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Brushing It Off? Applying the Theory of Planned Behavior to Dental Visit Behavior

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CHAPTER 1
THE IMPORTANCE OF ORAL HEALTH

Oral health plays a key role in general health. The Surgeon General’s report from 2000 on *Oral Health in America* emphasized that dental diseases can have detrimental effects on the rest of the body (U.S. Department of Health and Human Services [HHS], 2000). Dental disease has been linked to heart disease and stroke, diabetes, birth complications, and chronic pain from dental issues has even been linked to depression (Centers Disease Control and Prevention [CDC], 2011, HHS, 2000). Some dental problems may be signs of underlying systemic health issues and vice versa. The majority of these dental problems can be detected during a routine dental visit (American Dental Association [ADA], 2013, 2014d). Thus, avoiding regular visits and recommended treatment has the potential to adversely affect overall health.

Two common dental diseases are caries (tooth decay) and periodontitis (gum disease) (CDC, 2011). They can each have significant effects on general health. In some cases, untreated dental problems can be fatal. Two high-profile cases of tooth infection were covered on Frontline in the Dollars and Dentists piece (Rosenbaum, Byker, & Mangini, 2012). In each case, bacteria from an untreated tooth infection spread to the brain, causing death. Both deaths would have been prevented with proper dental care and treatment. Recent research has also documented fatalities related to untreated dental
problems. Shah, Leong, Lee, & Allareddy (2013) examined data on hospitalizations for periapical abscesses across 8 years and found that 66 cases resulted in death. Although rarely fatal, untreated dental problems can be very serious.

Gum disease has also been shown to affect general health. For example, gum disease and diabetes are highly correlated; each condition affects the other (Mealy, 2006). Mealy (2006) explained that the body’s inability to control glucose levels can also make the gums more vulnerable to infection; in turn, infection of the gums has been shown to increase insulin resistance and make glucose levels harder to control. He recognized mixed findings, but detecting and treating the dental problem has potential to improve a more general health issue. Left untreated, both conditions could worsen. The impact of gum disease is not limited to diabetes. Bensley, VanEenwyk, and Ossiander (2011) found that people with severe gum disease were more likely to report other chronic diseases, for example, heart disease.

Oral health also has social and psychological effects. Untreated dental disease can affect a child’s ability to speak and eat, as well as cause distraction in learning and missed school (HHS, 2000). Dental problems have led to millions of work days missed for adults (Academy of General Dentistry [AGD], 2008). Oral health is also considered a large part of attractiveness. According to a 2008 survey, over half of respondents indicated that one’s smile is “very important” to attractiveness, which can impact the potential for personal and professional relationships. For example, the look of a person’s teeth can
make or break chances for employment (Aleccia, 2013). Oral health can impact the potential for success in all areas of life.

Prevention is critical to maintaining optimal oral and overall health. Regular dental visits play a critical role—they are important for identifying oral health problems early on, some of which may be symptoms of other disease, and preventing additional oral health problems like tooth decay and gum disease from developing (ADA, 2013). Although dental disease can be prevented at home by brushing, flossing, and avoiding risky behaviors like smoking or chewing tobacco, dental professionals offer additional means for prevention such as dental sealants, fluoride treatments, x-rays, and oral exams for detecting cancer (HHS, 2000). Personal oral hygiene habits are important, but another important preventive measure for oral health is keeping regular dental visits (HHS, 2000). Given the potential for such large scale adverse effects of dental disease, routine dental visits are important in maintaining optimal physical and mental health. Avoiding the dentist can have huge implications for future physical, psychological, and social well-being.

Despite the importance of the dental visit, recent research has demonstrated that even people with the resources to visit the dentist are visiting the dentist less (Vujicic, Nasseh, & Wall, 2013). In order to change dental visit behavior and reverse this trend to improve the oral health of public, and thus overall health, more research is needed to more fully understand the roots of dental visit behavior. The purpose of the current study is to describe research based in social psychological theory that will guide efforts to
improve oral health through influencing people to visit the dentist regularly. Changing
dental visit behavior will require social change in ways people think, feel, and act
towards dental visits.

Bandura’s (2004) social cognitive theory describes three components necessary
for social change: theory, implementation, and dissemination. The theory outlines the
factors that lead to change, how they lead to change, and the relationships between them.
Implementation requires translating theoretical findings into specific strategies for
change. Dissemination involves spreading the word about the need for change and
strategies for change. Change in the context of the current study is defined as one’s
behavior in regards to preventive dental care, or the routine dental visit. Various strategies
for encouraging the public to seek preventive dental care are already in practice. The
current study will focus on the theoretical component of social change, namely to identify
and describe the factors involved in a person’s decision to seek preventive dental care.
Specifically, the decision to seek preventive dental care will be examined using Ajzen’s
(1991) theory of planned behavior. The findings of this study may be used to inform
members of the public health and dental professions as to which current strategies are
more or less effective from a theoretical standpoint, and possibly lead to the development
of new or revised strategies for encouraging the public to seek preventive dental care, and
ultimately, improve overall health of the public.

Bandura (2004) described social cognitive theory (SCT) as the framework for
considering prevention-driven health behaviors. He argued that core factors of SCT are
knowledge about healthy and unhealthy behaviors (or beliefs about risks and benefits associated with each), perceived self-efficacy (or one’s belief about control over actions to reach a health goal), outcome expectations (or the result one expects as a consequence of action), the health goal itself and plans to achieve it, and perceived facilitators and impediments (or things that will help or prevent a person from taking the actions needed to achieve a health goal). These facilitators and impediments he referred to embody self-efficacy and are the basis for the perceived behavioral control (PBC) component of the theory of planned behavior. This control component is the distinguishing factor between the theory of planned behavior and theory of reasoned action.
CHAPTER 2
THEORIES OF REASONED ACTION AND PLANNED BEHAVIOR

The theory of planned behavior (TPB) is an expansion of the theory of reasoned action (TRA) that addresses the role of self-efficacy in behavior. Ajzen and Fishbein (1980) developed TRA, an expectancy-value model, based on the notion that outcomes of behaviors are distinct from actual behaviors. Thus, in order to predict a given behavior, one must distinguish the specific action that constitutes the behavior from consequences of the behavior. For example, oral health is the outcome of performing or not performing specific behaviors, like brushing, flossing, getting dental check-ups, not smoking. Whether or not a person participates in those specific behaviors is a separate issue from the corresponding consequences of participation. One must focus on a specific action of interest as the dependent variable in order to predict as accurately as possible how a person will act.

Ajzen and Fishbein (1980) broke a single behavior down into several different components. Intention is the best predictor of behavior and immediately precedes behavior in their model. Essentially, it is a measure of how driven a person is to engage in a given behavior. It is determined by two different factors according to Ajzen and Fishbein (1980). They broke intention down into a person’s attitude toward performing a behavior and subjective norm, or a person’s belief about whether other people significant
to the person perform the behavior. Each of these components carries a weight—this is where expectancy-value comes into play. The actual attitude and subjective norm associated with a behavior are central, but the strength of each component (from the person’s perspective) can vary relative to the other components. Thus, attitude toward a given behavior and subjective norm may be equally influential in determining intention, or one may be more influential than the other.

The attitude toward a behavior accounts for a person’s own evaluation or general feelings about performing a given behavior. Attitude toward behavior forms when a person considers the consequences of a given behavior in combination, or outcome evaluations, with the likelihood of that consequence occurring as a result of the behavior, or behavioral beliefs. Each behavioral belief is weighted by its corresponding outcome evaluation. The resulting sum of these products quantifies the person’s attitude toward the behavior. Thus, two different people could have the same assessment of the result of participating in the same behavior, but the two could hold different attitudes if the weight of the same assessment differs between them. Further, only the beliefs that are salient to a person contribute to their attitude toward the behavior, and those which are not salient do not contribute to their attitude toward the behavior. Which beliefs about a behavior are salient may vary by the person considering the behavior and the behavior itself. (Ajzen & Fishbein, 1980).

The subjective norm component accounts for external social influence factors influencing behavior, which takes the TRA a step above other models for health behavior,
e.g., the health belief model (Rosenstock, 2000) or transtheoretical model (Prochaska, DiClemente, & Norcross, 1992). The subjective norm forms when a person considers people who are most important to them and their beliefs about how those people would feel about the person participating in the behavior, or normative beliefs, in combination with how important it is to the person to comply with the opinions of these important others, or motivation to comply. Each normative belief is weighted by its corresponding motivation to comply. The resulting sum of these products quantifies the person’s subjective norm related to the behavior. Two people may recognize the same set of important others but hold very different normative beliefs about those others, while two people holding the same set of normative beliefs may recognize very different sets of important others. Which important others who are most salient to a person (e.g., parents, children, spouses, friends, etc.) may vary depending on the behavior in question and on the person considering the behavior. (Ajzen & Fishbein, 1980)

The TRA is a classic example of an expectancy-value model; it depicts any behavior as one large web of weighted sums of the many beliefs that relate to that behavior. In turn, those beliefs drive intention to participate in that behavior, and ultimately, the behavior itself. In other words, the theory of reasoned action is a complex mediational model of behavior. Ajzen (1991) took TRA one step further by adding a component for control, creating the theory of planned behavior (TPB). This control component influences behavioral intentions but also feeds directly into actual behavior, based on the notion that a person may or may not actually have control over whether or
not they participate in a specific behavior. The same core components from the TRA apply: attitude toward behavior and subject norm predict intention which predicts behavior. The added component of perceived behavioral control also predicts intention and behavior; it is the component that makes the TPB unique.

Perceived behavioral control (PBC) is a distinct aspect of the TPB due to its direct relationship with behavior; the same is not true of the other belief components in the model. The reason for this direct link is that a person will only participate in a behavior if they believe they can participate in the behavior. This is what makes PBC so important. Two people may intend to participate in the same behavior, but if one of them is not confident they can do it, that person is less likely to participate in the behavior than the person who expressed confidence. Measuring confidence in ability to participate in a behavior captures PBC which ultimately determines whether or not the behavior in question will occur.

Like attitude toward behavior and subjective norm, PBC is a function of beliefs and their respective weights. PBC forms when a person considers the aspects of performing behavior that may make the behavior more or less difficult, or control beliefs, in combination with the person’s perceived likelihood that they will perform the behavior under those conditions, or difficulty of behavior. Each control belief is weighted by its corresponding difficulty of behavior measure. The resulting sum of these products quantifies the person’s PBC over performing the behavior. Two people may recognize the same aspects that could make a behavior difficult but have very different ideas about how
difficult those aspects actually are, or they might recognize different aspects that could make a behavior difficult but perceive the same level of difficulty about those aspects. Which aspects are most salient to a person may vary depending on the behavior in question and on the person considering the behavior.
Although others (Perugini & Bagozzi, 2001; Prochaska et al., 1992; Rosenthal, 2000) have developed models for predicting health behavior, the TPB is arguably one of the best models for explaining health behaviors, namely, those for which a person has some degree of control in the decision to participate. Godin and Kok (1996) conducted a meta-analysis to test the capability of the TPB to predict various health behaviors and found that it is just as good at predicting health behaviors as the well-established TRA. More recently, Cooke and French (2008) conducted a meta-analysis to determine how well TRA and TPB predict screening program attendance, including a decade of research not addressed by Godin and Kok (1996), with a focus on attendance at screening programs. They concluded that both TRA and TPB are effective in predicting screening program attendance. In essence, the dental visit is a routine oral health screening; thus, one could infer that the TPB can predict dental visit behavior as accurately as it has predicted attendance at other types of health screenings.

Despite TPB’s excellent track record for predicting behavior, researchers have suggested the addition of other components to the model to improve its predictive power and account for leftover variance in behavioral intentions and actual behavior (Ajzen, 1991; Bilic, 2005). Suggested components have included past behavior, related or
contradictory behaviors, additional norms and attitudes, habit, affect, and sociocultural factors (e.g., Abraham & Sheeran, 2003; Ajzen, 1991; Armitage & Connor, 1999; Bilic, 2005; Bowie, Curbow, La Veist, Fitzgerald, & Zabora, 2003; Cooke & Sheeran, 2004; Drossaert, Boer, & Seydel, 2003; Gagne & Godin, 2007; Godin & Kok, 1996; Griva Anagnostopoulos, & Madoglou, 2010; Michels, Carter, Taplin, & Kugler, 1995; Payne, Jones, & Harris, 2002; Rivis & Sheeran, 2003; Verplanken & Faes, 1999).

Two of these suggested factors, habit and affect, are key components in a model proposed by Triandis (1979). Habit and affect distinguish his model from TPB. Both models summarize behavior as a function of internal and external factors. However, where Ajzen and Fishbein (1980) tended to focus on the cognitive aspect of attitudes, Triandis (1979) highlighted the affective aspect of attitudes. Specifically, Triandis (1979) defined the probability of a person engaging in a particular behavior as a function of habit and intention, the relative weights of each, physiological arousal, and facilitating factors. He defined intention as a function of social factors, affect toward a behavior, the value of perceived consequences related to the behavior, and the relative weights of each. Ajzen (1991) asserted the probability of a person engaging in a particular behavior as a function of behavioral intention and perceived control and defined intention as a function of attitudes (beliefs about the behavior), subjective norms (normative beliefs) and perceived control (control beliefs). The components of both models overlap. They each contain components for intention, attitude toward behavior, social influences, and self-efficacy to achieve the behavior. Rather than choose one model over the other, the current study
investigated habit and affect as additional components to a TPB model for dental visit behavior.

Habit

Triandis (1979) defined habit as an automatic behavior which requires no conscious thought. It is learned via reinforcements, cues, and the ability and confidence to learn. Intentional at first, it becomes automatic over time. Other researchers have described habit similarly, explaining that once a behavior is performed many times it becomes habitual and is no longer processed deliberately, when the context remains consistent (e.g., Aarts, Verplanken, & van Knippenberg, 1998; Bamberg, Ajzen, & Schmidt, 2003; Klockner & Matthies, 2009). A defining characteristic of habit is automaticity. The other characteristic of habit noted by Triandis (1979) is strength; the more frequently a habit is performed, the stronger the habit becomes. The stronger the habit becomes, the better it predicts the behavior. Triandis (1979) asserted that as the influence of one predictor of behavior strengthens, habit for example, the influence of the other predictor, intention, weakens.

Triandis (1979) asserted that behavior occurs either as a result of habit or conscious processing (intention)—strictly one or the other. Some behaviors can be performed without any conscious processing. For example, a person may habitually flip on the light switch each time they enter a room. They do it without thinking, whether or not light in the room may be required to see. In this case, either intention or habit leads to the behavior, in accordance with Triandis’ (1979) model. However, certain behaviors
absolutely cannot occur without some level of intention. In other words, a person cannot automatically do the behavior without first being conscious that they will do it. In these cases, the notion that intention and habit are strictly independent may not hold up. For example, a person who has been visiting the dentist regularly over a lifetime must consciously recognize that they intend to visit the dentist each year in order for the visit to occur, but the decision to do so does not require any real processing of the benefits or costs related to the behavior. They intend to visit the dentist simply because they always have. Therefore, just as a physical act like flipping a light switch behavior can occur habitually, the intention to visit the dentist can occur habitually.

Given that habit represents multiple past behaviors, it is more complex to measure than past behavior. Triandis (1979) proposed measuring habit by the frequency of a behavior occurring and a person’s perception of the likelihood the behavior will occur in different contexts. Similarly, Verplanken et al. (2011) used frequency of past behavior to measure habit strength, a direct measure. They used number of times car was chosen and time spent deciding travel choice as indirect measures of habit strength. Considered separately, frequency of past behavior (number times car had been chosen) was not a significant predictor of intention, but time taken to decide travel choice was a significant predictor. Dumitrescu, et al. (2011) also measured frequency of dental visits and other oral health behaviors, however, these simply measured occurrence of past behavior and not necessarily habit. Intention was correlated with oral health behaviors but was not found to be a significant predictor in the TPB models they tested.
Triandis (1979) did not propose habit as a predictor of intention, but only as a predictor of actual behavior. However, especially given the element of past behavior in Triandis’ (1979) measurement of habit, habit may be related to intention as well as actual behavior. In fact, Norman and Cooper (2011) found that frequency and habit strength were both significant predictors of intention. They measured more than just frequency, so their findings are not surprising given the notion that habit is more than just a past behavior. Findings for the impact of habit are mixed overall, but its potential as a predictor of intention has not been ruled out.

Affect

Affect, another key component addressed by Triandis (1979) has also been suggested as an additional component in the TPB (e.g., Ajzen, 1991; Bowie et al., 2003; Drossaert et al., 2003; Dumitrescu et al., 2011; Michels et al., 1995; Perugini & Bagozzi, 2001). Triandis (1979) explained affect as the emotional system of a person. Each characteristic of an attitude object may elicit positive or negative feelings of varying strengths about that object, and these taken together make up the total affect toward an object. Feelings elicited are learned from direct and/or indirect experience with that object. The valence of an experience may influence emotions related to the behavior and, thus, impact whether or not a person will decide to engage in the behavior (Bowie et al., 2003; Griva et al., 2010). However, affect toward a behavior may or may not match affect toward the object of the behavior. For example, a person may whole-heartedly feel that visiting the dentist is beneficial to their oral health and therefore intend to visit the
dentist. But, that does not mean they will enjoy the tooth scraping that happens during a typical dental check-up. The intention to visit the dentist anyway would be indication that affect toward the behavior trumps affect toward the object.

