

**Cognitive Challenging and Restructuring versus Relaxation Intervention  
Strategies for the Management of Pain in Catastrophizers receiving Dental Hygiene  
Treatment**

by

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Philosophy

at

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## Abstract

Pain catastrophizing is one of the most important psychological predictors of the pain experience. This relationship is important in designing interventions for pain. The objective of this randomized controlled trial was to determine if two different psychological group interventions would impact on pain catastrophizing and thus on pain perception in comparison with a control condition. The participants were 58 individuals high in pain catastrophizing attending a dental hygiene treatment appointment at a university training clinic. Participants were randomly assigned to one of three groups. The first intervention was a pain catastrophizing reduction intervention group in which 17 participants were trained to identify catastrophizing thoughts and develop strategies for reducing the frequency of, and restructuring, these thoughts. The second intervention was a relaxation focused intervention group in which 23 participants learned distraction and relaxation strategies for pain reduction. Both intervention groups received dental hygiene treatment after receiving two one-hour group intervention sessions. A wait list control group with 18 participants was used. After the intervention, participants received dental hygiene treatment where they rated their physical and emotional distress. Statistical analyses revealed that both intervention groups reported an increase in positive mood relative to the wait list control group. The pain catastrophizing reduction intervention group reported significantly less pain during dental hygiene procedures than the other two groups.

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## Chapter 1: Introduction

### **The Definition of Pain**

Pain has been defined in a variety of ways since the beginning of the century. The International Association for the Study of Pain has put forth the most accepted definition of pain. According to this definition, pain is “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage” (Merskey & Bogduk, 1994). The International Association for the Study of Pain definition notes that pain is always subjective, thus acknowledging the role of psychological factors in enhancing the subjective report of pain. The Gate Control Theory by Melzack and Wall (1965) provided the most widely accepted general theoretical model for the role of psychological factors in pain.

### **The Influence of Psychological Factors on Pain**

The Gate Control Theory of Pain proposes a dynamic role between the peripheral and central nervous systems in pain perception. More specifically, the theory proposes that specific brain activity may open and close gating mechanisms in the spine, thereby increasing or decreasing pain (Melzack & Wall, 1965). Such brain activities were described as various psychological processes: the discrimination of sensory input, the subjective reaction to such input, and the cognitive evaluation of the sensation. Past experiences, attention, anxiety, and feelings of control over the pain effect the cognitive evaluation of pain.

As a result of the Gate Control Theory of Pain, there has been much scientific investigation into the relationship between psychological factors and pain. Two main

themes have been identified in this literature (Sullivan, Stanish, Sullivan, & Tripp, 2002). Firstly, symptoms of emotional distress such as depression and anxiety have been found to arise as a consequence of chronic pain (Sullivan, Thorn, Haythornthwaite, Keefe, Martin, Bradley, & Lefebvre, 2001). Secondly, cognitive variables such as fear of pain, expectancies about pain, self-efficacy, and pain catastrophizing have been shown to increase or decrease pain in individuals suffering from a variety of pain disorders (Sullivan, Stanish, Waite, Sullivan, & Tripp, 1998; Jensen, Turner, Romano, & Karoly, 1991).

### **Pain Catastrophizing**

There are many psychological factors that have been identified as influencing the pain experience. Pain catastrophizing is one of the most important psychological predictors of the pain experience (Sullivan, Bishop, & Pivik, 1995). Ellis (1962) used the term catastrophizing in order to define a person's over-reaction to life events such as treating them as "catastrophes". Later Beck (1976) defined catastrophizing as ruminating about the worst possible outcome that could happen when anticipating danger or difficulty, particularly in circumstances where this is actually unlikely. The present study is concerned with the concept of pain catastrophizing which is more specific than catastrophizing as described by Ellis and Beck above.

