:

What is the relationship between evaluation of outcome expectancies and attitudes?

Study Design

This study employed a sequential, mixed method design to investigate the determinants of waterpipe use intention among college students. Research was conducted in three phases. The initial qualitative phase was used to explore waterpipe smokers' characteristics, and the beliefs, attitudes, and social factors that influence waterpipe smoking intention. The second, quantitative phaseexplored and examined bivariate relationships between waterpipe smoking intention, attitudes,outcome expectancies, normative beliefs, and socio-demographic characteristics while controlling

for threats to internal validity. A final qualitative phase was conducted to verify findings and clarify any unanticipated quantitative findings. This triangulation of data served to increase the study's validity.

Study Population and Sample

This study was conducted with college students attending an urban university institution – USF – in Tampa, Florida. College students were selected as participants for this study for several reasons. First, as noted in two U.S. studies, waterpipe smoking was most frequently initiated by youth during their late teens and early twenties (Barnett, et al., 2009; Grekin & Ayna, 2008). Second, while practiced by people in many age groups, waterpipe smoking appears to be increasing rapidly among students at universities and colleges. Third, it was determined that more information was needed to understand the variation in influence of predictors of waterpipe smoking initiation among young people(Primack, et al., 2008). Lastly, the study sample and triangulation of data will better informprevention measures to decrease the potential morbidity associated with waterpipe smoking among university housed college students at this particular university.

USF is situated in Hillsborough County on the west central coast of Florida. Its location can be seen in Figure 3. In Fall of 2010, 30,963 students were enrolled in undergraduate programs on the Tampa campus(USF, 2010).

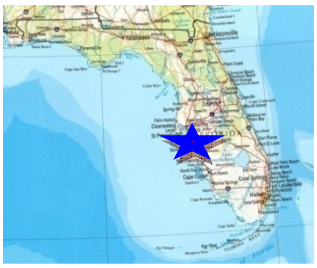

Figure 3: The University of South Florida

The sample for this study was drawn from undergraduate students who were living in USF housing on the Tampa campus during the Spring 2011 semester. The USF housing student profile for the Spring 2011 semester can be seen in Table 1.

Table 1: USF Housing Student Profile Spring 2011

Description	**Number**	**%**
Non-resident alien	251	4.7
Race/Ethnicity unknown	70	1.3
Hispanic/Latino/Spanish	848	15.9
American Indian/Alaskan Native	17	0.3
Asian/Pacific Islander	287	5.4
Black, non-Hispanic	687	12.9
Native Hawaiian/Pacific Islander	8	0.1
White, non-Hispanic	3057	57.2
Two or more races	116	2.2
Total	5341	100%

Inclusion criteria for the study samples of undergraduate students included: (1) current residence in USF owned housing, and (2) 18 years of age or older.Five thousand three hundred and forty-one undergraduates living in USF housing were selected randomly as participantsfor this study because they were considered to be more representative of younger students engaged in campus activities, a better reflection of students impacted by college-based promotional events for waterpipe smoking, and a more accessible sample for college-based prevention efforts. The survey sample was identified and a recruitment email was dispersed throughthe university's Registrars' office.

Purposive student samples meeting these inclusion criteria were drawn for the qualitative phases of the study. Students were recruited for individual interviews and focus groups using a central location intercept method conducted at the Marshall Student

Center, in addition to flyers for the focus groups. This Center attracts a large number of students living on campus and is believed to be frequented less often by students who commute from the surrounding area. Students come to the Center for a variety of activities (eating, socializing, studying, and shopping) that afford them time to talk with a researcher about the project, participate in a short interview, and/or schedule participation in a focus group discussion. From the focus group and intercept interview participants, those interested in participating in the study's verification stage were recruited.

Preliminary observations were conducted in five of the waterpipe lounges/restaurants surrounding the USF Tampa campus. However, at the time of data collection, one lounge had closed and one was no longer offering patio hookah and consisted mainly of Middle Eastern middle aged men inside the lounge. A minimum of two observations were conducted at each of the three remaining sites during the observational qualitative phase.

Methodology

Phases I and III Qualitative Research

The initial qualitative phase included intercept interviews, focus groups, and observations of local waterpipe lounges/restaurants to explore the factors that influence waterpipe smoking. Qualitative methods are the preferred method for exploring people's perceptions of the factors that influence health behaviors and understanding the context in which choices are made. Observation is especially helpful in identifying differences between people's self-reported behaviors and what they actually do in a given situation. Qualitative methodologies were used in the initial exploratory phases to gain insights into students' perceptions of water pipe smoking related to their normative and behavioral

beliefs. The Office of Research, Division of Research Compliance Institutional Board at USF approved the study protocol (IRB #108637) and data collection instruments.

Participant Observations

The study initiated with observations of participants at waterpipe lounges/restaurants surrounding the USF campus. Hookah bars were observed six times during the Fall 2010 and Spring 2011 semesters.Observations were conducted on Thursday, Friday, or Saturday evenings for a two hour time period between 8 and 11:30 p.m. Observation reports at each site were guided by an observation guide, both which can be found in Appendix 1.

Observations began priorto intercept interviewing and continued into the survey distribution phase.Based on preliminary observations, it was determined that the best time to observe and be able to secure a seat was between eight and eleven p.m.As a participant observer, purchasing and smoking of a waterpipe was undertaken at each observations site to fit in socially in the group and avoid appearing as a researcher and questioning from the establishment.

An observation guide was developed and reviewed by two anthropologists prior to observation conduction. Due to the ubiquity of cell phones, the researcher employed a notepad on the cell phone for observational note taking. Observational data consisted of detailed notes of the physical layout of the lounge, the composition of people, a description of the types of waterpipe devices/mouthpieces, other activities that are taking place concurrently, and any conversation that can be retrieved for terminology associated

with waterpipe smoking. Of special interest was the composition of groups that smoke together (number of participants,gender, relative age, and ethnicity).

This form of participant observations allowed the researcher to observe participants without interviewing them and enabled the researcher to validate interview data and take notes during the observation. Observational information chronicled the researcher's own perceptions (reflexivity) and feelings along with the details of the observation as outlined in an observational guide based on the interviews and focus groups. Additionally, the observations were interpreted to provide tentative conclusions, and develop new points to observe in the next observation session. Schensul et al. (1999) suggest that observers begin by observing the settings, tracking event sequence, counting, and ethnographic mapping. Spending time in the field and using rich descriptions to convey the observations improves the validity of observations (Creswell, 2009). The researcher transcribed the observational notes into a Microsoft Word document immediately following the observation to ensure reliability of the results.

Intercept Interviews

Intercept interviews were also conducted during the initial qualitative phase. An interview guide was developed to explore normative and behavioral beliefs about waterpipe smoking, identify important others, and inquire about how important these others are to the participant's intention to smoke waterpipe, knowledge of perceived norms related to waterpipe smoking, and perception of benefits and barriers of waterpipe smoking. The guide was reviewed by two dissertation committee members. Interviews were conducted in the Marshall Center over a period of two weeks. A kiosk was secured

in the middle of the Marshall Center for recruitment, consent signing, and interviewing. A hookah device was set up on the kiosk for display. Students approached the interviewer and inquired about the hookah. If the student lived in University owned housing and was at least 18 years of age, the interviewer explained the study and inquired about their interest in voluntary participation. Those who agreed were given an informed consent document, which was reviewed, ensuring the interviewee of confidentiality and the voluntary nature of the interview. The interviewee was asked their permission to digitally record the interview. All but one participant agreed to be recorded. All interviewees received a $10 gift card incentive for participation. Initially, twenty interviews (10 smokers and 20 nonsmokers)of approximately 15 to 20 minutes long were proposed. Because saturation was not reached with this sample size, the researcher conducted a total of 17 individual and 6 dyadic interviews with smokers and also conducted a total of 29 individual and 2 dyadic interviews with nonsmokers.

Demographic Characteristics of the Intercept Interviews

Background information was limited to year of study and major for students who participated in the intercept interviews. Data were gathered from 11 female and 18 male smokers with areas of study ranging from Biomedical Science to Psychology. Nonsmoker data were gathered from 18 females and 16 males with areas of studies for these students representing a variety of disciplines (Business, Psychology, Public Health, and German). Results of these interviews were used to inform the survey response options.

Focus Groups

Focus groups can stimulate a rich discussion of the factors that influence waterpipe smoking and clarify differences between students' perceptions of their behavior and practices observed in hookah bars (Debus, n.d.). Additionally, focus groups are a good precursor to the quantitative component of the research because they reveal the words students use to discuss waterpipe smoking and its determinants (Neumeier, 2006).

Focus groups were conducted in a reserved conference room at the Marshall Student Center after completion of theintercept interviews. All focus groups were conducted by a moderator and a note taker (an anthropology doctoral candidate). Three focus groups wereconducted with students who acknowledged having smoked waterpipe tobacco, currently lived in University housing and were 18 years of age or older. Development of the focus group guide was based on the literature, the TRA, and the intercept interview findings.A minimum of two focus groups, lasting two hours, were proposed for this study; however, an additional focus group was conducted to ensure the achievement oftheoretical saturation (Glaser & Strauss, 2009).

Students were recruited for the focus groups using flyers posted around the campus in areas that were approved for student research. The researcher posted flyers in Psychology, the Marshall Center, the College of Public Health, and campus residencies that were identified through the intercept interviews as having a large number of waterpipe smokers. Additionally, students were recruited during the intercept interviews at the student center. Names and contact information from students indicating their interest in participating in the focus groups was stored in a file on a password protected

computer. Additionally, the researcher gave these individuals a card with the focus groups dates and the researcher's email address on it in the event they had any additional questions. Some of the recruited students contacted the researcher via email to inquire about other friends that wished to participate in the focus group. These individuals were asked to contact the researcher to determine if they met the inclusion criteria. All participants were sent a reminder email one week prior to the focus group and again the prior day. These same participants were sent a text message the day of the focus group as a final reminder.

All focus groups lasted no more than two hours and were scheduled within a two week period of time. Prior to conduction of the focus groups, the study was explained, the consent forms were reviewed and signed, and a demographic form was provided to each participant. Consent forms were placed in a sealed envelope and stored in a locked file cabinet after the focus group. A copy of the consent form was provided to any participant who requested one. Two recorders were placed at each end of the table to ensure good sound quality for transcription. Recordings were stored in a password protected personal computer.Focus group participants were provided with a $30 gift card and sandwiches for participation.

Demographic Characteristics of the Focus Group Participants

The initial focus group was attended by a predominate number of males. Participants ranged in age from 19 to 24 years of age and represented four countries of origin. The second and third focus group included a more even distribution of males and females; however, participants in the third focus group were comprised mostly of

students from India, where waterpipe tobacco smoking is very prevalent. Demographic information and smoking characteristics were obtained only for the focus group participants and can be found in Table 2.

Verification Focus Group

A group discussion was conducted during the third and final phase of the research to obtain students' assessment of study conclusions and clarify any unanticipated survey findings (Bernard, 2006). Four students who currently smoke hookah and three students who do not smoke hookah agreed to participate in the group discussion. Five males and two female students participated in the verification group discussion. A summary PowerPoint presentation of the research findings was provided during the focus group. As each slide was presented, students were asked to provide their views on the accuracy of the conclusions reached.

Table 2: Demographic Information for Focus Group Participants

	Gender	**Age (n)**	**Country of Origin (n)**	**Times smoked in past 30 days**	**Bowls smoked in typical session**	**Lone Smokers (n)**	**How often do they smoke alone**
FG #1	12 males	3 – 19 years	Canada = 2	Avg. = 2.17	Avg. = 2	2	1-2 x year
	0 females	2 – 20 years	India = 4	Max = 8			Rarely
		3 – 21 years	Egypt = 1				
		1 – 22 years	US = 5				
		1 – 23 years					
		1 – 24 years					
FG #2	4 males	2 – 19 years	Bangladesh = 1	Avg. = 5.22	Avg. = 1.9	4	Used to a lot
	5 females	2 – 20 years	India = 1	Max = 15			2 x month
		1 – 21 years	US = 5				1 x month
		3 – 22 years	Thailand = 1				no response
		1 no response					
FG #3	5 males	1 – 19 years	India = 8	Avg. = 19	Avg. = 1.4	4	1 x week
	5 females	2 – 20 years	Germany = 1	Max = 80			rarely
		3 – 21 years	England = 1				1 x week

		1 – 22 years			Every a.m.
		2 – 23 years			
Totals	21 males	6 – 19 years	Canada = 1	20	Rarely = 2
	10 females	6 – 20 years	India = 13		Used to a lot = 1
		7 – 21 years	Egypt = 1		1x month = 1
		5 – 22 years	US = 10		2 x month = 1
		3 – 23 years	Thailand = 1		Every day = 1
		1 – 24 years	England = 1		No response = 1
		1 no response			

Phase II Quantitative Research

Online Survey

In the second phase of the research, an online survey was administered to a random sample of students living in USF housing. The survey was administered after the intercept interviews and focus groups were completed. For efficiency and uniformity, the survey was administered online. This mode of survey delivery was free to the researcher and provided a high speed of returned responses. All students in the sample have access to computers. The survey was designed to protect student privacy, allowing them to complete the survey when and where they chose, and allowed for confidentiality in a voluntary capacity. College students are online regularly and at ease communicating via this medium with 86% of college students having gone online and 85% owning their own computer(Jones, 2002).

Survey Instrument Development

Establishing Face and Content Validity

Instrument development was guided by surveys that have been used to explore waterpipe smoking attitudes and believes in other studies (Chaaya, et al., 2004; Eissenberg, et al., 2008; Grekin & Ayna, 2008; Maziak, Eissenberg, et al., 2004; Primack, et al., 2008; Roskin & Aveyard, 2009; S. Smith-Simone, et al., 2008), the intercept interviews and focus group findings, observational findings, and topic-specific literature. This information and guides such as the National Cancer Institute's adolescent smoking consequences questionnaire (NCI, n.d.) and the Fishbein-Ajzen-Hanson

questionnaire (Fishbein, Azjen, & Hanson, n.d.)provided further guidance into question structure and response options.

Additionally, Dr. Kenneth D. Ward (University of Memphis) and Dr. Brian A. Primack (University of Pittsburgh),experts in the field of waterpipe smoking research, reviewed the survey instrument. They provided detailed feedback that helped refine important items and add other questions appropriate for the college population. Doctoral dissertation committee members alsoprovided guidance and input.

After the survey was reviewed by the experts, it was pretested with 12 college students who reported living in university housing and being a hookah smoker. The purpose of the pretest was to ensure readability, comprehension, and to estimate the time required for completion. Students from the population under study were recruited via email to complete the survey and provide written feedback. An incentive of a $10 Amazon gift card was provided. The average time to complete the survey was six minutes. The final survey was assessed for grade level readability using the Flesch-Kincaid online tool readability test, resulting in the estimate of grade 5.9 and can be found in Appendix 2. Theoretical construct measurements can be seen in Table 3.