Triandis (1979) includes affect toward the behavior as a predictor of intention which is effectively an inclusion of an attitude component, comparable to the attitude component in TRA and TPB. Triandis (1979) defined attitude as predominantly affect-loaded and thus labeled the component as “affect.” Findings for affect as an additional predictor have been mixed; some have found it to be a significant predictor of behavioral intention (e.g., Dumitrescu et al., 2011; Perugini & Bogozi, 2001). Ajzen (2011) has asserted that affect is accounted for as a portion of the behavioral beliefs that make up the attitude component. Separating affect from attitude may help capture feelings toward the object as well as attitude toward the behavior, independent from one another (Triandis, 1979). Triandis’ (1979) affect component encompasses feelings toward a behavior, and his consequence component encompasses beliefs about what will occur as a result of performing the behavior, a component that is comparable to the direct measure of attitude toward behavior in TRA/TPB models. In fact, Dumitrescu et al. (2011) tested affective attitudes as a separate component and found that it did have a direct influence on intention, which challenges Azjen’s (2011) assertion. Others have found that affect plays an indirect role, (Chapman & Coups, 2006; Izard, 2010) or that affect does not account for any additional variance (e.g., Bowie et al., 2003). Altogether, the degree and manner
to which affect plays a role has varied, but generally speaking, the literature supports a link between affect and intention.

The degree of influence that affect has on behavioral intention may also depend on the behavior in question. For example, Sims, Tsai, Koopmann-Holm, Thomas, and Goldstein (2014) demonstrated that emotion influences choice of physician. Care-seekers preferred a doctor whose affect mirrored the care-seeker’s ideal emotion – excited or calm. Trustworthiness of the doctor mediated the effect of emotion on physician choice; participants were more likely to trust a provider who expressed emotion that matched the patient’s ideal emotional state. People base some important healthcare decisions on how they want to feel. They may be just as likely to base healthcare decisions, specifically dental care decisions, on how they do not want to feel, e.g., fearful or anxious.

Oral Health Literacy and Knowledge

Knowledge about an attitude object is arguably critical in forming beliefs about it. Thus, knowledge of oral health issues may be critical in forming beliefs about the dental visit. Specifically, knowledge about the importance of oral health, signs of oral disease, and ways to prevent oral health problems, such as visiting the dentist regularly, could inform a person’s beliefs about visiting the dentist. Having knowledge of the benefits of visiting the dentist would likely lead to positive beliefs about the dental visit, for example that visiting the dentist is good for oral health. On the flip side, knowledge of disadvantages of visiting the dentist, such as cost, could lead to negative beliefs about the dentist, for example, that visiting the dentist is expensive. Badri, Saltaji, Flores-Mir, and
Amin (2014) included oral health knowledge items as part of the attitude component, and Dumitrescu et al. (2011) included oral health knowledge as an additional component in predicting intention to improve oral health behaviors. They found that oral health knowledge was a significant predictor of instrumental attitudes and, in turn, intention. In other words, they found that the relationship between oral health knowledge and intention was mediated by attitude.

In the same vein, it is possible that oral health knowledge could determine specific normative beliefs about visiting the dentist. For example, having knowledge of the benefits of visiting the dentist as one way to prevent oral disease could lead a person to believe that the people who love them would approve of them visiting the dentist based on the notion that they would not want a loved one to have an oral disease. In the same way, knowledge of disadvantages of visiting the dentist might lead a person to believe the people they love would not approve of a dental visit, based on the notion that these loved ones think they should not be spending money. In other words, it is possible that the relationship between oral health knowledge and intention could be mediated by subjective norm. However, this specific effect has not been a focus of past research; although typically significant, subjective norm is generally not the stronger predictor of behavioral intention and health behaviors (e.g., Badri et al., 2014; Bowie et al., 2003; Cooke & French, 2008).

In summary, these additional components, habit, affect, and oral health knowledge, have the potential to account for additional variance in the explanation of
dental visit behavior. The ADA recommends regular dental visits to maintain optimal oral health (ADA, 2014b, 2014d); in other words, visiting the dentist should be a habit. Fear of the dentist or anxiety associated with dental visits may deter some people from visiting the dentist regularly or at all (e.g., Hagglin, Hakeberg, Ahlqwist, Sullivan, & Berggren, 2000; Sohn & Ismail, 2005). Lack of knowledge about oral health and consequences of not visiting the dentist may also contribute to people not visiting the dentist regularly or at all. Thus, fear and lack of oral health knowledge may prevent them from establishing a dental visit habit. Given the importance of regular dental visits and the impact of fear or anxiety and oral health knowledge in dental visit behavior, habit and affect as proposed by Triandis (1979) are arguably two significant components to add to the TPB for better prediction of dental visit behavior.
CHAPTER 4
DECREASE IN DENTAL VISITS

Although oral disease can be prevented by brushing, flossing, and avoiding risky behaviors, dental professionals offer additional means for prevention such as dental sealants, fluoride treatments, x-rays, and oral exams for detecting cancer (HHS, 2000). Despite the importance of dental visits, people are visiting the dentist less. This downward trend in dental visits is evident among adults from most income groups; both low-income and higher income groups have seen a decrease (Vujicic et al., 2013; Nasseh & Vujicic, 2014). The current study aimed to answer this key question: why is the number of dental visits decreasing?

The recent economic crisis has no doubt played a role; people lost jobs, income, and dental coverage. But this decrease in dental visits began prior to the recession, and since the economy has begun to recover, the numbers have not rebounded (Wall, Vujicic, & Nasseh, 2012). With the recession, access to dental care became a problem for groups not traditionally affected by access to care issues; dental visits have decreased among higher income adults who do not face the same kinds of barriers as their lower income or geographically isolated counterparts. Even people not directly affected by the recession were influenced.

One explanation for the decrease in dental visits lies in indirect effects of the loss
of resources among the people around them. Even if a person is not directly affected by financial hardship, exposure to it can influence a person to spend more conservatively. Quinn, Catalano, and Felber (2009) investigated utilization of preventive dental care. They found that utilization of preventive dental care decreased as unemployment increased among two dentally insured populations. Within these two populations, even those people who had retained dental insurance visited the dentist less for preventive care after unemployment had increased. The authors argued that this was due to the community connection between people not directly affected by job loss with people who had lost jobs. They explained that merely witnessing increased unemployment, although not personally experiencing it, diverted attention away from seemingly less critical items, like preventive dental care, other health care, or luxury items. The knowledge that others are struggling financially may influence those who are not struggling to spend more conservatively. This could lead people who actually can afford preventive dental care to avoid it. Ultimately, the way they think about dental care and dental visits may have changed; a visit with the dentist is no longer seen as important.

The true importance of dental care is not necessarily well-known, even among more educated populations. The need for increased oral health literacy among the general population, policy makers, and health professionals has been emphasized (HHS, 2000). Results of a recent oral health knowledge survey indicated several oral health areas in which public knowledge is lacking (Fox, 2012). Even college-educated respondents answered just 65% of questions correctly. Findings illustrate that a substantial proportion
of people do not fully understand the importance of oral health, what impacts it, or how to achieve optimal oral health. For example, they do not know the appropriate age for a child’s first dental visit, that they should brush after every meal, or the true cause of cavities.

Others may recognize the importance of oral health but misunderstand what it means to have good oral health. Survey respondents ranked smile above eyes, hair, and skin in terms of importance in attractiveness (Fox, 2012). Clearly, the appearance of one’s smile is important. But perceptions of oral health and actual oral health do not always match; an attractive smile may not be a healthy smile. If a person thinks their teeth look good and feel okay, they may assume they do not need dental care. For example, Bloom, Gift, and Jack (1992, as cited in HHS, 2000) reported that the most common reason people gave for not visiting the dentist was that they did not think they had any dental problems. Even if no dental problems are apparent to a person, they may actually have dental issues in need of treatment. For instance, according to the Roper Report (as cited in HHS, 2000), 80% of respondents thought they had no gum disease, but when asked to indicate various symptoms of gum disease, 70% indicated having a symptom. People may not recognize symptoms of oral disease as symptoms.

Limited knowledge and misguided beliefs are likely contributing to the downward trend in dental visits, but the possible explanations for decreasing dental visits are many and span across various areas, i.e., lack or perceived lack of financial resources, the belief that dental care is not important, or fear of dental procedures. Most likely, the decrease in
dental visits can be attributed to a combination of economic and attitudinal factors, in TPB terms, perceived behavioral control and attitudes. Oral health and hygiene habits and feelings about dental care also play a likely role.

Without action, the downward trend in dental visits may continue, or even worsen, for adults across the board. There is a need to stop this trend and change dental visit behavior in order to improve the oral health, and overall health, of the public. According to social cognitive theory (Bandura, 2004), the first step in changing behavior is understanding behavior. A better understanding of attitudes about oral health and dental care is necessary in order to understand dental visit behavior and design effective interventions for changing dental visit behavior, especially during a time when dental visits are on the decline. Attitudes about oral health and dental care include the cognitions, beliefs, and affect associated with oral health, oral hygiene, dental visits, and prevention. All of these factors combine to influence a person’s intention to go or not go to the dentist. The TPB is well-suited to model the way in which these factors all interact to influence dental visit behavior.
CHAPTER 5

THE CURRENT STUDY

Specific investigation of dental visit behavior is limited in TPB research. A simple PsychInfo search for “TPB and health behavior” yields studies on topics including exercise/physical activity, healthy eating, condom use, substance abuse, and others. Most of the research addresses these types of behaviors—activities a person can participate in to maintain general health independently from a health care professional. A smaller portion of the available TPB research focuses on preventive screening behaviors which are also key in maintaining one’s health. Preventive screening behaviors are distinct from the independent health behaviors listed above because they require contact with a trained health professional. Although the focus on preventive health behaviors has grown in recent years, the research does not address preventive dental care—regular dental visits. However, findings from studies of other similarly structured behaviors inform on the influence various TPB components may have on dental visit behavior.

A Modified TPB Model

The current study drew from Badri et al. (2014) and Dumitrescu et al. (2011) to broaden the spectrum of research on the application of the TPB to include dental visit behavior. The aim of this study was to determine the predictive strength of TPB components, attitudes, subjective norms, and perceived behavioral control, as well as
habit and affect, on a person’s decision to visit the dentist. A component for oral health knowledge was also included. Findings from this study will contribute to the TPB literature and a better understanding of dental visit behavior through the application of the TPB to explain dental visit behavior among adults. These findings may also inform on visits with other types of healthcare providers, and unlike the research on mammograms, is not limited to the behaviors of older women.

To best understand the reasons people decide to visit or not visit the dentist, each component in the model must be considered in the context of one’s beliefs about going to the dentist, starting with behavioral beliefs, normative beliefs, and control beliefs. The motivation of a person to comply with these beliefs must also be determined. Pinpointing these beliefs will help to determine a person’s attitudes toward the behavior, subjective norms, and perceived control regarding visiting the dentist. Gathering information about a person’s intentions for going or not going to the dentists can be used to predict whether a person will or will not actually go to the dentist. Combined, these components can predict a person’s decision in regards to visiting the dentist. The current study determined which components are most heavily weighted in this decision.

Given the limited research on TPB and the dental visit specifically, previous research on similar behaviors served as the basis for hypotheses in this study. Because the dental visit is in essence an oral health screening, findings from other types of health screening research is informative. The most commonly researched type of screening in conjunction with TPB has been the mammogram (e.g., Ashing-Giwa, 1999; Bowie et al.,
2003; Drossaert et al., 2003; Griva et al., 2010; Michels et al., 1995; Steadman, Rutter, & Field, 2002; Steele & Porche, 2005). Given that the dental visit occurs in the context of oral health behaviors, the TPB research on oral hygiene behaviors is also informative (e.g., Buunk-Werkoven et al., 2009; Dumitrescu et al., 2011; Godin & Kok, 1996).

The immediate antecedent of actual behavior, intention, has been shown to be the best predictor of actual mammogram behavior according to the TPB model (Drossaert et al., 2003; Griva et al., 2010). Although this relationship has been firmly established, the official driver(s) behind it have yet to be generally recognized. Establishing these drivers of the link from intention to behavior has become a major focus of some TPB research. Additional components have been tested as possible mediators of this relationship. For example, Cooke and French (2008) have suggested an implementation variable, or plans for participating in a behavior, as the mediator linking intention and behavior. The current study is a first step in examining the way in which various factors influence a person’s decision to visit the dentist. Thus, it focused on the factors that influence that decision rather than actual dental visit behavior.

Hypotheses

Generally speaking, attitude is the best predictor of behavioral intention in health screenings (Cooke & French, 2008). Attitude has been shown to be the strongest predictor of actual oral hygiene behavior. Dumitrescu et al. (2011) found that attitudes toward specific oral health behaviors were the most influential in improving brushing, flossing, using mouthwash, and visiting the dentist. Therefore, I predicted that attitude
toward visiting the dentist would be the strongest predictor of intention to visit the
dentist, relative to other components in the model.

Additionally, attitudes may differ based on individual characteristics. For
e example, a person’s perceptions about the degree of control they have over visiting the
dentist could moderate their attitudes about visiting the dentist. Attitude toward visiting
the dentist may not matter in a person’s decision if they believe they have no control over
whether or not they actually visit the dentist. For example, a person may believe that they
do not have the money to pay for a dental visit, the time to go, or the ability to travel to
the dentist’s office. Regardless of whether or not the person believes that visiting the
dentist is beneficial to health, they will likely not visit the dentist.

Age and race or ethnicity could also moderate attitudes toward visiting the dentist.
Reasons for not going to the dentist have been shown to differ by age, and these reasons
reflect attitude toward behavior and perceived behavioral control. For younger adults
(ages 19-34) the top reason cited for not visiting the dentist was the belief that they do not
need dental care, a behavioral belief, and for older adults, the top reason cited was cost
(ages 34-49), a control belief (Yarbrough, Nasseh, & Vujicic, 2014). Thus, attitude may
hold more weight in a younger person’s decision to visit the dentist, and it may hold less
weight in an older person’s decision to visit the dentist, compared to other components.

Also, studies have shown racial differences in attitudes. For example, African
Americans have expressed more negative attitudes towards dental care and oral health
(Gilbert, Duncan, Heft, & Coward, 1997) and more negative oral health perceptions
(Kelesidis, 2014) compared to other racial groups, likely rooted in cultural differences. For a person raised in an environment where dental visits are not considered a critical part of regular health maintenance, attitude toward visiting the dentist may hold more weight in predicting intention compared to a person who was raised in an environment where regular dental visits were considered a critical part of regular health maintenance. For this other person, attitude toward visiting the dentist may hold less weight compared to the expectation that they visit the dentist (subjective norm), or the habit of having visited the dentist regularly throughout childhood. Given these differences and the evidence that attitude is the best predictor of intention (e.g., Cooke & French, 2008) and oral health behaviors (Dumitrescu et al., 2011), I predicted that these variables would moderate the effect of attitude toward visiting the dentist on intention to visit the dentist.

Finally, it is possible that attitude towards visiting the dentist influences dental visit habits, which, in turn, influence intention to visit the dentist. Habit forms based on an initial behavior repeated over time (e.g., Aarts et al., 2006; Bamberg et al., 2003; Klockner & Matthies, 2009; Triandis, 1979). For this first time, the decision to perform the behavior is processed consciously, wherein attitudes play a key role. Certain beliefs about dental visits could lead to developing a stronger versus weaker habit of visiting the dentist, for example, believing or not believing that regular dental visits are one way to prevent oral disease. A person with more negative attitudes about dental visits may also have weaker habits related to visiting the dentist and thus weaker intentions for visiting the dentist. Therefore, I predicted that habit would drive the relationship between attitude
toward visiting the dentist and intention to visit the dentist. Hypotheses related to the
effect of attitude toward visiting the dentist are listed below:

Hypothesis 1a: The attitude component will be the strongest predictor, accounting
for the largest proportion of variance, in a person’s intention to visit the dentist.

Hypothesis 1b: This relationship will be moderated by perceived behavioral control, age,
and race/ethnicity.

Hypothesis 1c: This relationship will be mediated by habit.

Although the attitude component is a very strong predictor of behavioral
intentions, subjective norms and perceived behavioral control are strong predictors as
well (e.g., Buunk-Werkhoven et al., 2009; Cooke & French, 2008; Godin & Kok, 1996;
Steele & Porche, 2005, Griva et al., 2010). Whether or not the subjective norm or
perceived behavior control component is the stronger predictor has varied across studies.
For example, Bowie et al. (2003) found that in some cases, subjective norm is not
influential to behavioral intentions at all. Cooke and French (2008) explained that
subjective norm is a better predictor only for specific types of screening, i.e., prenatal, in
which the screening directly affects someone other than the screened person. Steele and
Porche (2005) found subjective norm was least influential antecedent of behavioral
intention for mammogram. Conversely, Griva et al. (2010) found that subjective norm
was important in women’s decisions about mammograms. Additionally and more
specifically, Badri et al. (2014) found that in many studies of dental visit attendance,
subjective norms were not as strong as other predictors. Therefore, I made no specific predictions regarding the subjective norm component.

