

Dental Anxiety, Dental visits and Oral Hygiene Practices

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Purpose: The present study investigated the effects of dental anxiety and dental visits on oral hygiene practices which included brushing, flossing and amount of time brushing.

Materials and Methods: The study included a dental questionnaire developed to measure aspects of dental visits, oral hygiene and dental anxiety. A demographic questionnaire included questions pertaining to age, ethnicity and citizenship. Participants included 77 undergraduate students attending a diverse southern United States university enrolled in psychology courses.

Results: Linear regression was conducted to explore the association between dental anxiety and oral hygiene practices. Results revealed the model explained a significant proportion of variance in oral hygiene practices, $R^2 = 0.141$, $F(1,76) = 12.441$, $P < 0.001$. Specifically, higher dental anxiety was associated with poorer oral hygiene practices. A correlation was conducted to investigate the association between dental visits and oral hygiene practices. Results revealed a correlation between dental visits and brushing $r(75) = 0.342$, $P = 0.002$, and flossing frequency $r(75) = 0.294$, $P = 0.009$. There was no association between visits to the dentist and time spent brushing teeth.

Conclusion: Results indicate that dental anxiety is associated with oral hygiene practices. Additionally, those who visit the dentist more often have somewhat better oral hygiene practices. The present study indicates that there may be a learned association between dental anxiety and oral hygiene practices. Methods of education can be developed to disassociate anxieties that may inhibit optimum oral hygiene practices. It may also be beneficial for dental professionals to emphasise the value of the amount of time patients spend brushing their teeth.

Key words: behavioural decision making, dental anxiety, dental visits, learned association, oral hygiene practices

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Dental anxiety is a significant problem for patients and dental care providers. Anxiety often causes patients to avoid necessary treatment, and once in the dental chair, they often are difficult to treat (Lahmann et al, 2008). The question arises as to what extent dental anxiety effects activities beyond the dental office, such as personal oral hygiene practices. Identifying factors that impact oral hygiene practices is of significant value, since non-compliance with oral hygiene recommendations is a major problem in preventive dentistry (Sniehotts et al, 2007). Good oral hygiene practices take only minutes a day and save more than \$4 billion per year in treatment costs (Dolatowski, 2008).

Dental anxiety consists of a number of components and refers to a high degree of fear or anxiety associated with dentistry (Locker, 1996). A pathological form of this fear is variously called dental phobia, odontophobia, dentophobia and dentist phobia. Dental anxiety is generally manifested through negative past experiences with the dentist or vicariously through negative perceptions of the dentist. Research on dental anxiety generally focuses on prevalence, impact on dental health and impact on oral health quality of life. The prevalence of dental anxiety ranges from 4% to 20% (Locker, 1996; Rafique, 2008). In milder forms, it is estimated that as many as 75% of US adults experience some degree of dental anxiety (Agdal, 2010).

Research on the association between dental anxiety and the impact on dental health includes direct effects (Bare and Dundes, 2004) and treatment (Berggren, 2001; McGarth and Bedi, 2003). A direct effect of dental anxiety is a tendency to avoid recurring treatment and to only seek care for emergencies such as a severe toothache or dental ab-

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ccess (Armfield, 2010). Many times, anxious patients lose teeth that otherwise could have been saved with routine restorative or periodontal treatments but, due to delays, can no longer be restored. Researchers have found associations between dental anxiety and oral health. Specifically, individuals with higher dental anxiety self-report poorer oral health than those with lower dental anxiety (Armfield et al, 2007). It has also been reported that higher dental anxiety is associated with more decayed teeth (DT) and missing teeth (MT; Armfield et al, 2009).

The impact of dental anxiety on daily life has also been of interest (Rafique et al, 2008). The Center for Disease Control (CDC) states that missing teeth can contribute to poor diet and to embarrassment resulting in diminished social interaction and communication (CDC, 2004). The Oral Health Quality of Life (OHQoL) scale is a 16-item self-reporting measure that explores the physical (e.g. eating, appearance, breath), social (e.g. relationships, work, finances) and psychological (e.g. sleep, confidence, mood) aspects of dental anxiety. It has been shown that those persons with the highest levels of dental anxiety have the poorest OHQoL: individuals with high dental anxiety are two to three times more likely to have a low OHQoL score than those having low anxiety (Rafique et al, 2008). The same study (Rafique et al, 2008) found an association between OHQoL and sleep, personal relationships and finances. However, current research has not investigated the effects of dental anxiety on personal oral hygiene habits.

Plaque is a primary factor in gingivitis and periodontal disease (Greenstein, 1992), but plaque control prevents these diseases. In addition, brushing and flossing remove plaque and contribute to the prevention of dental caries, in which the delivery of fluoride by toothpaste provides the major cariostatic effect (Choo et al, 2001). Current oral hygiene measures include mechanical aids such as toothbrushes, floss, interdental cleaners and chewing gum. Chemotherapeutic agents such as mouthrinses and dentifrices are also used in personal oral hygiene.