Pain catastrophizing has been defined as a tendency to focus excessively on the negative aspects of pain (Crombez, Eccleston, Baeyens, & Eeelen, 1998; Spanos, Radtke-Bodorik, Ferguson, & Jones, 1979). Likely the most commonly used and widely-accepted definition of pain catastrophizing was put forth by Sullivan and

colleagues (1995), which defines pain catastrophizing as an exaggerated negative orientation toward pain that is characterized by magnification, rumination, and helplessness. More specifically, the construct can be defined as an individual's tendency to focus excessively on pain sensations, to magnify the threat value of pain sensations, and to feel helpless in the control or reduction of pain intensity (Sullivan et al., 1995). This definition combines three earlier definitions of pain catastrophizing. Firstly, Chaves and Brown (1978, 1987) described pain catastrophizing as a tendency to magnify or exaggerate the threat value of the pain sensations. Spanos and colleagues (1979) defined pain catastrophizing as a form of worrying, fear, and inability to divert their attention away from pain. Finally, Rosenstiel and Keefe (1983) defined pain catastrophizing as helplessness and pessimism in relation to the individual's ability to deal with the pain experience.

### **Pain Catastrophizing and Other Psychological Factors**

Pain catastrophizing has been significantly correlated with depression, fear of pain, and pain expectancy. Sullivan and D'Eon (1990) argued that pain catastrophizing may be a symptom of depression. Pain catastrophizing can be conceptualized as a negative pain-related cognition, which pertains to the high threat value of pain for that individual. Sullivan and D'Eon (1990) first reported the relationship between pain catastrophizing and depression in chronic pain patients. More recently, Willoughby, Hailey, Mulkana, and Rowe (2002) induced a depressed mood state prior to participants undergoing a cold pressor task. The depressed mood state group in comparison to the neutral mood state group had significantly lower cold pressor task tolerance times and

higher pain catastrophizing scores. The authors concluded that depressed mood may result in more negative and extreme cognitions (i.e., pain catastrophizing) about pain. Sullivan and colleagues (2001) consider the correlation between catastrophizing and depression to be so high as to question their operational and conceptual distinctiveness. Hagga (1990) argued that depression and catastrophizing are not redundant because the correlations between them are typically moderate. In fact, several studies have established the independence of these constructs (Geisser, 1995; Keefe, Brown, Wallston, & Caldwell, 1989; Keefe, Lefebvre, Egert, Affleck, Sullivan, & Caldwell, 2000). For example, Geisser (1995) reported that pain catastrophizing mediated the relationship between depression and the evaluative and affective aspects of pain.

There is a close relationship between pain catastrophizing and pain related fear (Buer & Linton, 2002; Chaves & Brown, 1987; Crombez et al., 1998; Sullivan et al., 1995; Vlaeyen, de Jong, Geilen, Heuts, & van Breukelen, 2002; Vlaeyen, Kole-Snyders, Boeren, & Van Eek, 1995). In two studies of low back pain patients, pain catastrophizing was related to fear of reinjury and fear of movement. Pain catastrophizing may lead to avoidance and pain related fear (Vlaeyen et al., 1995). Therefore pain catastrophizing may act as a mediator between pain and pain-related fear (Crombez et al., 1998; Sullivan et al., 1995). The theory follows that individuals who catastrophize in pain situations may expect new pain or further injury, which may reinforce the fear of re-movement or re-injury in individuals with chronic pain. Likewise, those individuals high in pain catastrophizing with acute pain, may fear more pain and as a result experience higher pain intensity. Pincus, Burton, Vogel, and Field

(2002) identified a number of psychological factors, including catastrophizing, as playing a critical role in the progression from an acute to a chronic pain condition.

Pain catastrophizing has been linked to both actual and anticipated pain experiences or pain expectancies (Sullivan, Rodgers, & Kirsch, 2001). Expectancy of pain moderates the relationship between pain catastrophizing and pain (Sullivan et al., 2001). Sullivan and colleagues (2001) found that catastrophizing was significantly associated with the pain expectancy ratings, and the association between catastrophizing and pain experience remained significant when accounting for pain expectancies. Therefore catastrophizing and expectancies contributed uniquely to the prediction of pain experience.