Perceived behavioral control has also been influential in women’s decisions about mammograms. Steele and Porche (2005) found it was the best predictor of mammogram intention among rural women, likely due to lack of resources such as transportation. The research on the indirect effects of financial hardship (Quinn, Catalono, & Felber, 2009), recent loss of income during the recession, and loss of dental coverage (Wall et al., 2012) have likely contributed to perceptions of lack of resources for dental care. For instance, military women with private insurance were more likely to intend to get a mammogram compared to those with no private insurance (Michels et al., 1995). Perceived behavioral control is expected to play a larger role in a person’s decision to visit the dentist; lack of dental coverage then, should decrease a person’s likelihood for visiting the dentist.

In the context of hygiene behaviors, perceived behavioral control has been the best predictor of intention (Dumitrescu et al., 2011). For example, Buunk-Werkhoven et al. (2009) found that PBC explained one-third of the variance in oral hygiene intentions. All of this taken together supports the notion that perceived behavioral control may be more influential compared to subjective norm on a person’s decision to visit the dentist than in other types of screening. Therefore, I predicted that perceived behavioral control related to visiting the dentist would be the second strongest predictor of intention to visit the dentist.
Further, a person’s perceived behavioral control over visiting the dentist may be moderated by individual characteristics such as income and dental insurance coverage, in other words the ability to pay for dental care. A person who has lower income or lacks dental insurance may believe that they cannot afford a dental visit and therefore perceive a lack of control in the decision to visit the dentist, regardless of whether or not they believe dental visits are good for oral health. In this case, the perceived lack of control over visiting the dentist would override beliefs that visiting the dentist is beneficial to health. Similarly, the belief that one’s own actions can help prevent disease could moderate perceived behavioral control. A person who is convinced that nothing can be done to prevent oral disease may see no point in visiting the dentist regularly. Again perceived behavioral control would hold more weight in predicting intention to visit the dentist relative to attitude toward visiting the dentist. Therefore, I predicted that these variables would moderate the effect of perceived behavioral control on intention to visit the dentist. Hypotheses related to the effect of perceived behavioral control are listed below:

*Hypothesis 2a: The perceived behavioral control component will be the second best predictor in a person's intention to visit the dentist.*

*Hypothesis 2b: This relationship will be moderated by type of dental insurance coverage a person has, income, and the belief that oral/dental disease is preventable.*
Although Triandis (1979) proposed habit as a component for actual behavior rather than behavioral intention, it may have an effect based on the notion that habit is a compilation of many past behaviors. Given the influence of past behavior on behavioral intentions (e.g., Ajzen, 1991; Bilic, 2005; Drossaert et al., 2003; Griva et al., 2010; Michels et al., 1995), and habit’s basis in past behavior, I expected habit to influence intention to visit the dentist. Current oral hygiene behaviors, or oral hygiene habits, were not a significant predictor of intention to improve oral health behaviors (Dumitrescu et al., 2011), but this may be due to the way in which habit was measured, considering only frequency. The current study measured habit strength based on frequency of dental visits and likelihood to go that many times, time since last dental visit, and time until next dental visit. Although oral hygiene behavior was not a significant predictor of intention to improve oral health behaviors (Dumitrescu et al., 2011), it is arguably related to dental visit habits given that this measure of habit was not limited to frequency of the behavior in question. Therefore, I predicted that strength of habit for visiting the dentist would contribute significantly to intention to visit the dentist.

Additionally, habit for visiting the dentist may be moderated by oral hygiene behavior and type of last dental visit. A person’s oral hygiene behavior can be thought of as a habit as well. Arguably, a person with good oral hygiene habits (routinely brushing for the recommended duration, flossing, and using mouthwash) could also have a stronger habit for visiting the dentist. For a person with strong oral hygiene habits then, attitude towards visiting the dentist may not hold as much weight in predicting intention
to visit the dentist compared to habit for visiting the dentist. The opposite could be true of a person with weaker oral hygiene habits; attitude could hold more weight than habit for this person. Habit strength may also be moderated by type of last dental visit; a routine visit could indicate stronger habit for visiting the dentist than that of a person whose last visit to the dentist was for treatment of a dental problem. Therefore, I predicted that these variables would moderate the effect of habit strength on intention to visit the dentist.

Finally, rather than habit mediating the relationship between attitude and intention, it is possible that attitude mediates the relationship between habit and intention. Habits of visiting the dentist could influence or reinforce attitudes which in turn influence intention to visit the dentist. For example, a person who sees the dentist regularly for routine check-ups may develop more positive attitudes related to visiting the dentist and thus have stronger intentions for visiting the dentist in the future. Therefore, in addition to testing the the hypothesis that attitude would mediate the relationship between habit and intention (Hypothesis 1c), I also tested the hypothesis that attitude towards visiting the dentist would drive the relationship between habit strength and intention to visit the dentist (Hypothesis 3c). Thus, Hypotheses 1c and 3c were somewhat exploratory.

Hypotheses related to the effect of habit strength are listed below:

*Hypothesis 3a: The habit component will be a significant predictor in a person’s intention to visit the dentist.*

*Hypothesis 3b: This relationship will be moderated by oral hygiene behavior and the nature of a person’s last dental visit.*
Hypothesis 3c: This relationship will be mediated by attitude towards visiting the dentist.

The influence of affect on intention has been mixed. Like Triandis (1979), Ajzen (1991) and Michels et al. (1995) approached affect as a specific type of attitude and suggested that it may account for leftover variance. However, Bowie et al. (2003) measured anxiety levels related to mammograms and found that anxiety had no influence on intention. Perugini and Bagozzi (2001) tested the effects of anticipated positive and negative emotion. These components specifically measured how one would feel if they were to succeed or not succeed in performing a behavior. Neither directly impacted intention, but both were key in predicting a desire component which, in turn, successfully predicted intention.

The inconsistent findings for the role of affect could be rooted in type of behavior studied; Bowie et al. (2003) investigated mammogram attendance while Perugini and Bagozzi (2001) investigated diet and exercise. Though these behaviors are quite different, the affect associated with each seems to be attached to the outcome of behavior rather than the behavior itself. For instance, the anxiety surrounding a mammogram may actually be anxiety over what the mammogram might find. Likewise, emotions attached to diet and exercise were affiliated with the outcomes of each behavior: weight gain or loss.

One could argue that fear of the dentist and/or dental care is a much more intense emotion than anxiety over whether or not additional treatment may be needed. In the case
of dental visit behavior, the fear is directly connected to the dentist delivering care and the activities that dental care involves, i.e., dental scaling, rather than the oral health outcome. Given the intensity of this type of affect, it is expected that affect will indeed play a role in dental visit behavior. Sohn and Ismail (2005) demonstrated that anxiety over visiting the dentist does lessen the likelihood of a person visiting the dentist, even if they have dental insurance. Therefore, I predicted that affect towards visiting the dentist would contribute significantly to intention to visit the dentist.

Additionally, Dumitrescu et al. (2011) found that separating out an affective attitude component resulted in a better fitting model of intention to improve oral health behaviors. However, the attention to affect about dental visits specifically was minimal in Dumitrescu et al.’s (2011) study. Badri et al. (2014) did not separate out affect as its own component but included a more extensive list of affect items directed toward the dental visit. Considering Triandis’ (1979) conception of affect as independent and the findings of Dumitrescu et al. (2011) and Badri et al. (2014) together, the current study separated affect out as an independent component and included more items specifically focused on affect related to the dental visit in order to measure affect.

Affect related to the dental visit could also be moderated by the degree of trust a person feels toward the dentist and the type of services received. For example, for a person who does not trust their dentist, e.g., they believe that dentists do not care about their patients, dentists do not care about prevention, or their dentist doesn't explain procedures, emotion elicited by the thought of visiting the dentist could hold more weight.
in their intention to visit the dentist compared to their attitude toward visiting the dentist
despite their belief that dental visits are beneficial to oral health. Similarly, for a person
who has had an invasive dental procedure, e.g., a tooth extraction, emotion elicited by the
thought of visiting the dentist could hold more weight in their intention to visit the dentist
in the future compared to other components.

Whether or not a person has visited other health providers recently may also
moderate the affect elicited by visiting the dentist. For example, for a person who has
visited other health providers recently, affect may hold less weight in their intention to
visit the dentist; the person is in the habit of visiting health providers in general, and thus,
may intend to visit the dentist based on this habit of regular check-ups with various types
of health providers, regardless of how nervous they may or may not be about the visit.
Therefore, I predicted that these variables would moderate the effect of affect towards
visiting the dentist on intention to visit the dentist.

Finally, it is possible that affect related to visiting the dentist influences attitudes
which in turn influence intention to visit the dentist. A person who associates fear with
dental visits may also have more negative attitudes toward visiting the dentist and thus
weaker intentions to visit the dentist. Therefore, I predicted that attitude towards visiting
the dentist would drive the relationship between affect and intention to visit the dentist.
Hypotheses related to the effect of affect towards visiting the dentist are listed below:

*Hypothesis 4a: The affect component is a significant predictor in a person’s
decision to visit the dentist.*
Hypothesis 4b: This relationship will be moderated by trust towards dentists, type of services received during a person's last dental visit, and attendance at other types of health provider appointments within the last 12 months.

Hypothesis 4c: This relationship will be mediated by attitude towards visiting the dentist.

Finally, Dumitrescu et al. (2011) tested oral health knowledge as a component. They demonstrated that oral health knowledge was an indirect predictor of intention to improve oral behaviors; oral health knowledge influenced attitudes which, in turn, influenced intention. Therefore, I predicted that attitude towards visiting the dentist would drive the relationship between oral health knowledge and intention to visit the dentist:

Hypothesis 5a: Attitude will mediate the relationship between oral health knowledge and intention to visit the dentist.

The list of components and additional factors discussed above is by no means all-inclusive. However, based on previous research, these factors were expected to account for a substantial proportion of variance in a person’s decision to visit the dentist within the next six months.

The current study was unique from any studies of dental visit behavior to date. It drew largely from two previous works. Dumitrescu et al. (2011) examined dental visit behavior as one of several other oral health behaviors, and Badri, et al. (2014) conducted a meta-analysis to examine the literature on dental visit behavior and build a model
explaining it. Like both of these studies, the current study examined dental visit behavior from the perspective of the TPB. However, the components included in the model for this study were distinctive. Like Dumitrescu et al. (2011), a separate affect component was included, but unlike Dumitrescu et al. (2011), it included an additional component for habit. Neither Dumitrescu et al. (2011) or Badri et al. (2014) included a component for habit. Dumitrescu et al. (2011) did ask respondents to report length of time since their last dental visit, however, that question was merely a measure of past behavior. The current study asked additional questions in order to measure habit strength surrounding the dental visit rather than simply measuring past behavior.

Additionally, the sample for the current study was unique. Dumitrescu et al. (2011) drew their sample from an undergraduate participant pool at a Romanian university. Badri et al.’s (2014) study focused primarily on dental visit behavior among children. The sample for the current study came from the pool of U.S. Amazon MTurk workers over age 18. Thus, it was not limited to college students or children.

Triandis (1979) described an act or behavior as one small step toward a larger goal. Visiting the dentist is one step toward maintaining optimal oral health. This study is another step toward a better understanding of dental visit behavior, considering new components and a different sample. Ultimately, the findings from this study could contribute to developing strategies for reversing the current decline in dental visits.
CHAPTER 6

METHODS

Design and Procedure

The current study utilized survey methodology to gather data on oral health knowledge, oral health habits, TPB variables, habit, and affect. Two questionnaires were developed for this two-part study, using procedures recommended by Francis et al. (2004). First, an elicitation study was conducted to determine oral health knowledge, the most commonly held beliefs about the act of visiting the dentist (behavioral beliefs), what others think about visiting the dentist (normative beliefs), control over visiting the dentist (control beliefs), dental visit routine (habit), and how people feel about visiting the dentist (affect). Responses to this elicitation study questionnaire were used to develop indirect measures of attitudes, normative beliefs, and control beliefs to include on the second questionnaire, the TPB questionnaire, for the study. Once the questionnaire was developed, it was piloted to assess clarity and difficulty of items, wording or formatting, length of the questionnaire, and fairness of compensation for the task.

Both questionnaires were developed and deployed online using Loyola University Chicago’s web survey application, Opinio. The links to access these questionnaires were distributed using Amazon Mechanical Turk (MTurk), a web service that allows users to
complete a variety of “human intelligence tasks (HITs),” made available by other users, for varying levels of compensation (Amazon Web Services, 2015). Each link was posted as one of many HITs available to a select group of MTurk users until the quota for each questionnaire was reached. The elicitation study questionnaire was posted on December 20, 2014 and closed on December 21, 2014. The pilot questionnaire was posted on February 12, 2015 and closed the same day. The final questionnaire was posted on February 21, 2015 and closed on February 22, 2015.

Participants completed the elicitation study questionnaire in 6 minutes on average; each participant was compensated with a $0.50 credit to their Amazon.com account. Participants completed the pilot questionnaire in 11 minutes on average; each participant was compensated with a $0.75 credit and $0.25 bonus to their Amazon.com account. In response to participant feedback about fairness of the $0.75 base compensation amount and compensation rates recommended in the Dynamo Guidelines (“Fair payment,” 2014), an additional $0.25 credit was given to all pilot respondents in order to approach recommended compensation rates while remaining low enough to prevent coercion of MTurk workers to participate simply for a high incentive. Participants completed the final questionnaire in 11 minutes on average; each participant was compensated with a $1.00 credit and 389 also received a $0.25 bonus to their Amazon.com account.

Survey Instruments

Two questionnaires were developed for the current study. The procedure for survey development followed Francis et al. (2004) who used the item structure
established by Ajzen and Fishbein (1980). Additionally, Ajzen (2006) and Dumitrescu et al. (2011) were consulted for item development. The elicitation study questionnaire asked participants to list advantages and disadvantages of visiting the dentist, individuals or groups that would approve or disapprove of respondents visiting the dentist, what factors enable or prevent respondents from visiting the dentist, and anything else respondents associate with visiting the dentist. These questions were meant to elicit attitudes, normative beliefs, and control beliefs about visiting the dentist among MTurk users in the sampling frame. (See Appendix A for a copy of the elicitation study questionnaire.) Responses from the elicitation study were analyzed and used to develop indirect measures of attitude (attitude beliefs), subjective norm (normative beliefs), and perceived control (control beliefs) for the final questionnaire.

The final questionnaire covered five main areas: core components of the TPB, oral health knowledge, habit, affect, and demographics. Following procedures outlined by Francis et al. (2004), intentions were measured in general terms, e.g., whether or not a person expects to visit the dentist at all within the next six months. These items used a seven-point rating scale, 1 being “strongly disagree” and 7 being “strongly agree” (see Question 33 in Appendix B).

Attitudes, affect, subjective norms, perceived behavioral control, and habit strength were measured directly and indirectly. Measures of behavioral beliefs, normative beliefs, and control beliefs were meant to indirectly assess attitudes, affect, subjective norms, and perceived behavioral control, respectively. Direct measures of attitude
included both instrumental and experiential assessments. For example, an instrumental item asked participants how useful versus worthless is visiting the dentist, and an experiential item asked how pleasant versus unpleasant is visiting the dentist. These items used a seven-point scale ranging from 1 to 7. Positive and negative anchors were alternated between 1 and 7 (see Question 34 in Appendix B). Measures of behavioral beliefs addressed commonly held beliefs about visiting the dentist among the sampling frame. Items assessed the strength of these beliefs, e.g., if visiting the dentist is doing something good for a person. These items used a seven-point rating scale, 1 being “unlikely” and 7 being “likely” (see Question 35 in Appendix B). Other items assessed outcome evaluation, e.g., whether a person doing something good for them is undesirable or desirable. These items used a seven-point rating scale, 1 being “undesirable” and 7 being “desirable” (see Question 36 in Appendix B).

Direct measures of subjective norm included items to assess the opinions of others who are important to a person in regards to visiting the dentist, i.e., whether most people who are important to a person feel that the person should or should not visit the dentist. This item used a seven-point semantic differential scale, -3 being “should” and +3 being “should not” (see Question 37 in Appendix B). Other items e.g., that others expect the person to visit the dentist, used a seven-point rating scale, 1 being “strongly disagree” and 7 being “strongly agree” (see Question 46 in Appendix B). Measures of normative beliefs addressed commonly held beliefs about what others think about a person visiting the dentist on two levels: injunctive and descriptive. Both types of items assessed the strength
of normative beliefs. Injunctive items assessed whether participants think important others would approve or disapprove of them visiting the dentist (see Questions 38, 39, and 40 in Appendix B). Descriptive items assessed what a person thinks other people would do in regards to visiting the dentist, e.g., whether or not other people visit the dentist every six months. These items used a seven-point semantic differential scale ranging from -3 to +3. Positive and negative anchors were alternated between -3 and +3 (see Questions 42, 43, 44, and 45 in Appendix B). Other items assessed motivation to comply with these normative beliefs, e.g., whether doing what other people do is important to a person. These items used a seven-point rating scale, 1 being “not at all” and 7 being “very much” (see Question 47 in Appendix B).

