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Relation of distress tolerance and dental care-related fear and anxiety

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Thesis submitted to the
Eberly College of Arts and Sciences at West Virginia University
in partial fulfillment of requirements for the degree of
Master of Science in Psychology

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Abstract

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Distress tolerance can be defined as the degree to which one is able to cope with and endure negative emotional states. This study examined possible differences in levels of distress tolerance between adults with dental phobia and age-, sex-, and income-matched adults without dental phobia. Using 42 volunteers who responded to advertisements ($n = 21$, dental phobia group; $n = 21$, healthy comparison group), this investigation utilized self-report measures of distress tolerance, fear of pain, anxiety sensitivity, dental care-related fear and anxiety, and depression. All participants were assessed with the Anxiety Disorders Interview Schedule (ADIS-IV); for the dental phobia group, the purpose of the interview was to confirm presence of dental phobia and note any comorbid anxiety, mood, or substance use/abuse disorders. For the healthy comparison group, the purpose of the ADIS-IV was to ensure that no anxiety, mood, or substance use/abuse disorders could be diagnosed. The dental phobia group had lower levels of distress tolerance than those in the healthy comparison group. Bivariate correlational analyses indicated that distress tolerance was negatively associated with anxiety sensitivity, fear of pain, self-reports of dental fear, and depression. Findings indicate that individuals with dental phobia may be particularly sensitive and less able to tolerate fear of pain, anxiety, and other negative emotions. Low distress tolerance, therefore, may be an etiological component of dental care-related anxiety, fear, and avoidance. Further, given the association between distress tolerance and fear of pain, it is proposed that in a dental phobia sample, distress tolerance and pain tolerance may be related constructs.

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Relation of Distress Tolerance and Dental Phobia

Despite major advances in dentistry, dental care-related fear and anxiety remain significant barriers to proper dental care in the United States (Botto, Donate-Bartfield, & Nihill, 2013; Edmunds & Buchanan, 2012; McNeil & Randall, 2014). According to a national telephone survey, 23% of Americans reported being nervous about visiting the dentist (Dionne, Gordon, McCullagh, & Phero, 1998). Dental phobia is the fourth most common phobia (Fiset, Milgram, Weinstein, & Melnick, 1989), affecting around 3% of individuals (Oosterink, de Jongh, Hoogstraten, 2009; Stinson et al., 2007). Due to the serious individual and public health consequences of avoiding dental care, such as oral diseases, and even systemic issues such as cardiovascular disease and respiratory infection (Deshpande, Khan, & Genco, 1999; Mojon, 2002), an improved understanding of the etiologies and maintenance of dental phobia is imperative. It is possible that low distress tolerance, or inability to tolerate negative internal states, plays a role in the etiology or maintenance of dental care-related anxiety and fear. Fears and anxieties about dental care are good exemplars for other specific phobias, in which distress tolerance also may play a role in pathogenesis and maintenance.

Distress Tolerance: History, Definition, and Measurement

Distress tolerance can be defined as the perceived or actual behavioral capacity to tolerate negative, aversive, or uncomfortable emotional states, such as guilt, distress, anxiety, fear, disgust, depression, sadness, and anger, among others (Marshall-Berenz, Vujanovic, Bonn-Miller, Bernstein, & Zvolensky, 2010; Simons & Gaher, 2005). Distress tolerance has been described as a higher order construct that affects other behavioral, cognitive, and affective variables, such as attention, distress appraisal, and behavioral responses to threat (Simons & Gaher, 2005). Despite a relatively long history of research and clinical interest in the construct of

distress tolerance, its potential for enhancing understanding of psychopathology has not been fully exploited (Zvolensky, Leyro, Bernstein, & Vujanovic, 2011). The relation of distress tolerance to anxiety, substance abuse, and other psychological disorders is of growing interest to researchers as a possible mechanism or risk factor for the development and maintenance of psychopathology (Zvolensky & Otto, 2007).

The notion of distress tolerance and its relation to psychopathology dates back to the mid-twentieth century (Frenkel-Brunswick, 1948, 1951, 1959), but the construct has not yet been operationalized or measured in a consistent, unified manner. Some researchers have conceptualized the construct in terms of tolerance of painful or uncomfortable physical states as measured by pain-induction procedures (Hancock, Ross, & Szalma, 2007; Schmidt & Cook, 1999), while the majority of researchers tend to conceptualize distress tolerance in terms of being able to withstand aversive emotional states, including ambiguous or uncertain situations, anxiety, fear, or frustration (Buhr & Dugas, 2002; Dugas, Gagnon, Ladouceur, & Freeston, 1998; Frenkel-Brunswick, 1948, 1951, 1959). Currently, only one comprehensive and integrative review of these diverse and overlapping conceptualizations exists, in book form (Zvolensky, Bernstein, & Vujanovic, 2011).

Currently, there are two self-report measures that assess distress tolerance. The Distress Tolerance Scale (DTS; Simons & Gaher, 2005) was designed to measure emotional distress tolerance (as opposed to physical discomfort intolerance). The DTS consists of 15 items on a 5-point Likert scale, ranging from “strongly agree” to “strongly disagree.” Example items include “feeling distressed or upset is unbearable to me” and “I’ll do anything to stop feeling distressed or upset.” Higher scores indicate higher levels of distress tolerance. The DTS is described in greater detail later in this document.

Harrington (2005) designed a 28-item self-report measure for use in rational-emotive therapy that conceptualizes distress tolerance as a wider construct than did Simons and Gaher (2005). Harrington's (2005) Frustration-Discomfort Scale measures frustration tolerance and includes dimensions of emotional intolerance, achievement frustration, and discomfort intolerance. Questions are rated on a 5-point Likert scale ranging from "absent" to "very strong". Example items include, "I can't stand having to wait for things I would like now" and "I can't stand having to persist at unpleasant tasks." The Frustration-Discomfort Scale has demonstrated good internal consistency ($\alpha = .94$) and strong discriminative validity. Higher scores indicate poorer capacities to tolerate frustration and discomfort.

Brown, Lejuez, Kahler, Strong, and Zvolensky (2005) characterized overt behavioral measures of distress tolerance as "task persistence," such that most behavioral measures assess how long an individual persists at a frustrating task. Longer persistence times generally indicate higher distress tolerance. Many studies have employed physical tolerance tasks to measure distress tolerance. Generally, the longer that the participant can tolerate an uncomfortable state, the higher the individual's ability to tolerate distress. Examples include cold-pressor tasks (e.g., Burns, Bruehl, & Caceres, 2004; Willoughby, Hailey, Mulkana, & Rowe, 2002), whole body air temperature exposures (e.g., Thomas, Ahlers, House, & Schrot, 1989), CO₂-enriched air exposures, which cause physiological changes that mimic feelings of anxiety and panic (e.g., Brown et al., 2005; Zvolensky, Eifert, Lejuez, & McNeil, 1999) and breath-holding tasks (e.g., Hajek, Belcher, & Stapleton, 1987; Zvolensky, Feldner, Eifert, & Brown, 2001).

Another class of behavioral measures of distress tolerance are cognitive tasks meant to induce frustration and negative emotional states. Examples of frustration induction tasks include the Wisconsin Card Sort Task (Heaton, Chelune, Talley, Kay, & Curtis, 1993), the paced

auditory serial addition task (PASAT; Gronwall & Sampson, 1974), and the mirror-tracing task (Quinn, Brandon, & Copeland, 1996).

No study has used physiological outcomes (e.g., heart rate, respiration) as primary indicators of distress tolerance. Several studies, however, have used physiological measures to suggest that their physical or cognitive tolerance tasks induced stress and/or anxiety. For example, Lejuez and colleagues (2003) found that doing the PASAT resulted in skin conductance changes and changes in heart rate variability. Additionally, CO₂-enriched air exposures result in increased heart rate and respiration rates (Zvolensky & Eifert, 2001), although these physiological changes likely are related to the direct effect of the CO₂ on respiratory processes.

Defining Dental Phobia

The DSM-V defines specific phobia as a “marked fear or anxiety about a specific object or situation” (American Psychiatric Association, 2013, p. 197). Criteria include excessive fear in the anticipation or presence of the feared stimuli, extreme anxiety when presented with the feared object, avoidance of the feared stimuli or tolerating it with great anxiety, and interference with the person’s daily functioning. Adults with specific phobias also must recognize that their fear is irrational. Dental anxiety is common, but not all individuals with dental care-related fears and anxieties qualify for a diagnosis of specific phobia. According to a national telephone survey, 23% of Americans reported being “nervous” about visiting the dentist (Dionne et al., 1998). An important semantic and conceptual note is that dental fear and anxiety are distinct states that exist along continua in the general population (McNeil & Randall, 2014). That is, many people have some level of dental fear and/or anxiety, but not necessarily at the level to qualify for a diagnosis of dental phobia. Individuals with dental phobia represent a

heterogeneous group in terms of symptom topography, level of fear, and etiology (McNeil & Randall, 2014).

Dental phobia is the fourth most common phobia (Fiset et al., 1989), affecting around 3% of individuals (Oosterink et al., 2009; Stinson et al., 2007), although population estimates of clinically-significant dental fear and anxiety are much higher in the range of 10-20% (McNeil & Randall, 2014; Smith & Heaton, 2003). Similar to other forms of psychopathology, individuals with dental phobia frequently report decreased psychosocial well-being, including lower self-esteem and greater loneliness and social isolation, compared to individuals without dental phobia (Berggren, 2003; Locker, 2003). Further, poorer oral health is associated with worse quality of life, especially in the dimensions of vitality, social functioning, and psychological well-being (Mehrstedt, Tönnies, & Eisentraut, 2004). Oral health-related quality of life, which can be defined as how one perceives one's dental health impacting (either positively or negatively) one's satisfaction, enjoyment, and contentment, is negatively associated with dental anxiety (McGrath & Bedi, 2004). That is, individuals who report lower oral health-related quality of life have higher levels of dental anxiety (McGrath & Bedi, 2004).

Individuals with dental phobia typically avoid dental care, but some endure it with great emotional discomfort (McNeil & Randall, 2014). Not surprisingly, dental avoidance is positively associated with tooth decay and number of missing teeth (Schuller, Willumsen, & Holst, 2003). Jamieson, Mejía, Slade, and Roberts-Thomson (2009) found that dental fear was a significant predictor of untreated tooth decay. Poor oral health is associated with a number of other health problems, including cardiovascular disease, respiratory infection, and adverse pregnancy outcomes (Deshpande et al., 1999; Gaffield, Colley-Gilbert, Malvitz, & Romaguera, 2001;

Mojon, 2002). Dental fear and anxiety are not trivial matters; a case study by Koloffon (1998) described a patient whose dental anxiety and fear resulted in death from infection.

Possible Etiologies of Dental Phobia

Learning

Many researchers attempting to explain dental fear/anxiety have relied on classical conditioning theory and a patient's history of painful or traumatic dental experiences (McNeil & Randall, 2014). Operant conditioning also has a role in dental fear/anxiety acquisition and maintenance, and is a part of Mowrer's Two-Factor theory (McNeil, Vargovich, Sorrell, & Vowles, 2014). Mowrer (1939) theorized that neutral stimuli (e.g., dental chair, lights of the dental office, smell of latex gloves) become aversive in the presence of, or directly preceding, a painful and fear-evoking event or experience (e.g., injection, extraction). The dental patient responds with anxiety and fear and subsequently responds this way in situations in which the now-conditioned stimuli (e.g., dental chair, lights, latex gloves) are present. Thus, the fearful dental patient avoids future experiences with dental care and negatively reinforces the fear, and intensifies it (McNeil et al., 2014). Rachman's (1978) three pathways of fear acquisition suggest other avenues in which dental fear/anxiety may be acquired. Dental care-related fear also may result from an individual's social environment; one may hear friends or family members complain about painful and fear-evoking dental procedures, or one may learn fears through popular media outlets (Melamed & Williamson, 1991; McNeil & Randall, 2014).

Mowrer's theory, however intuitive, fails to explain the fact that not all patients develop fear of pain and subsequent fear of the dentist. The fear-avoidance model explains how some individuals respond to pain with little to no fear of future injury and others develop anxiety about the pain and avoid it in the future (McNeil, Sorrell, & Vowles, 2006). Armfield, Spencer, and

Stewart (2007) and Weinstein (1990) explained that those patients who develop fear and thus avoidance of dental care fall into a “vicious cycle of dental fear” wherein the individual’s avoidance leads to more severe dental problems, which results in more painful dental procedures.

Research with dental phobic patients supports these behavioral theories. Data demonstrate that the majority of children’s dental fear results from conditioned fear from a previous dental experience (Townend, Dimigen, & Fund, 2000). Similarly, in a study of over 100 adult patients with dental phobia, Berggren, Carlsson, Hakeberg, Hägglin, and Samsonowitz (1997), found that the majority of patients’ phobias originated from conditioned fear of dentistry. It should be noted, however, that accounting for a “majority” of patients still leaves the etiologies for other patients unexplained.

Genetics

Genetic transmission of a vulnerability to dental care-related fear and anxiety is probable. It is well established that genetics play a role in the development of anxiety disorders in general (Boomsma, Busjahn, & Peltonen, 2002; Hettema, Neale, & Kendler, 2004). Recent studies suggest that dental fear/anxiety is no exception. Genetic factors may predispose some individuals to develop dental phobia by making them more susceptible to developing fears through the other possible etiologies described, such as learning (McNeil & Randall, 2014).

Ray and colleagues (2010) found a higher concordance rate of dental fear and anxiety among monozygotic twins than dizygotic twins. In a large sample of Appalachian families, Randall et al. (2012) found that not only dental fear was heritable, but also fear of pain. Of note, there was a large genetic correlation between dental fear and fear of pain, suggesting that the relation between these states results at least in part from genetic factors.

Cognitive Vulnerability

Armfield (2006) proposed a model of cognitive vulnerability to explain dental fear/anxiety, wherein an individual's perception of a stimulus is influenced by his or her fear-related schema, which includes dimensions of disgust, unpredictability, danger, and uncontrollability. According to this model, when individuals with dental phobia encounter dental care, they have an automatic fear response as well as a cognitive evaluation of the situation, which leads them to perceive and interpret the dental stimuli as dangerous or harmful.

Individuals whose dental fear is associated with cognitive vulnerability report fear of embarrassment, more depression, and higher levels of trait anxiety (Berggren et al., 1997). This cognitive vulnerability schema also may be a mechanism of the development of dental care-related fear and anxiety in children (Carrillo-Díaz, Crego, Armfield, & Romero, 2012).