### **Pain Catastrophizing and Heightened Pain Experience**

Individuals high in pain catastrophizing report more intense pain and increased emotional distress (Heyneman, Fremouw, Gano, Kirkland, & Heiden, 1990; Keefe et al., 1989; Turner, Jensen, Sullivan et al., 1995; Warm's & Carenas, 2002). In addition, individuals high in pain catastrophizing tend to engage in more pain behaviour (e.g., vocalizations, attending to the injured or pain area), as well as increased disability, increased use of health care services, and increased use of analgesics (Heyneman et al., 1990; Jensen et al., 1991; Keefe et al., 1989; Rosenstiel & Keefe, 1983; Severeijns, Vlaeyen, van den Hout, & Weber, 2001; Spanos et al., 1979; Sullivan et al., 1995; Sullivan & D'Eon, 1990). Furthermore, there is no relationship between degree of physical injuries and pain catastrophizing. Pain catastrophizing predicts emotional distress, pain intensity, and disability independent of physical impairment (Severeijns et

al., 2001). Pain catastrophizing is a likely precursor for pain rather than a consequence of pain (Burton, Tillotson, Main, & Hollis, 1995; Klennerman, Slade, Stanley, Pennie, Reilly, Atchison, Troup, & Rose, 1995; Linton, Buer, Vlaeyen, & Hellsing, 2000). These findings support Vlaeyen and colleagues' (1995) cognitive behavioural conceptualization of chronic pain which assumes that pain catastrophizing promotes fear of movement and re-injury. The fear of re-injury in turn leads to avoidance behaviour, disuse, disability, and depression. In individuals experiencing acute pain, pain catastrophizing likely similarly promotes fear of injury and pain.

The relationship between pain catastrophizing and heightened pain experience has been found in both experimental and clinical contexts, in many pain populations (e.g., spinal cord injury, arthritis, chronic back pain), in a variety of procedures, and in both children and adults (Gil, Abrams, Phillips, & Keefe, 1989; Jensen, Turner, & Romano, 1992; Keefe et al., 1989; Parker, Smarr, Buesher, Phillips, Frank, Beck, Anderson, & Walker, 1989; Severreijns et al., 2001; Turner et al., 2002; Turner & Clancy, 1986; Turner, Dworkin, Mancl, Huggins, & Truelove, 2001). Recent research has suggested that pain catastrophizing may not be restricted to pain-specific domains but also important in non-pain related experiences, such as influenza (Devoulyte & Sullivan, 2003).

### **Theoretical Models of Pain Catastrophizing**

The conceptual and theoretical models of pain catastrophizing and its relation to pain have received much attention in the literature (Sullivan et al., 2001; Turner & Aaron, 2001). Sullivan and colleagues (2001) have summarized five different

theoretical models that could account for the relationship between pain and pain catastrophizing: the classic and general schema activation models, the appraisal model, the attention model, and the communal coping model. Each of these models has received some support in the literature and they are not necessarily incompatible with one another. Sullivan and colleagues (2001) suggest that these models can account for different components of the relationship between pain and pain catastrophizing. The appraisal, schema, and attentional models are ‘proximal explanations’ of the cognitive factors that link catastrophizing to pain, whereas the communal model is a ‘distal explanation’ for the development and maintenance of catastrophizing (Sullivan et al., 2001). Proximal explanations refer to the cognitive factors which are closely effected by the effects of catastrophizing. Distal explanations refer to those factors which are those factors which are distantly effected by the effects of catastrophizing.

In the classic schema–activation model, catastrophizing is viewed as a ‘cognitive distortion’ that contributes to the precipitation and maintenance of depressive symptoms (Beck, 1976). From this model, a depressive schema would be activated after the occurrence of a negative life event. Once activated, the schema would give rise to cognitive distortions, one of which is catastrophizing. These distortions bias the individual’s perspective and as a result trigger depressive symptoms. As mentioned previously, it was originally argued that pain catastrophizing could be a symptom of depression and therefore placed within the same framework as depression. However, more recently pain catastrophizing has been reported to be a unique contributor to the pain experience (Hagga, 1990; Keefe et al., 1989; Geisser et al., 2000). Depression does not appear to be a precondition to the relationship between pain catastrophizing



and pain, rather catastrophizing mediates the relationship between depression and pain. Therefore perhaps a less typical application of the schema activation model, which I refer to as the “general schema activation model”, could better explain the relationship between pain catastrophizing and pain.