Direct measures of perceived behavioral control included items to assess a person’s self-efficacy for visiting the dentist, e.g., how easy it is for a person to visit the dentist, e.g., whether a person thinks they could visit the dentist if they wanted to, and assessment of the controllability of visiting the dentist, e.g., whether or not a person feels that visiting the dentist is completely up to them. One of these items used a seven-point rating scale, 1 being “easy” and 7 being “difficult” (see Question 49 in Appendix B). The other items used a seven-point semantic differential scale, -3 being “strongly disagree” and +3 being “strongly agree” (see Questions 48, 50, and 51 in Appendix B). Measures of control beliefs addressed commonly held beliefs about a person’s own control over visiting the dentist. Items assessed the strength of these beliefs, e.g., whether or not a person thinks they will able to get a dental appointment. These items used a seven-point
rating scale, 1 being “unlikely” and 7 being “likely” (see Question 52 in Appendix B). Other items assessed the influence each belief has on actually visiting the dentist on two levels. Likelihood items assessed how a particular belief affects the likelihood that a person will visit the dentist, e.g., whether a convenient appointment increases the chance that a person will visit the dentist. These items used a seven-point rating scale, 1 being “less likely” and 7 being “more likely” (see Questions 53, 54, 55, and 56 in Appendix B). Difficulty items assessed how easy versus difficult a person feels it is to visit the dentist, e.g., whether dental coverage makes it easier or more difficult other people visit the dentist. These items used a seven-point rating scale, 1 being “much more difficult” and 7 being “much easier” (see Questions 58, 59, and 60 in Appendix B).

Measures of affect assessed the degree to which each of six emotions is experienced when one thinks about visiting the dentist using a seven-point rating scale, 1 being “not at all” and 7 being “extremely” (see Question 61 in Appendix B). Other items from Al-Omiri, Al-Wahadni, and Saeed’s (2006) questionnaire were modified for the current study to gather information about participants’ past dental visit behavior, i.e., dental visit habit. Drawing from Triandis (1979), direct measures of habit were based on frequency of the behavior, i.e., the number of times in a year a person typically sees the dentist, and likelihood of performing the behavior in a given context, i.e., seeing the dentist that number of times in the current year (see Questions 13 and 14 in Appendix B). Additionally, habit was assessed by time of a person’s last dental visit and likelihood of visiting the dentist in the next year (see Questions 3 and 5 in Appendix B). An indirect
measure of habit consisted of two questions at the start of the survey asking respondents to list the various types of doctor visits they have attended in the past year and which of those they make sure they visit every year (see Questions 1 and 2 in Appendix B).

In addition to TPB, affect, and habit items, the second questionnaire also included items to assess oral health knowledge. These items were modified from items developed by Al-Omiri, et al. (2006) for their study to measure oral health knowledge, attitudes, and behaviors among adolescents. Dumitrescu et al. (2011) also used oral health knowledge items developed by Al-Omiri et al. (2006).

Demographic items were included at the end of the questionnaire: respondent age, gender, income, and dental insurance status. Overall, the final questionnaire consisted of about 65 items. For the most part, items for each component were presented together, e.g., in blocks. For the final questionnaire and the list of pilot test items and questionnaire items, see Appendix B.

Sample

Dumitrescu et al. (2011) noted their sample as a limitation; it consisted of mostly female undergraduate students, and therefore, the authors asserted that their findings may have been biased. Indeed, a person’s attitudes, subjective norms, and perceived control may vary by certain characteristics of the person (e.g., Bowie et al., 2003; Michels et al., 1995). Females and college students tend to be more knowledgeable about oral health (Fox, 2012), so it is possible that a mostly female college student sample would provide overestimates of oral health knowledge and oral health behaviors. To learn more about
the reasons behind the drop in dental visits in the United States, the current study aimed to use a sample that is more representative of the group which has seen a sharp decrease in dental visits despite having the financial resources for preventive dental care: non-poor adults between ages 19 and 34 (Vujicic, Goodell, & Nasseh, 2013).

The sampling frame for the current study consisted of MTurk users. On average, they are 32 years old and tend to reside in the United States or India (Mason and Suri, 2012). Ross, Irani, Silberman, Zaldivar, and Tomlinson (2010) found that their MTurk respondents were younger, more educated, tended to be female, and reported lower income compared to the U.S. population in general. Thus, participants in the current study were expected to be more educated and more likely to be female, similar to the sample from Dumitrescu et al. (2011). However, the sample for the current study was not limited to a single university’s student pool and was expected to be more representative of younger adults in the United States rather than Romania.

As recommended by Francis et al. (2004), a sample of 25 MTurk users completed the questionnaire for the elicitation study. Responses were used to develop items for the pilot of the final questionnaire. A sample of 34 MTurk workers pilot tested the final questionnaire and provided feedback about clarity and difficulty of items, wording or formatting, length of the questionnaire, and fairness of compensation for the task.

In order to determine the appropriate sample size for the second questionnaire, a power analysis was conducted using an online sample size calculator (Creative Research Systems, 2012). The desired confidence level, confidence interval, and population size
are required to calculate sample size. However, the exact number of MTurk users fitting specifications for the sampling frame is not known. Ross et al. (2010) noted that the number of MTurk workers in 2009 was 200,000; the current number of workers fitting the targeted demographic for the current study is unknown. To achieve a 95% confidence level and a confidence interval of 5 from a population of unknown size, the appropriate sample size is 384. To account for the possibility of bad responses, the goal sample size was increased to 427 (an 11% increase). Data collection was cut off once the 427 MTurk HITS made available were completed, resulting in a final sample of 424 completed questionnaire responses. (Not every participant who completed the HIT formally submitted their questionnaire responses. This was likely due to technically difficulties related to LUC’s server and its capacity to handle this number of people in an Opinio questionnaire at one time.)

Of the 424 participants who completed the final questionnaire, 67% were age 35 or younger. The original goal of the study was to focus on the age group of 19 to 34. However, because 33% of the respondents were not in this age group, focusing solely on this group alone would compromise power of the study. Therefore, the current study examines responses from MTurk users of all ages who live in the United States.
CHAPTER 7

DATA PREPARATION AND DESCRIPTIVES

Elicitation Study

In line with the procedure described by Francis et al. (2004), responses to the elicitation study questionnaire were reviewed in order to determine which behavioral beliefs, affective beliefs, normative beliefs, and control beliefs were mentioned among respondents from the MTurk sampling frame. Responses to each item were coded into categories (1 category = 1 belief). The frequencies of resulting categories were tabulated and ordered from most frequently mentioned belief to least frequently mentioned belief. Over 75% of the listed beliefs were developed into items for the final questionnaire. (Francis et al. (2004) have noted that including the top 75% beliefs generally covers the commonly held beliefs among the target population.)

Final Questionnaire Pilot

In line with the procedure described by Francis et al. (2004), responses to the pilot questionnaire were reviewed in order to evaluate the understandability, clarity, and difficulty of items on the second questionnaire. Frequency distributions for each item were examined to confirm that all response values were in range. All responses were in range. Responses to pilot questions were examined in order to identify issues with the final questionnaire. Nearly all participants (94%) indicated that no items were confusing.
or difficult to answer, 97% found none of the wording or formatting to be frustrating, and 88% did not find the length of the questionnaire to be discouraging. Although 79% indicated that $0.75 was fair as base compensation for completing the questionnaire, comments regarding compensation rate were examined closely. Base compensation was adjusted to $1.00 based on this feedback. No other significant changes were made to the final questionnaire.

Data Cleaning

Raw data were imported and prepared in SAS for analysis following the process outlined by Francis et al. (2004). First, raw data were screened for accuracy. Frequency distributions for each questionnaire item were examined to confirm that response values were in-range. The raw data did not reflect semantic differential (ranging from -3 to +3) value labels that appeared on the questionnaire; raw data values ranged from 1 to 7. Thus, the values for semantic differential items and all indirect measures were recoded such that 1 became -3 and 7 became +3. (See Questions 35–40, 42-45, 47-56, 58-60 in Appendix B). Next, some items were reverse coded so that for all questionnaire items, a higher score corresponded to a positive response. (See Questions, 40, 43, 49 in Appendix B.) For example, scores on generalized behavioral intention (Question 33 in Appendix B), some scores on direct measures attitude (rows 1, 2, and 5 of Question 34 in Appendix B), scores on one direct measure of subjective norm (Question 37 in Appendix B), scores on two indirect measures of subjective norm (Questions 40, 43 in Appendix B), and scores on one direct measure of perceived behavioral control (Question 49 in Appendix B).
B) were reversed given that they were presented in the questionnaire with negative anchors on the right end of these scales. For each oral health knowledge item, a corresponding variable was created to indicate whether or not the answer to that item was correct.

Next, data were screened to identify invalid responses. Attention check items (see Questions 21, 41, 57, in Appendix B) were reviewed for missing values and incorrect responses. Participants who left any attention check item blank or provided an incorrect answer were excluded from final analysis. Additionally, standard deviations were computed for each set of related items. For each set of items, responses to those items were examined for standard deviations of 3.0 or higher. For two sets of items, responses indicated that the participant did not notice a reversed scale relative to other items. For example, the participant responded with a value of “3” for four items in a row. Upon recoding items, a response of “3” became “-3.” These participants were excluded from final analysis. In total, 54 participants were excluded, leaving data from 370 respondents for analysis.

Composite Scores

Before computing composite scores, internal consistency was tested for the following components: attitude toward behavior, behavioral beliefs, subjective norm, normative beliefs, perceived behavioral control, control beliefs, affect, and habit. Initial examination of internal consistency indicated that some additional items required reverse scoring in order to achieve at Cronbach’s alpha of more than 0.60. (See the 2nd, 4th, 8th,
9th rows of Questions 35 and 36, Question 50, 2nd row of Question 52, Question 54, and the 1st, 3rd, 5th rows of Question 61.) After reverse scoring these additional items, internal consistency was tested again. Cronbach’s alpha for each component, habit, and affect was greater than 0.60, the minimum acceptable according to Francis et al. (2004). See the table below for Cronbach’s alpha for each component. Thus, all items composing each component were used for calculation of composite scores. Given the nature of items composing the knowledge component (the sum of correctly answered items), internal consistency was not used to determine inclusions of items to calculate the composite score for knowledge.

Table 1. Internal Consistency of TPB Components

<table>
<thead>
<tr>
<th>Component (direct measures)</th>
<th>Number of Items</th>
<th>Cronbach’s alpha (standardized)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Intention</td>
<td>3</td>
<td>0.888803</td>
<td>369</td>
</tr>
<tr>
<td>Attitude toward Behavior</td>
<td>6</td>
<td>0.771552</td>
<td>368</td>
</tr>
<tr>
<td>Subjective Norm</td>
<td>4</td>
<td>0.622055</td>
<td>369</td>
</tr>
<tr>
<td>PBC</td>
<td>4</td>
<td>0.874707</td>
<td>368</td>
</tr>
<tr>
<td>Habit</td>
<td>4</td>
<td>0.839882</td>
<td>369</td>
</tr>
<tr>
<td>Affect</td>
<td>6</td>
<td>0.849575</td>
<td>366</td>
</tr>
</tbody>
</table>

After reverse scoring additional items, higher scores for each component indicate higher degrees of the construct measured by each component. Specifically, higher scores for affect indicate more positive feelings about visiting the dentist, higher scores for attitude and behavioral beliefs indicate more favorable attitudes toward visiting the dentist, higher scores for subjective norm and normative beliefs indicate more perceived
pressure from important others, higher scores for perceived behavioral control and control beliefs indicate feeling more in control over visiting the dentist, and higher scores for habit indicate stronger dental visit habits.

Composite scores were then calculated for each direct and indirect component to be included in analysis. Direct components included behavioral intention, attitude toward behavior, subjective norm, perceived behavioral control, affect, and habit. A mean composite score for generalized intention to visit the dentist was calculated based on scores from the three generalized intention items (see Question 33 in Appendix B). A mean composite score for attitude was calculated based on scores from six instrumental and experiential measures of attitude toward visiting the dentist (see Question 34 in Appendix B). A mean composite score for subjective norm was calculated based on scores from four measures of subjective norm (see Questions 37 and the 2nd, 3rd, 4th rows of Question 46). Because these four items were presented on different response scales, they were first standardized and then combined to create the composite score for subjective norm. A mean composite score for perceived behavioral control was calculated based on scores from four measures of perceived behavioral control (see Questions 48-51). Because these four items were presented on different response scales, they were first standardized and then combined to create the composite score for perceived behavioral control. A mean composite score for affect was calculated based on scores from six measures of affect (see Question 61 in Appendix B). A composite score for habit was based on the sum of the product of routine dental visit frequency and likelihood of
that frequency (based the suggestion of Triandis (1979)), time of last dental visit, and
time of next dental visit (see Questions 3, 8, 13, 14 in Appendix B). A composite score
for oral health knowledge was based on the sum of the number of correct responses to
eleven oral health knowledge items (see Questions 22-32 in Appendix B).

Indirect components include behavioral beliefs, normative beliefs, and control
beliefs calculated using the two types of indirect measures for each component. A
composite score for behavioral beliefs was calculated by multiplying the score for each of
nine behavioral belief items (see Question 35 in Appendix B) by the score for their
respective outcome evaluation items (see Question 36 in Appendix B) and summing those
products. A composite score for subjective norm was calculated by multiplying the score
for each of six normative belief items (Questions 38-40, 42-44 in Appendix B) by the
score for their respective motivation to comply items (see Question 47 in Appendix B)
and summing those products. A composite score for perceived behavioral control was
calculated by multiplying the score for each of seven control belief items (see Question
52 in Appendix B) by the score for their respective influence of control belief items (see
Questions 53-60) and summing those products. The table below presents descriptive
statistics for each direct and indirect composite score by component.
After computing direct and indirect composite scores, correlation analyses were conducted to determine how well each composite score of indirect measures reflects its respective composite score of direct measures. Each correlation was at least moderate, indicating that each indirect component does reflect its respective direct component and that they are not redundant of their respective direct components. Direct and indirect measures of attitude toward visiting the dentist were strongly correlated, $r(370) = 0.76$, $p < .0001$. Direct and indirect measures of subjective norm surrounding visiting the dentist were moderately correlated, $r(370) = 0.39$, $p < .0001$. Direct and indirect measures of perceived behavioral control over visiting the dentist were also strongly correlated, $r(370) = 0.71$, $p < .0001$.

Next, the distributions of each component, direct and indirect, were examined for skewness using univariate procedures (mean, median, mode, skewness, kurtosis, and
histograms). Based on recommendations in “Testing normality” (2014), composite scores were transformed if they exhibited skewness beyond -1.0 or +1.0 or kurtosis greater than 6.0. The distribution for perceived behavioral control was negatively skewed (-1.33). A square transformation was performed, resulting in a more extreme positive skew (3.53). Skewness for all other distributions fell between -1.0 and +1.0. Kurtosis for all distributions was below 6.0. Based on this information, untransformed composite scores were used for analysis.

Table 3. Skewness and Kurtosis of Composite Scores (N=370)

<table>
<thead>
<tr>
<th>Component</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Skewness (squared)</th>
<th>Kurtosis (squared)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral Health Knowledge</td>
<td>-0.80</td>
<td>1.65</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>-0.36</td>
<td>-1.29</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Attitude Toward Behavior</td>
<td>-0.72</td>
<td>1.24</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Subjective Norm</td>
<td>-0.67</td>
<td>0.31</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>PBC</td>
<td>-1.33</td>
<td>1.24</td>
<td>3.53</td>
<td>12.61</td>
</tr>
<tr>
<td>Habit</td>
<td>-0.10</td>
<td>-1.18</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Affect</td>
<td>0.13</td>
<td>-0.90</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes: All distributions were significantly different from normal, before and after transformation, p < .010.
CHAPTER 8
INITIAL REGRESSION ANALYSIS

First, correlational analyses were conducted to examine the correlation between intention to visit the dentist and each direct measure and each indirect measure. With the exception of oral health knowledge, all direct and indirect measures were significantly correlated with intention to visit the dentist. Therefore, oral health knowledge was excluded from subsequent analyses.

Table 4. Correlations between Antecedents and Behavioral Intention

<table>
<thead>
<tr>
<th>Component</th>
<th>Pearson’s r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral health knowledge</td>
<td>0.08506</td>
</tr>
<tr>
<td>Habit</td>
<td>0.44944*</td>
</tr>
<tr>
<td>Affect</td>
<td>0.23026*</td>
</tr>
<tr>
<td>Direct attitude toward behavior</td>
<td>0.31515*</td>
</tr>
<tr>
<td>Indirect attitude toward behavior</td>
<td>0.37481*</td>
</tr>
<tr>
<td>Direct subjective norm</td>
<td>0.26681*</td>
</tr>
<tr>
<td>Indirect subjective norm</td>
<td>0.16295**</td>
</tr>
<tr>
<td>Direct PBC</td>
<td>0.30793*</td>
</tr>
<tr>
<td>Indirect PBC</td>
<td>0.31754*</td>
</tr>
</tbody>
</table>

* p < .0001, ** p < .01

Additionally, correlation analyses were conducted to examine the correlation between intention to visit the dentist and each behavioral, normative, and control belief (weighted by outcome evaluation, motivation to comply, and difficulty of behavior, respectively). Most beliefs were significantly correlated with intention to visit the dentist.
The belief most strongly correlated with behavioral intention was the control belief, “I will have time for a routine dental check-up in the next 6 months,” (r = 0.32). Several behavioral beliefs had correlation coefficients over 0.25. The weakest correlations occurred for normative beliefs.