Comorbid Psychopathology

Roy-Byrne, Milgram, Khoon-Mei, Weinstein, and Katon (1994) found that 70 percent of patients with dental phobia had a lifetime co-morbidity of another Axis I disorder, particularly panic disorder, generalized anxiety disorder, and dysthymia. Similarly, Locker, Liddell, and Shapiro (1999) found a positive relationship between level of dental anxiety and number of other DSM-III diagnoses. Several studies (e.g., Locker et al., 1991; Roy-Byrne et al., 1994) operationalize comorbid dental phobia and anxiety or mood disorders through the use of DSM-IV diagnostic categories, but the conceptual overlap can be explained—perhaps more accurately—by trait levels of emotional dysregulation, anxiety sensitivity, discomfort intolerance, and distress tolerance. While it may be clinically convenient to describe relations between dental fear and depression/anxiety in terms of diagnostic categories, it is more scientifically fruitful to focus on specific constructs that may relate to dental fear and phobia.

Distress Tolerance as a Possible Component of Specific Phobia

As previously noted, specific phobia is an anxiety disorder characterized by intense fear and avoidance of an object or situation. This fear and avoidance causes significant distress and impairment in functioning (American Psychiatric Association, 2013). Dental phobia provides a distinctive opportunity to study distress tolerance. According to the model proposed by McNeil and Randall (2014), dental care-related fear, anxiety, and phobia develop from a variety of factors, including fear of pain, cognitive distortions such as catastrophizing and misappraisals, and past experiences with dentistry, including traumatic ones. Due to the nature of dental fear and anxiety, it is possible that distress tolerance plays a role in the development and maintenance of dental phobia. There is evidence for the relation between distress tolerance and dental fear and anxiety in the concepts of fear of pain, catastrophizing, and responses to trauma.

Fear of pain. Individuals with lower distress tolerance may avoid situations or make great efforts to modify situations that cause distressing emotions or states (Simons & Gaher, 2005), such as anxiety, fear, or pain. Pain tolerance and distress tolerance are separate, but likely related, constructs (Bernstein, Zvolensky, Vujanovic, & Moos, 2009). Lower distress tolerance may be related to greater fear of pain, which is the most significant predictor of dental fear and anxiety (McNeil & Berryman, 1989). As pain may be particularly noxious for individuals lower in distress tolerance, fears about pain may be higher in this group. Thus, individuals with lower distress tolerance may be particularly likely to avoid feeling fear about pain by not seeking dental care, which is part of a vicious cycle including dental phobia (McNeil & Randall, 2014).

Catastrophizing. Catastrophizing is a pattern of irrational cognitions (Farmer & Chapman, 2008) inherent to both distress tolerance and dental fear and anxiety, in which one thinks about the highly negative outcomes for a given circumstance. In dentistry, a pattern of

catastrophizing thoughts might be, “If I go to the dentist, I am going to be in a great deal of pain that will last for several hours and may lead to awful, permanent pain and I will end up having to go back again and again without ever getting relief.” Catastrophizing is understood as a determinant of physical and emotional distress during dental experiences (Sullivan & Neish, 1998, 2001). That is, individuals with a catastrophizing and worrying cognitive style towards dental care actually experience more physical and emotional distress, as well as more pain and more feelings of helplessness, during dental appointments (Sullivan & Neish, 2001).

Accordingly, Simons and Gaher (2005) suggested that individuals with low distress tolerance often respond to threatening situations by catastrophizing (e.g., “This is the worst pain I’ve ever felt and it is never going to go away”), whereas individuals with higher levels of distress tolerance respond to similar threatening situations by minimizing the situation (e.g., “This procedure is uncomfortable but it is not unbearable and it will be over soon.”).

The fear-avoidance model, which explains how some individuals respond to pain with little to no fear of future injury and others develop anxiety/fear about the pain and avoid it in the future (McNeil et al., 2006; Norton & Asmundson, 2003), also can be used to unite the concepts of catastrophizing and distress tolerance. In the case of dentistry, the fear-avoidance model states that one person may respond to a physically or emotionally distressing dental procedure by confronting the pain and moving on, while another person may respond to such a procedure by catastrophizing about all of the negative things that could have happened and avoid similar situations in the future (McNeil et al., 2006). It seems likely that individuals with low distress tolerance would fall in the latter category.

Responses to traumatic experiences. McNeil and Randall (2014) suggest that past experiences with dentistry or other traumas are one of several routes for the development and

maintenance of dental care-related fear and anxiety. There is a small but growing body of literature suggesting that lower distress tolerance predisposes trauma-exposed individuals to experiencing symptoms of posttraumatic stress disorder (e.g., Marshall-Berenz, Vujanovic et al., 2010; Vujanovic et al., 2012). In a sample of community-dwelling, trauma-exposed adults, it was found that perceived distress tolerance—as measured by the Distress Tolerance Scale (Simons & Gaher, 2005)—was positively associated with severity of several PTSD symptoms, including re-experiencing, emotional numbing, and hyperarousal (Vujanovic et al., 2012). These results provide evidence that individuals with low distress tolerance may be particularly sensitive and reactive to traumatic experiences, perhaps including dental ones, and this vulnerability may increase fear, anxiety, and dental avoidance behaviors.

Distress Tolerance and Related Constructs

It is important to distinguish distress tolerance from its related constructs, both for the purpose of more clearly operationalizing the construct, as well as for improving understanding of the clinical conceptualization of distress tolerance as it relates to dental phobia.

Anxiety sensitivity. Defined as the “fear of anxiety-related sensations” or, more simply, the “fear of fear” (Taylor, 1999, p. 243), anxiety sensitivity comprises cognitive, social, and physical components (i.e., fear of losing control, fear that others might observe anxiety symptoms, and fear of physical sensations; Wheaton, Mahaffey, Timpano, Berman, & Abramowitz, 2011). Individuals with higher levels of anxiety sensitivity believe that anxiety-related sensations (e.g., racing heart or excessive worry) may have dangerous consequences, such as heart attack or loss of control (Peterson & Reiss, 1992). Higher levels of anxiety sensitivity indicate a risk for developing anxiety pathology, including panic disorder, posttraumatic stress disorder, and pain-related anxiety among chronic pain patients (Ehlers,

1995; Greenberg & Burns, 2003; Kashdan, Zvolensky, & McLeish, 2008; Maller & Reiss, 2005; McNally, 2002). Stewart, Karp, Pihl, and Peterson (1997) also found higher levels of anxiety sensitivity to be related to substance abuse and alcohol dependence.

Anxiety sensitivity plays a role in dental fear (Locker et al., 1999). In a study of dental phobia patients about to undergo a dental procedure, those who scored higher in anxiety sensitivity expected to experience and reported experiencing more pain during the procedure than those with lower anxiety sensitivity (Klages, Kianifard, Ulusoy, & Wehrbein, 2006). According to Reiss' (1987) theory of the fear of anxiety, these individuals likely have higher sensitivity to fear of danger, and many people perceive dental care as potentially harmful or dangerous. Distress tolerance potentially could play a role in this model, as danger expectancy often is distressing.

Similar to the conceptualization of fear of pain and distress tolerance, it also is possible that individuals with lower distress tolerance may be particularly sensitive to feelings of anxiety and fear, and find these feelings extremely aversive. Because of this increased sensitivity, individuals with lower distress tolerance may avoid situations (e.g., dental ones) in which they are likely to experience anxiety so as to avoid these highly aversive cognitive, behavioral, and physiological symptoms.

Emotion regulation. Individuals engage in emotion regulation in order to control which feelings they experience, when they experience them, and how strongly they experience and express said feelings. Thus, emotion regulation allows people to moderate both their experience and expression of emotion (Shiota & Kalat, 2012). Emotion dysregulation is viewed as the crux of many psychological disorders, namely anxiety, depression, and substance use disorders (Gratz & Roemer, 2004; Gross & Munoz, 1995).

Gross (1998) developed a temporal continuum of emotion regulation which featured five points at which emotion can be regulated: selecting the situation, modifying the situation, deploying one's attention, changing one's cognitions, and modifying one's response. The first four points are considered "antecedent-focused" and the fifth is considered "response-focused" (Simons & Gaher, 2005, p. 85). In this way, emotion regulation of people with lower distress tolerance likely is characterized by attempts to avoid negative emotions and—if negative emotions are experienced—decrease negative internal states as quickly as possible (Simons & Gaher, 2005).

McHugh and colleagues (2012) identified an association between poor distress tolerance and poor emotion regulation strategies, finding that these two variables in combination predicted experiential avoidance. In the context of dental phobia, one could theorize that individuals with low distress tolerance and poor emotion regulation put great effort into avoiding the "antecedent-focused" points of emotion experience by avoiding thinking about the dentist, or making appointments, delaying necessary care, and so on, because these cognitions cause intolerable emotions that these individuals may be unable to regulate.

Discomfort intolerance. The degree to which an individual can tolerate uncomfortable physical states is known as discomfort intolerance. This construct includes all physical sensations that are uncomfortable, but not necessarily painful (Zvolensky, Leyro, Bernstein, & Vujanovic, 2011). With lifetime rates of having at least one uncomfortable or painful dental experience as high as 60% (Vassend, 1993), discomfort and pain certainly should not be ignored. Current behavioral dentistry literature generally does not distinguish between pain and discomfort (McNeil et al., 2014). In the dental office, a number of stimuli could cause discomfort but not necessarily cause pain, including the sound of the drill, the dentist putting fingers or

cotton in the patient's mouth, dentist spraying air into the patient's mouth, or the patient having something he/she needs to say when there are instruments in his/her mouth (Johnson, Mayberry, & McGlynn, 1990).

Hierarchical Model of State Intolerance

Bernstein and colleagues (2009) suggested a hierarchical model of distress tolerance. Intolerance can be experienced in reaction to both emotional and physical states. The hierarchical model of state intolerance distinguishes distress tolerance from discomfort intolerance such that distress tolerance is how people tolerate negative *emotional* states, while discomfort intolerance is how people tolerate negative *physical* states. Further, these authors suggest that distress tolerance impacts anxiety sensitivity while discomfort intolerance affects pain tolerance (Bernstein et al., 2009). See Figure 1 for a visual display of this model, adapted from Schmidt, Mitchell, Keough, and Riccardi (2011).

Tolerance of physical discomfort is not always related to affective states (Geisser, Robinson, & Pickren, 1992). McCown, Galina, Johnson, DeSimone, and Posa (1993) found no difference in cold pressor task tolerance between females with borderline personality disorder compared to a healthy comparison group. Individuals with borderline personality disorder have extremely low distress tolerance (Linehan, 1993), so it can be speculated that people with low distress tolerance may not necessarily have low pain tolerance.

Distress Tolerance in Psychopathology

Distress tolerance relates to many psychological disorders and also has "transdiagnostic relevance" (Vujanovic, Bernstein, & Litz, 2011, p. 126). Zvolensky, Bernstein, and Vujanovic, (2011) compiled a comprehensive review of distress tolerance and its theoretical relevance to various types of psychopathology, specifically anxiety, mood, and substance use/abuse disorders.

This review highlighted the notion that clinical research on the topic of distress tolerance lags behind theory. Still, because the focus of the present study is to investigate the role of distress tolerance in a particular specific phobia, dental phobia, it will be useful to review current knowledge of the role of distress tolerance in the development and maintenance of other psychological disorders.

Anxiety Disorders

Distress tolerance, along with anxiety sensitivity and discomfort intolerance, plays an important role in the development and maintenance of anxiety. Individuals with lower distress tolerance may be likely to develop problems with anxiety because they perceive anxiety to be so aversive and thus engage in safety behaviors to avoid experiencing negative emotions (Schmidt et al., 2011). Distress tolerance likely plays a role in the maintenance of obsessive-compulsive disorder and panic disorder (Schmidt et al., 2011). Individuals with obsessive-compulsive disorder and lower distress tolerance may continue to engage in compulsions because these behaviors reduce the negative emotional states brought on by obsessions (Schmidt et al., 2011). Individuals with panic disorder and lower distress tolerance may avoid situations in which they are likely to experience distress.

Despite the extensive theoretical work on distress tolerance and anxiety disorders, limited clinical research has investigated the role of distress tolerance in anxiety psychopathology (Schmidt et al., 2011). Distress tolerance as measured by the DTS (Simons & Gaher, 2005) was significantly negatively associated with compulsive hoarding behavior (Timpano, Buckner, Richey, Murphy, & Schmidt, 2009). In this study, individuals with high anxiety sensitivity and lower distress tolerance were at greater risk for hoarding behaviors.

Little is known about the role of distress tolerance in specific phobias. In the case of dental phobia, distress tolerance and anxiety sensitivity could interact to produce behaviors that function to avoid experiencing negative emotions. There are many theories to explain dental phobia, but distress tolerance thus far has not been included in them. It is possible that dental phobia is maintained in a similar manner, such that individuals with lower distress tolerance are unable to tolerate the fear and anxiety related to visiting the dentist, which further propagates avoidance.

Borderline Personality Disorder

Borderline Personality Disorder (BPD) is a serious mental disorder characterized by long-term instability and poor functioning in behavior, interpersonal relationships, emotions, and cognitions (Gunderson, 2001; Linehan, 1993). BPD affects about 2% of the general population (American Psychiatric Association, 2013; Lenzenweger, Lane, Loranger, & Kessler, 2007), but patients with BPD compose approximately 10-15% of clinical populations (American Psychiatric Association, 2013; Widiger & Weissman, 1991). Therefore, the pathogenesis of BPD has been extensively theorized, including the role of distress tolerance. Linehan (1993) postulated that an inability to tolerate negative emotions and distress is a central component of borderline personality disorder.

Symptoms of BPD may function as a means by which individuals attempt to avoid feeling negative emotions (Gratz & Tull, 2011). For example, Linehan (1987) suggested that lower distress tolerance contributed to the high rates of parasuicide (i.e., clear suicide attempt without intention to die) among individuals with BPD. In this case, parasuicide functioned as a manner through which one can avoid feeling negative internal states. Behavioral measures (PASAT and a computerized mirror-tracing task) of distress tolerance provide evidence of lower

distress tolerance in samples of BPD (Bornovalova et al., 2008). Interestingly, no studies employing behavioral measures of distress tolerance have found significant associations between level of distress tolerance and symptom severity in BPD (Gratz & Tull, 2011; Iverson, Follette, Pistorello, & Fruzzetti, 2012). These findings indicate that while individuals with BPD have low distress tolerance, behavioral measures of distress tolerance do not predict significant variability in levels of distress tolerance within the group. As noted above, pain tolerance of individuals with BPD are often incongruent with distress tolerance in this group, so other methods of measuring the construct may be necessary.