The general schema-activation model would propose that catastrophizers may have a “pain schema” that contains excessive negative information about pain and the individual’s ability to cope with pain which may influence emotional functioning leading to heightened pain experience. In fact, pain catastrophizing has been correlated with high levels of emotional distress (i.e., sadness, anxiety, fear, anger) (Sullivan et al., 1995).

Sullivan and colleagues (2001) highlight the two main shortcomings of schema models as follows. First, they are ambiguous about the conditions necessary for schema activation. Second, it is difficult to empirically test whether or to what degree a schema has been activated. Cognitive theories of emotional processing propose that schema activation occurs once a stimulus is appraised and selected information relevant to the schema is attended to.

Pain catastrophizing has also been defined as an ‘over appraisal’ of the negative aspects or consequences of pain (Lefebvre, 1981). In the appraisal model, the relationship between pain catastrophizing and pain is seen as resulting from existing beliefs about the pain experience that precede the pain experience. This model proposes that an individual’s appraisal of the threat value of a stressor (called primary appraisals) interact with the individual’s appraisal of the available coping strategies and the appraisal of the effectiveness of these strategies (called secondary appraisals) (Lazarus

& Folkman, 1984). The components of pain catastrophizing share features with the appraisal processes (Sullivan et al., 2001). Magnification and rumination are primary appraisals in which the individual would focus on, or magnify, the threat value of pain. Helplessness is a secondary appraisal in which the individual negatively evaluates their ability to cope with pain.

Pain catastrophizers' excessively negative focus has been conceptualized as being sustained by efficacy appraisals (Parker, et al. 1989; Rosenstiel & Keefe, 1983; Turner & Clancy, 1986). For example, in factor analyses, the Coping-Efficacy subscale, which measures an individuals' perceived efficacy with coping efforts, loads onto the pain catastrophizing subscale of the Coping Styles Questionnaire (Rosenstiel & Keefe, 1983). Appraisals could result in catastrophizers possessing a 'pain schema' containing negative information about pain experiences and negative beliefs about pain and their ability to cope with pain experiences (Sullivan et al., 1995; Turk & Rudy, 1992). If catastrophizers relate past pain experiences to heightened pain, they may develop expectancies about pain experiences, threat value of pain sensations, and their ability to manage the stress associated with painful experiences (Thorn & Boothby, 1999; Turk & Rudy, 1992). A recent study by Sullivan, Rodgers, and Kirsch (2001) examined the relationship between pain catastrophizing, emotional distress expectancies, and pain expectancies. Pain catastrophizing was associated with a tendency to underestimate pain and emotional distress. Sullivan and colleagues (2001) hypothesize that under-predicting pain may result in individuals high in pain catastrophizing being taken by surprise at the intensity of the pain experience. If catastrophizers do not have accurate pain expectancies and therefore may be taken by

surprise, it is possible that their effective use of coping strategies is compromised since they are not ready to employ them.

Individuals high in pain catastrophizing do not appear to differ from noncatastrophizers in the coping strategies they employ in pain situations. Rather catastrophizers appear to employ coping strategies ineffectively. Spanos and colleagues (1979) found no differences in the number of coping strategies that catastrophizers and non-catastrophizers used in a cold pressor task. However the difference between catastrophizers and noncatastrophizers was in the catastrophizers' inability to reduce their pain with these strategies. Catastrophizers were unable to reduce their pain regardless of the number of coping strategies they used. In contrast, non-catastrophizers reported reduced pain with more strategies used. This pattern of results has been replicated in dental situations (Chaves & Brown, 1978). Hence, it appears that catastrophizers use a similar number of coping strategies as non-catastrophizers, but do not benefit from their use.