Table 5. Correlations between Indirect Measures and Behavioral Intention

<table>
<thead>
<tr>
<th>Belief (indirect measure)</th>
<th>Pearson’s r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral beliefs (weighted by outcome evaluation)</td>
<td></td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, I will feel like I am doing something good for my oral health.</td>
<td>0.29735*</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, it will [not] cause me anxiety.✝</td>
<td>0.19927**</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, any oral health problems I might have will be detected early.</td>
<td>0.24008*</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, it will [not] be inconvenient for my schedule.✝</td>
<td>0.20111**</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, I will prevent oral disease.</td>
<td>0.28793*</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, I will feel like I am doing something good for my general health.</td>
<td>0.29137*</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, I will feel like I am doing something good for my teeth.</td>
<td>0.27201*</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, it will [not] cause me pain.✝</td>
<td>0.20089*</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, it will [not] be expensive.✝</td>
<td>0.18667**</td>
</tr>
</tbody>
</table>

✝ Terms inside brackets adjust statements to reflect reverse scoring
* p<.0001, **p<.01, ***p<.05
Table 5. Correlations between Indirect Measures and Behavioral Intention (continued)

<table>
<thead>
<tr>
<th>Belief (indirect measure)</th>
<th>Pearson’s r</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Normative beliefs (weighted by motivation to comply)</strong></td>
<td></td>
</tr>
<tr>
<td>My friends would approve of me visiting the dentist for a routine check-up in the next 6 months.</td>
<td>0.07202</td>
</tr>
<tr>
<td>My family would approve of me visiting the dentist for a routine check-up in the next 6 months.</td>
<td>0.17097**</td>
</tr>
<tr>
<td>My spouse/boyfriend/girlfriend would [approve] of me visiting the dentist for a routine check-up in the next 6 months.</td>
<td>0.15238**</td>
</tr>
<tr>
<td>My family members do visit the dentist for a routine check-up every 6 months.</td>
<td>-0.08180</td>
</tr>
<tr>
<td>My friends [do] visit the dentist for a routine check-up every 6 months.</td>
<td>0.11440***</td>
</tr>
<tr>
<td>My spouse/boyfriend/girlfriend does visit the dentist for a routine check-up every 6 months.</td>
<td>0.17089**</td>
</tr>
<tr>
<td><strong>Control beliefs (weighted by difficulty of behavior)</strong></td>
<td></td>
</tr>
<tr>
<td>I will have time for a routine dental check-up in the next 6 months.</td>
<td>0.31790*</td>
</tr>
<tr>
<td>Routine dental check-ups are [not] expensive.</td>
<td>0.12321***</td>
</tr>
<tr>
<td>The dentist of my choice will have open appointment times in the next 6 months.</td>
<td>0.25595*</td>
</tr>
<tr>
<td>I will have transportation to go to a routine dental check-up in the next 6 months.</td>
<td>0.24032*</td>
</tr>
<tr>
<td>I will have money to pay for a routine dental check-up in the next 6 months.</td>
<td>0.22154*</td>
</tr>
<tr>
<td>I will have dental insurance coverage for a routine dental check-up in the next 6 months.</td>
<td>0.20205*</td>
</tr>
<tr>
<td>Available appointment times will be convenient for my schedule.</td>
<td>0.20709*</td>
</tr>
</tbody>
</table>

† Terms inside brackets adjust statements to reflect reverse scoring
* \( p < .0001 \), ** \( p < .01 \), *** \( p < .05 \)
Regression Analysis

Data from 370 respondents was included in regression analysis. Of these 370 respondents, 66.7% were 35 or younger (M = 33.5). Additionally, most respondents were white (78.3%) and nearly all were not Hispanic (94.9%). The majority (68.1%) reported earnings of $50,000 or less, and nearly two-thirds (62.2%) indicated that they have dental insurance. More than half (56.6%) of respondents were male.

Overall, respondents reported good oral health habits and were knowledgeable about oral health topics addressed in the questionnaire. In regards to dental visits, 81.9% of respondents reported having visited the dentist within the past year, and 64.3% indicated that the primary reason for that visit was for a regular check-up. Over three-quarters (76.5%) of respondents reported that they make a point to see the dentist each year; 69.7% reported that their next dental visit was scheduled to occur within the next six months or the within the year; 71.5% reported that they typically see the dentist once, twice, or three times per year.

In regards to oral hygiene, 61.6% reported that they typically brush their teeth twice per day and nearly half (46.9%) indicated that when they brush they do so for two minutes, which is consistent with ADA recommendations for frequency of brushing and length of time to brush (ADA, 2014b). In regards to questions about oral health topics, the average number of correct answers was 8.5 out of 11. Almost all (90% or more) respondents correctly recognized that bleeding gums indicates gingivitis, that gingivitis can be prevented with regular brushing and flossing, that sweets and soft drinks affect
oral health, that dental visits are necessary, that oral health affects general health, and that treatment of a toothache is just as important as treatment of any other ailment. Over 85% of respondents recognized that oral disease is preventable. Fewer respondents (50.7%) correctly recognized that plaque is soft deposits on teeth and that it leads to cavities (50.1%).

Regression analyses were used initially to determine the influence of each component—attitude toward visiting the dentist, subjective norms surrounding visiting the dentist, perceived behavioral control over visiting the dentist, habit of visiting the dentist, and affect related to visiting the dentist—on intention to visit the dentist. (Oral health knowledge was excluded as a predictor given that it was not significantly correlated with intention to visit the dentist.) First, a multiple regression was conducted to test the following hypotheses:

*Hypothesis 1a: The attitude component will be the strongest predictor, accounting for the largest proportion of variance, in a person’s intention to visit the dentist.*

*Hypothesis 2a: The perceived behavioral control component will be the second best predictor in a person’s intention to visit the dentist.*

*Hypothesis 3a: The habit component will be a significant predictor in a person’s intention to visit the dentist.*

*Hypothesis 4a: The affect component is a significant predictor in a person’s decision to visit the dentist.*
Examination of residual tests and diagnostic plots as recommended by Ngo (2012) indicated that some assumptions for multiple regression may not have been met (see Figure 1). The Durbin-Watson D is about 2.1 (a value of 2.0 is ideal) which indicates that the residuals are probably not correlated and that the independent error assumption has likely been met. The residuals plotted against the predicted values show a rectangular pattern, indicating potential problems with model fit and unequal variances. The Q-Q plot (Row 2, Column 1) shows some deviation from a linear trend and the histogram (Row 3, Column 1) shows a slightly skewed distribution, both of which indicate possible violation of the normality assumption. The leverage plot (Row 1, Column 3) shows some possible outliers or otherwise influential observations. The Cook’s D graph (Row 2, Column 3) shows no influential observations above the 50th percentile. Due to these potential violations of assumptions, further testing was done.
Figure 1. Fit Diagnostics for Initial Regression Model

Next, the Box-Cox method was used to determine whether transformation of the response variable, intention to visit the dentist, might improve homogeneity of variance or linearity of the model. The result of $\lambda = 1.25$ indicated that the recommendation was for no transformation of the response variable, according to the recommended transformation chart from Ngo (2012). Based on results from the Box-Cox test, the response variable was not transformed.
Table 6 presents unstandardized parameter estimates from the initial regression analysis. Together, attitude toward visiting the dentist, subjective norms surrounding visiting the dentist, perceived behavioral control over visiting the dentist, habit of visiting the dentist, and affect related to visiting the dentist accounted for 22.7% of the variance in intention to visit the dentist. Two components were found to be significant predictors of intention to visit the dentist: habit of visiting the dentist (β = 0.08046, se = 0.01317, p < 0.0001), and attitude toward visiting the dentist (β = 0.44451, se = 0.15279, p = 0.0038). Independently, habit of visiting the dentist accounted for 7.66% of the variance in intention to visit the dentist, while attitude toward visiting the dentist accounted for 9.93% of the variance in intention to visit the dentist.
Table 6. Parameter Estimates for Initial Regression Analysis

<table>
<thead>
<tr>
<th>Component</th>
<th>Coeff (β)</th>
<th>SE</th>
<th>p</th>
<th>Semi-partial r^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.11354</td>
<td>0.70175</td>
<td>0.1134</td>
<td>—</td>
</tr>
<tr>
<td>Attitude</td>
<td>0.44451</td>
<td>0.15279</td>
<td>0.0038</td>
<td>0.09932</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>0.16330</td>
<td>0.16142</td>
<td>0.3124</td>
<td>0.03199</td>
</tr>
<tr>
<td>PBC</td>
<td>0.15307</td>
<td>0.13602</td>
<td>0.2612</td>
<td>0.02709</td>
</tr>
<tr>
<td>Habit</td>
<td>0.08046</td>
<td>0.01317</td>
<td>&lt;.0001</td>
<td>0.07660</td>
</tr>
<tr>
<td>Affect</td>
<td>-0.09265</td>
<td>0.09468</td>
<td>0.3285</td>
<td>0.00201</td>
</tr>
</tbody>
</table>

R^2 = .2265
F(5,364) = 22.61, p <.0001

Thus, Hypotheses 1a and 3a were supported; attitude toward visiting the dentist was the strongest predictor, accounting for the most variance in intention to visiting the dentist, and habit was also a significant predictor of intention to visit the dentist. In other words, respondents with stronger habits for visiting the dentist (a higher habit score) were more likely to intend to visit the dentist within the next six months, and respondents with more positive attitudes toward visiting the dentist (a higher composite attitude score) were more likely to intend to visit the dentist in the next six months. Hypotheses 2a and 4a were not supported and therefore the additional Hypotheses related to Hypotheses 2a and 4a were not tested:

_Hypothesis 2a: The perceived behavioral control component will be the second best predictor in a person's intention to visit the dentist._
Hypothesis 2b: This relationship will be moderated by type of dental insurance coverage a person has, income, and the belief that oral/dental disease is preventable.

Hypothesis 4a: The affect component is a significant predictor in a person’s decision to visit the dentist.

Hypothesis 4b: This relationship will be moderated by trust towards dentists, type of services received during a person’s last dental visit, and attendance at other types of health provider appointments within the last 12 months.

Hypothesis 4c: This relationship will be mediated by attitude towards visiting the dentist.
After the initial finding that attitude and habit were significant predictors of intention, conditional process analysis was used to further investigate the relationship between attitude and intention, the relationship between habit and intention, and test Hypotheses 1b, 1c, 3b, and 3c. Conditional process analysis allows for simultaneous testing mediation and moderation (Hayes, 2013). Based on Hayes’ (2013) model templates, a conditional process model includes one independent variable, one dependent variable, up to two moderators, and up to ten mediators. Because conditional process analysis is limited to two moderators in a given model, the decision was made to test each moderator and mediator separately. Model template 1 includes one independent variable, one dependent variable, and one moderator (see Figure 3) and was used to test Hypotheses 1b and 3b. Model template 4 includes one independent variable, one dependent variable, and one mediator (see Figure 4) and was used to test Hypotheses 1c and 3c.
Figure 3. Conditional Process Analysis Model Template 1

Figure 4. Statistical Diagram for Model Template 1
Figure 5. Conditional Process Analysis Model Template 4

![Conditional Process Analysis Model Template 4](image1)

Figure 6. Statistical Diagram for Model Template 4

![Statistical Diagram for Model Template 4](image2)
Proposed Moderators

Before proceeding with conditional process analyses, moderator variables were created based on the hypotheses to be tested. Several participant characteristics were predicted to moderate relationships between a given component and intention to visit the dentist. The following moderator variables were computed: oral hygiene habit, type of last dental visit (routine vs. treatment) for testing Hypothesis 3b, and race (white vs. not white) for testing Hypothesis 1b. Hygiene habit score was computed based on the sum of scores on several oral hygiene habit items: number of methods used to clean teeth/mouth, product of number of times one brushes per day and likelihood one will brush that often, and number of minutes participant brushes (less than a minute = 0, one minute = 1, two minutes = 2, two or more minutes = 3). A higher score indicated better hygiene habits. Type of last dental visit was coded as “routine” (a value of 0) if it involved oral screening/exam, or teeth cleaning, or x-rays. It was coded as “treatment” (a value of 1) if it did not qualify as “routine” and it involved fillings, gum treatment, fluoride treatment, orthodontic treatment, crown or bridge work, tooth extraction, or other procedure. Perceived behavioral control score and age were maintained as continuous variables.
Hypotheses 1b and 1c

Given the limitations on number of moderators in conditional process models, one model was tested for each moderator noted above. Thus, one model tested age, one model tested race, and one model tested perceived behavioral control. An additional model tested habit as a mediator in the relationship between attitude and intention.

Model 1. Model template 1 (Figure 3) was used to test moderation of the relationship between attitude and intention by age. The first model included attitude toward visiting the dentist as the independent variable (X), intention to visit the dentist is the dependent variable (Y), and age as the moderator (M). Subjective norms surrounding visiting the dentist, perceived behavioral control, habit, race, and affect related to visiting the dentist were included as covariates. Scores for attitude and age were mean-centered prior to analysis.
Hypothesis 1b predicted that the relationship between attitude and intention would be moderated by age. Table 8 presents unstandardized parameter estimates for each path in the model leading to the dependent variable, intention. The interaction between attitude and age was not a significant predictor of intention, $\beta = -0.0006$, $p > .05$ (see Table 8).

Thus, the direct relationship between attitude and intention was not moderated by age.

Table 8. Model 1: Predictors of Intention

<table>
<thead>
<tr>
<th>Predictor</th>
<th>coeff (β)</th>
<th>se</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>3.5316</td>
<td>0.4318</td>
<td>8.1784</td>
<td>0.0000</td>
<td>2.6824</td>
<td>4.3808</td>
</tr>
<tr>
<td>Age</td>
<td>0.0023</td>
<td>0.0091</td>
<td>0.2500</td>
<td>0.8027</td>
<td>-0.0156</td>
<td>0.0202</td>
</tr>
<tr>
<td>Attitude</td>
<td>0.4404</td>
<td>0.1550</td>
<td>2.8421</td>
<td>0.0047</td>
<td>0.1357</td>
<td>0.7452</td>
</tr>
<tr>
<td>Attitude x age</td>
<td>-0.0006</td>
<td>0.0105</td>
<td>0.0564</td>
<td>0.9550</td>
<td>-0.0201</td>
<td>0.0212</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>0.1779</td>
<td>0.1621</td>
<td>1.0979</td>
<td>0.2730</td>
<td>-0.1408</td>
<td>0.4967</td>
</tr>
<tr>
<td>PBC</td>
<td>0.1410</td>
<td>0.1367</td>
<td>1.0320</td>
<td>0.3028</td>
<td>-0.1227</td>
<td>0.4098</td>
</tr>
<tr>
<td>Habit</td>
<td>0.0806</td>
<td>0.0133</td>
<td>6.0505</td>
<td>0.0000</td>
<td>0.0544</td>
<td>0.1067</td>
</tr>
<tr>
<td>Affect</td>
<td>-0.0999</td>
<td>0.0958</td>
<td>-1.0430</td>
<td>0.2976</td>
<td>-0.2882</td>
<td>0.0884</td>
</tr>
<tr>
<td>Race</td>
<td>0.3804</td>
<td>0.2372</td>
<td>1.6039</td>
<td>0.1096</td>
<td>-0.0860</td>
<td>0.8468</td>
</tr>
</tbody>
</table>

$R^2 = .2414$

$F(8,360) = 14.32$, $p < .0001$

Model 2. Model template 1 (Figure 3) was used to test moderation of the relationship between attitude and intention by race. The second model included attitude toward visiting the dentist as the independent variable (X), intention to visit the dentist is the dependent variable (Y), and race as the moderator (M). Subjective norms surrounding visiting the dentist, perceived behavioral control, habit, age, and affect related to visiting
the dentist were included as covariates. Scores for attitude and race were mean-centered prior to analysis.

Hypothesis 1b also predicted that the relationship between attitude and intention would be moderated by race. Table 9 presents unstandardized parameter estimates for each path in the model leading to the dependent variable, intention. The interaction between attitude and race was not a significant predictor of intention, $\beta = -0.0614$, $p > .05$ (see Table 8). Thus, the direct relationship between attitude and intention was not moderated by race.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>coeff ($\beta$)</th>
<th>se</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>3.6398</td>
<td>0.4314</td>
<td>8.4378</td>
<td>0.0000</td>
<td>2.7915</td>
<td>4.4881</td>
</tr>
<tr>
<td>Race</td>
<td>0.3938</td>
<td>0.2347</td>
<td>1.6780</td>
<td>0.0942</td>
<td>-0.0677</td>
<td>0.8554</td>
</tr>
<tr>
<td>Attitude</td>
<td>0.4490</td>
<td>0.1537</td>
<td>2.9219</td>
<td>0.0037</td>
<td>0.1468</td>
<td>0.7512</td>
</tr>
<tr>
<td>Attitude x race</td>
<td>-0.0614</td>
<td>0.2572</td>
<td>-0.2387</td>
<td>0.8115</td>
<td>-0.5671</td>
<td>0.4444</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>0.1791</td>
<td>0.1616</td>
<td>1.1085</td>
<td>0.2684</td>
<td>-0.1386</td>
<td>0.4968</td>
</tr>
<tr>
<td>PBC</td>
<td>0.1426</td>
<td>0.1361</td>
<td>1.0479</td>
<td>0.2954</td>
<td>-0.1368</td>
<td>0.4101</td>
</tr>
<tr>
<td>Habit</td>
<td>0.0803</td>
<td>0.0133</td>
<td>6.0476</td>
<td>0.0000</td>
<td>0.0542</td>
<td>0.1065</td>
</tr>
<tr>
<td>Affect</td>
<td>-0.1038</td>
<td>0.0950</td>
<td>-1.0919</td>
<td>0.2756</td>
<td>-0.2907</td>
<td>0.0831</td>
</tr>
</tbody>
</table>

$R^2 = .2429$
$F(7,362) = 16.59$, $p < .0001$

**Model 3.** Model template 1 (Figure 3) was used to test moderation of the relationship between attitude and intention by perceived behavioral control. The third model included attitude toward visiting the dentist as the independent variable (X), intention to visit the dentist is the dependent variable (Y), and perceived behavioral
control as the moderator (M). Subjective norms surrounding visiting the dentist, habit, age, race, and affect related to visiting the dentist were included as covariates. Scores for attitude and perceived behavioral control were mean-centered prior to analysis.