Studies employing self-report methods have begun to investigate the theoretical relationship between lower distress tolerance and BPD-relevant symptoms. Lower distress tolerance has been found to be associated with self-injurious behavior (Gratz, Breetz, & Tull, 2010; McCoy, Fremouw, & McNeil, 2011), risky sexual behavior (Batten, Follette, & Aban, 2001), substance abuse (Buckner, Keogh, & Schmidt, 2007), and suicidal ideation (Lynch, Cheavens, Morse, & Rosenthal, 2004).

Substance Use Disorders

Disorders of substance abuse and dependence are characterized by continued use of alcohol or drugs despite familial, legal, emotional, or physical problems caused by substance use (Richards, Daughters, Bornovalova, Brown, & Lejuez, 2011). Distress tolerance likely plays a role “across the stages of substance abuse,” starting with initial use (Richards et al., 2011, p. 176). Daughters and colleagues (2009) found that adolescents with lower distress tolerance were more likely to initiate early alcohol use than adolescents with higher distress tolerance. Additionally, these researchers found associations between distress tolerance and adolescent delinquent behavior and internalizing symptoms; these characteristics may put individuals at

higher risk of abusing substances later in life (Richards et al., 2011). In their standardization study for the DTS, Simons and Gaher (2005) found moderate inverse correlations between distress tolerance and the self-report of alcohol ($r = -.23, p < .05$) and marijuana ($r = -.20, p < .05$) use to cope with distress, suggesting that individuals with lower distress tolerance are more likely to use substances to reduce or eliminate negative emotions.

Not surprisingly, in the context of substance abuse treatment, individuals with lower distress tolerance have poorer outcomes than those with better ability to tolerate negative internal states. Brown, Lejuez, Kahler, and Strong (2002) found that smokers with lower distress tolerance had a more extensive history of failed attempts at quitting than smokers with higher distress tolerance. Among patients in a residential substance abuse treatment facility, lower distress tolerance predicted early treatment dropout (Daughters, Lejuez, & Bornovalova, et al., 2005). In addition, pathological gamblers with lower distress tolerance had shorter abstinence attempts from gambling than gamblers with higher distress tolerance (Daughters, Lejuez, & Strong, et al., 2005).

In sum, distress tolerance has the potential to contribute to the understanding of dental phobia, and eventually may improve treatment for those with dental phobia. The current study aimed to determine if adults with dental phobia have lower levels of distress tolerance than those without dental phobia.

Statement of the Problem

Distress tolerance is an under-studied phenomenon that appears to be a component of many forms of psychopathology. The role of distress tolerance in specific phobia, including dental phobia, remains unexplored. While the literature provides theory and some evidence about the development and maintenance of dental fear and anxiety, much remains to be explored about

the emotional and cognitive states that may exacerbate and/or maintain dental fear/anxiety, such as level of distress tolerance. Dental phobia is somewhat unique in that people can avoid dental care for long periods of time, and only in the case of a dental or medical crisis, including pain or functional interference, is care absolutely necessary (McNeil & Randall, 2014).

The present study intended to enhance understanding of the specific emotional mechanisms of dental phobia, and could lead to improved treatment for individuals who suffer from it. Adults with dental phobia and age-, sex-, and income-matched healthy comparison peers completed the Distress Tolerance Scale. The rationale for matching participants on income is that dental avoidance tends to disproportionately affect individuals lower in socioeconomic status (Armfield, Spencer, & Stewart, 2006). The present study utilized the DTS (Simons & Gaher, 2005) because, unlike the Frustration-Discomfort scale (Harrington, 2005), the DTS emphasizes emotional distress tolerance, as opposed to frustration or physical discomfort.

These findings may be generalized to shed light on the role that distress tolerance plays in the development and maintenance of other specific phobias. Increasing understanding of distress tolerance in dental phobia has the potential to improve the effectiveness of behavioral treatments for anxiety disorders, including dental phobia.

Hypotheses

This study had two hypotheses. First, participants with dental phobia as diagnosed by the Anxiety Disorders Interview Schedule-IV (ADIS-IV) were predicted to have lower levels of distress tolerance in comparison to participants in the healthy comparison group on the total score and all four subscales (i.e., Appraisal, Absorption, Regulation, and Tolerance). Second, it was predicted that total Distress Tolerance Scale scores would be negatively correlated with scores on the ASI-III, FPQ-III, DFS, and BDI-II.

Methods

Experimental Design

This study utilized a two-group between subjects prospective design. Participants with dental phobia were matched with healthy comparison participants on the bases of age (i.e., within 5 years), sex, and income.

Participants

The power analysis program GPOWER 3 (Faul, Erdfelder, Lang, & Buchner, 2007) was used to determine the necessary sample size. This analysis indicated that at least 21 participants per group was recommended to achieve a power of $\phi = .80$ with two groups at an effect size of .8. The current study involved a total of 45 community dwelling participants with 42 participants having usable data (e.g., 21 in healthy comparison group, 21 in dental phobia group, 3 not meeting study participation criteria). Those in the healthy comparison group were matched with those in the dental phobia group on the variables of age, sex, and income. All participants were able to understand, speak, read, and write English. Proficiency in English was judged by the participant's ability to read aloud the questionnaire instructions for the Anxiety Sensitivity Index-III (ASI-III), which are provided in Appendix A.

Within the dental phobia group, there were 9 females and 12 males. They ranged in age from 22 to 64 years, and all 21 participants had avoided the dentist due to fear for at least 1.5 years. The majority of dental phobia participants (81.0%) were Caucasian, and over half of the participants reported having an annual household income of \$24,999 or less. Participants in the dental phobia group reported attaining an average of 15.1 years of education ($SD = 2.5$), which equates to approximately 3 years of education post high school.

Within the healthy comparison group, there were also 9 females and 12 males. They ranged in age from 18 to 70 years, and all 21 participants had visited the dentist in the past two years. The majority of healthy comparison participants were Caucasian (90.4%), and over half of the participants reported having an annual household income of \$24,999 or less. Participants in the healthy comparison group attained an average of 14.4 years of education ($SD = 2.6$), which equates to approximately 2.5 years of education post high school. Pre-established exclusion criteria were used to screen participants. Tables 1 and 2 display exclusionary criteria for the dental phobia group and the healthy comparison group, respectively.

See Table 3 for demographic characteristics. All participants were thanked for their participation and received \$25.00 following the completion of the tasks. (See Appendices B and C for the payment record forms.)

Self-Report Measures

Distress Tolerance Scale. (DTS; Simons & Gaher, 2005). The DTS is a 15-item, self-report measure designed to assess the ability to experience and withstand negative emotional states. Items are based on a five choice Likert scale (strongly disagree to strongly agree). The DTS is comprised of four subscales, including: perceived ability to tolerate emotional distress (e.g., “I can’t handle feeling distressed or upset”), self-report appraisal of distress (e.g., “My feelings of distress or being upset are not acceptable”), attention absorption by negative emotions (e.g., “When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually feels”), and behaviors to alleviate distress (e.g., “I’ll do anything to avoid feeling distressed or upset;” Simons & Gaher, 2005).

The DTS has demonstrated strong psychometric properties with good internal consistency for each factor and good test–retest reliability over a six month interval (Anestis,

Selby, Fink, & Joiner, 2007; Simons & Gaher, 2005). Simons and Gaher's (2005) standardization study established construct validity through relationships between the DTS and affective factors, including mood acceptance ($r = .47$), mood regulation expectancies ($r = .54$), and positive affect ($r = .26$). Timpano and colleagues (2009) found further evidence of the scale's strong psychometric properties in an undergraduate sample. Vujanovic et al (2012) found high internal consistency ($\alpha = .89$) in a sample of trauma-exposed adults. Recently, Iverson et al. (2012) validated the scale in a sample of individuals with borderline personality disorder. This measure was chosen because it most accurately assesses the construct of emotional distress tolerance. See Appendix D.

Fear of Pain Questionnaire-III. The Fear of Pain Questionnaire-III (FPQ-III) is a 30-item self-report measure of pain-related fear (McNeil & Rainwater, 1998). The measure consists of three subscales: Minor Pain, Medical/Dental Pain, and Severe Pain. Respondents rate items based on how fearful they are of experiencing the pain associated with each experience. Ratings are scored on a 5 point Likert-type scale ranging from 1 = *Not at all* to 5 = *Extreme*. Items are scored by summing sub-scales scores (McNeil & Rainwater, 1998). Higher total scores indicate higher levels of fear of pain.

The FPQ-III has several strengths, including short administration time, strong psychometric properties and norms for both clinical and nonclinical populations, as well as assessment of fear in relation to a wide range of painful stimuli. In the standardization samples, internal consistency was strong, Cronbach's $\alpha = .92$, as was test-retest reliability, $r = .74$ (McNeil & Rainwater, 1998). More recent studies (e.g., Osman, Breitenstein, Barrios, Gutierrez, & Kopper, 2002; Roelofs, Peters, Deutz, Spijker, & Vlaeyen, 2005) found additional support for

the FPQ-III's three factor structure and further evidence of reliability, as well as predictive, convergent, and discriminant validity. See Appendix E.

Anxiety Sensitivity Index-III. (ASI-III; Taylor et al., 2007). The ASI-III is an 18-item questionnaire that measures fear of anxiety-related sensations or arousal. This instrument assesses anxiety sensitivity with three subscales: Physical, Cognitive, and Social concerns in regard to anxiety. The ASI-III has an extensive research basis and has demonstrated strong psychometric properties. Internal consistency values as measured by Cronbach's alpha for the physical, cognitive, and social subscales were .79, .84, and .79, respectively. The ASI-III also demonstrated strong validity. Higher total scores indicate higher levels of anxiety sensitivity. See Appendix F.

Dental Fear Survey. (DFS; Kleinknecht, Klepac, & Alexander, 1973). The DFS is a 20-item questionnaire used to identify fearful stimuli and reactions associated with dentistry. It contains a 5-point Likert scale, ranging from no reaction or fear to great reaction or fear, and addresses issues such as avoidance of dentistry, the extent of physiological arousal felt during dental treatment, and level of fear elicited by various components of dental situations. Moore et al. (1996) found high internal consistency of the DFS. Overall alpha coefficients for both men and women were reported at .89. In addition, the DFS has been shown to correlate highly with other dental fear measures and with dentists' observations of patients' fear during treatment (Heaton, Carlson, Smith, Baer, & de Leeuw, 2007).

The DFS consists of three factor-analytically derived subscales, each measuring a different part of the dental care experience: Physiological, Specific Stimuli, and Avoidance (Kleinknecht et al., 1973). The Physiological subscale measures arousal and physical sensations related to dental care. The Specific Stimuli subscale assesses fear of specific stimuli involved in

dental care (i.e., needle, drill, smell of dental office). Finally, the Avoidance subscale measures anxiety about upcoming dental care, as well as avoidance of dental appointments (McGlynn, McNeil, Gallagher, & Vrana, 1987).

Strengths of the DFS include short administration time, wide use in behavioral dentistry research, items that shed light on an individual's specific feared stimuli, and strong psychometric properties in both clinical and non-clinical samples (Kleinknecht et al., 1973). Studies in the 1980s confirmed the measure's internal consistency and test-retest reliability (Kleinknecht, Thorndike, McGlynn, & Harkavy, 1984; McGlynn et al., 1987). Other studies (e.g., Smith & Moore, 1995; Wilson & Sinisko, 1997) found convergent, discriminant, and predictive validity in the DFS. See Appendix G.

Beck Depression Inventory–II. (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a 21-item self-report measure designed to assess the affective, cognitive, and vegetative symptoms of depression. It is considered the gold standard for assessing overall depression severity (Beck, et al., 1996). The BDI-II maps on to DSM-IV-TR criteria, which assess the cognitive, somatic, and affective components of depression (Beck et al., 1996). The BDI-II is composed of two subscales: Cognitive-Affective and the Somatic (Beck et al., 1996; Storch, Roberti, & Roth, 2004).

The BDI-II has high internal consistency, with Cronbach's alpha equal to .90, and strong convergent and discriminant validity (Titov, Dear, McMillan, Anderson, Zou, & Sunderland, 2011). The BDI-II also has strong test-retest reliability ($.74 < r < .96$) in an undergraduate clinical sample, outpatient sample, and hearing-impaired sample (Sprinkle et al., 2002). Convergent validity with the BDI-II was established with the BDI ($.84 < r < .93$), the Hamilton Psychiatric Rating Scale for Depression, the Beck Hopelessness Scale ($.68 < r < .71$), the

Speilberger's State Trait Anxiety Inventory Anxiety factor ($.52 < r < .69$), and the Speilberger's State Trait Anxiety Inventory Depression factor ($.57 < r < .76$) (Sprinkle et al., 2002; Storch et al., 2004). Higher total scores on this measure indicate higher levels of depression symptomatology. The BDI-II is not included in the appendices due to copyright restrictions.

Demographic questionnaire. The demographic questionnaire asked for participants' sex, age, ethnicity, income, education level, age of onset of dental fear, employment status, and income. This questionnaire also asked participants to rate their overall health, dental health, and how much difficulty they have with gagging during dental visits. Participants were asked to rate their overall health and, separately, their dental health, on a scale of 1 to 5, with responses being 1 = Poor, 2 = Fair, 3 = Good, 4 = Very Good, and 5 = Excellent (Locker, Wexler, & Jokovic, 2005; Robins, Hendin, & Trzesniewski, 2001). Additionally, all participants were asked, "How much of a problem have you had with gagging during dental visits?," with responses being 1 = Never, 2 = Sometimes, 3 = Often, 4 = Most of the time, 5 = Almost always. See Appendix H.

Semi-Structured Interview

Anxiety Disorders Interview Schedule– IV (ADIS-IV; Brown, Di Nardo, Lehman, & Campbell, 2001). This structured interview was designed to reliably assess and diagnosis current episodes of anxiety disorders. The ADIS-IV also assesses for disorders that have high comorbidity with anxiety disorders, including mood disorders, substance abuse disorders, and somatoform disorders. This instrument allows for a standardized diagnosis of participants' dental phobia, as well as any other relevant clinical syndromes. The ADIS-IV was administered by graduate students in clinical psychology ($n = 2$), or a licensed psychologist ($n = 1$). The graduate student interviewers developed competency in ADIS-IV administration through practicing the ADIS-IV several times with trained undergraduate standardized patients, and met a test criterion

of successfully identifying a diagnosis with a standardized patient. See Appendix M for ADIS-IV administration training competency checklist. The ADIS-IV has demonstrated good interrater reliability with kappa coefficients ranging from .67 to .86 (Brown et al., 2001). The ADIS-IV is not included in the appendices due to copyright restrictions.