Table 3: Theoretical Construct Measurements

Variable	**Measure**	**Scale**
Intention	Intention to smoke tobacco using a waterpipe within the next few months	One 7-point Likert scale from extremely unlikely to extremely likely
Attitude	Attitude toward *If I smoke hookah, this behavior is….*or *My smoking hookah*	Four 7-point Likert scales including bad/good, awful/nice, not fun/fun, and

	is…	unpleasant/pleasant
Subjective Norm	*If I smoke hookah most people who are important to me would……*	One 7-point Likert scale ranging from disapprove/approve
Behavioral Beliefs and Outcome Evaluation	Modal Beliefs about hookah smoking and the corresponding evaluation of each of the beliefs	36 7-point Likert scales; 18 for modal beliefs ranging from unlikely to likely and 18 for outcome evaluation ranging from unimportant to important.
Normative Beliefs and motivation to comply	Beliefs about approval or disapproval of smoking from four significant others (e.g., parents, friends) and the corresponding motivation to comply	8 7-point Likert scales; 4 related to perceptions of others ranging from disapprove to approve and 4 for motivation to comply ranging from disagree to agree

Establishing Internal Consistency and Stability

Test-retest reliability (stability) of items was estimated using correlational analysis and item percent agreement, depending on the nature of the specific items. The sample completing the instrument consisted of six students from the sample population and six students who were nonsmokers, recruited from the College of Public Health (the home college of the researcher). The testing timeframe was one week. This testing timeframe was based on the work of Marx, Menezes, Horovitz, Jones, and Warren (Marx, Menezes, Horovitz, Jones, & Warren, 2003), who showed no difference in reliability

between 2 days and 2 weeks for a health related quality of life instrument. An Amazon gift card of $10 was provided to students who completed both the "test" and the "retest."

Dichotomous items produced an average 95.3% agreement over time. The Likert scaled response options were evaluated both as individual items, scaled items, and as sum score grouped data. Spearman correlational analysis using sum scores revealed a total survey correlation of 0.920. Spearman correlation was used due to the Likert scale being considered ranked or ordered data.

After the test and retest, formulated scales and items to operationalize constructs and provide evident of construct validity using factor analysis. The main purpose of this factor analysis was to understand the structure of latent factors that exert influence on the observed variables. The survey was developed and entered into a free online survey tool for students called *Checkbox.* The tool provides a URL that links participants to the survey and collects the data in a spreadsheet format for analysis. The URL was made available to five of the undergraduate public health classes at the college, each consisting of approximately 40 students. Two drawings of $25 Amazon gift cards per class was the incentive for participation. Fifty-five students voluntarily completed the survey.

Using SPSS (version 19), factor analysis with varimax rotation was conducted on the hookah beliefs and opinions items to develop scales. Using Kaiser's criterion of retaining factors with an eigenvalue of greater than 1.0 and visualization of the scree plot(Fields, 2005), it was determined that four factors could reliably be extracted, these were labeled: Social; Focused; Health; and Family. An additionalquestion related to physical activity was removed from the survey based on its failure to load on one of the four identified factors. The lowest value for loading on a factor was 0.494. The four

factors were then evaluated for internal consistency reliability using Cronbach's alpha. Cronbach alpha scores can be seen in Table 4.

Table 4: Cronbach Alpha Scores for Factors

Factors	**Cronbach Alpha Scores**
Factor 1 – Social	0.905
Factor 2 – Focused	0.808
Factor 3 – Health	0.809
Factor 4 – Family	0.747

Reliability was assessed on other constructs within the survey instrument as well as inter-item correlations.Two items under the construct of beliefs (relax and relieve stress) provided near perfect correlation (.957), therefore, they were merged into one item: *If I smoke hookah, it will help me relax and relieve stress.* Table 5 provides a summary of the Cronbach alpha scores of the key theoretical constructs.

Table 5: Reliability of Constructs

Construct	**Cronbach's Alpha**
Beliefs about hookah smoking	0.846
Importance of beliefs	0.911
Attitude regarding hookah smoking	0.912
Important others	0.826
Motivation to comply with important others	0.728

After development and approval of the survey, it was manually entered into the USF Health Checkbox survey tool(USF, 2009a). It enables researchers to deliver online surveys through an external link and does not impose severe limits in terms of number of cases and variables.

Dillman et al. (2009) web survey tailored designed principles were utilized as a guide to decrease the total survey errors (e.g., coverage error, sampling error, non-response error, measurement error). More specifically, for web surveys, Dillman et al. (2009) recommended paying close attention to contact details, taking precautionary steps to ensure delivery of web surveys, providing clear instructions, and being prepared for issues such as bounced and inquiry emails.

The USF Institutional Review Board approved the survey instrument and distribution plan. Because the sample was limited to students 18 years of age and over, a waiver of documentation of consent was approved for the survey.

Survey Administration

The survey was disseminated by the University's Registrar's office over the course of two weeks during February 2011. The time period for dissemination was carefully chosen to fall after the spring semester began and before spring break to make sure the 30 day recall question regarding past use of waterpipe tobacco did not include a holiday period.

Whereas having the survey disseminated through the Registrar's Office made it possible to send the survey to a current list of students enrolled at USF, it also placed control of the process outside the investigator's immediate control. Unfortunately, the initial sampling frame included students having "ever lived" in University housing

instead of those currently living in university housing. After these students responded and the error noticed, the Registrar's Office recreated the sampling frame using the correct inclusion criteria and distributed the survey to 1500 students selected randomly. When the respondent rate did not meet the desired rate based on the power calculation, an additional 1500 students were selected at random and recruited by email through the Registrar's Office.

Response Rate

Only 8% of students recruited for the study completed a usable survey. Initially, 350 surveyswere submitted. Of these responses, two surveys were discarded because they failed to respond to the truthfulness question; seven surveys were eliminated because respondents completed less than 75% of the questions; one was deleted for non-response to a key question,*Have you ever smoked waterpipe tobacco even one or two puffs?;* 51 surveys were discardedbecause the respondents reported no longer living in University-owned housing; and one final survey was deleted due to filling out the survey twice. Thus, only 288 cases were included in the final analysis. Figure 4 depicts the survey case deletion process.

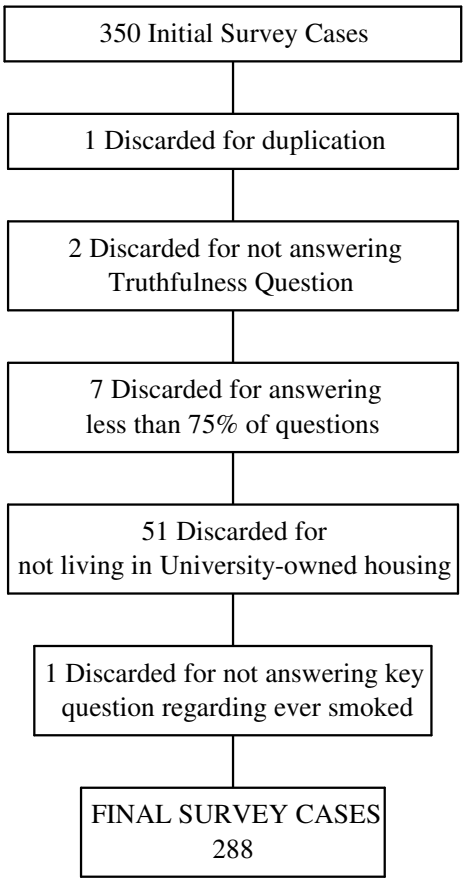

Figure 4: Survey Case Deletions

Recruitment

When inviting selected students to participate in the survey, the Registrars' office used a subject heading (Short USF student survey_Free Song Download and drawing entry) and invitation in the body of the email describing the project, estimated length of time to complete the survey, confidentiality information, voluntary nature of the survey, eligibility requirements, link to the survey, and a description of a gift provided for completing the survey. Survey incentive consisted of one downloadable song from Hip Digital Media(Digital, 2009) and a chance to win one of ten $50 Amazon gift cards. Incentives were recommended by Dillman et al. (2009) to increase response rates. The

email body sent to eligible participants can be found in Appendix 3. To safeguard against students under the age of 18 years taking the survey, the survey was programmed to terminate after students entered their age. However, it should be noted that limiting repeat survey attempts was not an available option in the survey tool. When the survey was completed, participants were instructed to enter their email address in which the code for the downloadable song and instructions were sent. Their name was placed on a list for the drawing at the end of survey data collection.Email addresses and song download codes were kept in a password protected file separate from the data.

Survey Sample Characteristics

Demographic variables measured included age, gender, ethnicity, citizenship status, and religious affiliation (Table 6). Approximately 70.5% of students reported being 18 and 19 years of age, with the mean age of students completing the survey being 19.2 years of age (s = 1.2). Most students completing the survey were White (66.0%), a distribution comparable to their representation in the population. Additionally, most of the students were female (71.5%).

Table 6: Demographic Characteristics of Sample[a]

Demographics	Sample, n=288 n (%)	Population n (%)
Gender		**unable to attain**
Female	206 (71.5%)	
Male	79 (27.4%)	
Age		
18 years	93 (32.3%)	
19 years	110 (38.2%)	

20 years	50	(17.4%)		
21 years	18	(6.3%)		
22 years	12	(4.2%)		
23 years or older	5	(1.7%)		
Race/Ethnicity				
White	190	(66.0%)	3057	(57.2%)
Black	31	(10.8%)	687	(12.9%)
Asian/Pacific Islander	17	(5.9%)	295	(5.5%)
American Indian/Alaskan Native	2	(0.7%)	17	(0.3%)
Other	46	(16.0%)	1285	(24%)
Hispanic/Latin origin				
Yes	54	(18.8%)	848	(26%)
No	233	(80.9%)	2603	(74%)
US Citizenship				
Yes	277	(96.2%)		
No	8	(2.8%)		
Religion				
No religion	76	(26.4%)		
Catholic	69	(24.0%)		
Protestant	30	(10.4%)		
Other Christian	84	(29.2%)		
Jewish	5	(1.7%)		
Muslim	3	(1.0%)		
Buddhist	3	(1.0%)		
Other	15	(5.2%)		

[a] Missing data not shown; percentages may not equal 100% due to rounding

Summary of Qualitative and Quantitative Research Samples

In sum, this study employed a three phase, sequential mixed methods design (See Table7) to identify the bivariate relationships between the primary determinant constructs of the Theory of Reasoned Action as well as their relationship to waterpipe smoking intentions. Sample sizes for each phase are provided in Table 7 below.

Table 7: Sequential Mixed Method Design

Phases	Design	Methods	Participants
I	Qualitative	17 Smoker Interviews 6 Smoker Dyadic Interviews	11 females/18 males
		29 Nonsmoker Interviews 2 Nonsmoker Dyadic Interviews	18 females/16 males
		3 Focus Groups	10 females/21 males
		6 observations	Varied
II	Quantitative	Online Survey(N=288)	206 females/ 79 males
III	Qualitative	1 focus group 4 smokers/3 nonsmokers	2 females/5 males

As seen in Table 7, many more males than femalesparticipated in thequalitative phase of the research and more females than males participated in the quantitative phase. Although both females and males were invited to participate in the focus groups, it was surprising to find almost double the attendance once the sessions began. Two females came to the first focus group, but when they saw that it was primarily males, they chose not to stay and decided to attend another one of the other sessions. The intercept interviews were conducted in the Marshall Center on several different occasions within a two week time period in an attempt to collect diverse students. The research was not designed to capture gender differences; however, it should be noted that there was inequality in participation both in the qualitative inquiry and survey responses.

Data Analysis

Qualitative Analysis

Intercept interview data were reviewed for inaccuracies and key findings. Recordings of the intercept interviews and the focus groups were transcribed by an outside professional service. Observational field notes were typed into a word document and the notetaker provided a summary for each focus group. Verbatim transcripts of the intercept interviews and of the focus group discussions were entered into NVivo*version 8.0.*

Two codebooks were developed with *apriori* codes based on the Theory of Reasoned Action and research questions; one codebook was designed for the smokers and another one was designed for the nonsmokers. Three researchers coded the qualitative data using the constant comparative method (Glaser & Strauss, 2009). Data analysis was done iteratively, with coding beginning as soon as information was available from the intercept interview. Three researchers coded each transcript and compared codes for inter-rater reliability adjusting how categories/codes were assigned. Researchers compared notes, using Google Documents and NVivo annotations throughout the interview document, on each topic for consistency and agreed on code definitions and appropriate statements. The coding began with smoker intercept interviews followed by the first smoker focus group which was hand coded together as a group, allowing the researchers to discuss codes and come to agreement prior to subsequent focus group coding. The final focus groups were coded by each individual coder using the Google Documents and NVivo annotations, along with email, for any necessary communication. After the smoker data was coded, the researchers met to discuss emerging themes.

The nonsmoker intercept interviews were coded in a similar fashion, ensuring consistency and reliability among the coders. Following the nonsmoker coding, the researchers met and discussed the emerging themes.

Quantitative Data Analysis

An *apriori* power calculation for multivariable analysis was conducted using two online calculators to determine the necessary sample size using a confidence level of 95% and an alpha of .05 (Biostatistics, n.d.; Raosoft, 2007). Necessary sample sizes calculated consisted of 328 and 381 necessary cases for multivariable analysis, such as logistic regression. These samples were based on a margin of error of 5%, a confidence level of 95% and a population size of 4700 (students in USF housing during Fall 2010). The Raosoft® calculator is specific for web surveys (Raosoft, 2007). This number exceeded the minimum sample size (100) needed to conductexploratory factor analysis(MacCallum, Widaman, Zhang, & Hong, 1999). Because online survey response rates for online surveys vary from 5 to 20% (Fowler, 2009), the number invited to participate was increased to 3000. The survey data were transferred from the Checkbox survey tool into an IBM SPSS software *version 19.0* for analysis.

Univariate Analysis

Prior to data analysis, demographic data were screened for outliers and continuous data were screened for non-normality using Shapiro-Wilk's statistic for normality. Univariate procedures included frequency distributions, basic descriptive statistics of variables (*gender, age, ethnicity, citizenship*, *and religion*).Frequencies and proportions, indicating prevalence in the sample, waterpipe use in the past 30 days and ever having used

waterpipe tobacco were generated with the socio-demographic variables to discern any potential differences between groups of individuals such as gender, ethnicity, and age.

Bivariate Analysis

Bivariate analyses consisted of relationship and correlational analyses and constituted the main analyses to answer the proposed research questions. The survey questions consisted of ordinal response categories. These response categories lend themselves to Spearman rank-order correlations with non-normal data. Additional analysis, although not to directly answer the research questions, assessed relationships between nominal data, such as demographic information, using Chi-Square tests of independence.Odds ratios were calculated on all 2 x 2 tables to improve interpretation of the relationships.

Because the proposed research responses were Likert-type, these response categories were analyzed as ranked data. Interrelationships of survey items representing constructs were evaluated for multicollinearity and singularity. To answer the research questions, correlations were conducted between the unidirectional constructs as displayed in the theoretical model. More specifically, correlations were calculated between outcome expectancy and evaluation of outcome expectancy with attitudes; motivation to comply and beliefs of important others with subjective norm: subjective norm and intention; and attitude and intention.