Finally, hypothesis 1b also predicted that the relationship between attitude and intention would be moderated by perceived behavioral control. Table 10 presents unstandardized parameter estimates for each path in the model leading to the dependent variable, intention. The interaction between attitude and perceived behavioral control was not a significant predictor of intention, $\beta = -0.0040$, $p > .05$ (see Table 10). Thus, the direct relationship between attitude and intention was not moderated by perceived behavioral control. Together, the results of Models 1, 2, and 3 indicate that Hypothesis 1b was not supported.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>coeff ($\beta$)</th>
<th>se</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>3.5377</td>
<td>0.4284</td>
<td>8.2587</td>
<td>0.0000</td>
<td>2.6953</td>
<td>4.381</td>
</tr>
<tr>
<td>PBC</td>
<td>0.1415</td>
<td>0.1372</td>
<td>1.0313</td>
<td>0.3013</td>
<td>-0.1283</td>
<td>0.4113</td>
</tr>
<tr>
<td>Attitude</td>
<td>0.4439</td>
<td>0.1558</td>
<td>2.8498</td>
<td>0.0046</td>
<td>0.1376</td>
<td>0.7502</td>
</tr>
<tr>
<td>Attitude x PBC</td>
<td>-0.0040</td>
<td>0.1514</td>
<td>-0.0261</td>
<td>0.9792</td>
<td>-0.3017</td>
<td>0.2938</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>0.1779</td>
<td>0.1616</td>
<td>1.1010</td>
<td>0.2716</td>
<td>-0.1399</td>
<td>0.4957</td>
</tr>
<tr>
<td>Habit</td>
<td>0.0808</td>
<td>0.0132</td>
<td>6.1232</td>
<td>0.0000</td>
<td>0.0549</td>
<td>0.1068</td>
</tr>
<tr>
<td>Affect</td>
<td>-0.1015</td>
<td>0.0962</td>
<td>-1.0559</td>
<td>0.2917</td>
<td>-0.2906</td>
<td>0.1068</td>
</tr>
<tr>
<td>Race</td>
<td>0.3895</td>
<td>0.2342</td>
<td>1.6633</td>
<td>0.0971</td>
<td>-0.0710</td>
<td>0.8500</td>
</tr>
</tbody>
</table>

$R^2 = .2428$

$F(7,362) = 16.58$, $p < .0001$
Model 4. Model template 4 (Figure 5) was used to test mediation of the relationship between attitude and intention by habit. The fourth model included attitude toward visiting the dentist as the independent variable (X), intention to visit the dentist is the dependent variable (Y), and habit as the mediator (M). Subjective norms surrounding visiting the dentist, age, race, and affect related to visiting the dentist were included as covariates. Scores for attitude and perceived behavioral control were mean-centered prior to analysis. Bias corrected bootstrap confidence intervals (95%) were based on 10,000 bootstrap samples.

Hypothesis 1c predicted that the relationship between attitude and intention would be mediated by habit. In order to determine whether or not mediation occurred, the paths from attitude to habit and from habit to intention were examined. Table 11 presents unstandardized parameter estimates for each path in the model leading to the mediator, habit. Attitude was not a significant predictor of habit, $\beta = -0.1901$, $p > .05$ (see Table 11). Without a significant relationship between the independent variable and the mediator, mediation cannot occur. Thus, the direct relationship between attitude and intention was not mediated by habit. Hypothesis 1c was not supported.
Table 11. Model 4: Predictors of Habit

<table>
<thead>
<tr>
<th>Predictor</th>
<th>coeff (β)</th>
<th>se</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>11.7332</td>
<td>2.8844</td>
<td>4.0678</td>
<td>0.0001</td>
<td>6.0609</td>
<td>17.4056</td>
</tr>
<tr>
<td>Attitude</td>
<td>-0.1901</td>
<td>0.6161</td>
<td>-0.3086</td>
<td>0.7578</td>
<td>-1.4017</td>
<td>1.0214</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>3.5648</td>
<td>0.6175</td>
<td>5.7727</td>
<td>0.0000</td>
<td>2.3504</td>
<td>4.7792</td>
</tr>
<tr>
<td>PBC</td>
<td>3.5978</td>
<td>0.5097</td>
<td>7.0581</td>
<td>0.0000</td>
<td>-2.5954</td>
<td>4.6002</td>
</tr>
<tr>
<td>Affect</td>
<td>1.6679</td>
<td>0.3713</td>
<td>4.4915</td>
<td>0.0000</td>
<td>0.9376</td>
<td>2.3982</td>
</tr>
<tr>
<td>Race</td>
<td>-0.2249</td>
<td>0.9451</td>
<td>-0.2380</td>
<td>0.8120</td>
<td>-2.0835</td>
<td>1.6337</td>
</tr>
<tr>
<td>Age</td>
<td>0.0142</td>
<td>0.0362</td>
<td>0.3919</td>
<td>0.6954</td>
<td>-0.0570</td>
<td>0.0854</td>
</tr>
</tbody>
</table>

R² = .3705
F(6,362) = 35.51, p < .0001

Hypotheses 3b and 3c

Again, given the limitations on number of moderators in conditional process models, one model was tested for each moderator proposed in Hypothesis 3b. Thus, one model tested oral hygiene score, and one model tested nature of last dental visit. An additional model tested attitude as a mediator in the relationship between habit and intention.

Model 5. Model template 1 (Figure 3) was used to test moderation of the relationship between habit and intention by oral hygiene score. The fifth model included habit of visiting the dentist as the independent variable (X), intention to visit the dentist as the dependent variable (Y), and oral hygiene behavior score as the moderator (M). Attitude towards visiting the dentist, subjective norms surrounding visiting the dentist, perceived behavioral control, nature of last dental visit, and affect related to visiting the
dentist were included as covariates. Scores for habit and oral hygiene were mean-centered prior to analysis.

Hypothesis 3b predicted that the relationship between habit and intention would be moderated by oral hygiene behavior. Table 12 presents unstandardized parameter estimates for each path in Model 5 leading to the dependent variable, intention. The interaction between habit and oral hygiene was not a significant predictor of intention, $\beta = 0.0011$, $p > .05$ (see Table 12). Thus, the direct relationship between habit and intention was not moderated by oral hygiene behavior.

Table 12. Model 5: Predictors of Intention

<table>
<thead>
<tr>
<th>Predictor</th>
<th>coeff ($\beta$)</th>
<th>se</th>
<th>$t$</th>
<th>$p$</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.2857</td>
<td>0.7097</td>
<td>3.2208</td>
<td>0.0014</td>
<td>0.8901</td>
<td>3.6814</td>
</tr>
<tr>
<td>Oral hygiene</td>
<td>-0.0201</td>
<td>0.0154</td>
<td>-1.3282</td>
<td>0.1850</td>
<td>-0.0509</td>
<td>0.0099</td>
</tr>
<tr>
<td>Habit</td>
<td>0.0846</td>
<td>0.0134</td>
<td>6.3275</td>
<td>0.0000</td>
<td>0.0583</td>
<td>0.1109</td>
</tr>
<tr>
<td>Habit x oral hygiene</td>
<td>0.0011</td>
<td>0.0016</td>
<td>0.6865</td>
<td>0.4928</td>
<td>-0.0021</td>
<td>0.0043</td>
</tr>
<tr>
<td>Attitude</td>
<td>0.4859</td>
<td>0.1548</td>
<td>3.1386</td>
<td>0.0018</td>
<td>0.1815</td>
<td>0.7904</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>0.1594</td>
<td>0.1621</td>
<td>0.9836</td>
<td>0.3259</td>
<td>-0.1593</td>
<td>0.4781</td>
</tr>
<tr>
<td>PBC</td>
<td>0.1457</td>
<td>0.1361</td>
<td>1.0706</td>
<td>0.2850</td>
<td>-0.1219</td>
<td>0.4132</td>
</tr>
<tr>
<td>Affect</td>
<td>-0.1034</td>
<td>0.0950</td>
<td>-1.0878</td>
<td>0.2774</td>
<td>-0.2902</td>
<td>0.0835</td>
</tr>
<tr>
<td>Nature of last dental visit</td>
<td>0.1991</td>
<td>0.1956</td>
<td>1.0180</td>
<td>0.3094</td>
<td>-0.1855</td>
<td>0.5836</td>
</tr>
</tbody>
</table>

$R^2 = .2438$  
$F(8,361) = 14.55$, $p < .0001$

*Model 5. Model template 1 (Figure 3) was used to test moderation of the relationship between habit and intention by nature of last dental visit. The sixth model included habit of visiting the dentist as the independent variable (X), intention to visit the*
dentist as the dependent variable (Y), and nature of last dental visit (routine = 0 vs. treatment = 1) as the moderator (M). Attitude towards visiting the dentist, subjective norms surrounding visiting the dentist, perceived behavioral control, oral hygiene, and affect related to visiting the dentist were included as covariates. Scores for habit and nature of last dental visit were mean-centered prior to analysis.

Hypothesis 3b also predicted that the relationship between habit and intention would be moderated by nature of one’s last dental visit. Table 13 presents unstandardized parameter estimates for each path in Model 6 leading to the dependent variable, intention. The interaction between habit and nature of last dental visit was not a significant predictor of intention, \( \beta = -0.0164, p > .05 \) (see Table 12). Thus, the direct relationship between habit and intention was not moderated by nature of one’s last dental visit. Together, the results of Models 5 and 6 indicate that Hypothesis 3b was not supported.
Table 13. Model 6: Predictors of Intention

<table>
<thead>
<tr>
<th>Predictor</th>
<th>coeff (β)</th>
<th>se</th>
<th>t</th>
<th>p</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.8642</td>
<td>0.7381</td>
<td>3.8804</td>
<td>0.0001</td>
<td>1.4126</td>
<td>4.3157</td>
</tr>
<tr>
<td>Nature of last dental visit</td>
<td>0.1945</td>
<td>0.1956</td>
<td>0.9945</td>
<td>0.3207</td>
<td>-0.1901</td>
<td>0.5790</td>
</tr>
<tr>
<td>Habit</td>
<td>0.0841</td>
<td>0.0133</td>
<td>6.3035</td>
<td>0.0000</td>
<td>0.0578</td>
<td>0.1103</td>
</tr>
<tr>
<td>Habit x nature of last dental visit</td>
<td>-0.0164</td>
<td>0.0211</td>
<td>-0.7760</td>
<td>0.4382</td>
<td>-0.0580</td>
<td>0.0252</td>
</tr>
<tr>
<td>Attitude</td>
<td>0.4890</td>
<td>0.1549</td>
<td>3.1575</td>
<td>0.0017</td>
<td>0.1844</td>
<td>0.7935</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>0.1719</td>
<td>0.1617</td>
<td>1.0634</td>
<td>0.2883</td>
<td>-0.1460</td>
<td>0.4899</td>
</tr>
<tr>
<td>PBC</td>
<td>0.1480</td>
<td>0.1360</td>
<td>1.0883</td>
<td>0.2772</td>
<td>-0.1195</td>
<td>0.4155</td>
</tr>
<tr>
<td>Affect</td>
<td>-0.1028</td>
<td>0.0950</td>
<td>-1.0828</td>
<td>0.2796</td>
<td>-0.2896</td>
<td>0.0839</td>
</tr>
<tr>
<td>Oral hygiene</td>
<td>-0.0215</td>
<td>0.0154</td>
<td>-1.3981</td>
<td>0.1629</td>
<td>-0.0518</td>
<td>0.0088</td>
</tr>
</tbody>
</table>

$R^2 = .2441$

$F(8,361) = 14.57, p < .0001$

Model 7. Model template 4 (Figure 5) was used to test mediation of the relationship between habit and intention by attitude. The seventh model included habit of visiting the dentist as the independent variable (X), intention to visit the dentist is the dependent variable (Y), and attitude as the mediator (M). Subjective norms surrounding visiting the dentist, perceived behavioral control, oral hygiene, nature of last dental visit, and affect related to visiting the dentist were included as covariates. Bias corrected bootstrap confidence intervals (95%) were based on 10,000 bootstrap samples.

Hypothesis 3c predicted that the relationship between habit and intention would be mediated by attitude. In order to determine whether or not mediation occurred, the paths from habit to attitude and from attitude to intention were examined. Table 14 presents unstandardized parameter estimates for each path in the model leading to the
mediator, attitude. Habit was not a significant predictor of attitude, $\beta = 0.0034$, $p > .05$ (see Table 11). Without a significant relationship between the independent variable and the mediator, mediation cannot occur. Thus, the direct relationship between habit and intention was not mediated by attitude. Hypothesis 3c was not supported.

Table 14. Model 7: Predictors of Attitude

<table>
<thead>
<tr>
<th>Predictor</th>
<th>coeff ($\beta$)</th>
<th>se</th>
<th>$t$</th>
<th>$p$</th>
<th>LLCI</th>
<th>ULCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>3.7093</td>
<td>0.1644</td>
<td>22.5688</td>
<td>0.0000</td>
<td>3.3861</td>
<td>4.0325</td>
</tr>
<tr>
<td>Habit</td>
<td>-0.0034</td>
<td>0.0045</td>
<td>-0.7422</td>
<td>0.4585</td>
<td>-0.0122</td>
<td>0.0055</td>
</tr>
<tr>
<td>Subjective norm</td>
<td>0.2546</td>
<td>0.0531</td>
<td>4.7919</td>
<td>0.0000</td>
<td>0.1501</td>
<td>0.3591</td>
</tr>
<tr>
<td>PBC</td>
<td>0.1078</td>
<td>0.0458</td>
<td>2.3557</td>
<td>0.0190</td>
<td>0.0178</td>
<td>0.1978</td>
</tr>
<tr>
<td>Affect</td>
<td>0.3797</td>
<td>0.0253</td>
<td>15.0091</td>
<td>0.0000</td>
<td>0.3299</td>
<td>0.4294</td>
</tr>
<tr>
<td>Oral hygiene</td>
<td>0.0153</td>
<td>0.0052</td>
<td>2.9696</td>
<td>0.0032</td>
<td>0.0052</td>
<td>0.0255</td>
</tr>
<tr>
<td>Nature of last dental visit</td>
<td>-0.0791</td>
<td>0.0662</td>
<td>-1.1958</td>
<td>0.2325</td>
<td>-0.2092</td>
<td>0.0518</td>
</tr>
</tbody>
</table>

$R^2 = .5195$

$F(6,317) = 65.40$, $p < .0001$

Additional Tests

The conditional process analyses explained previously tested age, race, and oral hygiene score as moderators; no moderation effects emerged for any of the hypotheses tested. However, each of these moderators could arguably function as mediators rather than moderators, though these specific mediation effects were not predicted a priori. For example, the attitude-intention relationship could be mediated by age and race. Younger versus older and white versus non-white respondents may have differences in attitude toward dental visits which lead to differences in intention to visit the dentist. The habit-
intention relationship could be mediated by oral hygiene score. Perhaps habit visits influences oral hygiene habits which in turn influence intention to visit the dentist.

In order to test for mediation, the mediator must have a significant relationship with both the independent and dependent variables (Baron & Kenny, 1986). Therefore, prior to conducting these mediation analyses, correlations were examined to determine whether full mediation analyses would be justified. Findings indicated that age and race were not significantly correlated with attitude toward dental visits, and that oral hygiene score was not significantly correlated with intention (see Table 15). Thus, further mediation analyses were not conducted. Age and race did not mediate the relationship between attitude and intention, and oral hygiene score did not mediate the relationship between habit and intention.

Table 15. Correlations between Additional Mediators, Attitude, and Behavioral Intention

<table>
<thead>
<tr>
<th>Mediator</th>
<th>Pearson’s r for attitude</th>
<th>Pearson’s r for intention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td>Race</td>
<td>0.05</td>
<td>0.09</td>
</tr>
<tr>
<td>Oral hygiene score</td>
<td>0.21*</td>
<td>0.06</td>
</tr>
</tbody>
</table>

* p < .0001
In summary, only Hypotheses 1a and 3a were supported. Attitude toward visiting the dentist was the best predictor of intention to visit the dentist in the next six months, accounting for the largest proportion of variance in that intention, 10% (see Table 6). Habit was the only other significant predictor, accounting for about 8% of the variance in intention to visit the dentist in the next six months. In other words, a respondent with more positive attitudes toward visiting the dentist and stronger habits of visiting the dentist expressed stronger intention to visit the dentist in the next sixth months.

The finding that attitude was the most influential is not surprising given findings from past literature. Dumitrescu et al. (2011) found that attitude was the most influential in improving oral hygiene behaviors including dental visits, while Cook and French (2008) found that attitude was most influential for intention to attend various types of health screenings. This study reiterates that attitude is key in predicting health-related behaviors.