Procedure

Recruitment of participants. Participants in the dental phobia group were recruited through local newspaper advertisements, and both groups were recruited through flyers posted on WVU's campus and the WVU Health Science Center, university and departmental listservs, online classified ads, and a community event. See Appendix I for the newspaper advertisement.

Telephone/email screening. Potential participants either called or emailed a designated local phone number or study email address, respectively. A graduate research assistant managed both the phone and email account, and screened each participant for the study. The screening script used for both phone and email is provided in Appendix J. If the participant was eligible for either group, an appointment was scheduled accordingly. Appointments for the dental phobia group took place at the WVU School of Dentistry, and appointments for the healthy comparison group took place at either the Quin Curtis Center for Psychological Services in Morgantown, WV or in a private room at the WVU Student Recreation Center during a community event.

Consent. When a participant arrived for the study, he/she was provided information verbally, and given a written informed consent form that provided information on study procedures. The informed consent for the dental phobia group is provided in Appendix K; the healthy comparison group consent is provided in Appendix L.

Study interview and self-report measures. Thereafter, the participant completed the DTS, FPQ-III, ASI-III, DFS, and BDI-II self-report measures through MediaLab, a computer-

based survey system (Jarvis, 2013). The ADIS-IV interviews were administered by graduate students in clinical psychology, or a licensed clinical psychologist. Participants in both the dental phobia and healthy comparison groups received \$25 for completing the session.

Results

Recruitment

Dental phobia group. Approximately 102 individuals telephoned or emailed about participating in the study from November 15, 2013 to June 15, 2014. All 102 inquiries were answered. Of the 102 inquiries, 19 did not respond to emails requesting information to screen for eligibility, and 83 were screened for eligibility. Of these 83 persons, 26 were eligible and were scheduled for the study. Of the 57 individuals not eligible for the study, reasons included having been to the dentist too recently, not avoiding the dentist primarily due to fear, being pregnant, living too far away from the study site, or not being at least 21 years old. Of the 26 participants with scheduled appointments, 22 showed up for their appointments. Due to not qualifying for a dental phobia diagnosis, one participant was excluded. All of the participants in the dental phobia group passed the English proficiency test. See Figure 2 for a participant flow chart of the dental phobia group.

Healthy comparison group. Approximately 154 individuals telephoned or emailed about participating in the study as a member of the healthy comparison group from November 1, 2013 to June 15, 2014. Of the 154 inquiries, 42 did not respond to the screening questions, 112 participants were screened for eligibility, and 23 were found to be eligible and appropriate to serve as an age-, sex-, and income-matched participant for the dental phobia group. Of the 89 individuals not eligible for the study, the reasons were having a history of anxiety or depression, having avoided the dentist for at least one year, avoiding dental visits due to fear, not being at

least 21 years old, or not being the appropriate age and/or sex to serve as a matched participant for the dental phobia group. There were 23 participants scheduled for the study, and all showed up for their appointments. Of the 23 participants, 2 were excluded due to presence of anxiety disorders. All of the participants in the healthy comparison group passed the English proficiency test. See Figure 3 for a participant flow chart for the healthy comparison group.

Demographic and Background Characteristics

The mean age of all participants was 36.2 years ($SD = 14.6$), and participants across groups did not differ significantly in age, $t(40) = -.2, p = .84$. There were 18 females (42.9%) and 24 males (57.1%), and the number of males and females was equivalent across groups. Overall, 85.7% ($n = 36$) of the participants identified as Caucasian, 7.1% ($n = 3$) identified as African American, 2.4% ($n = 2$) identified as Asian, and 4.8% ($n = 4$) identified with two or more ethnic/racial groups. There was no significant difference between the dental phobia group and the healthy comparison group's number of Caucasians versus members of other racial groups (Caucasians = 36 of 42), $\chi^2(1, N = 42) = .23, p = .63$.

Participants were asked to report their annual household income using the following scale: 1 = \$9,999 or less, 2 = \$10,000-\$14,999, 3 = \$15,000-\$24,999, 4 = \$25,000-\$34,999, 5 = \$35,000-\$49,999, 6 = \$50,000-\$74,999, 7 = \$75,000-\$99,999, and 8 = \$100,000 or greater. Across the sample, 38% ($n = 16$) earned \$9,999 or less annually, 21.4% ($n = 9$) reported an income of \$10,000-\$24,999, 9.5% ($n = 4$) reported an income of \$25,000-\$49,999, 21.4% ($n = 9$) reported an income of \$50,000-\$99,999, and 9.5% ($n = 4$) reported an income of \$100,000 or greater. The average income across the sample was approximately \$25,000, and there were no differences in income between groups, $t(40) = 1.09, p = .28$. The mean number of years of education of the sample was 14.7 years ($SD = 2.5$), which equates to approximately 3 years of

education post high school. There were no differences in education between groups, $t(40) = .79$, $p = .45$.

Further analyses were conducted to investigate possible group differences in terms of employment status, having health insurance and dental coverage, tobacco use, current use of medications, self-ratings of overall health and dental health, years since visiting the dentist, and presence of anxiety, mood, and substance use/abuse disorders. Analyses between the dental phobia group and the healthy comparison group showed that there were no significant group differences in participants' employment status (yes = 26 of 42), $\chi^2(1, N = 42) = 1.62$, $p = .34$ or having health insurance (yes = 39 of 42), $\chi^2(1, N = 42) = .36$, $p = 1.0$. Among those with insurance, more participants in the healthy comparison group report having dental coverage as a part of their insurance plan ($n = 15$) than those in the dental phobia group ($n = 8$), however this difference did not meet statistical significance (yes = 19 of 39), $\chi^2(1, N = 39) = 4.36$, $p = .054$.

Analyses between the two groups revealed that smoking cigarettes was more common in the healthy comparison group ($n = 11$) than in the dental phobia group ($n = 4$), although this difference did not meet statistical significance (yes = 15 of 42), $\chi^2(1, N = 39) = 5.01$, $p = .052$. Although a standard of reliability was not met (i.e., $p < .05$), the possibility of differences between groups on this variable is real. Participants in the dental phobia group reported taking more total medications ($M = 1.71$, $SD = 2.5$) than participants in the healthy comparison group ($M = .57$, $SD = .75$). The difference in total number of medications taken did not meet statistical significance, $t(40) = -2.0$, $p = .053$, however, similar to the tobacco variable, the possibility of a true difference in this variable is real. A detailed description of medications taken is provided in Table 4.

There was no difference between groups on the overall health self-rating ($M = 3.64$, $SD = .98$), $t(40) = .78$, $p = .44$. For the dental health self-rating, however, participants in the dental phobia group evaluated themselves more poorly ($M = 2.00$, $SD = .84$) than those in the healthy comparison group ($M = 2.95$, $SD = .18$), $t(40) = 3.05$, $p = .004$.

There was a significant difference in years since visiting the dentist between the healthy comparison group ($M = .82$, $SD = .32$) and the phobia group ($M = 7.24$, $SD = 6.95$), $t(33) = -3.44$, $p = .002$. For several participants ($n = 7$) in the healthy comparison group, data on the item, “How many years has it been since you visited the dentist?” were lost due to a technical error. All seven of these participants qualified for the study, so all of them had reported visiting the dentist in the last two years. Therefore, the mean and standard deviation of the healthy comparison group for this item should be interpreted with caution, but the results of the t test would likely remain significant if all data were present.

According to the ADIS-IV interviews, 100% of participants ($n = 21$) in the dental phobia group met criteria for specific phobia-dental/medical procedures. The second most common diagnosis was social phobia, followed by major depression, and PTSD. Many of the participants in the dental phobia study met criteria for multiple diagnoses, inclusive of dental phobia. For example, 14.3 % ($n = 6$) met criteria for two diagnoses, 9.5% ($n = 4$) met criteria for three diagnoses, 2.4% ($n = 1$) met criteria for four diagnoses, and 2.4% ($n = 1$) met criteria for five diagnoses. Of the participants in the healthy comparison group, none met criteria for any ADIS-IV diagnoses, as one of the exclusionary criteria was not having a history of anxiety, mood, or substance use/abuse disorders. See Table 5 for a complete listing of ADIS-IV diagnoses.

Primary Data Analyses

Self-report of distress tolerance. One-tailed t tests were conducted to assess possible differences in distress tolerance (i.e., DTS total score and subscale scores) between groups. Participants in the dental phobia group reported significantly lower levels of distress tolerance than those in the healthy comparison group. The effect size, calculated using eta squared, was .30. The actual difference in mean scores between the groups was large based on Cohen's guidelines (1988), where eta squared of .02-.12 is considered to be a small effect size, .13-.25 is considered a medium effect size, and .26 and greater is considered a large effect size.

All four of the subscales—Appraisal, Absorption, Regulation, and Tolerance—also were subjected to one-tailed t tests. The dental phobia group appraised themselves as being less able to cope with distressing situations than the healthy comparison group. Similarly, the dental phobia group reported being less able to avoid being completely absorbed by negative emotions than the healthy comparison group. The dental phobia group also reported a lesser ability to regulate negative emotions than the healthy comparison group. Finally, the dental phobia group reported a lower tolerance of negative emotions than the healthy comparison group. See Table 6 for DTS information.

Relation between distress tolerance and fear of pain, anxiety sensitivity, dental fear, and depression. Bivariate correlational analyses were conducted to determine the extent to which distress tolerance was related to self-reported fear of pain, anxiety sensitivity, dental fear, and depression. Due to a technical error, data for the BDI-II item number four, "Loss of pleasure," were missing for all participants. Values for this item were imputed using regression imputation (i.e., missing item responses were replaced with the mean of the other 20 items for each participant).

Total DTS scores were found to be significantly negatively correlated with scores on the FPQ-III, such that lower distress tolerance was related to higher fear of pain. Similarly, total DTS scores had a significant negative correlation with scores on the ASI-III, such that lower distress tolerance was related to higher anxiety sensitivity. Scores on the DTS also were significantly negatively related to scores on the DFS, such that lower distress tolerance was related to higher levels of dental fear. Finally, the DTS was found to be significantly negatively related to the BDI-II, such that higher depression correlated with lower levels of distress tolerance. Correlation results are shown in Table 7.

Exploratory Analyses

Self-report of fear of pain, anxiety sensitivity, dental fear, and depression. Given the finding of significant differences in distress tolerance between groups, it was deemed appropriate to examine differences in fear of pain, anxiety sensitivity, self-report of dental fear, and depression between the dental phobia group and the healthy comparison group, as these all are constructs that are conceptually relevant to distress tolerance. Two-tailed *t* tests were conducted to determine any differences between levels of fear of pain, anxiety sensitivity, dental fear, and depression between the dental phobia group and the healthy comparison group.

Total FPQ-III scores were significantly higher in the dental phobia group than in the healthy comparison group. All three subscales of the FPQ-III—Severe Pain, Minor Pain, and Medical/Dental pain—also were significantly higher in the dental phobia group than in the healthy comparison group. Similarly, ASI-III scores were significantly higher in the dental phobia group, than in the healthy comparison group. Not surprisingly, total DFS scores were significantly higher in the dental phobia group than in the healthy comparison group. All three subscales of the DFS—Physiological, Specific Stimuli, and Avoidance—were significantly

higher in the dental phobia group than in the healthy comparison group. The difference in BDI-II scores between the two groups did not meet statistical significance ($p = .093$), however the difference in means between the dental phobia group ($M = 9.6, SD = 2.1$) and the healthy comparison group ($M = 5.5, SD = 5.8$) is notable. There is a possibility that the two groups do indeed differ on this score. A chi-square analysis was performed to test whether the two groups differed in number of participants with BDI-II scores above the clinical cutoff for mild depression (i.e., total scores of 14 and above indicate mild depression; Beck et al., 1996). In the dental phobia group, 6 out of 21 participants had BDI-II scores at or above 14. In the healthy comparison group, 3 out of 21 participants had BDI-II scores at or above 14. No significant differences were found, $\chi^2(1, N = 39) = 1.27, p = .454$. See Table 8.

Self-report of gagging during dental visits. Recent findings suggest that more gagging during dental visits is associated with higher levels of dental fear (Randall, Shulman, Crout, & McNeil, 2014). Therefore, it was determined necessary to explore for differences in gagging frequency between the dental phobia group and the healthy comparison group. Participants in the dental phobia group reported having significantly more experience of gagging ($M = 2.43, SD = 1.36$) than the participants in the healthy comparison group ($M = 1.24, SD = .54$), $t(40) = -3.72, p = .001$.

Internal Consistency of Self-Report Measures

Each of the five self-report measures used in the current study were subjected to an internal consistency analysis to determine the reliability of the current sample's responses. The typical standards for interpreting Cronbach's alpha measures of internal consistency are as follows: $\alpha \geq 0.9$ = excellent, $0.7 \leq \alpha < 0.89$ = good, $0.6 \leq \alpha < 0.69$ = acceptable, $0.5 \leq \alpha < 0.59$ = poor, and $< .49$ = unacceptable (Kline, 2000).

Overall internal consistency values for self-report measures in the current sample were strong. Reliability of the DTS was excellent ($\alpha = .90$), which is consistent with previous research (Timpano et al., 2009; Vujanovic et al., 2012). The FPQ-III maintained excellent reliability ($\alpha = .96$), which is consistent with its development study (McNeil & Rainwater, 1998). Similarly, the ASI-III's reliability was excellent ($\alpha = .92$), which is similar to the alpha value obtained in its development study (Taylor et al., 2007). The DFS had excellent internal consistency ($\alpha = .98$), which also is consistent with its development study, if not slightly higher (Kleinknecht et al., 1973). Finally, excellent internal consistency ($\alpha = .91$) was obtained from scores on the BDI-II, which is similar to recent uses of the measure (Titov et al., 2011).

Discussion

Distress Tolerance and Dental Phobia

As predicted in the first hypothesis, participants with dental phobia had lower levels of distress tolerance in comparison to participants in the healthy comparison group on the total DTS score and all four DTS subscales (i.e., Appraisal, Absorption, Regulation, and Tolerance). Adults who volunteered to enroll in a treatment study for people with dental phobia had lower levels of total distress tolerance than a group of age-, sex-, and income-matched healthy participants. This difference was expected yet novel, as low distress tolerance has been shown to exist in other anxiety disorders (Marshall-Berenz et al., 2010; Timpano et al., 2009), but no prior research has examined the role of distress tolerance in dental phobia. Lower levels of distress tolerance may contribute to the pathogenesis and maintenance of symptomatology in patients with dental phobia, including avoidance of dental care.