Multivariable Analysis

Factor analysis wasused to assess and/or understand the underlying structure of a set of observed variables used to measure outcome expectancy in the final survey analysis. The purpose was to understand latent structures of the attitudinal construct in the final sample of 288 students.Cronbach's alpha was assessed to determine score reliability. To improve interpretation, varimax rotation was employed. Correlational matrices were generated during factor analysis to ensure that multicollinearity would not a problem for the data analysis. Additionally, Kaiser-Meyer-Olkin (KMO) and Barlett's test of Sphericity with anti-imaging was used to ensure that the sampling is adequate. KMO and Barlett's test are included in the analytical output for factor analysis.

CHAPTER 4: RESULTS

The primary purpose of this study was to determine if there were relationships between key constructs of the Theory of Reasoned Action and college students' intention to smoke waterpipe tobacco. The study employed a sequential mixed method design: in Phase 1, focus groups, intercept interviews, and observations were conducted. Results informed Phase 2, which consisted of an online survey, followed by Phase 3, verification of results. This chapter is divided into three parts: qualitative research findings from Phase 1 and Phase 3, followed byquantitative findings from Phase 2.

Qualitative Study Findings – Phase I and Phase III

Observations

The first section summarizes the general attitudes and behavioral beliefs about hookah expressed by USF students in individual interviews and focus group discussions with notations from the observations and the verification focus group. Students also discuss the people who have influenced their decisions regarding hookah smoking.

General Attitudes

Among current smokers, hookah is viewed primarily as a social activity. Given the importance of socialization among college students, it is not surprising that hookah's ability to be shared with friends is highly valued. As one young man said, it is "a great "icebreaker."

> *"It encourages a lot of socialization because you tend to have three or four people who are fixed to a pipe. You can't really be bouncing around. So it facilitates a lot of conversation."* (male)

> *"You could go insane if you never talk to nobody but when you have an event, you could get out and relax and actually smoke hookah with a bunch of people and socialize. It kind of brings you back to the routine now instead of being so distraught if you were just by yourself."* (male)

Only on one occasion during the observations was a person smoking by himself. During the majority of the observations, there were two to eight people smoking together, often sharing a pipe or two. The hookah lounges were arranged to encourage socialization and group interaction with large couches either rounded or facing each other.

During the verification focus group, smokers agreed that this social aspect is the primary reason they chose to smoke hookah. They described the on campus smoking as providing the same group interaction as seen in the hookah bars. A lone smoker was viewed as a deviation from the norm and more of a behavior exhibited by a chronic smoker or an individual who doesnot want to study alone and desires the companionship of the hookah.

In contrast, students who were not regular smokers were more likely to describe hookah in negative terms, such as "gross" and "disgusting". Many non-smokers viewed hookah as a drug, in large part because of the use a bong-like device and its similarity to cigarette smoking. For these students, hookah is a form of deviance that they reject.

> *"I don't really know too much about it, but I usually stay away from smoking and drugs and all that."* (male)

> *"At first I didn't even know what it was. [My] initial impression was, you know, people who are gangsters or like prostitutes, things like that – they just – they do this kind of things."* (female)

During the verification stage of the research, nonsmokers reconfirmed their desire not to participate but were less likely to call it a "drug." Smokers offered that beliefs of hookah as being a drug may be a misconception that nonsmokers have because of not being exposed to hookah until they enter college and because of smoke production may create an association of hookah with cigarettes or marijuana.

Behavioral Beliefs

Students shared many positive and negative beliefs about hookah smoking. Whereas awareness of these beliefs was widespread, smokers tended to report positive beliefs about hookah's benefits and reject ones about its negative effects; conversely, students who considered themselves to be nonsmokers believed that hookah has largely negative outcomes and offered few benefits.

As noted above, smokers described hookah as a social activity that enables them to make new friends or bond and reconnect with friends they already have. Several described it as a time to "chill" with their friends. During the verification group discussion, one student agreed and called it a "kinship" or "brotherhood" in their smoking circle.

> *"Well, it's kind of a social thing. I've met a lot of close friends here, just by going outside and smoking, and meeting people through that."* (male)

Several smokers described hookah as exhibiting other positive social qualities.

> *"Socially the way I think sounds like, if I smoke cigarettes people look at you the wrong the way and say, if I smoke hookah they say, "This guy's got taste." or something like that."* (male)

> *"Yes, but it's the same party we both went to. We saw somebody smoking [hookah] out there. It was the first time for us, so we thought it was really cool."* (male)

Whereas none of the smokers called hookah smoking cool, many nonsmokers felt others were smoking so they would look more mature and fit in.

> *"I think it's wrong. I think it's just another way to look cool."* (female)

> *"It's just sad. People just do it just to feel cool and I just think it's just a foolish reason."*(male)

> *"I guess it makes them look cool. Social factor. They feel older."* (male)

Although viewed primarily as a social experience, reports of smoking alone were not uncommon. As one male student explained, "*cigarettes are like 5 minutes and hookah is like 45 minutes."* During the verification phase, this point of view was confirmed, and because of the duration of time involved in smoking hookah, it was often used during individual study time or while watching television. Participants associated it with smoking a cigarette in the sense of if you are a cigarette smoker you will go outside and have a smoke by yourself. One smoker said, "*Time flies when you are having fun."*(male)

> *"Smoking alone is a once in a blue moon thing when you just want to relax by yourself, and 95% of the time, it's with friends."* (male)

During the verification dialogue, nonsmokers thought it would be "weird" to see a person smoking hookah alone.

Students also reported smoking hookah as a form of recreation. It was described as a fun and entertaining way to avoid boredom. One student referred to it as a "hobby."

> *"I mean there are more things you can do with it, like blow smoke rings or exhale really large puffs through a light and it looks pretty interesting."* (male)
>
> *"Just a fun atmosphere. Just things you can do with the hookah, like blowing rings, and making jokes and having fun."* (female)
>
> *"It consumes time when you're bored - nothing to do."* (male)

During the observations at the hookah bars, participants seemed to be having fun given the laughter and game-playing which took place. Verification discussions revealed that it is a hobby in the sense that some students collect devices to display around their rooms.

Nonsmokers viewed smokers as having too little to do and suggested smoking hookah offered smokers a means to fighting boredom. Nonsmokers in the verification group expressed that they felt that hookah smoking was what smokers choose to do as opposed to lacking anything to do.

> *"Well, when we hang out with this person, they tend to be, they tend to seem a little bored and when they get bored, they are like, "Hey, do you want to smoke hookah?"* (female)

Hookah's flavor is also seen as a valuable benefit. As observed in the bars, smokers have over 40 flavors from which to chooseand are allowed to mix flavors to enhance the experience. The flavor aspect was confirmed as a positive attribute in the verification process.

> *"I like the flavor. I like the – I guess you would call it like the rush, it's oxygen stuff."* (male)

> *"My friends like anybody – usually my friends who like "hey you want to try like maybe this guava tasting tobacco. We got great tasting tobaccos in different flavored tobaccos."* (male)

Relaxation was mentioned frequently as a reason to smoke hookah. It is seen as a way to escape from the pressures of school and a mechanism to cope with other frustrations of daily life. At one hookah bar observation, a young man was lying on the couch smoking his hookah while watching the television mounted on the wall above him.

During the verification, several students said that just lying down and relaxing is nonproductive and that smoking hookah is a "proactive" way to relax.

> *"It's comfortable, it's at the house. You just relax."* (male)

> *"It's the same thing as like eating in or dining out, and I think you'd rather eat in, you save money, and it's more comfortable. So relaxed, like home food."* (male)

> *"[It's] a way to meditate, I guess, and blow out your frustration."* (male)

Students also reported other physiological responses as desirable. These perceived physiologic responses, as noted in the quotes below, were confirmed during the verification, but one student commented that it depends on the device and how the shisha is packed and the size of the device.

> *"Like you get a little bit of a buzz,*
>
> *I mean I get lightheaded sometimes and I like that. It's nice."* (female)

In contrast to students who enjoyed how hookah made them feel, others reported they were disappointed with their initial trial and were dissuaded from doing it again

because it failed to deliver the pleasant feelings they expected. Confirmed in the verification is that some people mistakenly think hookah is similar to marijuana in its properties.

> *"Actually, I met my friend one time at a hookah place. That's where I tried that at one time but then I realized – hey, it's just basically like cigarette smoking. So I'm not a smoker."* (male)

> *"I kind of think, I thought originally it was kind of like the marijuana but then when I actually did try it, it was – I didn't get any feeling so apparently it's just like a cigarette."* (male)

> *"I thought originally it was kind of like the marijuana but then when I actually did try it, it was – I didn't get any feeling so apparently it's just like a cigarette. That it was something similar to marijuana but a legalized version."* (female)

Some smokers believe that hookah helps them focus when studying and improves their ability to concentrate. A few even reported doing homework at the hookah bars or while smoking in their dorms. These reports are consistent with observations of students working on laptops in hookah bars.

> *"…but a lot of times usually I would go there with just one friend and we'd just go with our homework and do our homework there, and even though it usually is more of a social thing for me, sometimes I would do that and I'd get a lot done."* (male)

Health issues were mentioned most often as a reason not to smoke; however, other disadvantages also were mentioned by smokers and non-smokers alike.

The most common problems attributed to hookah were shortness of breath, coughing, and headaches. During the last two observations, many participants werecoughing, and the researcher experienced a headache during one of the smokiest nights spent observing activities at a hookah lounge. When reviewing the verification

tape, students were coughing frequently. Additional health risks mentioned were inability to be good at sports do to the effects on the lungs.

> *"Definitely the lung effects; decreased lung capacity, damage to your lung tissue itself; you can probably hurt your throat if you do it wrong or if it burns."* (male)
>
> *"Yes, a little more forceful cough. It was like a dry cough."* (female)

Although some smokers reported negative physiological effects from hookah, these problems did not seem to deter them from smoking it. For example, a student who smoked hookah previously experienced these effects and quit as a result.

> *"Over time I started to see that it started messing up my respiratory. Actually I used to smoke a lot, I had quit about two years ago. I totally quit, so anything that's smoking related. So but I feel like I started seeing my neurons going down and my stamina going down."* (male)

Many students believe hookah smoking could result in more serious health outcomes, such as cancer and exposure to contagious diseases spread by sharing hookah pipes.

> *"Besides the fact that you can get lung cancer, throat cancer, other things you can catch from other people that you don't know if they're infected when you're sharing the mouthpiece and stuff like coxsackievirus or other things such as that."* (male)
>
> *"It's like when it's not ventilated, there's just smoke everywhere and that's recycling the smoke. I don't think that's good for my lungs."* (male)

Many nonsmokers explained their decision not to use hookah as a way to minimize the risk of these health problems and to avoid the possibility of addiction to smoking hookah.

> *"I feel like the first-hand smoke is going to be damaging to my lungs. My parents smoke so I don't want to have any more damage to my lungs and I guess that's it."* (female)
>
> *"Because I grew up with parents who smoke. The idea of just inhaling like a puff of tar, it's kind of gross."* (female)
>
> *"Also, the instrument used to inhale the smoke [that's] passed on, maybe it's something that's contagious."* (female)

In general, nonsmokers disregard what smokers have told them about hookah's relative safety compared to cigarettes.

> *"I think a lot of people see the benefit as they think it's healthier than cigarette smoking, and they don't think it's anywhere near as addictive."* (female)
>
> *"I would think anyone who sees hookah as an alternative to cigarette smoking. They'd be more like, "Oh yes, you should do it. It's natural. It goes through water. You're perfectly fine."* (female)

Some smokers acknowledged that hookah could create these health problems; however, they believe they will remain safe as long as they do not smoke it frequently. This belief was confirmed in the verification phase.

> *"Yes, because like you get the cancer when you pretty much smoke it like every single day."*(male)
>
> *"Yes, but I know that you don't smoke it as much [as cigarettes]. If you don't smoke it as much it's fine. You won't ever really go to get addicted…"* (male)

In contrast to smokers who reported being able to concentrate better when smoking hookah, nonsmokers believe that hookah has the opposite effect on concentration and that students who smoke hookah suffer academically. However, in the verification stage, it was felt that there are other mediators that contribute to poor performance and that it would be difficult to prove hookah smoking as the sole or primary cause. The students felt that freshmen come to college to party and are not

serious about academic performance, a factor considered to be a more likely explanation for poor academic performance.

> *"..but on my floor and they just like their school kind of goes down. Their grades. Their focus. "Oh, we're going to go smoke." Just negative."* (male)

> *"You can probably get addicted maybe not chemically but mentally. It'll affect your school life."* (female)

Other negative outcomes acknowledged by smokers include hassles associated with pipe maintenance, ashes, and accidents. However, during verification it was determined that set-up was for anything that you want to do to have fun, not just hookah. They felt that all devices take time to set up. During one of the observations, a participant was carrying the hookah device up to the counter for a refill and dropped the device on the ground. The glass shattered and charcoal and tobacco spilled on the floor. The owner seemed a little perturbed.

> *"It could burn holes through things or kind of ashes all over the place and things like that."* (male)

> *"Well one time that it came off and fell to the couch and the couch kind of got a hole burning through it."* (male)

Nonsmokers also find hookah's smell unappealing, but not necessarily bad.

> *"I have family, like extended family who smoke and is not great for their teeth. They have [body] smell all the time."* (male)

Another factor influencing the use of hookah is its cost. The cost of smoking in the hookah bars or restaurants observed for this study varied from $5 for a 45-minute session to $12 for an unlimited session. To avoid these charges, some students purchase a pipe so they can smoke at locations convenient to them. During the verification focus

group, one student equated it with drinking alcohol and said that it is cheaper to buy a bottle and go home to drink than to go to a club or bar and drink alcohol.

> *"I figured it was a good investment, instead of dishing out money every day [to go to a bar]."* (male)
>
> *"Because it's too expensive to go smoke in a hookah lounge, just so you save money."* (male)

Normative Beliefs

According to the profile sheets obtained during the focus groups and the interview guides, the age at which students began smoking hookah ranged from 10 years to 25 years, with the majority initiating during their freshman year at college. Students participating in the verification focus group claimed that beginning at younger ages was an outlier phenomenon, and that the range 17 to 24 years of age more accurately reflects waterpipe smoking initiation. Many smokers reported that hookah has become normative and that smoking is now socially accepted, or even expected on college campuses. The hookah bars were more likely to have a younger population than the hookah restaurants, as noted during the observations.

> *"Just like the people that we hung out with. It was sort of like you had to do it."* (male)
>
> *"Kind of it's like everyone else does it as if it's not – it's just an everyday thing, so it's like you don't – you feel more accepted to try it. I guess it's more [unintelligible] because it's not like you're smoking cigarettes."* (female)

Many smokers reported that older peers were a major factor in their decision to start. In fact, for some, hookah smoking is a norm or a valued tradition passed from older to younger students.