In 2007, health care spending for dental services was \$95.2 billion in the US (Centers for Medicaid and Medicare Services, 2007). Conventional treatment of oral diseases as just described is costly and not feasible in many low-income countries (WHO, 2003). Fortunately, most oral diseases can be prevented through proper oral hygiene practices (Davidson et al, 1997), and the cost of provid-

ing preventive dental treatment is estimated to be 10 times less than the cost of managing symptoms of dental disease in an emergency room (Pettinato et al, 2000).

The purpose of the present study was to explore the effects of dental anxiety and dental visits on oral hygiene practices. The study addresses the following questions: 1) Do dentally fearful individuals practice better personal oral hygiene than dentally non-fearful individuals? and 2) Will individuals who visit the dentist more often have better oral hygiene practices than those who visit the dentist less often?

MATERIALS AND METHODS

The present research protocol was approved by the Institutional Review Board (IRB) and all participants reviewed and signed a research consent form. Participants were undergraduate students attending a diverse private Southern US university who were enrolled in introductory psychology courses. Participants were free to choose from a series of research studies and received course credit for participating. A total of 77 participants completed the dental questionnaire, 57 females and 20 males with an average age of 21.4 years (SD = 3.9). The sample included 30 African Americans, 30 Hispanics and 17 Whites. A total of 44 participants were US-born while 23 participants were born outside the US.

The present study included a dental and demographic questionnaire. The dental questionnaire was a self-report scale developed to measure aspects of dental visits, care, oral hygiene, past experiences and dental anxiety. To gauge dental visits, a question was asked pertaining to frequency of yearly dental visits. Participants were asked about past and current orthodontic and cosmetic treatments. They were also asked (best guess) to report the number of cavities and or fillings they had. Oral hygiene practices were based on three questions: how often do you brush your teeth, how often do you floss and, when you brush your teeth, how long do you brush? To gauge past experience, two questions were included to determine any negative experiences during a dental visit. One question asked about painful experiences during a visit, while the second question asked about unpleasant experiences (e.g. did not like the dentist or dental hygienist) during visits.

To assess dental anxiety, the present study used a modified dental anxiety scale. Similar to Corah's

Dental Anxiety Scale, the scale used here included typical items relating to feelings during a dental appointment (Kumar et al, 2009). However, this modified version included an item pertaining to feelings days to weeks before the actual appointment. Researchers have found that general anxiety increases as the time draws closer to the event (Jones and Cale, 1989). It is possible that current dental anxiety scales not only capture dental anxiety but general anxiety as well. Therefore, it is important to collect information about feelings well in advance of the event to minimise the effect general anxiety may play on dental anxiety. Inclusion of an item relating to feelings well before the event could also further discriminate levels of dental anxiety among the participants. The modified dental anxiety scale was a Likert-type self-reporting measure with values ranging from 0 (no anxiety) to 5 (very high anxiety). The scale included the following four questions: what's your level of anxiety when making an appointment with the dentist (days to weeks before actual appointment), what's your level of anxiety when travelling to the dentist appointment, what's your level of anxiety when waiting in the dental office and what's your level of anxiety when sitting in the dental chair? Results for each question were combined to obtain an overall dental anxiety score. The dental anxiety scale used here did not fulfill diagnostic criteria for a dental phobia as stated in the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM,IV; APA, 2000). As a result, typical behavioural patterns were not identified (e.g. missing appointments) and a cutoff point was not defined.

The demographic questionnaire included questions pertaining to age, ethnicity and citizenship. The questionnaires were distributed in a paper format and completed in a group setting in a standard classroom. Participants were given ample time and instructed to complete the questionnaires to the best of their ability.

RESULTS

Exploratory analysis revealed 82% of the participants brushed their teeth two or more times per day and, when brushing their teeth, 54% brushed for at least two minutes. With regard to flossing, 27% flossed their teeth at least once a day and 65% of the participants reported having fewer than four cavities and/or fillings. Relating to dental work, 47% of the participants visited the dentist at least

twice a year. 59% of the participants reported having had orthodontic treatment while 86% reported having had cosmetic (e.g. teeth whitening, veneers, etc.) work performed.

To explore the reliability of the modified dental anxiety scale, a Cronbach's reliability analysis was conducted. The analysis included the four items that assessed the participant's feelings when making a dental appointment, driving to the dentist's office, waiting in the dentist's office and sitting in the dentist's chair. The analysis revealed a high reliability ($\alpha = 0.943$) for the dental anxiety scale. To evaluate the validity of the dental anxiety scale, a linear regression was performed. The dependent variable was the number of annual dental visits, while the predictor variable was the dental anxiety score. It was anticipated that a higher score on the dental anxiety scale would be associated with fewer visits to the dentist. As expected, the overall model explained a significant proportion of the variance in the number of annual visits to the dentist $R = 0.31$, $R^2 = 0.099$, $F(1,76) = 10.340$, $P = 0.005$. Specifically, higher dental anxiety scores were associated with fewer visits to the dentist. To further evaluate the validity of the dental anxiety scale, an additional linear regression was conducted. The dependent variable was dental anxiety score while the predictor variables were past painful and unpleasant experiences with the dentist. It was anticipated that a higher score on the dental anxiety scale would be associated with past painful and unpleasant dental experiences. As expected, the overall model explained a significant proportion of the variance in the anxiety score, $R = 0.295$, $R^2 = 0.087$, $F(2,77) = 3.576$, $P = 0.033$. Specifically, individuals who could recall past painful or unpleasant dental experiences had higher dental anxiety.