According to Simons and Gaher (2005), individuals with low distress tolerance: (a)

appraise their feelings of distress as unacceptable and their ability to cope with distress as inadequate, (b) become completely absorbed in their feelings of distress, (c) have a strong desire to regulate feelings of distress by escaping the negative emotions, and (d) have a difficult time tolerating negative emotions in general. These components of distress tolerance—appraisal, absorption, regulation, and tolerance—can be applied to dental phobia. When dental patients with lower distress tolerance associate dental visits with negative emotions (e.g., fear of pain, disgust, helplessness), they may appraise these feelings as being unacceptable and difficult or impossible with which to cope (appraisal). Dental patients with low distress tolerance can become absorbed in their feelings of fear of pain and anxiety (absorption), and desire to regulate their negative emotions via avoidance or engaging in safety behavior, such as self-medication (regulation). In general, dental patients with low distress tolerance struggle to tolerate negative emotions associated with dental care (tolerance).

Dental phobia participants' total DTS scores ranged from 18 to 73 (out of a total of 75). This large range indicates that although the group mean score was lower than that of the healthy comparison group, not all individual scores were low. It is possible that, like other components of dental phobia, there are individual differences in distress tolerance, which lends credence to the notion that dental phobia is a heterogeneous condition. See Table 9 for a frequency table of DTS scores.

Relation of Distress Tolerance and Other Emotional Constructs

The second hypothesis of the current study was that that total DTS scores would be negatively correlated with scores on the ASI-III, FPQ-III, DFS, and BDI-II. All of these hypothesized correlations were confirmed. Participants' scores on the DTS had a strong negative correlation with their scores on the FPQ-III. Given that fear is distressing to most people, it is not

surprising that individuals with lower distress tolerance reported more fear of pain; painful stimuli may be particularly noxious to individuals with low distress tolerance.

Participants' scores on the DTS had a strong negative correlation with their scores on the ASI-III. This correlation supports Bernstein et al's (2009) model, in which anxiety sensitivity is a lower-order component of distress tolerance; if distress tolerance demonstrates an individual's ability to tolerate negative emotions in general, anxiety sensitivity can be thought of as an individual's tolerance of fear (Schmidt et al., 2011). See Figure 1.

Participants' scores on the DTS were negatively correlated with scores on the DFS. Given that participants with dental phobia had lower levels of distress tolerance than those without dental phobia, this result is not surprising, but it strengthens the original finding by confirming it with a self-report measure.

Participants' scores on the DTS were negatively correlated with their scores on the BDI-II, such that lower distress tolerance was associated with higher levels of depression. Clen, Mennin, and Fresco (2011) suggested that distress tolerance is implicated in three crucial components of major depressive disorder: rumination, emotional suppression, and behavioral avoidance. Individuals with lower distress tolerance perceive unhappy emotions as "bad" or "negative," and their attempts at trying to remedy the negative emotions result in depressive rumination; individuals with lower distress tolerance also view themselves as being unable to cope with negative emotions, so they suppress them (resulting in flattened affect), and avoid activities that they perceive could cause negative feelings (resulting in behavioral avoidance).

Perhaps the most parsimonious interpretation of these findings is that individuals with low distress tolerance have poor emotion regulation skills, and therefore have difficulty modulating their fears of pain, fears of anxiety, fear of dental care, as well as general negative

affect associated with depression. The high comorbidity rate with other psychological disorders in this sample certainly supports this notion; low distress tolerance pervades most anxiety and mood disorders, and it could be argued that dental phobia in this study serves as an exemplar of other emotionally-related psychopathology.

This simple explanation, however, is less satisfying when the uniqueness of dental phobia is considered. In most anxiety disorders, exposure to feared stimuli can cause a great deal of emotional distress and exhaustion, but rarely causes direct physical pain (e.g., person with social phobia giving a speech in front of a class, or an individual with OCD abstaining from engaging in a particular compulsion may be distressing and difficult, but will unlikely result in physical pain, discomfort, or tissue damage). When someone with dental phobia confronts the feared stimulus (i.e., visiting the dentist), there is a realistic possibility of experiencing physical pain and discomfort (Vassend, 1993). Accordingly, the current study's finding of a negative association between distress tolerance and fear of pain suggests the possibility that distress tolerance may play a role in dental phobia that is unique to stimuli involved in dentistry, particularly painful ones.

Prior research suggests that for many people, the ability to tolerate physical pain/discomfort is distinct from the ability to tolerate emotional distress (Bernstein et al., 2009; Schmidt et al., 2011). Given the strong correlation between distress tolerance and fear of pain in the present sample, it is possible that for individuals with dental phobia, distress tolerance and pain tolerance may be theoretically linked. Similar to how increased anxiety sensitivity can affect expectations of pain and reports of pain experience (Klages et al., 2006), it is possible that lowered distress tolerance leads an individual to have difficulty tolerating all negative emotions associated with dental care (e.g., disgust, sadness, helplessness, fear) and in turn affects pain

sensitivity (i.e., those with lower distress tolerance report experiencing more pain).

Other Differences Between Groups

Another important finding of the current study was that the rate of comorbidity with other psychological disorders in the dental phobia group was high. This finding is consistent with previous work citing dental phobia as being highly comorbid with other anxiety and mood disorders (Roy-Byrne et al, 1994; Starcevic & Bogojevic, 1997). Anecdotally, at least three of the five participants who met criteria for Social Phobia mentioned that their oral health contributed to their anxiety in social situations (i.e., self-conscious of smile, embarrassed when dining with friends), or that their social phobia contributed to their avoidance of dental visits (i.e., fear of negative evaluation by dentist or hygienist).

FPQ-III and ASI-III scores were higher in the dental phobia group than in the healthy comparison group. These findings are not unexpected, given that fear of pain is known to be the strongest predictor of dental fear (McNeil & Berryman, 1989), and anxiety sensitivity is associated with specific phobia and fearfulness (Reiss, 1991). As anticipated, DFS scores were significantly higher in the dental phobia group than in the healthy comparison group.

There was no statistically significant difference between groups in BDI-II scores. This finding is somewhat surprising, given that four of the dental phobia participants met criteria for major depressive disorder, and that depression often is comorbid with dental phobia (Boman, Lundgren, Berggren, & Carlsson, 2009). It is likely that the power of the current study was not high enough to detect significant differences in BDI-II scores between groups.

Although there were no differences between groups in regard to having health insurance, among those with health insurance, those in the dental phobia group were slightly less likely to have dental coverage than those in the healthy comparison group. It is possible that lack of dental

coverage contributed to fearful patients' dental avoidance. Some consumers may perceive dental care as inordinately expensive, and the fear of high cost of care may compound fears of pain and anxiety about dental treatment, making avoidance an even more likely option.

Participants with dental phobia reported more frequent gagging during dental visits than those in the healthy comparison group, which is consistent with Randall et al's (2014) finding. In fact, the difference in gagging between phobic and non-phobic participants bolsters Randall et al's (2014) original finding, as the fearful participants in the current study actually met criteria for dental phobia, as opposed to simply having higher scores on dental fear self-report measures, as in their study.

Clinical Implications

Taken together, the findings of the current study suggest that including a measure of distress tolerance in the treatment of dental phobia could enhance case conceptualization and treatment planning. Some patients may benefit from brief distress tolerance skill-building (see Linehan, 1993) as an adjunct to exposure therapy for dental phobia. Further, it is possible that targeting distress tolerance skills could be useful in the treatment of other specific phobias as well.

For oral health professionals, consideration should be given to behavioral and pharmacotherapeutic interventions to help those who may be less able to tolerate the distress of fear-evoking and painful situations in dental care. Additionally, oral health professionals should be aware of the high rates of comorbidity with other psychological disorders, and how these other behavioral disorders may exacerbate or even complicate the "vicious cycle" of dental fear (Armfield et al., 2007; Weinstein, 1990). For example, individuals with comorbid dental phobia and social phobia may be particularly sensitive to criticism about their oral health, and may feel

embarrassed about delaying dental care, thus avoiding care due to fear of pain, fear of negative evaluation, and embarrassment, while simultaneously feeling self-conscious about their oral appearance. Similarly, avoidance of dental care in individuals with comorbid dental phobia and major depression may be exacerbated by feelings of hopelessness and helplessness, which are hallmark symptoms of depression.

These results possibly could be extended to healthcare providers outside of dentistry and psychology. Any healthcare provider who works with patients encountering pain or painful procedures (e.g., otolaryngologists, physical therapists, chronic pain specialists) could benefit from being aware of the association of fear of pain and distress tolerance, such that in some patients, fear of pain and less ability to cope with negative emotions may be associated. Future research is needed to determine the relation, if any, between actual pain tolerance and distress tolerance.

Limitations

Reliance on self-report measures. One major limitation of this study was its reliance on self-report measures for all variables. Using behavioral measures would enhance the robustness and validity of findings.

Participant self-selection. Another limitation of the current study was participant self-selection. Those who self-selected to voluntarily participate in this study, particularly those in the dental phobia sample, may differ from other individuals with dental phobia. Those in the dental phobia sample were a part of a volunteer group in a treatment for dental phobia. It is possible that participants with the most severe dental phobia did not participate due to their fear.

Small sample size/lack of diversity. The relatively small sample size and homogeneity of the participants presents a limitation. It was difficult to recruit a large sample of phobic

participants given the small community (Morgantown, WV), and the small sample size limits the strength of the findings. Further, the sample was racially and socioeconomically homogenous. The majority of the participants were Caucasian ($n = 36$, 85.7%). Additionally, the majority of the participants ($n = 25$, 57.1%) reported an annual family income of \$24,999 or fewer dollars. Although this ethnic/racial homogeneity limits the generalizability of the findings, it is consistent with the ethnic/racial make-up of West Virginia (i.e., 94% Caucasian, 6% other; U.S. Census Bureau, 2013). The current sample's household income was considerably lower than West Virginia's median household income of \$40,400 (U.S. Census Bureau, 2013). While this discrepancy in income between our sample and the state certainly limits generalizability, the lower income could be owed to the fact that 12 participants (28.6%) reported being students working toward either undergraduate or graduate degrees, and either not working or working only part-time while in school.

Missing Data

In the present study, there were two items with missing data for all participants: BDI-II Item #4, "Loss of Pleasure," and the demographics questionnaire item, "How many years has it been since you have visited a dentist?" For the latter item, data for the dental phobia participants were reconstructed from participant interviews that were a part of the larger study. Some of the data for this item from the healthy comparison participants were reconstructed from initial screening information, but not all were available. The reason for these missing data was a technical error during development of the questionnaire files on MediaLab (Jarvis, 2013). While this technical error did not cause major problems in the current study, it led the authors to consider the benefits and limitations of using a computer-based data collection model, such as MediaLab.

Benefits of using MediaLab included elimination of paper files, ease of saving and backing up data, and time saved during data entry. The main challenges of using MediaLab were issues with file configuration, which made transferring the questionnaire files from one computer (or external hard drive) to another, difficult and time consuming. Additionally, development of the questionnaires on MediaLab required some knowledge of computer programming, was time consuming, and it was easy to make small errors that caused subsequent missing data. Finally, although most participants had no problem using a computer to answer questions, two participants had difficulty using a computer and required a great deal of assistance from the research assistant when answering questions. Despite these limitations, prior research indicates that paper and pencil tests are associated with a higher number of missing items than computer-based surveys (Randall, McNeil, Crout, Weyant, & Marazita, 2013).

Future Research

Because distress tolerance is a relatively novel concept in the psychopathology literature, and quite novel in the dental phobia literature, opportunities for future research abound. Future work should elucidate possible distinctions between distress tolerance and pain tolerance, as well as other constructs. A better understanding of these constructs could aid in treatment development. For example, if it is found that distress tolerance and pain tolerance are separate but related constructs, then targeting distress tolerance could make uncomfortable medical/dental procedures more tolerable for patients who struggle to cope with negative emotions.

Any future work in the area of distress tolerance would benefit from both self-report and behavioral measures. Examples of behavioral measures of distress tolerance include frustration induction tasks (see Gronwall & Sampson, 1974; Quinn et al., 1996) or CO₂-enriched air exposures, which cause physiological changes that mimic feelings of anxiety and panic (e.g.,

Brown et al., 2005; Zvolensky, Eifert, Lejuez, & McNeil, 1999). The inclusion of behavioral measures is of particular importance in the case of comparing distress tolerance and pain tolerance, as pain tolerance is typically measured using a behavioral pain task (e.g., algometer, see Rainwater & McNeil, 1991). Including behavioral measures also would enhance construct validity.

Further understanding distress tolerance has the potential to aid in treatment development for individuals with dental phobia and other anxiety disorders. The utility of existing treatments addressing distress tolerance should be assessed for their efficacy in increasing distress tolerance in dental phobia. Dental care-related fear and anxiety remain as a public health issue affecting millions of individuals in the USA alone. As such, the translation of research findings to clinical practice should be maximized.

Conclusions

The primary finding of the current study was that individuals with dental phobia had significantly lower distress tolerance compared to a group of age-, sex-, and income-matched healthy adults with no anxiety, mood, or substance use/abuse disorders. Correlation analyses demonstrated significant negative associations between distress tolerance, fear of pain, anxiety sensitivity, self-reports of dental fear, and depression. Exploratory analyses revealed that the dental phobia group reported significantly higher levels of fear of pain, anxiety sensitivity, depression, and frequency of gagging during dental visits.