> *"When you go to high school and you get older friends and like grades above you, you just chill with them and that's what they do so you just smoke with them."* (male)

> *"It was like that's when I guess it was [introduced] because you have older friends when you're younger, but now you're the oldest like seventeen and all your friends are older so they can show you other things that you probably can't get on your own."* (male)

> *"You like pass it on. Like from the older generation to the younger generation around the high school."* (male)

Hookah smoking also was described by smokers as a staple or norm at student parties.

> *"So it's something to do, just like holding a cup at a party, like it's just something there."* (male)

Some students reported that hookah smoking is even accepted by their parents, but this point may reflect the students' cultural traditions rather than a more widespread or universal norm as many students were reportedly from India and other countries where waterpipe tobacco smoking is considered customary.

> *"My parents they like to smoke hookah, and they're not saying go ahead smoke as much as you want, they'll say mostly it's we just be careful with it. So I know my parents used to do a lot of stuff when they were younger,[laughter] so they don't have a lot of negative attitude about hookah."* (male)

> *Even my parents actually mentioned it to me like, "Oh guess what we just tried smoking hookah" and I'm like "Wait what?" How weird is that, but that's because my cousin took them somewhere and so but it was just like, "Oh so we tried it" and it was like they didn't think it was a big deal at all."* (female)

However, most smokers said their parents are unaware of their hookah smoking practice or disapprove of it. During verification, students said that because it is not easily detected (no clothing stains and or bad smell) that parents are unaware of their smoking.

> *"I grew from a very strict family, so anything out of our culture we can't."* (male)

> *"My mom doesn't know [laughter] and no one in my family knows. Some of my friends are not okay with it, friends who don't do it are hesitant towards it."* (female)

Siblings are another source of normative beliefs, with many smokers reporting that their family members influenced them to smoke for the first time.

> *"Definitely my family. I grew up around it."* (male)

> *"My sister took me to my first Hookah bar."* (male)

Most nonsmokers described hookah as popular activity among college students and reported that they have friends, roommates, and neighbors who smoke.

> *"A lot of my friends, because quite a few of my friends actually do smoke hookah, so they always talk about it."* (female)

A few nonsmokers felt that hookah was strange or noted that the practice was imported from other cultures.

> *"I thought it was weird that everyone was smoking out of the same [unintelligible] little thing – using the same pipe, I guess."* (female)

> *"I also have some Arabic friends and they tend to be primarily Hookah smokers."* (male)

> *"I'd say just neighbors from the dorm and a friend did too, and their parents but it's religious."* (male)

Motivation to comply

When discussing people who had influenced their decision to smoke hookah, many smokers mentioned their parents, siblings, and friends as having a significant impact.

> *"Yes, because I was at a family friend's house and we were all gathering around the hookah. I didn't know. Nobody knew what it was and my mom didn't know. She was like, "What is this?" and she tried it, and she's like, "Hey, [name] take it" and she made me smoke it."* (male)

> *"…it's probably very important because these are the people unlike my friends, I am from, I am a part of them. So if they have a suggestion for me, I have to kind of take it at face value. It's not like an advice. It's kind of like mandatory like this is my family."* (male)

Other smokers also acknowledged the opinions of others, but were careful to note that the choice to smoke was ultimately their own.

> *"It's the same for me. I know what they want me to do ever since I was little and they've taught me important values and stuff to stick to that, but overall it's my life so it's like a 70/30."* (female)

> *"It's important, but it's more of a personal decision that I don't think they should be concerned about."* (female)

A few smokers denied that they had been influenced by others at all.

> *"Not important at all. I respect how they feel about it, but it's not going to affect my choice on who I am because I'm going to do what's going to make me happy."* (female)

Most nonsmokers also denied being influenced by others, saying that the decision not to smoke has been theirs alone. They described themselves as "independent thinkers" capable of resisting encouragement or temptation from others around them.

> *"I really don't feel I should smoke it. If they're smoking it, then they can smoke it, even if it's around me, but I'm not going to do it."* (female)

> *"I know all the times the risks for a common goal that we have and just then, whatever. For something like this that I already know, that is not going to help me in any type of way. I could care less with what they want me to do."* (male)

> *"In some cases I feel like that's important, but in other cases like if they're like, "Oh you should smoke some hookah." I'm not going to do it because my family tells me to do it."* (female)

Quantitative Study Findings – Phase 2

Online Survey

Prevalence of Waterpipe Tobacco Smoking

To assess the prevalence of waterpipe tobacco smoking, respondents were asked: *Have you ever tried smoking tobacco from a hookah even 1-2 puffs.* Almost half (42.7%) of students reported having ever smoked waterpipe tobacco ("waterpipe ever smokers"). Current waterpipe tobacco use (past 30 days) was reported by 43(14.9%) students ("waterpipe current smokers"). Intention to smoke waterpipe tobacco in the next few months was assessed by collapsing the likert scale response into two variables: likely and unlikely. Sixty-nine percent of the respondents reported they were unlikely to smoke waterpipe tobacco and 22% were likely to smoke waterpipe tobacco in the next few months.

Bivariate Analysis

The primary analysis to answer the research questions consisted of bivariate correlations. More specifically, the chi-square test of independence was used to understand the relationships between nominal variables, and Spearman rank-order correlation was used to understand the relationships between ordinal variables.

Tobacco Use Characteristics

Chi-square tests of independence were used to examine relationships between demographic characteristics and tobacco use variables. The primary variables related to tobacco use were *waterpipe ever smokers* and *waterpipe current smokers*.

Results of the bivariate analysis indicated that having ever tried hookah was not statistically related to gender, age, or religion; however, there was a statistically significant relationship between being a waterpipe ever smoker and ethnicity (χ^2=19.170,df=4, p= 0.001). In particular, compared with Blacks, Whites had greater odds of reporting ever waterpipe use than Blacks (OR= 8.2, $p < 0.001$), and had slightly greater odds of reporting ever waterpipe use than Asians/Pacific Islanders (OR = 1.6, p = 0.35). Asians/Pacific Islanders had greater odds of reporting ever waterpipe use than Blacks (OR = 5.1, $p < 0.05$). Being a waterpipe current smoker (past 30 day use) was not statistically correlated with age, gender, ethnicity, or religion.

Bivariate Relationships to examine the Research Questions in the Study

Bivariate correlations of all survey items for each TRA construct revealed no multicollinearity or singularity. The primary bivariate analysis used was the Spearman rank-order correlation coefficient (alpha of 0.05). Constructs that were represented by more than one variable were averagedand then correlated. All items were assessed with 7-point Likert-type scales with endpoints indicated in each of the tables below, accompanied by a “neither/nor” mid-scale response option.Due to non-normality of the data, Spearman’s rhowas calculated to examine correlations among constructs in the theoretical model as guided by the research questions.

Research Question #1:

What is the relationship between attitudes and intention to smoke waterpipe tobacco?

The intention construct of the theoretical model was evaluated from one item assessing the respondents' intention to smoke waterpipe tobacco within the next few months. The construct for attitude was assessed by averaging four survey items assessing the respondents' negative or positive evaluation related to hookah smoking. These items were averaged based on the theoretical implication that attitudinal variables are not weighted for their importance (Ajzen & Fishbein, 1980b). Table 8 represents the survey items associated with the theoretical constructs of intention and attitude.

Table 8: Survey Items Representing the Theoretical constructs of Intention and Attitudes

Construct	**Reliability**	**Survey Item**	Mean
Intention		*I intend to smoke hookah within the next few months*	2.51
Attitude	0.950	*-If I smoke hookah, this behavior is: bad/good*	3.01
		-For me, smoking hookah is: awful/nice	3.17
		-For me, smoking hookah is: not fun/fun	3.27
		-For me, smoking hookah is: unpleasant/pleasant	3.22

After averaging the attitudinal construct survey items, the relationship between attitude and intention was examined using the Spearman's rho correlation coefficient. The results (N=276) indicated a statistical significant relationship ($p < 0.001$) between the attitude construct and intention to smoke waterpipe tobacco within the next few months. The correlation coefficient ($\rho = 0.804$) represents a strong positive relationship between

attitude and intention indicating that as people's evaluation of hookah becomes more positive, their intention to smoke it within the next few months increases.

Research Question #2:

What is the relationship between subjective norms and the intention to smoke waterpipe tobacco?

The second immediate precursor to intention to perform a behavior is subjective norm. Subjective norm is an evaluation of normative beliefs about performing a behavior. In other words, it is represented by people's beliefs that important others think they should or should not perform a behavior. For this study the subjective norm was evaluated on a scale ranging from extremely disapprove to extremely approve. The constructs of intention and subjective norms were evaluated with two individual survey questions (Table 9).

Table 9: Constructs of Intention and Subjective Norms

Construct	**Survey Item**	**Mean**
Intention	*I intend to smoke hookah within the next few months*	2.51
Subjective Norm	*-If I smoke hookah, most of the people who are important to me would: disapprove/approve*	2.79

Subjective norm and intention (N=285) were analyzed using Spearman's rho and produced a statistically significant relationship ($p < 0.001$). Spearman's rho correlation coefficient ($\rho = 0.512$) indicates a moderate relationship between subjective norm and intention to smoke waterpipe tobacco within the next few months.

At this point in assessing the first two research questions for this study, the two primary determinants of intention as indicated by the TRA were both statistically significant, however, attitude represented a stronger correlation ($\rho = 0.804$) than subjective norm ($\rho = 0.512$) for intention to smoke waterpipe tobacco in the next few months.

Research Question #3:

What is the relationship between beliefs of important others and subjective norms?

The next step in the analysis was to examinekey constructs embedded in the TRA. In particular, the relationship between subjective norm and beliefs of important others was examined. The construct of beliefs of important others was represented by four items indicated by important others that were identified during the qualitative phase of the research. More specifically, parents, siblings, friends, and boyfriends/girlfriends were indicated as being important others who influence hookah use. The constructs of subjective norm and beliefs of important others and their respective survey items are noted in Table 10.

Table 10: Constructs and Survey Items

Construct	Reliability	Survey Item	Mean
Subjective Norm		*-If I smoke hookah, most of the people who are important to me would: disapprove/approve*	2.79
Beliefs of Important Others	0.829	*-If I smoke hookah, my parents would: disapprove/approve*	2.23
		-If I smoke hookah, my friends would: disapprove/approve	3.89
		-If I smoke hookah my boyfriend/girlfriend would: disapprove/approve	3.40
		-If I smoke hookah, my siblings would: disapprove/approve	2.99

Spearman's rho correlation coefficient was used to examine the relationship between the two theoretical constructs, beliefs of important others and subjective norm (N=283). The constructs were statistically significantly related ($p < 0.001$) with a moderately strong correlation coefficient ($\rho = 0.699$), indicating that as a person believes important others approve of hookah smoking the person's normative beliefs of the behavior increase.

Research Question #4:

What is the relationship between motivation to comply and subjective norms?

According to the TRA, motivation to comply is also related to subjective norm, thereby influencing a person's normative beliefs about hookah smoking. The motivation to comply items were drawn from the same important others (parents, friends, siblings, boyfriend/girlfriend), but assessed the degree to which the respondent intends to perform

a behavior that they believe their important others think they should perform. Table 11 represents the survey items for motivation to comply and subjective norm.

Table 11: Survey Items for Motivation to Comply and Subjective Norm

Construct	**Reliability**	**Survey Item**	**Mean**
Motivation to Comply	0.766	*-Most of the time when my parents think I should do something, I go along with it: disagree/agree*	4.65
		-Most of the time when my friends think I should do something, I go along with it: disagree/agree	3.71
		-Most of the time when my boyfriend/girlfriend think I should do something, I go along with it: disagree/agree	3.95
		-Most of the time when my siblings think I should do something, I go along with it: disagree/agree	3.79
Subjective Norm		*-If I smoke hookah, most of the people who are important to me would: disapprove/approve*	2.79

Using Spearman's rank-order correlation (N=283), motivation to comply was not statistically significantly related to subjective norm ($\rho = 0.046$, $p=0.221$).

Research questions #3 and #4 examined the social influences to smoke or not to smoke waterpipe tobacco. The results suggest that in this population, students are more influenced by their perception of important others' desire for them to smoke or not to smoke hookah versus the student's general motivation to comply with important others.

The last two research questions focus on the direct relationship between attitude and the precursors (outcome expectancies and evaluation of outcome expectancies).

Research Question #5:

What is the relationship between outcome expectancies and attitudes?

With respect to the TRA, two influences on attitude are outcome expectancies and evaluation of outcome expectancies. Outcome expectancies were evaluated using 21 items to reflect the diverse components identified in the qualitative phase of the research. Table 12 represents the survey items representing the constructs of attitude and outcome expectancy that were averaged to determine the statistical relationship.

Table 12: Survey Items Representing the Constructs of Attitude and Outcome Expectancy

Construct	**Reliability**	**Survey Item**	**Mean**
Attitude	0.950	*-If I smoke hookah, this behavior is: bad/good*	3.01
		-For me, smoking hookah is: awful/nice	3.17
		-For me, smoking hookah is: not fun/fun	3.27
		-For me, smoking hookah is: unpleasant/pleasant	3.22
Outcome Expectancies	0.887	Read the statements and select an answer that best describes your beliefs and opinions whether you have smoked hookah or not: unlikely/likely	2.89
		-If I smoke hookah, it will help me relax and relieve my stress	2.09
		-If I smoke hookah, it will help me stay more focused	2.03
		- If I smoke hookah, it will help me to meet a	

	potential date	2.71
	-If I smoke hookah, I will be more social	3.93
	-If I smoke hookah, it will give me a headache	2.71
	- If I smoke hookah, it will help me to make new friends	1.73
	- If I smoke hookah, it reinforces my culture	3.43
	- If I smoke hookah, I will have fun	1.96
	-If I smoke hookah, I will feel more intellectual	1.40
	- If I smoke hookah, it will bring my family together	1.79
	-If I smoke hookah, it will help me to think more clearly	2.64
	- If I smoke hookah, I am being safer than if I smoke cigarettes	2.92
	- If I smoke hookah, it will help to pass the time	3.06
	-If I smoke hookah, it will give me a buzz	2.70
	-If I smoke hookah, it gives me a "legal high"	3.75
	- If I smoke hookah, it makes me dizzy	3.47
	- If I smoke hookah, it makes me short of breath	3.38
	- If I smoke hookah, it makes my chest hurt	4.03
	- If I smoke hookah, it makes me cough	2.56
	-If I smoke hookah, I will become addicted	4.00
	- If I smoke hookah, I will get lung cancer	

Analysis (N=252) of attitude and outcome expectancy consisted of averaging the variables that measured each construct and then examination using Spearman's rho.

Outcome expectancy was statistically significantly related to attitude about hookah smoking ($p<0.001$) with a corresponding moderate correlation of 0.409 indicating that outcome expectancy is related to attitudes but only to a moderate degree. Therefore, as outcome expectancies increase, so does the positive attitude regarding hookah smoking.