A closer examination of the beliefs underlying attitude shows that for each weighted behavioral belief, the relationship with intention was relatively weak, while the relationship with the composite score for direct attitude toward behavior was moderate.
(see Table 16). The exception to this pattern occurred for the belief that the dental visit “will be expensive” which was weakly correlated with both intention ($r = 0.19$) and the direct attitude toward behavior ($r = 0.27$). The belief most strongly associated with attitude toward visiting the dentist was that visiting the dentist will do “something good for my oral health” ($r = 0.60$). However, among correlations with attitude and intention, no single belief stood out as the primary belief. Thus, a focus on the multiple beliefs underlying attitude toward visiting the dentist is the best approach for attitude change. Given that attitude is the best predictor of intention to visit the dentist, these are the beliefs to work towards changing in order to make attitude toward visiting the dentist more favorable and increase intention to visit the dentist.
Table 16. Correlations between Behavioral Beliefs, Attitude, and Behavioral Intention

<table>
<thead>
<tr>
<th>Belief (weighted)</th>
<th>Pearson’s r for attitude</th>
<th>Pearson’s r for intention</th>
</tr>
</thead>
<tbody>
<tr>
<td>If I visit the dentist in the next six months, I will feel like I am doing something good for my oral health.</td>
<td>0.60*</td>
<td>0.30*</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, it will [not] cause me anxiety.✝</td>
<td>0.49*</td>
<td>0.20**</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, any oral health problems I might have will be detected early.</td>
<td>0.47*</td>
<td>0.24*</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, it will [not] be inconvenient for my schedule.✝</td>
<td>0.40*</td>
<td>0.20**</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, I will prevent oral disease.</td>
<td>0.55*</td>
<td>0.29*</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, I will feel like I am doing something good for my general health.</td>
<td>0.56*</td>
<td>0.29*</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, I will feel like I am doing something good for my teeth.</td>
<td>0.54*</td>
<td>0.27*</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, it will [not] cause me pain.✝</td>
<td>0.52*</td>
<td>0.20*</td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, it will [not] be expensive.✝</td>
<td>0.27*</td>
<td>0.19**</td>
</tr>
</tbody>
</table>

✝ Terms inside brackets adjust statements to reflect reverse scoring
* p < .0001, ** p < .01

Habit was the other significant predictor of intention to visit the dentist; this finding is also not surprising. Recall that the composite score for habit strength included timing of last dental visit, timing of next scheduled dental visit, frequency of routine check-ups per year, and likelihood of the respondent visiting the dentist that many times in the next year. The inclusion of timing of last dental visit and the frequency of routine check-ups tapped into past behavior which is well-established as a predictor of intention.
(e.g., Ajzen, 1991; Bilic, 2005; Drossaert et al., 2003; Griva et al., 2010; Michels et al., 1995). Additionally, this measure of habit tapped into planned future behavior. Plans to achieve an intended behavior have been proposed as the link from intention to actual behavior (Cooke & French, 2008). Given that habit (as measured in this study) represented elements of past behavior, typical behavior, frequency of behavior, and planned future behavior, the significant role of habit is no wonder.

Although Triandis (1979) originally proposed habit as a predictor of behavior rather than behavioral intention, the findings from this study support habit as useful in predicting intention to visit the dentist. Further research on the role of habit in both behavioral intention and behavior is needed to determine whether it extends to other types of health behaviors and should investigate other elements for inclusion in a habit score. For example, the manner in which a person goes about scheduling preventive visits may provide a fuller definition of habit and increase its strength as a predictor.

Perceived behavioral control was expected to be the second best predictor in intention to visit the dentist, however, the effect of perceived behavioral control was not significant. This effect was initially predicted based on research that has demonstrated the influence of perceived behavioral control. However, Steele and Porche (2005) found this effect for perceived behavioral control among women lacking resources for obtaining care, and respondents to this study may not be lacking in the same way. For example, the majority of respondents in this study reported having dental insurance coverage. Recall Michels et al. (2009) found that women with insurance coverage were more likely to get
mammograms than women without insurance coverage. For respondents in this study, perhaps lack of resources, and thus feelings of lack of control, did not apply. Taken in context, then, it is not so surprising that perceived behavioral control was not a significant predictor of intention to visit the dentist in this study. Further, this finding supports the notion that for non-poor groups, issues related to control, e.g., cost, may not be as influential as conventional wisdom suggests.

Subjective norm was also not a significant predictor of intention to visit the dentist, though, it was not expected to play a prominent role. In large part other research on health behaviors has found that it is not significant (e.g., Bowie et al., 2003), or it is the weakest predictor of antecedents in the TPB model (e.g., Badri et al., 2014; Steele & Porche, 2005). Recall that Cooke and French found subjective norm to play a significant role only for certain types of health screenings, e.g., prenatal. This exception is a case where one’s own health screening attendance impacts the life of another person. Generally speaking, one’s own oral health does not critically impact others, and therefore, what others think about one’s oral health may not be seen as important.

Affect was also not a significant predictor, despite expectations. However, the lack of an effect of affect is not wholly surprising. In previous studies, findings for affect are not well-founded. Badri et al. (2014) and Dumitrescu et al. (2011) did address affect in their studies; the addition of it was beneficial, but not to a large degree. Further, findings for the significant impact of affect in other studies may be more indicative of the emotions attached to outcomes of those health behaviors than the behaviors themselves.
(Bowie et al., 2003, Perugini & Bagozzi, 2001). The findings from the current study suggest that affect does not play as large a role in one’s decision to visit the dentist as is commonly thought. Often, people associate the dentist with anxiety or fear in conversation, but those feelings do not necessarily override attention to oral health through avoidance of preventive dental visits. In light of these findings, one could argue that beliefs about oral health and dental visits weigh more heavily in decisions about dental care than the temporary discomfort a routine dental visit may cause them. On the other hand, though affect may not be influential in the decision to visit the dentist, it may be influential in actually attending a dental visit. Future research could examine affect as a mediator of the relationship between behavioral intention and behavior.

Contrary to expectations, oral health knowledge was not significantly correlated with intention to visit the dentist or attitude toward visiting the dentist, and therefore, the hypothesis for a mediational relationship was not supported. In other words, high knowledge scores did not translate into increased willingness to visit the dentist or favorable attitudes towards visiting the dentist. These findings (or lack thereof) could be due to a ceiling effect in oral health knowledge scores. Most respondents scored well (19% answered 10 of 11 items correctly, 36% answered 9 items correctly, and 31% answered 8 items correctly) Additionally, mTurk users tend to have more education compared to the general public (Ross et al., 2010). Thus, it is not necessarily surprising that scores on oral health knowledge would be relatively high. It is also possible that the design of the oral health knowledge items made correct answers easy to distinguish, or
respondents in this study happen to be knowledgeable about oral health issues. Future research would benefit from exploring oral health knowledge among different types of respondents, for example, by comparisons between non-poor and poor groups. The conclusion that oral health education has no impact on attitude or intention to visit the dentist would be premature without considering future research with a more diverse group of respondents who may actually show differences in oral health knowledge.

In addition to basic multiple regression analysis, simple moderation and mediation effects were also tested. Age, race, and perceived behavioral control did not separately moderate the relationship between attitude and intention, and habit did not mediate it. Also, oral hygiene habits and nature of last dental visit did not separately moderate the relationship between habit and intention, and attitude did not mediate it. Future research on the topic of dental visit behavior would benefit from tests of moderated mediation. For example, just as oral health attitudes have been documented to vary by age or race (HHS, 2000) so too may attitudes toward visiting the dentist. The interaction of these characteristics with attitudes could very possibly moderate the direct and indirect relationships between attitude and intention.

Perceived Cost of the Dental Visit

Though other reasons are recognized, cost has often been the crux of discussion concerning the reasons a person may not visit the dentist. For example, one recent publication cites cost as the main reason that people do not see the dentist, based on self-report of survey respondents (Yarbrough et al., 2014). Another recent survey study found
that dental care was more likely than other types of care to be avoided due to expense (Board of Governors of the Federal Reserve System, 2015). However, findings from the current study would suggest that the focus of discussion be shifted away from cost specifically to address overall attitude towards visiting the dentist and behavioral beliefs about visiting the dentist.

One of these behavioral beliefs does address the cost issue surrounding dental visits. Although the behavioral belief, “if I visit the dentist in the next six months, it will be expensive,” was significantly correlated with attitude towards visiting the dentist ($r = 0.27$), this belief had the weakest relationship with attitude compared to the relationships of the eight other behavioral beliefs with attitude. The other behavioral beliefs measured in this study were much more strongly associated with the direct composite score for attitude toward visiting the dentist (see Table 16 above).

Additionally, the average rating of agreement with this behavioral belief was 4.5, the middle of a 1 to 7 (strongly agree) scale. If cost of dental visits really is a primary concern, one would expect this average to be closer to the high end of the scale. Respondents in this study, however, did not expect a dental visit to be particularly expensive or inexpensive. In light of these findings, beliefs about cost of visiting the dentist may not be that strongly tied to attitude toward behavior, the best predictor of intention to visit the dentist.

Two other beliefs about cost of the dental visit and the ability to afford it fell within the perceived behavioral control component and were substantially correlated with
the direct composite score for perceived behavioral control (r = 0.65, p < .0001, and 0.46, p < .0001). However, perceived behavioral control was not a significant predictor of intention to visit the dentist. In other words, the degree of control a person feels they have in their decision to visit the dentist, cost or otherwise, was not related to their decision to visit the dentist after controlling for attitude and habit. This finding alone further supports the notion that cost is not a critical factor in the decision to visit the dentist.

Together, these findings challenge the notion that cost is the critical factor in a person’s decision to forego a dental visit, highlighting attitude toward visiting the dentist as the key factor. One possible explanation of the findings from other research that cost is key in deciding not to visit the dentist may be rooted in misattribution. Maybe, cost is just the most salient issue to people when they are asked to name reasons for not visiting the dentist. Or, perhaps cost is viewed as a more socially acceptable reason for not visiting the dentist compared to pain, anxiety, or inconvenience, beliefs about which were more strongly correlated with attitude towards visiting the dentist than was expense of a dental visit. This is not to say that cost of visiting the dentist is unimportant; cost is undoubtedly an influential factor, but only in addition to other factors underlying attitudes toward visiting the dentist. The current study illustrates that cost may not be the crux of the issue.
Limitations

The current study does have limitations. First, respondents were not representative of the general population. The majority were white, under 35, earn $25,000 or more per year (above the national poverty salary for a family of 4 according to HHS (2015)), and the majority had dental insurance. Additionally, most indicated brushing twice a day, believe that oral disease is preventable, and were generally knowledgeable about oral health topics. However, the aim of the study was to better understand dental visit behavior among non-poor young adults. The majority of respondents were not poor, and the majority were young. That said, all respondents were mTurk users; the type of person who uses mTurk is likely not fully representative of the average non-poor young adult. Thus, these findings should not be generalized to all non-poor young adults.

Another limitation of this study is the use of regression-based conditional process analysis. In order to illustrate a fuller picture of dental visit behavior, structural equation modeling would be more methodologically appropriate for future studies like this one. Conditional process analysis did not allow for testing more than two moderators at a time. For the current study, one conditional process model was run to test each moderator and mediator proposed for the attitude-intention and habit-intention relationships. Use of structural equation modeling would allow for testing all of these relationships in a single model.
Practical Implications

So why is dental care utilization decreasing, and what can be done to stop this trend? While other issues are no doubt contributing to the trend, the current study illustrates that attitudes toward visiting the dentist and habit of visiting the dentist are the core issues. Thus, the solution is two-fold: address attitude toward visiting the dentist and the beliefs underlying attitude, and address strength of habit for visiting the dentist.

First, efforts should focus on improving the public’s overall attitude toward visiting the dentist. Improving attitude should increase intention to visit the dentist. The current study measured attitude toward visiting the dentist based on the following scales: beneficial to oral health vs. harmful to oral health, pleasant vs. unpleasant, useful vs. worthless, good vs. bad, beneficial to appearance vs. harmful to appearance, and comforting vs. frightening. Improving attitudes in this context would mean increasing perceptions of the dental visit as beneficial to oral health and appearance, pleasant, useful, good, and comforting. Persuasive appeals could focus on associating dental visits with the positive outcomes they lead to, like better oral and general health, healthy looking teeth, catching oral health problems early, preventing oral health problems, etc. Emphasis on the positive could downplay negative perceptions of the dental visit as unpleasant or frightening.

Second, the foundation for developing arguments to encourage dental visits lies in the specific underlying behavioral beliefs about visiting the dentist. No single belief stood out as most influential, so these persuasive appeals should be developed across multiple
beliefs. Efforts should focus on developing new or enhancing existing appeals. For example, one appeal could focus on communicating that dental visits are good for maintaining optimal health on several levels: general health, oral health, health of the teeth, catching early signs of oral disease, preventing oral disease. Each corresponding belief was positively correlated with intention to visit the dentist. Presenting arguments that demonstrate each of these health benefits of regular dental visits could increase the degree to which people agree with these beliefs and strengthen intentions to visit the dentist.

Another appeal could focus on dispelling anxiety and countering the belief that dental visits are painful. Perhaps detailed explanation about what actually happens during a dental visit, and the reasons these things are done, could reduce anxiety about the dental visit. Additionally, the regular dental visit may be more uncomfortable to some people than others; the belief that dental visits are painful may not be malleable, but the weight of it in the decision to visit the dentist may be reduced. Emphasis that a little bit of discomfort in the short-term (during regular dental visits) will reduce the chances of needing a more involved, more uncomfortable procedure in the future could encourage people to reconsider whether discomfort is really a valid reason to avoid dental visits. In other words, a “no pain, no gain” approach. Further, comparing the pain or discomfort of procedures done in a regular dental visit to the pain or discomfort of other activities a person may choose to participate in, could help to put beliefs about pain of dental visits
into perspective. For example, many people get tattoos and piercings which are arguably equally as or more painful than a tooth scaling.

An additional appeal could dispel erroneous beliefs about the cost and convenience of dental visits. Presenting the average cost of regular dental visits compared to spending on other items or services (like tattoos or piercings, other health provider visits, vacations, or other luxuries) could illustrate that dental visits are not as expensive as some may believe. Cost of a visit can vary by dentist or dental practice. Simply raising awareness of more affordable options (i.e., larger practices, community or dental school clinics) could be key in correcting the belief that dental visits are expensive. Also, illustrating that it is more economical to see the dentist regularly could help to correct this belief. For example, waiting to see the dentist until an oral health problem becomes unbearable could lead to a costly ER visit followed by costly treatment procedures, the cost of which could be more than the cost of attending regular dental visits over time. Emphasizing long-term cost savings could drive home the point that paying less in the short-term is favorable to paying more in the long-run.

The belief that dental visits are inconvenient could be challenged as well. Some dental offices offer evening and weekend appointments to help patients schedule visits without the need to take time off from work, but patients first have to find these dental offices. The process of finding a dental provider can be overwhelming; it requires investigation of location, hours, pricing, quality of care. Assistance in finding a dental provider with the most convenient location and appointment times could help to dispel
the belief that dental visits are inconvenient. The ADA does offer a find-a-dentist feature on its website (ADA, 2014c), but it does not provide dental office hours for a given location and is limited to ADA member dentists. A more comprehensive online search engine for dental offices is arguably needed.

Third, efforts should focus on increasing strength of dental visit habits. Increasing habit strength would be one way to increase intention to visit the dentist, and in turn, actual dental visits. Specifically, habit was defined by frequency of routine dental visits, likelihood of visiting the dentist at that frequency in a given year, time since last dental visit, and scheduled time for a future dental visit. Thus, increasing the strength of dental visit habits would mean boosting a person’s frequency of dental visits and estimated likelihood of attending that many visits in a year, as well as increasing the likelihood of scheduling a dental visit. Research has shown that having an implementation plan can significantly increase follow through from intention to do a behavior and actually doing a behavior (Verplanken & Faes, 1999). Thus, scheduling the appointment is arguably half of the battle in boosting dental visit attendance. Improving attitudes about visiting the dentist and correcting or mitigating the influence of certain beliefs through persuasive appeals such as those discussed above are key in encouraging a person to actually schedule a dental visit.

Attitude change is difficult, and the habit for regular dental visits is a challenging one to acquire, especially if it is new. This is one reason ADA encourages parents to get children in to see the dentist as early as one year old (ADA, 2014a); it starts a habit for
dental visits for the child and begins to shape (hopefully favorable) attitudes towards oral health dental visits that they will carry into adulthood. Repeated behavior over time forms a habit that does not require much conscious thought (e.g., Aarts et al., 2006; Bamberg et al., 2003, Klockner & Matthies, 2009). For adults who did not learn dental visit habits growing up, the challenge is convincing them to go to that initial dental visit; one visit begins the process of establishing habit. Additionally, scheduling follow-up appointments at the end of each dental visit further reinforces dental visit habits, reducing the thought and other effort required of a dental patient in actively deciding to schedule the next appointment. Messages that encourage positive attitudes about visiting the dentist and the importance of establishing a dental visit habit could be effective in convincing more people, who have the resources, to visit the dentist regularly.

Conclusion

Although a large portion of the variance in intention to visit the dentist remains unexplained, the current study contributes to the TPB literature in several ways, despite its limitations: it replicates the general finding that attitude toward behavior as the best predictor of behavioral intention, it illustrates the role of habit as a predictor of behavioral intention, adds to the knowledge of various influences on dental visit behavior, and points to directions for additional research.