Although the particular path by which distress tolerance affects dental phobia remains to be elucidated, this study clarified that distress tolerance likely has a role in the pathogenesis and/or maintenance of dental phobia. Future research should delineate differences between distress tolerance and pain tolerance in anxiety disorder and other populations

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Table 1

Exclusionary Criteria for Dental Phobia Group

Exclusionary Criteria	
1.	Under the age of 21
2.	Been to the dentist in the last year
3.	History of substance abuse or psychosis, or currently suicidal
4.	If female, currently pregnant or breastfeeding, or planning to become pregnant
5.	Taking medication that may interact with study medication

Table 2

Exclusionary Criteria for Healthy Comparison Group

Exclusionary Criteria	
1.	Under the age of 21
2.	Not been to the dentist in the last two years
3.	Avoids dental visits due to fear
4.	History of any psychological disorders
5.	If female, currently pregnant or breastfeeding, or planning to become pregnant

Table 3

Total Number/Mean (and Percentages) for Demographic Characteristics

	Group	
	Dental Phobia <i>n</i> = 21	Healthy Comparison <i>n</i> = 21
Sex		
Female	9 (42.86%)	9 (42.86%)
Male	12 (57.14%)	12 (57.14%)
Age	36.63 (14.92)	35.70 (14.8)
Race		
Caucasian	17 (81.0%)	19 (90.4%)
African American	2 (9.5 %)	1 (4.8%)
Asian	1 (4.8%)	-
Multiracial	1 (4.8%)	1 (4.8%)
Relationship Status		
Single	4 (19.1%)	12 (57.1%)
Separated/divorced/widowed	8 (38.1%)	4 (19.1%)
Married/cohabitate	8 (38.1%)	4 (19.1%)
Partner, no cohabitation	1 (4.8%)	1 (4.8%)
Income		
≤\$9,999	8 (38.1%)	8 (38.1%)
\$10,000-24,999	6 (28.6%)	3 (14.3%)
\$25,000-\$49,999	3 (14.3%)	1 (4.8%)
\$50,000-\$99,999	2 (9.5%)	7 (33.3%)
≥\$100,000	2 (9.5%)	2 (9.5%)
Education (12 = HS diploma)	15.05 (2.5)	14.43 (2.6)

Table 4

Frequency (percentage) of participants taking medications

	Group	
	Dental Phobia	Healthy Comparison
Acetaminophen (Tylenol)	1 (4.8%)	-
Albuterol (Rescue Inhaler)	3 (14.3%)	1 (4.8%)
Allergy x 1	-	1 (4.8%)
Allergy x 2	2 (9.5%)	-
Antidepressant	1 (4.8%)	1 (4.8%)
Aspirin	2 (9.5%)	-
Benzodiazapene	1 (4.8%)	-
Birth control	4 (19.0%)	2 (9.5%)
Blood pressure x 1	1 (4.8%)	4 (19.0%)
Blood pressure x 2	1 (4.8%)	-
Blood pressure x 3	1 (4.8%)	-
Cholesterol	-	1 (4.8%)
Diabetes medication	1 (4.8%)	-
Ibuprofen (Motrin)	2 (9.5%)	-
Omeprazole	2 (9.5%)	1 (4.8%)
Opioid	1 (4.8%)	-
Migraine medication x 1	-	-
Migraine medication x 2	1 (4.8%)	-
Sleep aid	1 (4.8%)	-
Stimulant	1 (4.8%)	-
Thyroid medication	2 (9.5%)	1 (4.8%)

Table 5

Frequency (and percentages) of ADIS-IV Diagnoses in Dental Phobia Group

ADIS Diagnosis	Frequency (%)
Specific phobia-Dental	21 (100%)
Social Phobia	5 (23.81%)
Major Depression	4 (19.04%)
PTSD	3 (14.28%)
Specific phobia-Needle, blood, illness	2 (9.52%)
Specific phobia-Other (e.g., water)	2 (9.52%)
Panic Disorder	2 (9.52%)
GAD	2 (9.52%)
OCD	1 (4.76%)
Somatization Disorder	1 (4.76%)
Agoraphobia	-
Dysthymia	-
Psychosis	-
Hypochondriasis	-
Bipolar Disorder	-

Table 6

Means (and Standard Deviations) and results of t tests for DTS

	Group		<i>t</i>	<i>df</i>
	Dental Phobia <i>n</i> = 21 <i>M (SD)</i>	Healthy Comparison <i>n</i> =21 <i>M (SD)</i>		
DTS Total	46.1 (15.4)	62.6 (9.4)	4.17**	40
DTS Subscale Average	3.0 (1.0)	4.1 (.7)	4.18**	40
Absorption	2.8 (1.2)	3.9 (1.0)	3.29**	40
Regulation	3.0 (1.2)	3.9 (.9)	2.83**	40
Appraisal	3.3 (1.2)	4.4 (.7)	3.60**	40
Tolerance	3.0 (1.0)	4.2 (.8)	4.35**	40

*p < .05**p < .01

Table 7

Summary of Intercorrelations on the DTS, FPQ-III, ASI-III, DFS, and BDI-II

Measure	DTS	FPQ-III	ASI-III	DFS	BDI-II
DTS					
FPQ-III	-.59**				
ASI-III	-.76**	.58**			
DFS	-.57**	.60**	.39*		
BDI-II	-.69**	.37*	.70**	.22	

* $p < .05$ ** $p < .01$

Table 8

Means (and Standard Deviations and results of t tests for FPQ-III, ASI-III, DFS, and BDI-II

	Group		<i>t</i>	<i>df</i>
	Dental Phobia	Healthy		
	<i>n</i> = 21	Comparison <i>n</i> =21		
	M (SD)	M (SD)		
FPQ-III	84.0 (29.2)	52.8 (14.3)	-4.39**	40
Severe	29.3 (11.9)	20.4 (7.9)	-2.87**	40
Minor	20.4 (7.9)	16.5 (4.7)	-2.22*	40
Medical/Dental	29.1 (8.7)	13.5 (3.4)	-7.63**	40
ASI-III	13.8 (11.2)	7.1 (5.7)	-2.45*	40
DFS Total	75.9 (10.0)	25.4 (6.4)	-19.44**	40
Physiological	16.4 (4.4)	6.5 (1.8)	-9.52**	40
Specific Stimuli	25.6 (4.9)	9.2 (3.9)	-11.91**	40
Avoidance	29.5 (4.9)	8.4 (1.1)	-19.45**	40
BDI-II	9.6 (9.4)	5.5 (5.8)	-1.72 ^a	40

* $p < .05$

** $p < .01$

^a $p = .093$

Table 9

Frequency table of total DTS scores

Score	Group		Healthy Comparison	
	Dental Phobia			
	Frequency	Cumulative Percent	Frequency	Cumulative Percent
18	1	4.8	-	-
26	1	9.5	-	-
27	1	14.3	-	-
31	1	19.0	-	-
32	2	28.6	-	-
34	1	33.3	-	-
36	1	38.1	-	-
42	1	42.9	-	-
44	-	-	1	4.8
45	1	47.6	-	-
47	-	-	2	14.3
49	2	57.1	-	-
52	1	61.9	1	19.0
53	1	66.7	-	-
55	-	-	1	23.8
57	1	71.4	2	33.3
60	1	76.2	-	-
61	-	-	2	42.9
62	1	81.0	1	47.6
63	1	85.7	-	-
64	2	95.2	-	-
68	-	-	5	71.4
69	-	-	2	81.0
70	-	-	1	85.7
73	1	100.0	-	-
74	-	-	2	95.2
75	-	-	1	100.0

Figure 1

Hierarchical model proposed by Bernstein et al (2009) and model illustration adapted from Schmidt et al. (2011)

Figure 2

Dental Phobia Group Participant Flow

Figure 3

Healthy Comparison Group Participant Flow

Appendix A
Reading Comprehension Test

When the participant arrived at this item, the researcher said, “Please read this text aloud. It’s something we ask all participants to do.”

Please select the number that best corresponds to how much you agree with each item. If any items concern something that you have never experienced (e.g., fainting in public) answer on the basis of how you think you might feel *if you had* such an experience. Otherwise, answer all items on the basis of your own experience. Be careful to circle only one number for each item and please answer all items.

Appendix B

Acknowledgement of Payment-Dental Phobia Group

Help for Patients Who Avoid Dental Care: Learning to be More Comfortable**Acknowledgement of Payment**

Name (print): _____

Address (print): _____

City, State, Zip (print): _____

Social Security Number: _____

My signature below indicates that I have received \$25.00 (twenty-five dollars) in cash in association with my participation in the research study on “**Help for Patients Who Avoid Dental Care: Learning to be More Comfortable**”

Signature: _____

Date: _____

Witness: _____

Appendix C

Acknowledgement of Payment-Healthy Comparison Group

“Health and Mental Health” (Healthy Comparison Group)**Acknowledgement of Payment**

Name (print): _____

Address (print): _____

City, State, Zip (print): _____

My signature below indicates that I have received \$25.00 (twenty-five dollars) in cash in association with my participation in the research study on **“Health and Mental Health”**

Signature: _____

Date: _____

Witness: _____

Appendix D
Distress Tolerance Scale

Directions: think of times that you feel distressed or upset. Select the item from the menu that best describes your beliefs about feeling distressed or upset.

	Strongly agree	Mildly agree	Agree and disagree equally	Mildly disagree	Strongly disagree
1. Feeling distressed or upset is unbearable to me.	1	2	3	4	5
2. When I feel distressed or upset, all I can think about is how bad I feel.	1	2	3	4	5
3. I can't handle feeling distressed or upset.	1	2	3	4	5
4. My feelings of distress are so intense that they completely take over.	1	2	3	4	5
5. There's nothing worse than feeling distressed or upset.	1	2	3	4	5
6. I can tolerate being distressed or upset as well as most people.	1	2	3	4	5
7. My feelings of distress or being upset are not acceptable.	1	2	3	4	5
8. I'll do anything to avoid feeling distressed or upset.	1	2	3	4	5
9. Other people seem to be able to tolerate feeling distressed or upset better than I can.	1	2	3	4	5
10. Being distressed or upset is always a major ordeal for me.	1	2	3	4	5
11. I am ashamed of myself when I feel distressed or upset.	1	2	3	4	5
12. My feelings of distress or being upset scare me.	1	2	3	4	5
13. I'll do anything to stop feeling distressed or upset.	1	2	3	4	5
14. When I feel distressed or upset, I must do something about it immediately.	1	2	3	4	5
15. When I feel distressed or upset, I cannot help but concentrate on how bad the distress really feels.	1	2	3	4	5

Appendix E
Fear of Pain Questionnaire-III (FPQ-III)

The items listed below describe painful experiences. Please look at each item and think about how FEARFUL you are of experiencing the PAIN associated with each item. If you have never experienced the PAIN of a particular item, please answer on the basis of how FEARFUL you expect you would be if you had such an experience. Fill in one circle for each item below to rate your FEAR OF PAIN in relation to each event.

	Not At All	A Little	A Fair Amount	Very Much	Extreme
1. Being in an automobile accident.	☐	☐	☐	☐	☐
2. Biting your tongue while eating.	☐	☐	☐	☐	☐
3. Breaking your arm.	☐	☐	☐	☐	☐
4. Cutting your tongue licking an envelope.	☐	☐	☐	☐	☐
5. Having a heavy object hit you in the head.	☐	☐	☐	☐	☐
6. Breaking your leg.	☐	☐	☐	☐	☐
7. Hitting a sensitive bone in your elbow – your “funny bone.”	☐	☐	☐	☐	☐
8. Having a blood sample drawn with a hypodermic needle.	☐	☐	☐	☐	☐
9. Having someone slam a heavy car door on your hand.	☐	☐	☐	☐	☐
10. Falling down a flight of concrete stairs.	☐	☐	☐	☐	☐
11. Receiving an injection in your arm.	☐	☐	☐	☐	☐
12. Burning your fingers with a match.	☐	☐	☐	☐	☐
13. Breaking your neck.	☐	☐	☐	☐	☐
14. Receiving an injection in your hip/buttocks.	☐	☐	☐	☐	☐
15. Having a deep splinter in the sole of foot probed and removed with tweezers.	☐	☐	☐	☐	☐

	Not At All	A Little	A Fair Amount	Very Much	Extreme
16. Having an eye doctor remove a foreign particle stuck in your eye.	☐	☐	☐	☐	☐
17. Receiving an injection in your mouth.	☐	☐	☐	☐	☐
18. Being burned on your face by a lit cigarette.	☐	☐	☐	☐	☐
19. Getting a paper-cut on your finger.	☐	☐	☐	☐	☐
20. Receiving stitches in your lip.	☐	☐	☐	☐	☐
21. Having a foot doctor remove a wart from your foot with a sharp instrument.	☐	☐	☐	☐	☐
22. Cutting yourself while shaving with a sharp razor.	☐	☐	☐	☐	☐
23. Gulping a hot drink before it has cooled.	☐	☐	☐	☐	☐
24. Getting strong soap in both your eyes while bathing or showering.	☐	☐	☐	☐	☐
25. Having a terminal illness that causes you daily pain.	☐	☐	☐	☐	☐
26. Having a tooth pulled.	☐	☐	☐	☐	☐
27. Vomiting repeatedly because of food poisoning.	☐	☐	☐	☐	☐
28. Having sand or dust blow into your eyes.	☐	☐	☐	☐	☐
29. Having one of your teeth drilled.	☐	☐	☐	☐	☐
30. Having a muscle cramp.	☐	☐	☐	☐	☐

Appendix F
Anxiety Sensitivity Index-III (ASI-III)

Please circle the number that best corresponds to how much you agree with each item. If any items concern something that you have never experienced (e.g., fainting in public) answer on the basis of how you think you might feel *if you had* such an experience. Otherwise, answer all items on the basis of your own experience. Be careful to circle only one number for each item and please answer all items.

	Very Little	A little	Some	Much	Very much
1. It is important for me not to appear nervous.	0	1	2	3	4
2. When I cannot keep my mind on a task, I worry that I might be going crazy.	0	1	2	3	4
3. It scares me when my heart beats rapidly.	0	1	2	3	4
4. When my stomach is upset, I worry that I might be seriously ill.	0	1	2	3	4
5. It scares me when I am unable to keep my mind on a task.	0	1	2	3	4
6. When I tremble in the presence of others, I fear what people might think of me.	0	1	2	3	4
7. When my chest feels tight, I get scared that I won't be able to breathe properly.	0	1	2	3	4
8. When I feel pain in my chest, I worry that I am going to have a heart attack.	0	1	2	3	4
9. I worry that other people will notice my anxiety.	0	1	2	3	4
10. When I feel "spacey" or spaced out I worry that I may be mentally ill.	0	1	2	3	4
11. It scares me when I blush in front of people.	0	1	2	3	4
12. When I notice my heart skipping a beat, I worry that there is something seriously wrong with me.	0	1	2	3.	4
13. When I begin to sweat in a social situation, I fear people will think negatively of me.	0	1	2	3	4
14. When my thoughts seem to speed up, I worry that I might be going crazy.	0	1	2	3	4
15. When my throat feels tight, I worry that I could choke to death.	0	1	2	3	4
16. When I have trouble thinking clearly, I worry that there is something wrong with me.	0	1	2	3	4
17. I think it would be horrible for me to faint in public.	0	1	2	3	4
18. When my mind goes blank, I worry there is something terribly wrong with me.	0	1	2	3	4

Appendix G
Dental Fear Survey

INSTRUCTIONS: The items in this questionnaire refer to various situations, feelings, and reactions related to dental work. Please rate your feeling or reaction on these items by using the following scales. Fill in the appropriate circle which most closely corresponds to your reaction.