Research Question #6:

What is the relationship between evaluation of outcome expectancies and attitudes?

The final research question focused on evaluation of outcome expectancies as related to attitude about hookah smoking. Evaluation of outcome expectancies assessed whether the previous outcome expectancies were viewed by the respondents as being important. Table 13 represents the survey items utilized in the analysis to determine the relationship.

Table 13: Survey Items Utilized in the Analysis

Construct	**Reliability**	**Survey Item**	**Mean**
Attitude	0.950	*-If I smoke hookah, this behavior is: bad/good*	3.01
		-For me, smoking hookah is: awful/nice	3.17
		-For me, smoking hookah is: not fun/fun	3.27
		-For me, smoking hookah is: unpleasant/pleasant	3.22
Evaluation of Outcome Expectancies	0.928	In deciding to smoke hookah, how important are each of the following reasons: unimportant/important	
		-The lightheadedness that results from smoking	3.63
		- The stress relief that results from smoking hookah	3.29
		-The social activity that results from smoking	3.68

	hookah	3.00
	-The ability to make new friends by smoking hookah	2.36
	-Meeting potential dates by smoking hookah	2.07
	-The tradition of smoking hookah	2.76
	- The "buzz" I get from smoking hookah	3.65
	- The headaches that result from smoking hookah	3.76
	- The shortness of breath that results from smoking hookah	4.10
	-The chest pains I experience the next day from smoking hookah	3.16
	-The ability to stay focused when smoking hookah	3.08
	-The ability to pass time when smoking hookah	3.55
	-The relaxed feeling from smoking hookah	3.17
	-The ability to be athletic after smoking hookah	3.45
	-That hookah is less harmful than cigarettes	3.36
	-The group dynamics when smoking hookah	3.40
	-The "fun" that occurs when smoking hookah	4.55
	-The bad health effects from smoking hookah	

Evaluation of the relationship between evaluation of outcome expectancies (N=254) and attitude revealed a statistically significant relationship ($p < 0.001$). Spearman's rho correlation between evaluation of outcome expectancies and attitude was

low ($\rho = 0.289$) indicating that there is only a slight increase in attitude as outcomes are viewed as more important.

Research questions #5 and #6 assess the attitudinal component related to waterpipe tobacco smoking. The results indicated that students in this population have a more positive attitude about hookah smoking based on the attributed beliefs about hookah smoking versus how important these beliefs are to them.

Multivariable Analysis

Exploratory factor analysis was conducted with the items representing outcome expectancies to identify latent variable structure. Using SPSS *version 19,* factor extraction was performed with the 18 variables noted in Table 17 representing outcome expectancy. To ensure adequate sampling Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was performed and an acceptable value of 0.908 was identified. Additionally, Bartlett's test of sphericity was statistically significant ($p<0.001$) indicating that there are some relationships between the variables that are included in the analysis making factor analysis an appropriate test to conduct. Factor extraction was based on Kaiser's criterion of retention of a factor with an eigenvalue of 1.0 or greater and examination of the scree plot. To improve interpretation of factors, orthogonal rotation using varimax was employed.

Through examination of the rotated component matrix and the communalities of the variables, three factors were extracted and can be found in Table 14. Factor 1 consisted of ten items: *relax and relieve stress, stay focused, meet potential date, be more social, make new friends, have fun, safer than cigarettes, pass the time, give me a "buzz,"*

*and give me a "legal high."*Factor 1 represents the benefits that hookah smoking provides to students. Cronbach's alpha for Factor 1 was 0.926. Factor 1 accounted for 37% of the total variance. Examination of Cronbach's alpha if items are deleted indicated that all items were appropriately extracted into this factor. Factor 2 consisted of seven items: *gives me a headache, makes me dizzy, makes me short of breath, makes my chest hurt, makes me cough, I will become addicted, and I will get lung cancer.*Factor 2 represents the negative health effects. Cronbach's alpha for Factor 2 was 0.888. Factor 2 accounted for 20.5% of the total variance. Examination of Cronbach's alpha if items were deleted indicated all items were appropriately extracted into this factor. Factor 3 consisted of four items: *reinforces my culture, I will feel more intellectual, brings my family together and helps me to think more clearly.* Factor 3 represents meeting expectations. Cronbach's alpha score for Factor 3 was 0.824. Factor 3 accounted for 6% of the total variance. Examination of Cronbach's alpha it items were deleted indicated that all items were appropriately extracted into this factor. The three factors together accounted for a cumulative 63.5% of the total variance.

Table 14: Factors, Cronbach Alpha, and Associated Variables

Factors	Cronbach's alpha	Variables (factor loading)
Factor 1	0.926	*If I smoke hookah it will help me relax and relieve my stress*(0.787)
"Benefits"		*If I smoke hookah it will help me stay more focused*(0.632)
		If I smoke hookah, it will help me meet a potential date(0.647)
		If I smoke hookah, I will be more social(0*.733)*
		If I smoke hookah, it will help me to make new friends(0.752)

		If I smoke hookah, I will have fun(0.827)
		If I smoke hookah, I am being safer than if I smoke cigarettes(0.608)
		If I smoke hookah, it will help to pass the time(0.806)
		If I smoke hookah, it will give me a buzz(0.801)
		If I smoke hookah, it gives me a "legal high"(0.669)
Factor 2	0.888	*If I smoke hookah, it will give me a headache*(0.622)
"Negative Health Effects"		*If I smoke hookah it makes me dizzy*(0.733)
		If I smoke hookah, it makes me short of breath(0.866)
		If I smoke hookah, it makes my chest hurt(0.887)
		If I smoke hookah it makes me cough(0.847)
		If I smoke hookah I will become addicted(0.711)
		If I smoke hookah I will get lung cancer(0.654)
Factor 3	0.824	*If I smoke hookah it reinforces my culture* (0.644)
"Meeting Expectations"		*If I smoke hookah I will feel more intellectual (0.652)*
		If I smoke hookah it will bring my family together(0.784)
		If I smoke hookah it will help me to think more clearly (0.697)

Further investigation into the correlation of factors associated with the identified outcome expectancy and general attitude revealed statistically significant results for each factor and the corresponding general attitude. More specifically, analysis using Spearman's rho produced a correlation coefficient of 0.674 ($p < 0.001$) for Factor 1 and attitude, a coefficient of -0.353 ($p<0.001$) for Factor 2, and a coefficient of 0.636

($p<0.001$) for Factor 3. The relationship of Factor 1 (benefits) with attitude represents a positive correlation indicating that as a person's perceived benefits of smoking waterpipe tobacco increase then their attitude about waterpipe tobacco smoking also increases or becomes more favorable. The relationship of Factor 2 (negative health effects) was negatively correlated with attitude. This relationship indicates that as a person's perceives waterpipe tobacco as being more negatively related to health their attitude about waterpipe tobacco smoking decreases or becomes less favorable. Factor 3 (meeting expectations) was positively related to attitude indicating that as a person perceives family as being a benefit of waterpipe tobacco smoking then their attitude towards smoking becomes more favorable. These extracted factors and their corresponding correlation coefficients with the attitude construct can be seen in Table 15.

Table 15: Extracted Factors and Correlations with Attitude

Factor	Correlation Coefficient	P-value	N
Factor 1 (benefits)	0.674	<0.001	269
Factor 2 (negative health)	-0.353	<0.001	268
Factor 3 (family values)	0.636	<0.001	269

In summary, a person's attitude regarding waterpipe tobacco smoking is a more important determinant of intention to smoke waterpipe tobacco than subjective norms in this sample population as seen in Figure 5. On evaluation of the precursors to attitude, behavioral beliefs exert a stronger relationship than evaluation of behavioral beliefs, however, they both positively influence attitudes to waterpipe tobacco smoking. On evaluation of the determinants of subjective norm, beliefs of important others provides

the most influence. This analysis suggests that personal factors are of greater importance when determining factors that influence intention to smoke waterpipe tobacco. And of the behavioral beliefs that influence attitudes toward waterpipe tobacco smoking, two factors (benefits and family values) were strongly correlated, suggesting that as these beliefs are viewed as outcomes of waterpipe tobacco smoking then the attitude toward waterpipe tobacco smoking becomes more favorable. Factor 2 (negative health) is negatively correlated, suggesting that a person believes that negative health effects are the outcome to waterpipe tobacco smoking then their attitude toward waterpipe tobacco smoking becomes more unfavorable.

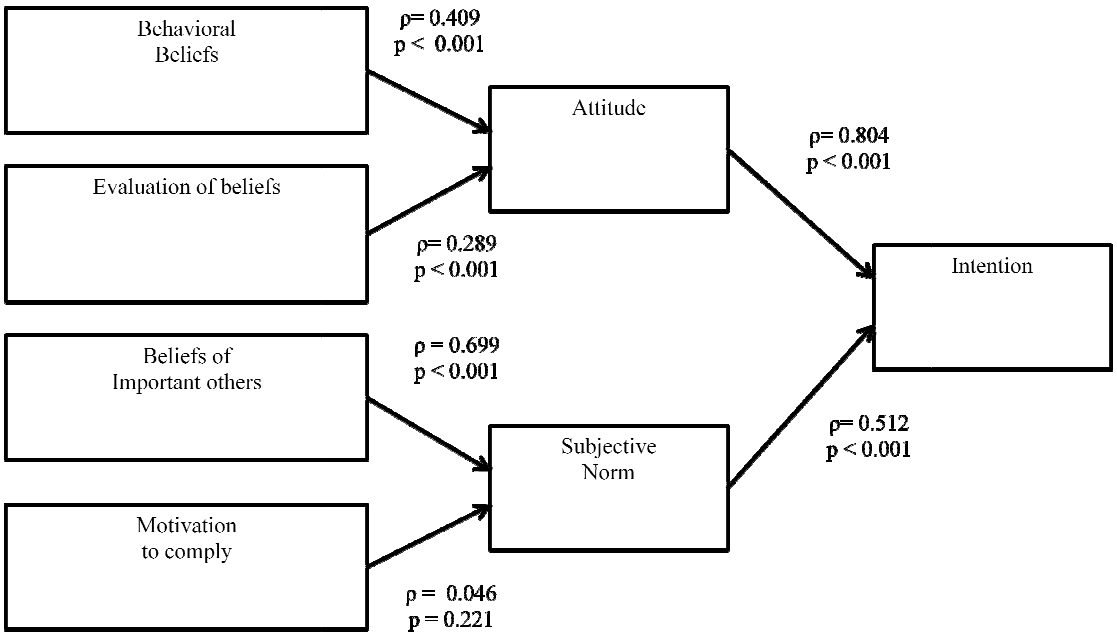

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Figure 5: TRA model and Correlations

CHAPTER 5: DISCUSSION

This chapter includes a discussion of the results relative to the reviewed literature and the proposed research questions. It is organized into the following sections: research summary, discussion of the results, recommendations, next steps in the research process, strengths and limitations of the study, implications for public health practice, suggestions for dissemination of findings, and a summary and conclusion.

Research Summary

The prevalence of waterpipe tobacco smoking among college students in the US is increasing (Primack, et al., 2008; Smith-Simone, et al., 2008; Sutfin, et al., 2011). Researchers have noted the importance of monitoring waterpipe smoking and developing responsive interventions to minimize its health impact; thus, items that provide insights about these specific behaviors are often included in general health surveys. College students may be a particularly vulnerable population when it comes to experimentation with waterpipe smoking because of its perceived social and contextual value. Literature reviews and this research show that hookah smoking is a valuable social component of their college experience. It serves as an avenue to help them build relationships and to meet new people.

The TRA promotes understanding of the antecedents of intention to perform a given behavior. According to the TRA, intention is the central determinant of a behavior; however, as people formulate their intention they consider other specific and independent constructs. In particular, the theory posits that individuals take into account favorable or

unfavorable attitudes in adopting the behavior, as well as perceived social pressure (subjective norm).

The primary purpose of this mixed method study was to examine the relationship between constructs of the TRA and waterpipe smoking. A final study objective was to illuminate the relationships of variables that influence attitudes toward waterpipe smoking by identifying factors that contribute to outcome expectancies. The study included sequential primary data collection emanating from naturalistic observations, one-on-one intercept interviews, focus group interviews, and an online survey of randomly selected students living in University-owned housing. The survey sought demographic data, information about waterpipe smoking behaviors, and responses to items specific to the TRA that were developed based on the qualitative data. Items were subjected to extensive pilot testing prior to dissemination. Exploratory factor analysis was the primary multivariable analysis to simplify the outcome expectancy construct and provide items for future research to confirm or refute the underlying factor structures.

Discussion of Results

In the study, current waterpipe tobacco use (past 30 days) was nearly 15%. Other US university-based studies report similar results. For example, Primack et al. (2008) estimated current use to be 9.5% in a random sample of undergraduate and graduate students; Eisenberg et al. (2008) reported current use to be 20.4% in their study of first-year psychology students; Smith et al. (2006) reported a 15.3% rate in a study of freshman at a private university; and most recently, Sutfin et al. (2011) reported a 17% rate in a random sample of 3770 students across eight universities in one US state as can be seen in Table 16.

Table 16: US College Studies

Author	State	N	Waterpipe smoking
Sutfin, et al. 2011	N.C.	3770 College drinking survey	17% - past 30 days
Primack, et al. 2010	8 colleges in US	8745 NCHA	7.2% - past 30 days 30% - ever tried
Eissenberg, et al. 2008	Virginia	744 VCU psychology students	20% - past 30 days
Primack, et al. 2008	Pennsylvania	647 U of Pitt NCHA	9.5%- past 30 days 41% - ever smokers
Smith-Simone, et al. 2006/2008	D.C.	411 Johns Hopkins freshmen	15% - past 30 days
Grekin, et al. 2008	Michigan	602 psychology students	15% - ever tried
Ward, et al. 2007	Va/Tenn	143 café and restaurant patrons	22% - weekly

The proportion of students who reported that they had ever tried waterpipe tobacco smoking was 42.7% in this study, comparable to 40% to 50% range found in other US studies (Eissenberg, et al., 2008; Primack, et al., 2008). These results suggest that the prevalence of waterpipe smoking among college students is not a waning fad.

In the present sample, Whites were more likely to have tried waterpipe tobacco than Blacks or Asian/Pacific Islanders, a finding that also is consistent with other university-based studies that examine hookah smoking (Primack, Fertman, Rice, Adachi-Mejia, & Fine, 2010; Primack, et al., 2008; Smith, Curbow, & Stillman, 2006; Sutfin, et al., 2011). Whereas these findings suggest that Whites should be given greatest priority in anti-hookah interventions, current adoption may be slower among other racial or ethnic groups, making it important to monitor their waterpipe use and to note if it begins to show an uptake pattern similarto that observed among Whites.