To explore the influence of dental anxiety on oral hygiene, a linear regression was conducted. The dependent variable was oral hygiene practices while the predictor variable was the dental anxiety score. Oral hygiene practices were the sum of three items, brushing and flossing frequency plus amount of time spent brushing. Responses to brushing frequency ranged from a few times to a month to more than twice a day, and flossing frequency ranged from a few times a year to more than twice a day. The amount of time spent brushing ranged from less than one minute to more than three minutes. Results revealed that the overall model explained a significant proportion of the variance in oral hygiene practices: $R = 0.375$, $R^2 = 0.141$, $F(1,76) = 12.441$, $P = 0.001$. Specific-

ally, higher dental anxiety was associated with poorer oral hygiene practices.

In order to assess the association between visits to the dentist, daily brushing and flossing and time spent brushing, a correlation analysis was conducted. A correlation was found between dental visits and frequency of brushing ($r(75) = 0.342$, $P = 0.002$) and flossing ($r(75) = 0.294$, $P = 0.009$). Specifically, the more participants visited the dentist, the more they brushed and flossed on a daily basis. A correlation was not found between visits to the dentist and time spent brushing teeth ($r(75) = 0.134$, $P = 0.241$). Individuals who visited the dentist more often did not seem to spend more time brushing their teeth than those who visited the dentist less often.

DISCUSSION

The major findings can be summarised as follows: 1. Dentally fearful individuals practiced poorer oral hygiene than those with lower levels of dental anxiety; 2. Individuals who visited the dentist more often had somewhat better oral hygiene practices than those who visited the dentist less often.

Dentally fearful individuals practiced poorer oral hygiene than those with lower levels of dental anxiety. Classical conditioning demonstrates that individuals develop conditioned responses to an event, for example, the famous study conducted by Ivan Pavlov demonstrated that a dog could develop the conditioned response of salivating when hearing the sound of a bell (McSweeney and Bierley, 1984). If you were to think of your favorite food for example, be it strawberries, chocolate or maybe curry, it would not be surprising if you began to salivate. Through experience, you have learned to love this food and this learned association has caused you to salivate (Eysenck, 2004). Individuals can associate a physiological response to a negative or positive event with cues that remind them of the event (Reid et al, 2008). For example, research has shown that the physiological response due to consumption of a drug can occur when the individual handles something that is reminiscent of the drug (Reid et al, 2008). Through experience, the individual learns to associate the feeling felt when using the drug with such things as the location where the drug is consumed and the drug paraphernalia. Similarly, individuals who feel anxiety when visiting the dentist may learn to associate those negative feelings with oral hygiene practices. As a result, the

individual may not only avoid the dentist, but any cue (i.e. brushing and flossing) that is associated with the dentist.

Individuals who visit the dentist more often have somewhat better oral hygiene practices than those who visit the dentist less often. During dental appointments, dentists and hygienists instruct patients on proper oral hygiene such as daily flossing and brushing for at least three minutes twice a day (CDA, 2005). As a result, it is no surprise that individuals who choose to visit the dentist more often brush and floss more than those who visit the dentist less often. However, the lack of an association between amount of time brushing teeth and visits to dentists warrants further consideration. Two possibilities could explain this result. First, dental professionals may not be informing their patients of the importance of the amount of time spent brushing teeth. Second, patients are being informed, but choose not to follow the recommendation. The latter could be due to patients not believing the additional brushing time is really necessary. It may be beneficial for dental professionals to further emphasise the value of time spent brushing, as well as frequency, for thorough plaque removal.

The present study explored the effects of dental anxiety and dental visits on oral hygiene practices. A strength of the study is its general applicability to the broader US ethnic population which consisted of Blacks (39%), Hispanics (39%) and Whites (22%). Some limitations of the research were that there were a limited number of male participants (26%) and only undergraduate students from a private, Southern US university were included in the present research. As noted by Mertz and O'Neil (2002), dental disease recognises few barriers of class, ethnicity or economic status, so a larger sample may have provided insight into any potential ethnic or socioeconomic differences in dental anxiety. In summary, the importance of understanding dental anxiety is evident not only as it relates to dental visits but to all oral hygiene practices.

CONCLUSION

The present study indicates that dental anxiety and dental visits are associated with oral hygiene practices. Theoretically, the present study indicates that there may be a learned association between dental anxiety and oral hygiene practices. Practically, methods of education can be developed to disassociate anxieties that may inhibit optimum oral hy-

giene practices. Further, dental professionals may consider emphasising the value of the amount of time patients spend brushing their teeth.

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