	Never	Once or twice	A few times	Often	Nearly every time
1. Has fear of dental work ever caused you to put off making an appointment?	☐	☐	☐	☐	☐
2. Has fear of dental work ever caused you ___ to cancel or not appear for an ___ appointment?	☐	☐	☐	☐	☐

When having dental work done:

	Not At All	A little	Somewhat	Much	Very much
3. My muscles become tense...	☐	☐	☐	☐	☐
4. My breathing rate increases...	☐	☐	☐	☐	☐
5. I perspire...	☐	☐	☐	☐	☐
6. I feel nauseated and sick to my stomach...	☐	☐	☐	☐	☐
7. My heart beats faster...	☐	☐	☐	☐	☐

Following is a list of things, and situations that many people mention as being somewhat anxiety or fear producing. Please rate how much fear, anxiety, or unpleasantness each of them causes you. (If it helps, try to imagine yourself in each of these situations and describe what your common reaction is.)

	Not At All	A little	Somewhat	Much	Very much
8. Making an appointment for dentistry.	☐	☐	☐	☐	☐
9. Approaching the dentist's office.	☐	☐	☐	☐	☐
10. Sitting in the waiting room.	☐	☐	☐	☐	☐
11. Being seated in the dental chair.	☐	☐	☐	☐	☐
12. The smell of the dentist's office.	☐	☐	☐	☐	☐
13. Seeing the dentist walk in.	☐	☐	☐	☐	☐
14. Seeing the anesthetic needle.	☐	☐	☐	☐	☐
15. Feeling the needle injected.	☐	☐	☐	☐	☐
16. Seeing the drill.	☐	☐	☐	☐	☐
17. Hearing the drill.	☐	☐	☐	☐	☐
18. Feeling the vibrations of the drill.	☐	☐	☐	☐	☐
19. Having your teeth cleaned.	☐	☐	☐	☐	☐
20. All things considered, how fearful are you of having dental work done?	☐	☐	☐	☐	☐

Appendix H
Demographic and General Dental Information Interview

Note: For all questions, 77= Refuse to answer; 88= Not applicable; 99 = Missing data; Text in *italics* are instructions for interviewer

1. Date (MM/DD/YEAR)	___ ___ / ___ ___ / ___ ___ ___
2. Subject ID	___ ___ ___
3. Interviewer (first and last name)	_____
4. Date of birth (MM/DD/YEAR)	___ ___ / ___ ___ / ___ ___ ___
5. Sex 01=Male 02= Female	___ ___
6. Are you of Hispanic, Latino, or Spanish origin? Yes, Hispanic= 01 No, white, non-Hispanic = 02	___ ___
7. What is your race? Please select all that apply: American Indian /Alaska Native 01 Asian 02 Black/African American 03 Caucasian/white 04 Pacific Islander 05 Other 06 Not applicable 88 Missing data 99	___ ___ ___ ___ ___ ___ ___ ___

8. What is your relationship status? Divorced 01 Live-in partner 02 Married 03 Separated 04 Significant other, not living together 05 Single 06 Widowed 07	— —
9. Number of years of education? High School Diploma = 12 College Degree = 16	— —
10. What is your current job or occupation status? Working full-time 01 Working part-time 02 Looking for work-unemployed 03 Retired 04 Disabled or unable to work—no public assistance 05 Disabled or unable to work—receives public assistance 06 Other 07 <i>If answer to 10 is 01, 02, ASK 10a .</i> <i>If answer to 10 is 04, 05, 06, ASK 10b.</i>	— —
10a. What is your job or occupation? (<i>SKIP TO 11</i>)	_____
10b. What was your job or occupation?	_____
11. What is your annual household income? (combined income for you and partner, if any) Fewer than 10,000 01 10,000-14,999 02 15,000-24,999 03 25,000-34,999 04 35,000-49,999 05 50,000-74,999 06 75,000-99,999 07 100,000 or more 08	— —

[illegible]

20. What procedures, if any, were conducted? <i>Select all that apply.</i> Cleaning 01 X-Rays 02 Filling(s) 03 Extraction(s) 04 Root canal 05 Crown 06 Veneers 07 Orthodontia 08 Other 09	— — — — — — — —
21. How much a problem have you had with gagging during dental visits? Never 01 Sometimes 02 Often 03 Most of the time 04 Almost always/always 05	— —
22. In general, my dental health is Poor 01 Fair 02 Good 03 Very good 04 Excellent 05	— —
23. In general, my overall health is Poor 01 Fair 02 Good 03 Very good 04 Excellent 05	— —
24. Do you currently use tobacco? YES = 01 NO = 02 <i>If NO (02), answer 24a.</i> <i>If YES (01), SKIP TO 25.</i> 24a. Have you ever used tobacco? YES = 01 NO = 02 <i>SKIP to 28.</i>	— — — —

25. What type of tobacco do you use? <i>Mark all that apply.</i> Cigarettes 01 Chewing tobacco 02 Cigars 03 Pipe 04 Other 04	— — — — — —
26. How often do you use tobacco? Fewer than once per month 01 1-2 times per week 02 6-7 times per week 03 1-5 times per day 04 6-10 times per day 05 11+ times per day 06	— —
27. At what age did you start using tobacco?	— —
28. How much dental pain do you currently have? None 01 Some 02 Moderate 03 A lot 04 Extreme 05	— —
29. Are you currently experiencing any pain other than dental pain? YES = 01 NO = 02 <i>If YES (01), answer 29a.</i> <i>If NO (02), SKIP TO 31</i>	— —

29a. What type of pain do you have? (<i>Mark all that apply</i>) Fibromyalgia 01 Back 02 Head/migraine 03 Abdominal 04 Lower extremity 05 Face 06 Upper extremity 07 Chest 08 Pelvic 09 Generalized (non-fibromyalgia) 11 Other 12	— — — — — —
30. Are you currently significant non-dental pain that has lasted 6 months or more? YES = 01 NO = 02	— —
31. Have you ever experienced non-dental pain that has lasted 6 months or more? YES = 01 NO = 02	— —

For the interviewer:

Additional relevant notes:

Appendix I

Dental Phobia Group Newspaper Advertisement

Do you avoid dental care due to fear?

WVU researchers seek to help people who avoid dental care, and to learn more about treatment of dental fear and phobia

If you have avoided going for dental care for at least 1 year, you may be eligible for this research study. Participation in this project ("Help for Patients who Avoid Dental Care: Learning to be More Comfortable") involves interviews, surveys, and a specialized dental fear treatment program.

- **Includes 4 visits, a study medication, and learning ways to cope during dental care**
- **Financial compensation provided for time and travel to WVU's School of Dentistry, with free parking, but no free dental treatment**
- **Must be at least 21 years old**
- **Must have avoided the dentist for at least 1 year due to fear**

Interested? Call (304) 685-5501 or email wwuanxietylab@gmail.com to see if you are eligible for this study

IRB Approval on file
Daniel W. McNeil, Ph.D., Principal Investigator
Department of Psychology
Eberly College of Arts & Sciences
West Virginia University

Appendix J
Phone and Email Screening Questions

Dear _____,

Thank you for your interest in our study. We can arrange your participation around your schedule. There are a few questions you need to answer to see if you are qualified for the study:

1. Do you have a history of psychological disorders (e.g., depression, anxiety, psychosis, substance abuse)?
2. When was the last time you went to the dentist?
3. Do you avoid dental visits due to fear?
4. How old are you?
5. If you are female, are you pregnant, breastfeeding, or planning to become pregnant?

Thanks,

Sarah Hayes

(researcher phone number)

Appendix K

Dental Phobia Group Consent Form

Human Research Protocol
More Than Minimal Risk Form
(With HIPAA)

**More Than Minimal Risk
Consent and HIPAA Form
Patients**

Principal Investigator **Daniel W. McNeil, Ph.D.**
 Department **Arts & Sciences - Psychology**
 Protocol Number **1310112539**
 Study Title **Help for Patients who Avoid Dental Care: Learning to be More Comfortable**
 Co-Investigator(s) **Bryan D. Weaver, DDS, MD; Cristian Sirbu, Ph.D.; Gagan Kaushal, Ph.D.; Aaron Metzger, Ph.D.; Sarah E. Hayes, Cameron L. Randall, Laura Quentin, Patricia Hopkins**
 Sponsor (if any) **West Virginia Clinical & Translational Science Institute and the Indiana Clinical & Translational Sciences Institute**

Contact Persons

In the event you experience any side effects or injury related to this research, or if you have any questions, concerns, or complaints about this research, you can contact Dr. Daniel W. McNeil at 304/293-1712.

For information regarding your rights as a research subject, to discuss problems, concerns, or suggestions related to the research, to obtain information or offer input about the research, contact the Office of Research Compliance at (304) 293-7073.

In addition if you would like to discuss problems, concerns, have suggestions related to research, or would like to offer input about the research, contact the Office of Research Integrity and Compliance at 304-293-7073.

Introduction

You, _____, have been asked to participate in this research study, which has been explained to

you by _____. This study is being conducted by Daniel W. McNeil, Ph.D., Bryan D. Weaver, DDS, MD; Cristian Sirbu, Ph.D.; Gagan Kaushal, Ph.D.; Aaron Metzger, Ph.D.; Sarah E. Hayes, Cameron L. Randall, Laura Quentin, and Patricia Hopkins at West Virginia University, in conjunction with Co-Principal Investigator Andrew Goddard, M.D., of Indiana University, with funding provided by the West Virginia Clinical & Translational Science Institute and the Indiana Clinical & Translational Sciences Institute.

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Human Research Protocol
More Than Minimal Risk Form
(With HIPAA)

Purpose(s) of the Study

This purpose of this pilot research study is to determine if the use of low dose D-Cycloserine improves standard exposure treatment for dental phobia, to learn more about the best ways to help people with dental phobia so that they can go to dental appointments. WVU expects to enroll approximately 20 adults with dental phobia. Indiana University also will recruit a total of approximately 20 adults with dental phobia. A total of 40 adults from both sites are expected to participate in this study.

Description of Procedures

There are four appointments involved in this study.

1. The first appointment involves approximately 2½ hours and will be a comprehensive evaluation involving interviews, questionnaires, and blood tests (as described below).
2. Approximately one week later, the second appointment will take place, and will last approximately 2 hours; a blood test will be conducted (as described below). After taking either the study medication (D-Cycloserine) or placebo (like a sugar pill), the treatment will involve a psychological method known as "exposure" which will involve you experiencing and learning to cope with anxiety associated with a dental environment (e.g., sitting in a dental chair), and also viewing film clips of different dental procedures, to help prepare you for receiving procedures like them in the future.
3. Approximately one week later, the third appointment will take place, and will last approximately 2 hours; a blood test will be conducted (as described below). After taking either the study medication (D-Cycloserine) or placebo (like a sugar pill), the treatment will involve a psychological "exposure," although this one will involve you experiencing and learning to cope with anxiety associated with your sitting in a dental chair, and receiving a one-hour cleaning of your teeth along with an examination, to help prepare you for receiving dental procedures in the future. Any findings or suspected dental conditions will be reported to you in writing.
4. Approximately one week later, the fourth and final appointment will take place, and will last approximately 2½ hours, and will be a comprehensive evaluation (as described below), interviews and questionnaires.

-- Study Medication and Psychological Exposure

This study involves receiving either a drug (i.e., D-Cycloserine) or a placebo (like a sugar pill), along with a standard treatment, psychological exposure, which is a systematic way of learning to handle situations that cause fear or anxiety. You will receive only two capsules of the medication, one at each of the psychological exposure sessions.

The D-Cycloserine is being used in an investigational way, in an attempt to enhance the learning that occurs during the psychological exposure treatment. It is not known whether this new experimental way of using this medication will be of help, but the psychological exposure therapy is considered the most effective treatment for phobias such as dental phobia.

It is not clear at the present time whether exposure would be more effective with or without the D-Cycloserine. For this reason, whether you receive the active drug (i.e., D-Cycloserine) or the placebo will be based upon chance using a method of selection called randomization (like flipping a coin); your chances of receiving the experimental therapy are approximately the same as that of receiving current therapy. You will not know whether or not you are receiving the active medication or the placebo and neither will the hygienists, dentists, and psychologists who are working directly

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with you.

-- Blood Tests

About 3 teaspoons of blood will be drawn at the first appointment, if needed, and about 6 teaspoons in the second appointment, and about 3 teaspoons in the third appointment. A total of about 9 teaspoons will be drawn during the course of the study (with an additional 3 teaspoons if needed at the first session).

The study physician may determine that you need to have blood tests to insure that your medical status is appropriate for the administration of the study medication. If that is the case, then additional blood will be drawn during your 1st appointment.

-- Alcobreath and Pregnancy Tests

Prior to sessions 2 and 3, you will be given an Alcobreath test to assess for the presence of alcohol in your system. If you are female, prior to sessions 2 and 3, a pregnancy test will be conducted on a urine sample, to insure that you are not pregnant.

-- Questionnaires

You will be asked to complete 8 questionnaires during the two evaluation appointments (i.e., 1st and 4th appointments.), requiring approximately 45 minutes, which are included as part of the 2½ hour evaluation sessions. You do not have to answer all the questions. You will have the opportunity to see the questionnaires before signing this consent form.

-- Videotaping

The interviews and the two treatment sessions will be videotaped so that their reliability and consistency with the protocol can be evaluated. Videotapes will be destroyed no later than 5 years after publication of articles that result from this study.

-- Discontinuation of Treatment

Treatment will be stopped if your condition becomes worse or if the health professionals involved in your care determine that this treatment is not in your best interest.

-- DNA, RNA, and Cortisol Sample Analysis

You will be asked to provide a blood sample for DNA and RNA analyses, as well as evaluation of stress hormones (i.e., cortisol). You will not be provided the results of these analyses.

Dr. Daniel W. McNeil (the Principal Investigator of this project at the West Virginia University) and Dr. Andrew Goddard (the Principal Investigator of this project at Indiana University) will control the use of your biological samples and genetic material for this research study, and will store your biological samples with codes (not identifying information) in freezers at Indiana University. In the future, new research may identify other factors that could be involved in response to medications and other aspects of health. If this happens, Dr. McNeil and Dr. Goddard would also like to examine them. Thus, if you agree, your biological samples and DNA will be saved for future testing of newly identified factors involved in oral health. When all of her research studies of oral health are completed, any remaining biological samples

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and DNA will be destroyed at that time. If you do NOT agree, your biological samples and DNA will be discarded at the end of this particular research study. Please indicate below if you give Dr. McNeil and Dr. Goddard permission to save your biological samples and genetic material, without personal identifiers, for use in other research projects involving the study of health.