The TRA has been applied mostly to cigarette use with the constructs being reliable predictors of intention to smoke cigarettes. In the area of waterpipe tobacco use, the TRA has been applied only partially, thus yielding limited construct appraisal. This study took into account each theoretical construct of the TRA. Consistent with the theory, this study revealed that attitude and subjective norms were positively correlated with intention to smoke waterpipe tobacco. Holding positive attitudes toward waterpipe smoking was, however, more positively associated with intention than was subjective norm. This relationship was consistent with qualitative findings, suggesting that students made their own decisions about waterpipe tobacco smoking.

Furthermore, the results of this study suggest that when outcome expectancies latent constructs were extracted, the social aspects and meeting expectations aspects of waterpipe smoking were significantly related to intention to smoke waterpipe tobacco. Students find waterpipe smoking a way to seek pleasure (*getting a buzz or legal high, finding it a relaxing and stress-free way to pass the time or socialize with friends*). Students also seek meeting expectations related to *bringing family together and reinforce*

their culture along with staying focused. However, this finding requires further explication as to how why waterpipe tobacco smoking is related to expectations.

This study was consistent with previous literature examining perceived benefits of waterpipe smoking among college students. Primack et al. (2008) examined a random number of US undergraduate and graduate students in one university and found that social acceptability and popularity of smoking hookah were strong predictors of use. In a study of US college freshman,Smith-Simone et al. (2008) reported that students perceived waterpipe tobacco smoking as the most socially acceptable form of tobacco smoking among their peers. Other international studies, have reported similar perceived benefits. Roskin et al. (2009) surveyed British college students and found they viewed waterpipe tobacco smoking as a relaxing and affordable way to enjoy the fruit flavors. Chaaya et al. (2003) studied college students in Lebanon and found that students perceived waterpipe tobacco smoking as a way to promote family gatherings, a way to relax and freely communicate with others, and a time to think.

In this research, the social nature and relaxation benefits were strongly correlated with positive attitudes towards waterpipe tobacco smoking. Additionally, students perceived waterpipe tobacco smoking as being less harmful than other forms of tobacco use. Some students did not believe that the tobacco used in waterpipe contained nicotine and some students did not believe that the product smoked was related to tobacco. Whereas other students understood that it was indeed tobacco in the waterpipe, they believed that the water served as a filtration mechanism that offered protection from harmful chemicals.

Similar to previous research, this study found that smokers believed it to be a safer alternative than other forms of tobacco products such as cigarettes and chew tobacco. For example, Smith-Simone et al. (2006) reported that US college freshmen perceived waterpipe tobacco smoking to be less harmful than cigarettes. Primack et al. (2008) found similar perceptions, but also reported that students believed waterpipe tobacco to be less addictive. Sutfin et al. (2011) found that college students in eight different universities in one US state were more likely to be current waterpipe tobacco smokers if they viewed it as less harmful than cigarettes. These same misperceptions were found in international studies of college students. Roskin et al. (2009) reported that the majority of waterpipe tobacco smokers felt that it was less harmful than cigarettes and some even felt it way to wean themselves from cigarette smoking. Chaaya et al. (2003) reported that Lebanese university students believed waterpipe tobacco smoking to be less harmful than cigarettes.

This research also supports previous studies indicating that students associate popularity with waterpipe tobacco smoking. Qualitative inquiry and verification discussions supported a sense of "fitting in" and a feeling of maturity when smoking hookah. Students viewed waterpipe tobacco smoking as enabling them to make new friends and meet potential dates. Primack et al. (2008) found perceived popularity a strong predictor of waterpipe tobacco smoking in his random sample of college students.

In contrast to findings reported by Roskin et al. (2009), an "exotic appeal" of waterpipe tobacco smoking emerged neither from qualitative data, nor in the verification focus group. Furthermore, students in the sample failed to report that waterpipe tobacco smoking was a gateway activity to cigarette smoking as Ward et al (2006) suggest.

Rather, this research supports the potential of waterpipe tobacco smoking to be a gateway to poly-pharmacy including alcohol and illicit drugs used in combination, both on and off campus as qualitative data indicated. Similar to other research conducted with college students, this sample also smoked hashish or marijuana in combination with the waterpipe tobacco (Sutfin, et al., 2011).

Having depressed affect has been cited by some authors as a reason for students to smoke waterpipe tobacco (Grekin & Ayna, 2008). Although depression did not emerge in this study as an antecedent of waterpipe tobacco smoking, there was a strong correlation with the need for escapism from the daily pressures of school and work. This form of escapism through hookah smoking may be related to depression, but warrants further investigation.

The affordability of smoking waterpipe tobacco was discussed in the qualitative research. Students who smoke hookah more often found that the bars/restaurants were becoming too expensive and elected to purchase their own pipe and tobacco. With occasional smokers, the bar scene was seen as an affordable venue, but for the routine smoker, the benefits and affordability associated with owning a pipe was viewed as a more attractive and cost-effective alternative. Some students even referred to hookah pipe ownership as an investment.

Although this study did not investigate dependence and waterpipe tobacco, it was interesting to note that in the qualitative inquiry students found lone smokers to be acceptable, at least from the smoker's perspective. Lone smoking was not viewed as a form of dependence. The literature comparing social versus lone waterpipe tobacco smoking does imply a dependence issue. Both Salameh et al. (2008) and Maziak et al.

(2004) found that intensity of smoking was related to lone smoking patterns and that waterpipe smoking can produce dependence.

Recommendations

The relatively high rates of waterpipe tobacco smoking found in this sample and other studies (Primack, et al., 2008; Smith-Simone, et al., 2008; Sutfin, et al., 2011) suggest that a need for a preventive intervention targeting undergraduate students exists. Of special concern are widely held misperceptions that hookah is safe to smoke, and unlike cigarettes, is safe from the risk of addiction or serious health problems. Although there are influencers of waterpipe smoking, students report they are the ultimate decision makers related to hookah smoking. Therefore, understanding their wants and needs, particularly those met by smoking waterpipes, is a priority.

We have learned from this study that personal factors weigh heavier on intention than do the social factors. One strategy to deter uptake and decrease current use would be to reinforce the negative health effects and educate students on the true facts regarding waterpipe tobacco smoking as they enter college so that they can make informed decisions about smoking. Consideration should also be taken to inform their caregivers, as this study may suggest that caregivers are important to college students and they too may be misinformed about the safety of waterpipe tobacco smoking. It also became apparent during this research that University personnel, who are responsible for students, are also misinformed about waterpipe tobacco smoking. Educating USF Housing Resident Assistants about the harmful effects provides a readily accessible resource for students. During the course of this research, advertisements for local hookah cafes were

seen on campus and in the Oracle (campus paper). College administrators should not allow such advertisements and perhaps AHEC and other college organizations can utilize these modes of information dissemination to educate readers.

From a policy perspective, there are several concerns. The first concern is the status of regulation from the federal level. Waterpipe tobacco is currently excluded in general tobacco legislation because of the fact that the waterpipe tobacco is not burned directly, but rather, is combusted from the charcoal. Including waterpipe tobacco under the same regulations as cigarettes would increase taxation and possibly make waterpipe tobacco a less affordable behavior choice. Secondly, there is anecdotal discussion of making the USF campus smoke-free. This discussion has both positive and negative implications. Banning smoking on campus may decrease the smoking circles and cast a more negative light on hookah smoking, similar to cigarettes. The ban would need to be specific as to the type of smoking that is not allowed on campus so as to avoid the loopholes currently acknowledged in federal legislation. The negative implications include the possibility that students may migrate from smoking outdoors to smoking indoors. This transition is concerning given the amount of carbon monoxide that hookah produces and reports of fires in dormitories. The potential for adverse health effects would put students at risk.

Research Next Steps

Additional research can expand understanding of factors that can be used to prevent college students from smoking hookah. Improved understanding of the motivational factors for initiating waterpipe tobacco smoking might be obtained through

use of a larger sample. In turn, these findings might benefit development of a counter-marketing plan or campaign.

The current study examined hookah smoking based on constructs derived from the TRA. Although the TRA has been useful in improving understanding of cigarette smoking, its value may not transfer directly to the practice of waterpipe tobacco smoking. Thus, consideration of alternative behavioral models and frameworks seem warranted, not only for anticipating who will or will not gravitate toward waterpipe tobacco smoking, but for creating responsive interventions that dissuade experimentation and uptake. Additional next research steps would be to test the TRA model using confirmatory factor analysis or structural equation modeling.

Study Strengths and Limitations

This research study capitalized on the benefits of a mixed method design in which qualitative methods were used to identify attitudes, behavioral beliefs, and other factors that influence college students' decisions to smoke hookah. Results were used to create an online survey for exploring the relationship between key constructs in the TRA and smoking intention. Moreover, the qualitative methods aided in contextualizing waterpipe smoking and added to the validity of the quantitative data (Creswell, 2009). The results have the potential to heighten awareness of the issue of waterpipe smoking and inform the development of waterpipe smoking prevention efforts among college students.

This study has several important limitations. First, with the exception of observational studies, the study relied on self-reported data to identify the determinants of intention to smoke waterpipe. Self-report data has the potential to alter the estimates of true relationships due to social desirability. Social desirability response bias may have

influenced this study's results as found in aggregate estimates of alcohol consumption, whereby respondents may be concerned about social norms (Fowler, 2009). Also, people in waterpipe lounges/restaurants may change their behavior if they realize they are being observed (Gittelsohn, Shankar, West, Ram, & Gynwali, 1997). To help minimize reactivity, the researcher smoked in almost every lounge/restaurant and avoided obvious note taking and other activities that might have revealed research conduction. However, these efforts to minimize reactivity do not negate investigator bias during the observational periods.

Despite application of random sampling techniques, the study is delimited to the actual respondents, thereby creating response bias. Furthermore, participants included only a modest fraction of the students solicited. A low response rate threatens internal validity. Primack et al. (2008) reported the response rates of online surveys at between 10 and 30 percent. The present study had just an 8% response rate despite the incorporation of participant incentives and multiple attempts to reach students. Additional efforts to increase response were included in the survey design elements, such as increasing convenience and accessibility of the survey by placing it online, and allowing respondents to stop and resume as needed (Dillman, Smyth, & Christian, 2009). Finally, was not possible to compare characteristics of responders and non-responders for insights into bias that may have been introduced into the final study sample do to an inability to obtain population characteristics other than ethnicity.

More men than women attended the focus groups. Several factors may have accounted for this difference. The recruitment for focus groups took place in the Marshall Center. During the verification phase, students commented that men are more

willing to declare their behaviors than are women. If this belief is valid, it may have accounted for the unequal gender response. Overall, however, the focus groups were well attended.

The interviews with smokers predominantly involved men. Although this distribution may indicate that more men than women are likely to be hookah smokers, a definitive conclusion would require a sample balanced more equitably by sex. The nonsmoker interviews reflected no gender bias.

Despite the efforts to decrease response bias, more women took the survey than did men and more men than women participated in the smoker interviews and smoker focus groups. Sutfin et al. (2011) had a 63% female response rate to the online survey across eight universities and Primack et al. (2008) had a 66% female response rate, indicating this phenomenon is not unusual. One recommendation would be to better understand appropriate incentives for male students. In this particular research, it was discovered in the verification focus group that a free song download was not an incentive given that students pirate free songs. It is possible that had the survey been made available for a longer period of time and more reminders or prompts had been included, a better response rate might have been obtained.

The institution from which the sample was obtained represents yet another sampling limitation. Although USF is a public university, it may not be representative of other public universities, especially given the nonresponse to the survey which threatens the validity of the conclusions. Therefore, conclusions are delimited to students living in University-owned housing at this single university.

Due to the cross-sectional nature of the study, directionality and causality cannot be determined. This study did not explore the TRA in its entirety, as the goal of the TRA is to predict and understand a behavior. To fully understand the model and determine the relationship between intention and behavior, a longitudinal study would need to be employed. This study looked only at the correlation between individual constructs in the TRA. Additionally, despite the widespread use of the TRA to predict and understand behavioral intention, this theory has been criticized for not explaining behavioral change, a matter that is key in alcohol and drug education prevention. Another limitation of using TRA is the assumption that human beings act rationally. Evolving literature on behavioral economics indicates that humans are not always rational or predictable in their behavior (Ariely, 2008).

Dissemination of Findings

There are many audiences that would benefit from these findings, including professionals in public health, particularly health education, as well as other health practitioners. Potentially, student services and student health services personnel at colleges and other educational institutions could benefit from these findings by including factual data about waterpipe smoking in new student orientations. Further beneficiaries may be persons working in tobacco use, including personnel from voluntary health organizations such as the American Lung Association, the American Cancer Society, the American Heart Association, and others. Finally, social and behavioral science researchers who are beginning to explore the waterpipe smoking phenomenon in greater detail can continue to advance understanding of the reasons why it is attractive to persons of college age.

One mode of dissemination would consist of journal articles to include the *American Journal of Public Health*, *Tobacco Control*, *Journal of American College Health*, *Respiratory Care Journal*, *American Journal of Health Behavior*, the *College Student Journal*, and *American Journal of Emergency Medicine*. For those organizations that would benefit from more direct communication such as college health departments and the American Lung Association local chapter, an informal summary of findings in a presentation format will be offered. Another mode of dissemination would be through formal oral presentations at conferences such as American Association of Respiratory Care's National Conference and the American Public Health Association's national conference. Finally, due to the population from which the samples were drawn, an executive summary will be provided to the University of South Florida and the campus health department for informing and assisting with potential future waterpipe interventions. For funding this study, the Area Health Education Center at USF will be provided with a summary of findings and a formal oral presentation. Currently AHEC funds local talks on waterpipe tobacco smoking in the Tampa Bay community.

Summary and Conclusion

Educating students who are new to college, as well as their parents, about waterpipe tobacco smoking may help to inform their decisions whether or not to smoke hookah. As noted in this study, some parents are unaware of the dangers of the behavior or at least provide a counter-marketing point of view.. The results of this study suggest that prevention programs, possibly including social marketing campaigns, should focus on decreasing favorable attitudes associated with waterpipe smoking through counter-

marketing by clarifying its addictive nature, as well as the associated communicable diseases and other negative health effects. Associating waterpipe smoking to cigarette smoking may help to deter adoption of the behavior as borne out in the qualitative data that showed nonusers of hookah associated it with cigarettes, whereas users disassociated the two behaviors. To the extent that current findings might be duplicated elsewhere, waterpipe tobacco smoking is prevalent on or near college campuses. Understanding the theoretical constructs of intention to smoke waterpipe tobacco among college students helps to tailor interventions. Despite its limitations, this study provides guidance for developing targeted prevention programs focused on waterpipe tobacco use. These interventions may help to decrease the prevalence of waterpipe smoking and potential nicotine addiction.

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APPENDICES

Appendix 1: Observation Guide

Date:

Observer:

Location:

Start Time of Session: _____ End Time of Session: _____

Total Number of Participants at Start of Session:

Are all participants smoking Hookah? □ Yes □ No

If Not, Describe Group Dynamics: (Where are smokers sitting compared to nonsmokers)

Gender of Participants: Number of Males _____; Number of Females _____

Site Description: (What is the room like? How are tables arranged?)