In practical terms, this study provides additional insight into the reasons a person may or may not visit the dentist in order inform approaches to remedy the decline in dental care utilization. Through better understanding influences on dental visit behavior,
improvements can be made in developing educational programs and persuasive messaging about the importance of oral health and dental visits by targeting and correcting specific beliefs about oral health and dental visits. Future research should focus on using the findings from this study to develop or enhance persuasive appeals, as previously discussed, to encourage dental visits among non-poor, younger populations. Equally important, these findings could provide dentists a fuller understanding of patient concerns, help in shaping dentist-patient interactions, and hopefully, achieve improved dental visit habits among the general public.
APPENDIX A

ELICITATION STUDY ITEMS
Instructions

This questionnaire has been developed to learn more about the people's perceptions of visiting the dentist. Please take a few minutes to list your thoughts in response to the following items.

1. Please describe what is included in a routine dental visit:

2. What are the advantages of visiting the dentist?

3. What are the disadvantages of visiting the dentist?

4. Which individuals or groups important to you would approve of you visiting the dentist?
5. Which individuals or groups important to you would disapprove of you visiting the dentist?

6. What other reactions from individuals or groups important to you do you associate with visiting the dentist?

7. What factors or circumstances enable you to visit the dentist?

8. What factors or circumstances make it difficult or impossible for you to visit the dentist?

9. When you think about going to the dentist, how do you feel? Please list those emotions below:
Question 10

10. What else comes to mind when you think about visiting the dentist?

[New text]

Section 6

Demographics

Please answer the next set of questions about yourself. This information will be used to learn more about how different types of people think and feel about oral health and dental visits.

[New question] [New question from library] [other surveys]

Question 11

11. Do you have dental insurance?

- [ ] Yes
- [ ] No

Split section | New text | New question | New question from library / other surveys

Question 12

12. How old are you?

[ ]

Question 13

13. In which country do you currently live?

[New text]

Question 14

14. What is your gender?

- [ ] Male
- [ ] Female
15. What is your income bracket?

- $0 - $25,000
- $25,000 - $50,000
- $50,000 - $75,000
- $75,000 - $100,000
- $100,000 or more

16. Please indicate your race:

- White
- Black or African-American
- American Indian or Alaska Native
- Hawaiian Native or Other Pacific Islander
- Asian
- Two or more races
- Other

17. Are you of Hispanic or Latino ethnicity?

- Yes
- No
APPENDIX B

FINAL QUESTIONNAIRE
Thank you for your interest in this survey!

Before you begin, please take a moment to think about the various types of doctor appointments you’ve had over the past year.

Question 1
Using the list below, please select each type of appointment you attended within the last year.

- Psychologist
- Optometrist
- Dentist
- Chiropracter
- General Practitioner/Internist
- Dermatologist
- Other, please specify:

Question 2
Which types of health related visits do you make a point to attend every year, even if you have not attended yet this year?

- Chiropracter
- Psychologist
- Dermatologist
- General Practitioner/Internist
- Optometrist
- Dentist
- Other, please specify:
Instructions

This questionnaire has been developed to learn more about people’s perceptions of dental care and oral health. For each item, please choose the answer that best fits you.

You and Your Oral Health

Question 3

When was your last dental visit?

- Within the past 6 months
- 6 months to 1 year ago
- 1 to 2 years ago
- More than 2 years ago
- I have never had a dental visit.

---------- page break ----------

Section 4

Question 4

What is the primary reason you have never visited the dentist?

- I have no pain or other dental issues.
- There are no dental clinics or offices nearby.
- I do not have time for a dental visit.
- The cost of the dental visit.
- I am afraid of the dentist.
- Other, please specify: _________________

---------- page break ----------

Section 5

Question 6

What was the reason for your last dental visit? (Select all that apply.)

- It was time for my regular check-up.
Question 6

What was the reason for your last dental visit? (Select all that apply.)

- [ ] It was time for my regular check-up.
- [ ] I had a scheduled appointment for treatment.
- [ ] Dental pain
- [ ] Dentist advice
- [ ] Family/friend advice
- [ ] Other, please specify: ________________________

Question 7

Please indicate the type of services you received at your last dental visit: (Select all that apply.)

- [ ] Exam/oral screening
- [ ] Teeth cleaning
- [ ] X-rays
- [ ] Filling
- [ ] Gum treatment
- [ ] Fluoride treatment
- [ ] Orthodontic treatment
- [ ] Crown or bridge work
- [ ] Tooth extraction
- [ ] Other, please specify: ________________________

Question 8

When is your next dental visit scheduled?

- [ ] In the next 6 months
- [ ] Between 6 months and 1 year from now
- [ ] Between 1 and 2 years from now
- [ ] I plan to schedule a visit, but have not scheduled it yet.
- [ ] I do not plan to schedule a visit.

Question 9

What is the primary reason you have not scheduled your next visit to the dentist?

- [ ] I do not have a specific reason for not going.
- [ ] Going to the dentist makes me anxious.
- [ ] The services provided are painful for me.
- [ ] I cannot afford another dental visit.
- [ ] There is no dental clinic or office nearby.
- [ ] I do not have any dental problems right now.
- [ ] I do not have time for another dental visit.
- [ ] Other, please specify: ________________________
**Previous Dental Visits**

Please answer the next set of questions about your regular dentist. If you do not have a regular dentist, please answer the questions about the last dentist you visited for a check-up.

---

**Question 10**

The dentist explained procedures to me before completing them. (Procedures include cleaning, parts of the dental exam, treatment, or any other services provided.)

- True
- False

---

**Question 11**

I could tell that the dentist cares about me as a patient.

- True
- False

---

**Question 12**

The dentist cares more about treating dental problems than preventing dental problems.

- True
- False

---

**Question 13**

How often do you visit the dentist for a routine check-up?

- Less than once a year
- Once per year
- Twice per year
- Three times per year

---

**Question 14**

How likely do you think it is that you will visit the dentist that many times in the next 12 months?

1 2 3 4 5 6 7

Unlikely 0 0 0 0 0 0 0 Likely
Question 15
What is the primary reason you visit the dentist less than one time per year?
- The cost of the dental visit
- There are no dental clinics or offices nearby.
- I do not have time for a dental visit.
- I have no dental pain or other dental issues.
- I am afraid of the dentist.
- Other, please specify: 

---------- page break ----------

Section 9
Oral Hygiene Habits
Please answer the following questions about your oral hygiene habits.

[ Edit | Delete ]

Question 16
What do you use to clean your teeth? (Select all that apply.)
- Toothbrush and toothpaste
- Floss
- Mouthwash
- Toothpicks
- Other, please specify: 

Question 17
How often do you brush your teeth per day?
- Less than once
- Once
- Twice
- More than twice

Question 18
How likely do you think it is that you will brush your teeth that many times per day during the next week?

1 2 3 4 5 6 7
Unlikely Likely
When do you typically brush your teeth? (Select all that apply.)
- Morning
- After lunch
- Before going to bed
- Other times, please specify: [ ]

About how long does it take when you brush your teeth?
- Less than one minute
- One minute
- Two minutes
- More than 2 minutes

Please type the name of your favorite color in the space below.

---

Oral Health Information

Please answer the following questions about some common oral health issues and topics.

Bleeding gums indicate which of the following?
- Gingivitis
- Healthy gums
- Gum recession
### Question 23
How can a person prevent gingivitis?

- Brushing and flossing
- Eating soft foods
- Taking Vitamin C

### Question 24
What is plaque?

- Soft deposits on teeth
- Heavy deposits on teeth
- Tooth discoloration

### Question 25
Dental plaque can lead to which of these oral health problems?

- Inflammation of the gums
- Staining of the teeth
- Cavities

### Question 26
The "routine check-up" refers to a visit where you have a teeth cleaning, exam, and sometimes x-rays.

Are routine dental check-ups necessary?

- Yes
- No

### Question 27
Do cavities affect how teeth look?

- Yes
- No
Visiting the dentist for routine check-ups is:

Question 26

Does oral health affect general health?

Question 27

Do soft drinks affect oral health?

Question 28

Do sweets affect oral health?

Question 29

Does oral health affect general health?

Question 30

Treatment of a toothache is as important as treatment of any other ailing part of the body.

Question 31

Oral diseases, like cavities or gum disease, are completely preventable.

Question 32
The Routine Dental Visit

The questions and items on following pages are about your thoughts and feelings associated with visiting the dentist. Please choose the answers that best describe you.

For this part of the survey, "routine check-up" refers to a visit where you have a teeth cleaning, exam, and sometimes x-rays.

<table>
<thead>
<tr>
<th>Question 33</th>
<th>Strongly agree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Strongly disagree</th>
<th>7</th>
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<tbody>
<tr>
<td>I expect to visit the dentist for a routine check-up in the next six months.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I want to visit the dentist for a routine check-up in the next six months.</td>
<td></td>
<td></td>
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<tr>
<td>I intend to visit the dentist for a routine check-up in the next six months.</td>
<td></td>
<td></td>
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<table>
<thead>
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<th>Question 34</th>
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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Strongly disagree</th>
<th>7</th>
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<tbody>
<tr>
<td>Visiting the dentist for routine check-ups is:</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>beneficial to my oral health</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>harmful to my oral health</td>
<td></td>
</tr>
<tr>
<td>pleasant for me</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>unpleasant for me</td>
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<tr>
<td>worthless</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>useful</td>
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<tr>
<td>bad</td>
<td></td>
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<td></td>
<td></td>
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<td>good</td>
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<td>comforting</td>
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<td>frightening</td>
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<td>harmful to my appearance</td>
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<td></td>
<td>beneficial to my appearance</td>
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<td>Question 35</td>
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<td>3</td>
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<td>Likely</td>
<td></td>
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<td>----------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>If I visit the dentist in the next six months, I will feel like I am doing something good for my oral health.</td>
<td>C C C C C C C</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, it will cause me anxiety.</td>
<td>C C C C C C C</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, any oral health problems I might have will be detected early.</td>
<td>C C C C C C C</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, it will be inconvenient for my schedule.</td>
<td>C C C C C C C</td>
<td></td>
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</tr>
<tr>
<td>If I visit the dentist in the next six months, I will prevent oral disease, e.g., cavities, gum disease.</td>
<td>C C C C C C C</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, I will feel like I am doing something good for my general health.</td>
<td>C C C C C C C</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, I will feel like I am doing something good for my teeth.</td>
<td>C C C C C C C</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>If I visit the dentist in the next six months, it will cause me pain.</td>
<td>C C C C C C C</td>
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</tr>
<tr>
<td>If I visit the dentist in the next six months, it will be expensive.</td>
<td>C C C C C C C</td>
<td></td>
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Question 36

<table>
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<tr>
<th>Activity</th>
<th>Undesirable</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Desirable</th>
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<tr>
<td>Doing something that is good for my oral health is:</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doing something that causes me anxiety is:</td>
<td>☐</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detecting oral health problems early is:</td>
<td>☐</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Doing something inconvenient for my schedule is:</td>
<td>☐</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preventing oral disease is:</td>
<td>☐</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doing something that is good for my general health is:</td>
<td>☐</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doing something that is good for my teeth is:</td>
<td>☐</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doing something that causes me pain is:</td>
<td>☐</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doing something expensive is:</td>
<td>☐</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Most people who are important to me think that I __________ visit the dentist for a routine check-up in the next six months.

Should ☐ ☐ ☐ ☐ ☐ ☐ ☐ Should not

My friends would __________ of me visiting the dentist for a routine check-up in the next six months.

Disapprove ☐ ☐ ☐ ☐ ☐ ☐ ☐ Approve
Question 39
My family would ________ of me visiting the dentist for a routine check-up in the next six months.

-3 -2 -1 0 1 2 3
Disapprove ○○○○○○○○ ○ Approve

Question 40
My spouse/boyfriend/girlfriend would ________ of me visiting the dentist for a routine check-up in the next six months.

-3 -2 -1 0 1 2 3
Approve ○○○○○○○○ ○ Disapprove

Question 41
Please provide a rating of 2 on the scale below.

1 2 3 4 5 N/A
Poor ○○○○○○○○○○ Excellent ○

Question 42
My family members ________ visit the dentist for a routine check-up every six months.

-3 -2 -1 0 1 2 3
Do not ○○○○○○○○○○○○○○ ○ Do

Question 43
My friends ________ visit the dentist for a routine check-up every six months.

-3 -2 -1 0 1 2 3
Do ○○○○○○○○○○○○○○ ○ Do not
My spouse/boyfriend/girlfriend _________ visit the dentist for a routine check-up every six months.

Question 44

Most people _________ visit the dentist for a routine check-up every six months.

Question 45

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is expected that I visit the dentist for a routine check-up in the next six months.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel under social pressure to visit the dentist for a routine check-up in the next six months.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>People who are important to me want me to visit the dentist for a routine check-up in the next six months.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Question 47

<table>
<thead>
<tr>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Very much</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>What my friends think I should do is important to me.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>What my family thinks I should do is important to me.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>What my spouse/boyfriend/girlfriend thinks I should do is important to me.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Doing what my friends do is important to me.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Doing what my family does is important to me.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<td>○</td>
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<tr>
<td>Doing what my spouse/boyfriend/girlfriend does is important to me.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

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Section 17

Question 48

I am confident that I could visit the dentist for a routine check-up in the next six months if I wanted to.

-3 -2 -1 0 1 2 3

Strongly disagree ○ ○ ○ ○ ○ ○ ○ Strongly agree

Question 49

For me to visit the dentist for a routine check-up in the next six months is _________.

1 2 3 4 5 6 7

Easy ○ ○ ○ ○ ○ ○ ○ Difficult
Question 50

The decision to visit the dentist for a routine check-up in the next six months is beyond my control.

-3 -2 -1 0 1 2 3
Strongly disagree □ □ □ □ □ □ □ Strongly agree

Question 51

It is completely up to me whether or not I visit the dentist for a routine check-up in the next six months.

-3 -2 -1 0 1 2 3
Strongly disagree □ □ □ □ □ □ □ Strongly agree
Question 53
When I have time, I am _________ to visit the dentist for a routine check-up.

1 2 3 4 5 6 7
Less likely More likely

Question 54
When a routine dental check-up is expensive, I am _________ to visit the dentist for a routine check-up.

1 2 3 4 5 6 7
Less likely More likely

Question 55
When the dentist of my choice has open appointment times, I am _________ to visit the dentist for a routine check-up.

1 2 3 4 5 6 7
Less likely More likely

Question 56
When I have transportation, I am _________ to visit the dentist for a routine check-up.

1 2 3 4 5 6 7
Less likely More likely

Question 57
Please select "Cat" from the list below.

- Rat
- Cat
- Bird
- Dog
Section 22

Question 58
Having money to pay for a routine dental check-up makes it ________ to visit the dentist for a routine check-up.

1 2 3 4 5 6 7
Much more difficult Much easier

Question 59
Having dental insurance makes it ________ to visit the dentist for a routine check-up.

1 2 3 4 5 6 7
Much more difficult Much easier

Question 60
Convenient appointment times make it ________ to visit the dentist for a routine check-up.

1 2 3 4 5 6 7
Much more difficult Much easier

Section 21

Question 61
Please rate the degree to which you feel each of the following emotions when you think about visiting the dentist.

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Not at all</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<th>Extremely</th>
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<tbody>
<tr>
<td>Afraid</td>
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<tr>
<td>Nervous</td>
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<tr>
<td>Confident</td>
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<td>Angry</td>
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<td></td>
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<td>Happy</td>
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<td></td>
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</tbody>
</table>
**Demographics**

Please answer the next set of questions about yourself. This information will be used to learn more about how different types of people think and feel about oral health and dental visits.

[Edit] [Delete]

**Question 62**

Do you have dental insurance?

- Yes
- No

**Question 63**

What is your age?

**Question 64**

What is your income bracket?

- $0 - $25,000
- $25,000 - $50,000
- $50,000 - $75,000
- $75,000 - $100,000
- $100,000 or more

**Question 65**

What is your gender?

- Male
- Female
Question 66

Please indicate your race:

- White or Caucasian
- Black or African-American
- American Indian or Alaska Native
- Hawaiian Native or Other Pacific Islander
- Asian
- Two or more races
- Other

Question 67

Are you of Hispanic or Latino ethnicity?

- Yes
- No
Pilot Questions:

What did you think?
Please offer your feedback about this survey in the next few questions.

Did any items seem confusing or difficult to answer? Please explain in the space provided.

- Yes
- No

Did you find any of the wording or formatting to be frustrating? Please explain in the space provided.

- Yes
- No

Did you find the length of the questionnaire discouraging? Please explain in the space provided.

- Yes
- No

Do you feel that $0.75 (with the chance for a $0.25 bonus) is fair compensation for the time it took to complete the questionnaire? Please explain in the space provided.

- Yes
- No

Other comments about the questionnaire?
REFERENCE LIST


Fox, K. (2012, June 18). Consumers score a ‘D’ for knowledge of oral health: ‘Nice smile’ tops eyes, hair, as most important attribute. *ADA News.*


VITA

Rebecca Starkel was raised in St. Joseph, Missouri. Before attending Loyola University Chicago, she attended the University of Missouri, Columbia, where she earned a Bachelor of Arts in Psychology, with Honors, in 2003. She came to Chicago in 2004 and received a Master of Arts in Applied Social Psychology in 2007.

While at Loyola, Starkel worked as a graduate assistant and teaching assistant for Dr. Scott Tindale, and taught several undergraduate courses including Research Methods and Statistics while also pursuing a career in the applied field. Currently, Starkel is a Senior Research Analyst in the American Dental Association Health Policy Institute in Chicago, Illinois where she resides.