YES _____ NO _____

Signature _____

Date _____

By signing this consent form you also give permission for your de-identified data to be deposited into secure, controlled-access research databases, from the collaborating institutions, West Virginia University and Indiana University. This information may help other researchers gain a better understanding of, and develop better treatments for dental phobia and other anxiety disorders.

Risks and Discomforts

1. The psychological exposure that will be used as a treatment for your dental phobia may be distressing because it involves your being in a dental situation and, although gradual, may
2. Use of any medication has some risk. D-Cycloserine has been FDA-approved for the treatment of tuberculosis for over 20 years, at significantly higher doses than used in this study and with long-term daily use. Side effects have been observed only with daily administration of more than 500 mg; those side effects include:

Common (more than 1 in 100 treated patients)

- confusion or abnormal behavior
- numbness or tingling in your hands or feet
- tremors (shaking)
- drowsiness
- dizziness
- difficulty speaking
- irritability
- headache
- seizure (unknown frequency)
- coma (unknown frequency)

Rare (between 1 in 10,000 and 1 in 1,000 treated patients)

- allergic reactions (difficulty breathing; closing of the throat; swelling of the lips, tongue, or face; skin rash or hives)
- cardiac arrhythmias (irregular heart rate) and sudden development of congestive heart failure (with symptoms such as shortness of breath, fatigue, or swelling in the legs and feet)

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3. The questions in the interviews and questionnaires may be personal to you.
4. The dental exam infrequently causes some slight gum bleeding, which usually stops within a few minutes.
5. Having blood drawn may cause bruising, bleeding, or in rare cases, infection.
6. In the unlikely event of a breach of confidentiality, there is a very remote possibility that the information could affect your ability to be insured, your ability to be employed, your future plans for children, or your family relationships.

Alternatives

You do not have to participate in this study.

You may decide to receive psychological and/or dental treatment at another office or clinic.

Benefits

By participating, your treatment may help to reduce the fear and anxiety associated with your dental phobia, which may help you to attend dental appointments regularly. You will receive feedback about the results of your dental exam and psychological evaluations, along with the names of dentists who could help with any additional dental needs.

The knowledge gained from your participation in this study may eventually lead to a better understanding of, and better treatments for, dental phobia and other anxiety disorders.

Financial Considerations

You will be paid for each of the two evaluation sessions. You will be paid \$25 for the completion of the first evaluation session, \$50 for visit 2, \$50 for visit 3, and \$75 for visit 4, for a total of \$200.

If you withdraw before the end of the study, no additional payments will be made. In order to process this payment, you will be asked to provide your Social Security Number. The only dental care that will be provided through this study is a dental exam and a one-hour cleaning of your teeth. Not all of your teeth may be able to be cleaned during this time period. No other free dental care will be provided.

Voluntary Compensation

If you are injured as a result of this research, treatment will be available. Responsibility for this treatment will be borne by you. Compensation for your injuries will not be provided voluntarily by the investigator, sponsor, West Virginia University, or other associated affiliates. There is no commitment to provide any compensation for research-related injury. You should realize, however, that you have not released this institution from liability for negligence. Please contact the investigator, Daniel W. McNeil at 304-293-1712 if you are injured or for further information.

Confidentiality

Any information about you that is obtained as a result of your participation in this research will be kept as confidential as legally possible. Your research records and test results, just like hospital records, may be subpoenaed by court order or may be inspected by federal regulatory authorities without your additional consent.

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In any publications that result from this research, neither your name nor any information from which you might be identified will be published without your consent.

We know that information about you and your health is private. We are dedicated to protecting the privacy of that information. Because of this promise, we must get your written authorization (permission) before we may use or disclose your protected health information or share it with others for research purposes.

You can decide to sign or not to sign this authorization section. However, if you choose not to sign this authorization, you will not be able to take part in the research study. Whatever choice you make about this research study, it will not have an effect on your access to health care at West Virginia University.

HIPAA

We know that information about you and your health is private. We are dedicated to protecting the privacy of that information. Because of this promise, we must get your written authorization (permission) before we may use or disclose your protected health information or share it with others for research purposes.

You can decide to sign or not to sign this authorization section. However, if you choose not to sign this authorization, you will not be able to take part in the research study. Whatever choice you make about this research study will not have an effect on your access to medical care.

Persons/Organizations Providing the Information

Patient

Persons/Organizations Receiving the Information

- The research site(s) carrying out this study. It also includes each site's research staff.
- The United States Department of Health and Human Services (which includes the National Institutes of Health, Food and Drug Administration (FDA) and other groups that have the right to use the information as required by law.
- The National Institutes of Health and the people and companies that they use to oversee, manage, or conduct the research.
- The members and staff of any Institutional Review Board (IRB) that oversees this research study.
- West Virginia University Office of Research Compliance and Office of Sponsored Programs.

The Following Information Will Be Used

Information from you about you that is created or collected during the study such as: history and physicals, visit notes, nursing and staff notes, demographic data, and study forms.

The Information is Being Disclosed for the Following Reasons

- Review of your data for quality assurance purposes
- Publication of study results (without identifying you)

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- Other research purposes such as reviewing the safety or effectiveness of the study drug and other products or therapies; conducting performance reviews of the study drug; evaluating other products or therapies for patients; developing a better understanding of disease; improving the design of future clinical trials

You May Cancel this Authorization at Any Time by Writing to the Principal Investigator:

Dr. Daniel W. McNeil, West Virginia University, 53 Campus Drive, Morgantown, WV 26506-6040.

If you cancel this authorization, any information that was collected already for this study cannot be withdrawn. Once information is disclosed, according to this authorization the recipient may redisclose it and then the information may no longer be protected by federal privacy regulations.

This authorization will not expire unless you cancel it.

I have read this section and all of my questions have been answered. By signing below, I acknowledge that I have read and accept all of the above.

_____
Signature of Subject or Authorized Representative

_____
Date

_____
Print Name of Subject or Authorized Representative

Voluntary Participation

Participation in this study is voluntary. You are free to withdraw your consent to participate in this study at any time. Refusal to participate or withdrawal will not affect your future care at West Virginia University and will involve no penalty to you. In the event new information becomes available that may affect your willingness to participate in this study, this information will be given to you so that you can make an informed decision about whether or not to continue your participation.

You have been given the opportunity to ask questions about the research, and you have received answers concerning areas you did not understand.

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Upon signing this form, you will receive a copy.

I willingly consent to participate in this research.

Signatures

_____ Signature of Subject or Subject's Legal Representative	_____ Printed Name	_____ Date	_____ Time

The participant has had the opportunity to have questions addressed. The participant willingly agrees to be in the study.

_____ Signature of Investigator or Co-Investigator	_____ Printed Name	_____ Date	_____ Time

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Appendix L
Healthy Comparison Group Consent Form

Human Research Protocol
Only Minimal Risk Consent Form
(With HIPAA)

**Only Minimal Risk
Consent Information and HIPAA Form
Control Subjects**

Principal Investigator   **Daniel W. McNeil, Ph.D.**

Department   **Arts & Sciences - Psychology**

Protocol Number   **1310112539**

Study Title   **Help for Patients who Avoid Dental Care: Learning to be More Comfortable**

Co-Investigator(s)   **Bryan D. Weaver, DDS, MD; Cristian Sirbu, Ph.D.; Gagan Kaushal, Ph.D.; Aaron Metzger, Ph.D.; Sarah E. Hayes, Cameron L. Randall, Laura Quentin, Patricia Hopkins**

Sponsor (if any)   **West Virginia Clinical & Translational Science Institute and the Indiana Clinical & Translational Sciences Institute**

Contact Persons

In the event you experience any side effects or injury related to this research, or if you have any questions, concerns, or complaints about this research, you can contact Dr. Daniel W. McNeil at 304/293-1712.

For information regarding your rights as a research subject, to discuss problems, concerns, or suggestions related to the research, to obtain information or offer input about the research, contact the Office of Research Compliance at (304) 293-7073.

In addition if you would like to discuss problems, concerns, have suggestions related to research, or would like to offer input about the research, contact the Office of Research Integrity and Compliance at 304-293-7073.

Introduction

You, _____, have been asked to participate in this research study, which has been explained to you by _____. This study is being conducted by Daniel W. McNeil, Ph.D., Bryan D. Weaver, DDS, MD; Cristian Sirbu, Ph.D.; Gagan Kaushal, Ph.D.; Aaron Metzger, Ph.D.; Sarah E. Hayes, Cameron L. Randall, Laura Quentin, and Patricia Hopkins at West Virginia University, in conjunction with Co-Principal Investigator Andrew Goddard, M.D., of Indiana University, with funding provided by the West Virginia Clinical & Translational Science Institute and the Indiana Clinical & Translational Sciences Institute.

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Purpose(s) of the Study

The purpose of this study is to determine if individuals without dental phobia have higher levels of distress tolerance, or ability to withstand negative emotions, than those with dental phobia. WVU expects to enroll approximately healthy 25 adults without dental phobia.

Description of Procedures

There is one appointment involved in this study, which will involve approximately 2 hours and will be a comprehensive evaluation involving interviews and questionnaires. You will be asked to complete 8 questionnaires during the evaluation appointments, requiring approximately 45 minutes, which are included as part of the 2½ hour evaluation session. You do not have to answer all the questions. You will have the opportunity to see the questionnaires before signing this consent form.

-- Videotaping

The interviews and the two treatment sessions will be videotaped to ensure treatment integrity. Videotapes will be destroyed following the study using electronic shredding.

By signing this consent form you also give permission for your de-identified data to be deposited into secure, controlled-access research databases, from the collaborating institutions, West Virginia University and Indiana University. This information may help other researchers gain a better understanding of, and develop better treatments for dental phobia and other anxiety disorders.

_____
Signature

_____
Date

Discomforts

There are no known or expected risks from participating in this study, except for the mild frustration associated with answering the questions. In the unlikely event of a breach of confidentiality, there is a very remote possibility that the information could affect your ability to be insured, your ability to be employed, your future plans for children, or your family relationships.

Alternatives

You do not have to participate in this study.

Benefits

You may not receive any direct benefit from this study. The knowledge gained from your participation in this study may eventually lead to a better understanding of, and better treatments for, dental phobia and other anxiety disorders.

Phone: 304-293-7073
Fax: 304-293-3098
<http://oric.research.wvu.edu>

Chestnut Ridge Research Building
886 Chestnut Ridge Road
PO Box 6845
Morgantown, WV 26506-6845

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Subject's
Initials _____
Date _____

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Human Research Protocol
Only Minimal Risk Consent Form
(With HIPAA)

Financial Considerations

You will be paid for your participation in the evaluation session. You will be paid \$25 for the completion of the evaluation session. In order to process this payment, you will be asked to provide your Social Security Number. No dental, medical, or psychological care will be provided.

Confidentiality

Any information about you that is obtained as a result of your participation in this research will be kept as confidential as legally possible. Your research records and test results, just like hospital records, may be subpoenaed by court order or may be inspected by federal regulatory authorities without your additional consent.

In any publications that result from this research, neither your name nor any information from which you might be identified will be published without your consent.

We know that information about you and your health is private. We are dedicated to protecting the privacy of that information. Because of this promise, we must get your written authorization (permission) before we may use or disclose your protected health information or share it with others for research purposes.

You can decide to sign or not to sign this authorization section. However, if you choose not to sign this authorization, you will not be able to take part in the research study. Whatever choice you make about this research study, it will not have an effect on your access to health care at West Virginia University.

HIPAA

We know that information about you and your health is private. We are dedicated to protecting the privacy of that information. Because of this promise, we must get your written authorization (permission) before we may use or disclose your protected health information or share it with others for research purposes.

You can decide to sign or not to sign this authorization section. However, if you choose not to sign this authorization, you will not be able to take part in the research study. Whatever choice you make about this research study will not have an effect on your access to medical care.

Persons/Organizations Providing the Information

Patient

Persons/Organizations Receiving the Information

- The research site(s) carrying out this study. It also includes each site's research staff.
- The members and staff of any Institutional Review Board (IRB) that oversees this research study.
- West Virginia University Office of Research Compliance and Office of Sponsored Programs.

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The Following Information Will Be Used

Information from you about you that is created or collected during the study such as: visit notes, demographic data, and study forms.

The Information is Being Disclosed for the Following Reasons

- Review of your data for quality assurance purposes
- Publication of study results (without identifying you)

You May Cancel this Authorization at Any Time by Writing to the Principal Investigator:

Dr. Daniel W. McNeil, West Virginia University, 53 Campus Drive, Morgantown, WV 26506-6040

If you cancel this authorization, any information that was collected already for this study cannot be withdrawn. Once information is disclosed, according to this authorization the recipient may redisclose it and then the information may no longer be protected by federal privacy regulations.

This authorization will not expire unless you cancel it.

I have read this section and all of my questions have been answered. By signing below, I acknowledge that I have read and accept all of the above.

_____
Signature of Subject or Authorized Representative

_____
Date

_____
Print Name of Subject or Authorized Representative

Voluntary Participation

Participation in this study is voluntary. You are free to withdraw your consent to participate in this study at any time. Refusal to participate or withdrawal will not affect your future care at West Virginia University and will involve no penalty to you. In the event new information becomes available that may affect your willingness to participate in this study, this information will be given to you so that you can make an informed decision about whether or not to continue your participation. You have been given the opportunity to ask questions about the research, and you have received answers concerning areas you did not understand.

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Upon signing this form, you will receive a copy.

I willingly consent to participate in this research.

Signatures

_____ Signature of Subject or Subject's Legal Representative	_____ Printed Name	_____ Date	_____ Time

The participant has had the opportunity to have questions addressed. The participant willingly agrees to be in the study.

_____ Signature of Investigator or Co-Investigator	_____ Printed Name	_____ Date	_____ Time

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Appendix M

ADIS-IV Training Competency Checklist

1. Successful completion of the courses Behavior Pathology and Clinical Interviewing
2. Familiarity with ADIS-IV manual and interview (read at least twice)
3. Observe an ADIS-IV administration (in person or video)
4. Practice ADIS-IV with a graduate student colleague
5. Three practice interviews with standardized patients (filmed)
  - a. Observe self
  - b. Observation by graduate student colleague
  - c. Test—obtain correct diagnosis on case history written by Daniel W. McNeil, Ph.D.,
with observation by Dr. McNeil