Description of Ambiance: (Is music playing? Are drinks and food being served?)

Description of Hookah devices (Are there multiple hoses, mouthpieces, tall, short)

Description of Smoking: (How are participants sharing the hookah)

Describe the Overall events: (Are people eating, drinking? What is the conversation?)

AdicionalObservación Notes:

Observation #1

June 18, 2010

Location: Hookah restaurant/bar

Mary Martinasek (ethnographer)

Location:

We entered the front of the restaurant and requested seating in the hookah area on the patio. The time was 2115. The patio, which seats around 30 people, was nearly full. Tables lined each side of the long patio with a narrow walking area in between. The patio was situated against the side of the restaurant building. The building wall had two flat screen televisions mounted on them. Speakers were mounted on the wall, as well. We were seated at the far end of the patio, close to the hookah bar that had several empty bar stools and many empty hookahs waiting to be ordered. The patio tables were arranged so that 2, 4, or 6 people could sit comfortably. The patio had an overhang roof

Appendix 1 (continued)

to keep the rain off and a rolled up plastic barrier on the side facing the parking lot in the event of inclement weather.

Atmosphere:

Music was piped through the speakers and consisted of reggae to dance hall type genres in addition to Egyptian style music. At 2230 the music got slightly louder. A one-man band was setting up a sound system around 2300. Drinks and food were being served by scurrying wait staff. The lighting was relatively bright for an evening outdoors. Hookahs were placed on tables and on the floors beside the tables. The noise and music were so loud at times it was difficult to converse with people at my own table. Later in the evening a belly dancer came out onto the patio. People were letting out bird like shrills and placing dollars in the waist of her pantaloons.

Participants:

When we arrived there were five tables occupied. The first table had 4 females and 2 males most of whom appeared to be in their 20s to low 30s, however one female appeared to be in her 50s and a male in his 40s. All appeared to be Caucasian. There was one hookah in the middle of the table and everyone shared the mouthpiece to smoke. This table smoked hookah the entire time that we were there. The second table had four females and three males all whom appeared to be in their mid-20s and 30s. The two females at the end of the table were the primary hookah smokers. At the third table was seated one female and three males who all appeared to be in their 20s. The fourth table had two females and two males in the 20s. The one female was smoking the hookah rapidly and she was the primary smoker of the group. The fifth table had three females in their mid-20s. There were no smokers and no alcohol was being consumed in this group.

One table (Table 2) changed composition during the observation with two people in their 30s joining about midway through. During the observation period, the people that left the patio were mostly couples.

Activities:

Activities consisted of drinking, eating, smoking laughing, cursing, and cheering.

Hookah Devices:

Hookahs were about 2.5 feet tall with a glass vase and filled with water. There was a single hose with multiple mouthpiece tips provided in plastic sleeves. Most of the participants shared the mouthpiece. The hose was of a plastic feel and the permanent tip was made of metal and the handle was made of wood.

Ethnographer observation:

What struck me the most about this experience was as we were leaving for the evening, around 2315 and walking down the long aisle to leave the patio, there was one long table with at least eight people sitting, eating, drinking and smoking hookah. In the middle of

Appendix 1 (continued)

the table, seated, was a little girl who was 8-10 years of age. She was being exposed to the hookah smoke, drinking atmosphere, and conversations.

Observation #2

July 3, 2010

Location: Hookah Restaurant

Mary Martinasek (ethnographer)

Location:

This location was the same as observation #1. The hookah bar was located outdoors under a roof adjacent to a restaurant. There were fans blowing on us as it was summer time and flat screen televisions adorned the outside wall of the restaurant. Tables were arranged in groups of 2 - 8, some being square and others oblong. Because of the narrow length of the area, it was difficult to observe people at the other end. We arrived at 2100 and the only seating available was near the entrance to the patio. Because of the rain earlier in the day, there were plastic scroll down coverings on the patio to block potential rainfall from reaching the patron's tables. About 2230, the plastic was rolled up to allow an open-air feel. Prior to this open air exposure, the only opening to the outside was at the entrance to the patio. At the entrance was a courtyard area with a gate around it and a fountain situated in the middle. Couches made of rattan and other seats were configured to face the fountain. This area was not covered and was saturated from the earlier rain, therefore no one sat in this section of the patio.

Atmosphere:

Sports were being played on the flat screen TVs, but there was no volume coming from the source. Around 2230, about the same time they lifted the patio plastic roll down covering, music began to play through the outdoor speakers. Because of the loudness of the sound, it was difficult to carry on a conversation.

Participants:

Table 1 closest to us had three middle aged Middle Eastern looking individuals (2 males and 1 female) sitting around it. Only the eldest man and the woman smoked the hookah which was situated on the floor between their seats. The other person at the table was smoking cigarettes.

Table 2 had four under-aged looking individuals drinking water and socializing. There were 2 males and 2 females. They sat male facing female. All smoked hookah except for one of the guys. They left the table around 2130 as a group.

Table 3 arrived around 2130 and they appeared to be of Middle Eastern decent. A man

Appendix 1 (continued)

and young adult shared a hookah and mouthpiece and sat next to each other at the corner of a long table. The young adult appeared to be nervous as he was tapping his foot and inhaling large quantities of smoke when the pipe first was delivered to their table. A woman sat with them but did not smoke until two other women joined their table. The one woman who joined the table was wearing a burca. The three women ordered a separate hookah and shared it amongst themselves. They also shared the permanent mouthpiece.

Table 4 had three Middle Eastern looking men who appeared to be in their 30s. Two more men joined them after about 20 minutes. Three of the men at the end of the table smoked hookah, but the two that joined did not. The men used the disposable mouthpieces provided. They drank beer, ate, and conversed. It was too loud to hear conversation topics.

Table 5 arrived about 2152. There were four people (2 males and 2 females) The females sat opposite the males at the square table. They appeared to be in their 30s. Only one man smoked the hookah and he smoked it frequently and with large inhalations during the observation period.

Table 6 had two females and one male who all appeared to be in their 20s. One hookah sat in the middle of their table. One of the females seemed to smoke the hookah more passionately and frequently than the others. The second female was passed the pipe on occasion, but took a small puff and quickly passed it on. She appeared to be participating just to fit in and did not seem to enjoy it as much as the other female. They all shared the permanent mouthpiece. After a while another guy joined the table and also joined in the smoking.

Table 7 at the far end of the patio sat two females and a male. They were smoking hookah, but it was too difficult to observe them from the distance.

At Table 8 there were two guys who each had their own hookah device placed on the floor next to them.

Activities:

Because it was a restaurant and full bar, patrons were eating and drinking while enjoying their friends, conversations and sharing hookah.

Hookah Devices:

Hookah devices were placed on table tops and on the floor next to the tables, Most were about 2.5 feet tall with a glass vase filled with what appeared to be tap water. They were single hose devices and plastic mouthpieces were provided for the table patrons. It appeared that most people did not change out the tip, but rather shared the permanent mouthpiece. The hose had a plastic feel and the permanent mouthpiece was made of metal. The handle was made of wood. Servers wandered around the patio providing fresh charcoal to the top of the hookahs. The charcoal was a round wood charcoal.

Appendix 1 (continued)

Ethnographer observation:

Towards the end of the observation period, a table of eight came into the patio. They all appeared to be in their mid-30s. They had a very small infant in the stroller with them. Although they did not order hookah during the short time we were there, there was plenty of smoke being blown around the patio by the fans and the patrons. A diagram of the first two observation sites can be found in Figure A-1.

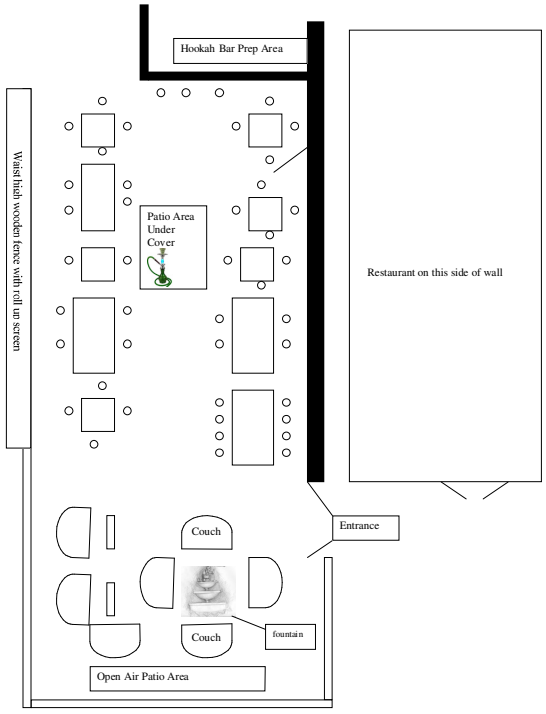

Figure A1: Diagram of first two observation sites

Observation #3

December 3, 2010

Location: Hookah Bar

Mary Martinasek (ethnographer)

Location:

The hookah bar was situated at the end of a strip center. There were two glass doors at the entryway. As we entered, immediately in front of us was a tall desk and a cashier who proceeded to ask for our identification and collect money for the entrance into the hookah bar. The cost was discounted if a USF ID was provided. The cost of $11 was for

Appendix 1 (continued)

unlimited hookah. The bar closed at 3 a.m. so that would allot us 6 hours of smoking if we elected to stay until closing.

The bar was long and relatively narrow. Couches were arranged in semi-circles lining each side of the bar. They sat up to about eight people comfortably. The couches were a plush blue velvet material. Centered in the middle was a wooden table for the hookah device and ordering menu. The walls were painted a dark red, as was the ceiling. The walls were adorned with very large pictures portraying somberness such as a noose above two people's heads wrapped in a sheet. There was a stage for a band, but no one was set up at this time. There was no alcohol served at the bar, just a refrigerator of beverages at the entrance where patrons selected their choices and paid at the cash register. A diagram of the bar can be found in figure A-2.

Atmosphere:

The lighting was dim and a down tempo music played through the speaker system. Streams of hookah smoke could be seen billowing up towards the ceiling.

Participants:

Because of the seating, it was very difficult to observe anyone else except for the people adjacent to our couch. When we arrived there were about ten people there (7 males and 3 females). During the observation period, two girls arrived together and 2 females and a male left at the same time. It seemed that most of the people were college students. Except for the three people who left, everyone else stayed there the two hours that we were there. The male working the front was also smoking hookah, very heavily and very passionately. Of the people that were observable, all seemed to be using the disposable mouthpieces. The males seemed to be smoking more often than the females.

Activities:

People were talking, drinking soda, blowing smoke rings, playing chess, and active on their laptops. The bar had free Wi-Fi.

Hookah Devices:

The hookah devices were about 2 feet tall and had a decorative colored glass vase. The hose was plastic with a wooden handle and a metal permanent tip. Plastic tips were provided by the young female servers. The hookah top was wrapped in foil and the server said it keeps the charcoal from burning the carpet or couches if they were to get knocked over.

Appendix 1 (continued)

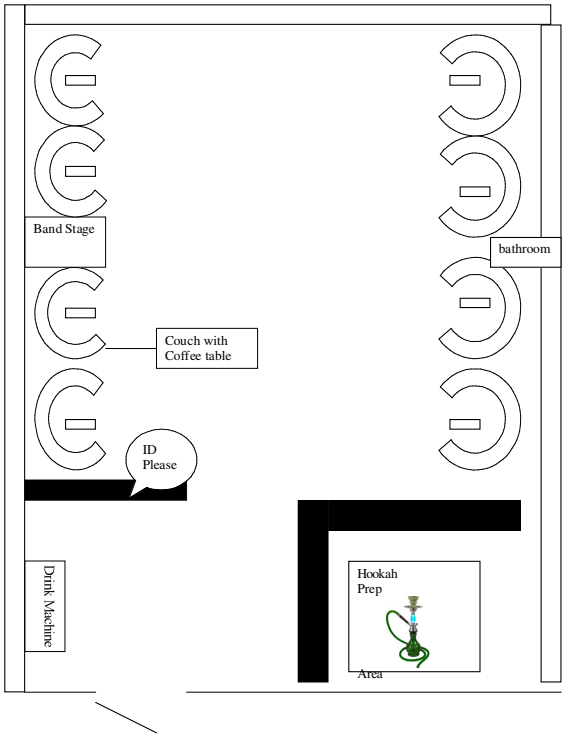

Figure A2: Hookah bar layout

Observation #4

December 11, 2010

Location: Hookah Bar

Mary Martinasek (ethnographer)

Location:

This hookah bar was situated in the middle of a small strip center. The entrance to the bar consisted of two glass doors. Upon entering, we were faced with a tall desk and a male attendant who asked to see our identification. When asked if we could get a student discount, he said that they don't give discounts there. We paid $10 for a hookah, which came with one free refill. This bar was divided into two areas separated by a five-foot wooden partition. We sat on the left side of the partition. We arrived at 2045 and were the only smokers at the start of the observation and by the time we left at 2245 there were three groups of smokers. The room had red velour couches that seat two people. There were two couches facing each other with an oblong table in the middle for the hookah device or to place drinks, etc. There were about four to five of these couch clusters in

Appendix 1 (continued)

each of the two areas. The lighting was dim with teardrop glass lights hanging over each table. A TV was mounted at the ceiling level in the back corners of the bar. The bar sold a variety of beers and nonalcoholic beverages. There was a set up on the side we were on for an acoustic one-man band. Random pictures ranging from postcard size to larger adorned the walls. It appeared they were on consignment as there were prices next to each picture. They looked like student artwork and varied from cityscapes to animals. A diagram of the layout can be found in Figure A-3.

Atmosphere:

There was stereo music playing in the background. It was light enough that we could hear other conversations. The music ranged from reggae to light rock sounds.

Activities:

People were drinking both beer and nonalcoholic beverages. One group was playing checkers. One group was eating a bag of Airheads.

Participants:

Most people stayed within their groups and didn't socialize with other groups. First group arrived around 2040 and consisted of five males and one female. They departed at 2210. Everyone in this group smoked hookah and seemed to range in age from 19-22 years. The female sat in between two males on one couch and the other two males sat on the opposite couch. They ordered a total of three hookahs. Their discussion ranged from ninja turtles to school.

Hookah Device:

The hookah was about 2.5 feet tall and similar to other bars in that it was a glass vase on the bottom, single plastic hose with a wooden handle and metal permanent mouthpiece. The bar did offer plastic tips.

Ethnographer Observation:

Although not viewed as a typical pick up location, one of the guys from the other group came over to our couches and tried to initiate a conversation. He asked us where we were from and what other hookah bars we had attended. He was from Lakeland and said that he and his buddies often come to Tampa because they like to hookah bars.

Along with the talking and laughing that took place throughout the observation, it was noticable that many people were coughing. This may be more noticable to me because of my clinical background.

Appendix 1 (continued)

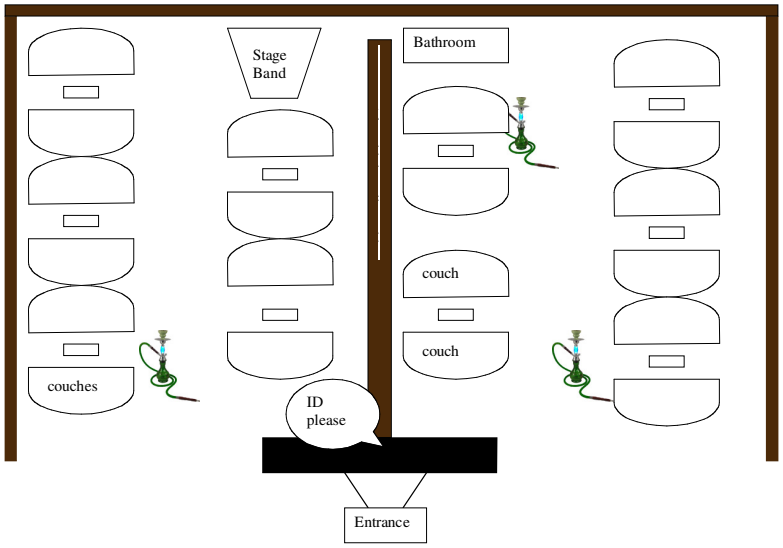

Figure A3: Layout of hookah bar

Observation #5

January 28, 2011

Location: Hookah Bar

Mary Martinasek (ethnographer)

Location:

This bar was the same hookah bar as the previous location #4. We arrived at the location at 2100 and left at 2310. We decided to sit on the right side of the partition this time. The walls were noted to be brown in color. There was a hookah menu provided at each table allowing us to pick our flavors. I counted 20 tea hookah choices and 48 regular hookah choices. The attendant said that the tea hookah does not contain nicotine.

Participants:

When we arrived at the lounge there were two college-aged males each with their own hookah. One of the guys was lying on the couch smoking his hookah. No conversation took place between them. They were drinking sodas. The other guy was trying to blow smoke rings. They each received one hookah refill during the observation period and then departed together around 2200.

Appendix 1 (continued)

An Asian couple arrived around 2145 and shared a hookah and mouthpiece. They were there for the duration of the observation. They cuddled often and were playing a game called Connect 4.

An African American female and Hispanic male arrived around 2200. They each ordered their own hookah and did not share. The each sat on their own couch facing each other. The conversation was not discernable. On the other side of the partition were three groups that came in at different times. At one point, one of the groups moved to our side and sat watching the television, which was playing the news.

Atmosphere:

It was a relaxing atmosphere with light music playing in the background.

Ethnographers Observation:

There was more smoking occurring tonight compared to the last observation here. My eyes were burning by the time I left.

Observation #6

February 12, 2011

Location: Hookah Bar

Mary Martinasek (ethnographer)

Location:

This observation took place in the same location at observation #3. We arrived at this location at 2100. When we arrived there were many couches already filled with what appeared to be mostly college-aged young adults. Because of the layout of the room it was difficult to observe others beyond a few couches. The stage for a band had guitars in their stands, but no one was playing when we arrived. The stereo music played a variety of music from light rock to more contemporary easy listening music. The patrons were singing along with the song, "Ain't no way to hide your lying eyes", which is from my era! I ordered my usual hookah, but decided to get mango flavored this time. An acoustic one-man band started playing at 2130. He sang and played the guitar while people watched. People clapped after each song and cheered him on to sing more songs. It appeared to be "open mic" night as he encouraged others to come up and sign or play a tune.

Hookah:

I was reviewing the hookah menu in more detail than the previous observation and noted that they offered 34 flavors and the waitress said I could mix up to three flavors. They also had supreme flavors for $5 extra. They were a different brand than the other 34 flavors. At the bottom of the menu was a Surgeon General's warning that if pregnant

Appendix 1 (continued)

may cause premature birth, low birth weight or fetal injury. There were no other warnings noted. I asked the waitress if I could smoke cigarettes in the bar and she said "unfortunately not". My hookah got a little strong at one point and I asked the waitress if she could change the charcoal and so she offered to repack the shisha but I just asked her to change the charcoal. After she did she took the hose and sucked on my mouthpiece to see if it was better. I was a little disgusted with the fact that she shared my mouthpiece and didn't put a tip on it.

Participants:

Because we were seated by the door it was easy to watch people coming and going. At 2140, two guys and a girl left together. At 2030 two males and two females entered the bar. I did notice one single guy in the very back of the bar sitting by himself smoking a hookah. He left just before we did. At 2035, two males and two females left together.

Activities:

People were laughing, talking, and I noticed there were a lot more people coughing than in previous observations. Activities consisted of card games, laptop work, and general conversations. At the couch adjacent to ours were two guys blowing hookah bubbles using some device. I asked the waitress what it was and she said they offer cut off plastic bottles and a container of soap so that patrons can blow bubbles for fun.

Ethnographer Observation:

One male who entered later in the evening came in smoking an electronic cigarette. There was a lot of discussion at his table but unfortunately I could not hear any of it. There was a lot of smoke in the bar tonight. On occasion the owners would open the front door to air out the place. My eyes were burning and I was starting to get a headache. When I got home I checked my exhaled carbon monoxide level and it was at 13 ppm, with 0 ppm being normal. This increase in CO may be why I had a headache. By the morning my level was down to 6 ppm and by 3 p.m. it was 3 ppm. My headache lingered throughout the day.

Appendix 2: Survey Instrument

1. Do you live on campus in university-owned housing such as campus residencies, fraternity houses, sorority houses or apartments on campus?

[ ]Yes 1 Go to Q2

[ ]No 2 Terminate survey

2. How old are you?

[ ] 16 years or younger 8 Terminate survey

[ ] 17 years 7 Terminate survey

[ ] 18 years 6 Go to Q3

[ ] 19 years 5 Go to Q3

[ ] 20 years 4 Go to Q3

[ ] 21 years 3 Go to Q3

[ ] 22 years 1 Go to Q3

[ ] 23 years or older 1 Go to Q3

Smoking Status Questions]

These questions ask about hookah smoking. Hookah smoking also is known to some people as shisha smoking, narghile/arghile smoking and waterpipe **tobacco** smoking. The following questions refer to smoking **tobacco only such as shisha** in these devices (hookah/waterpipe), unless otherwise specified.

3. Have you ever tried smoking tobacco from a hookah even 1-2 puffs/draws?

[ ] Yes 1 (Go to Q6)

[ ] No 2 (Continue to Q5)

4. If you were to consider smoking hookah in the future, which individuals or groups might encourage you to smoke? [Options of level of influence; not at all, somewhat influential, very influential]

[] Friends

[] Family

[] Hookah lounge owners

[] Sorority/Fraternity

Appendix 2 (continued)

(Go to Q11)

5, About what age were you when tried smoking hookah for the first time?

6. The **first time** you used hookah, with whom did you smoke?

[ ] I smoked it alone

[ ] one or both of my parents

[ ] one or more adults other than parents

[ ] one or more of my siblings

[ ] one or more of my friends

[ ] Other _____

7. During the **past 30 days**, have you smoked hookah, even one or two puffs?

[ ] Yes 1

[ ] No 2

8. When you smoke hookah, about how often do you share the mouthpiece with other people?

[ ] All or most of the time

[ ] Some of the time

[ ] Never or almost never

9. Where do you smoke hookah most often?

Select all that apply:

[] Dorm

[] Apartment

[] Hookah bar

[] House

Other (please specify_____)

[Intention Question]

10. I intend to smoke hookah within the next few months.
[Probably: probably not] with response options of extremely, quite, slightly neither on each side of the 7 pt. scale

Appendix 2 (continued)

[Behavioral Belief Questions]

Below are some statements about hookah smoking. Please read the statement and select an answer for each one that best describes your beliefs and opinion.

Likely to unlikely – 7 pt. scale

11. If I smoke hookah, it will help me relax and relieve my stress
12. If I smoke hookah, it will help me stay focused on my schoolwork.
13. If I smoke hookah, I will be more social.
14. If I smoke hookah, it will give me a headache.
15. If I smoke hookah, it will help me to make new friends.
16. If I smoke hookah, it will help me to meet others of the opposite sex.
17. If I smoke hookah it reinforces my culture.
18. If I smoke hookah, it gives me a "legal high."
19. If I smoke hookah, it makes me dizzy.
20. If I smoke hookah, it makes me short of breath.
21. If I smoke hookah, it makes my chest hurt the next day.
22. If I smoke hookah it makes me cough.
23. If I smoke hookah, I will become addicted.
24. If I smoke hookah, I will get cancer.
25. If I smoke hookah, I will have fun.
26. If I smoke hookah, I will feel more intellectual.
27. If I smoke hookah, it will bring my family together.
28. If I smoke hookah, it will help me think.
29. If I smoke hookah, I feel safer than if I smoked cigarettes.
30. If I smoke hookah, it will help to pass the time.

[Questions related to evaluation of Behavioral beliefs]

31. In deciding to smoke hookah, how important is each of the following reasons for smoking hookah?

1=extremely unimportant, 2=somewhat unimportant, 3=neither important nor unimportant, 4=somewhat important, 5=extremely important

35. The lightheadedness that results from smoking hookah.
36. The stress relief that results from smoking hookah.
37. The social activity that results from smoking hookah.
38. The ability to make new friends by smoking hookah.
39. Meeting people of the opposite sex by smoking hookah.
40. The traditional importance of smoking hookah
41. The "high" I get from smoking hookah.
42. The headaches that result from smoking hookah
43. The shortness of breath that results from smoking hookah.
44. The chest pains I experience the next day from smoking hookah.
45. The ability to stay focused when smoking hookah.

Appendix 2 (continued)

46. The ability to pass time while smoking hookah.
47. The relaxed feeling from smoking hookah.
48. The ability to be athletic
49. That hookah is less harmful than cigarettes
50. The group dynamics
51. The "fun" that occurs from smoking hookah
52. The bad health effects from hookah

[Attitude Questions]
Response options on 7 pt scale [Extremely, quite, slightly, neither]

Please read the following four statements and select an option that best describes your attitude regarding hookah smoking.

53. For me, smoking hookah results in a behavior that is:

__Extremely Bad: __Quite Bad:___Slightly Bad:___Neither bad nor good:___Slightly good:___Quite Good:___Extemely Good

54. For me, smoking hookah is:
    [Pleasant : unpleasant]

55. For me, smoking hookah is:
    [Nice: awful]

56. For me, smoking hookah is:
    [A lot of fun: not fun]

[Questions about Important Others]

57. If I smoke hookah, my parents would:
    Approve: disapprove with choice options extremely; quite; slightly; neither on each side of the scale.

58. If I smoke hookah, my friends would:
    Approve; disapprove with choice options extremely; quite; slightly; neither on each side of the scale.

59. If I smoke hookah, my boyfriend/girlfriend would:
    Approve; disapprove with choice options extremely; quite; slightly; neither on each side of the scale.

Question about Motivation to comply with Important others

60. Most of the time, when my parents think I should do something, I go along with it.
    Agree/Disagree with choice options extremely; quite; slightly; neither on each side of the scale.

Appendix 2 (continued)

61. Most of the time, when my friends think I should do something, I go along with it.
Agree/Disagree with choice options extremely; quite; slightly; neither on each side of the scale.

62. Most of the time, when my boyfriend/girlfriend thinks I should do something, I go along with it.
Agree/Disagree with choice options extremely; quite; slightly; neither on each side of the scale.

[Question about subjective norms]

63. If I smoke hookah, most of the people who are important to me would:
Disapprove to Approve with choice options extremely; quite; slightly; neither on each side of the scale.

[Question about cigarette use]

64. Within the past 30 days, on how many days did you smoke regular cigarettes, even a puff?
[] None

[] 1-2 days

[] 3-5 days

[] 6-10 days

[] 11-20 days

[] 21-30 days

[Demographic Questions]

65. In what year were you born? Drop down choice
66. What is your sex?
[] Male 2

[] Female 1

67. How do you usually describe your race? Please mark that which applies the best.
[] White

[] Black

[]Asian/Pacific Islander

[]American Indian/Alaskan Native

[]Other_____

Appendix 2 (continued)

68. Are you of Hispanic/Latino origin?
[] Yes

[] No

69. In what country were you born? _____ (open ended)
70. Are you a U.S. citizen?
[] Yes 1

[] No 2

71. What is your religion?
[] No chosen religion

[] Atheist/Agnostic

[] Catholic

[] Protestant

[] Other Christian

[] Jewish

[] Muslim

[] Buddhist

[] Other _____

72. Have you noticed any flyers around campus with information about the health effects of hookah smoking?
[] Yes 1

[] No 2

73. Please enter your email address for your free song download information to be sent.

Appendix 3: Survey Email

Dear USF Students (Smokers and NONsmokers):

You have been randomly selected to take an important online survey being conducted by Mary Martinasek, a graduate student in the College of Public Health at the University of South Florida. This survey seeks information regarding how you feel about hookah tobacco smoking (waterpipe smoking/narghile smoking) and asks you about your perception. This survey pertains to tobacco smoking with a waterpipe **NOT** smoking marijuana or other substances.

Please read the following important detailed information before beginning the survey.

What will be done:

Participate in an online survey that will take less than 10 minutes to complete.

Benefits of this study:

By taking this survey, you will be helping me understand some of the reasons why college students like you decide to smoke (or not smoke) hookah. For agreeing to participate in this survey, **you will receive a Free Song Download and a chance to win one of ten $50 Amazon gift cards**. To prevent multiple responses from the same respondent, a unique identification number (I.D.) has been assigned to your email address.

Risks or discomforts:

No risks or discomforts are anticipated from taking part in this study. If you feel uncomfortable with any question, you can skip that question or withdraw from the study altogether. If you decide to stop before you have completed the survey, your responses will not be discarded.

Confidentiality:

Your responses will be confidential. I will not know your IP address when you respond to the Internet survey. I will ask you to provide an email address when you complete the survey so that I can send you the free song download. Only I will see your individual survey responses. After I have finished data collection and sent out the song download information, I will destroy all participants' email addresses from my files.

Appendix 3 (continued)

Decision to stop taking the survey at any time:

Your participation is voluntary; you are free to withdraw your participation from this study at any time. If you do not want to continue, you can simply exit the website.

How the findings will be used:

The results of the study will be used for scholarly purposes only. The results from the study will be presented in educational settings and at professional conferences, and the results might be published in a professional journal in the field of public health. Neither your name nor any identifying information about you will be included in any of these reports. The survey results will be used is to provide health and safety information to the USF student community.

Contact information:

If you have concerns or questions about this study, please contact me -- Mary Martinasek at (813) 493-4546. This research study has been approved by the Institutional Review Board of USF IRB # 108637. The distribution of this survey has been approved in accordance with the USF system Policy Number 0-520. If you have any IRB questions, you can contact the IRB at (813) 974-5741.

By beginning the survey, you acknowledge that you have read this information and agree to participate in this research.

This survey may be accessed with the link below:http://hsccm2.hsc.usf.edu/checkbox/Survey.aspx?surveyid=5496