An individual's appraisals about pain can effect his/her pain intensity and psychological and physiological functioning (Geisser, Robinson, & Henson, 1994; Keefe, Caldwell, Queen, Gil, Martinez, Crisson, Ogden, & Nunley, 1987; Keefe, Salley, & Lefebvre, 1992; Turner & Clancy, 1986). Changes in pain-related appraisals and coping strategy use are associated with improvement in pain intensity and psychological and physiological functioning (Turner & Clancy, 1986; Keefe, Caldwell, Williams, Gil, Mitchell, Robertson, Martinez, Ninley, Beckman, Crisson, & Helms, 1990). Therefore, targeting pain catastrophizers' expectancies about pain by challenging their negative thoughts of pain catastrophizing and pain schema, may be an effective method of

intervening and reducing the emotional and physical distress they experience, increasing the accuracy of their pain expectancies, and increasing the effectiveness of their coping strategies.

The attentional model of pain catastrophizing states that the pain schema of catastrophizers may lead to attention directed toward the pain-related information contained in an individual's appraisals. Therefore the appraisal model is closely linked to the attentional model. It follows from the appraisal model that an individual who exaggerates the threat value of pain would likely increase their attention towards the pain.

An alternative explanation for the difficulty in effectively employing coping strategies is that catastrophizers may be unable to sustain their attention to the strategies they use. It has been hypothesized that the proposed attention difficulties in individuals high in pain catastrophizing results from an excessively negative focus on the pain experience. Individuals who exaggerate the threat value of pain stimuli or sensations will allocate more attention to pain sensations. Individuals with high appraisals of threat will direct their attention toward the source of the threatening information, such as their pain experience (Crombez et al., 1998). Grisart and Van der Linden (2002) linked the attentional interference in chronic pain patients to the attention consumed by the pain experience, catastrophizing thoughts and fear related thoughts.

This attentional interference has been offered as an explanation for the difficulty catastrophizers have when using distraction coping strategies and suppressing pain related thoughts (Heyneman et al., 1990; Sullivan, Rouse, Bishop, & Johnston, 1997). This difficulty likely results from the catastrophizer's inability to redirect their attention

away from the pain sensations. Sullivan and colleagues (1997) examined the effects of thought suppression on pain during an experimental pain procedure. Prior to undergoing a cold pressor task, half the participants were told to suppress their procedure-related thoughts and the other half were told to record their ongoing thoughts. Thought suppression and pain catastrophizing were associated with greater pain. Similarly, an attention diversion strategy (i.e., distraction, imagery) used by catastrophizers in the Heyneman and colleagues (1990) study resulted in less improvement in their pain tolerance scores than those trained on a self-instruction strategy, which involved monitoring and manipulating thoughts about the pain experience. Therefore, the most effective interventions may be those that focus on the appraisals and expectations that catastrophizers have about pain rather than redirecting their attention. This lends support to both the attentional and appraisal model.

Crombez, Eccleston, Van den Broeckm, Van Houdenhove, and Goubert (2002) investigated whether the relationship between pain catastrophizing, heightened pain experience, and attentional interference can be more generally accounted for by negative affectivity. Negative affectivity was defined as “a personality trait characterized by low mood and the predisposition to appraise personal and emotional situations as threatening” (Crombez et al., 2002). Patients with lower back pain were asked to perform an auditory reaction time task while being exposed to a series of threatening electrocutaneous stimuli. Attentional interference was measured by a increase in reaction times to auditory probes during pain. Self-report measures were completed in order to assess pain catastrophizing and negative affectivity. The results of this study identified pain catastrophizing as enhancing attentional interference during

pain. This effect remained when controlling for the effects of negative affectivity. Therefore, the role of pain catastrophizing in the pain experience cannot be explained by a general dispositional negative affectivity and pain catastrophizing is specifically related to a difficulty attending to other tasks while in pain.

Finally, the communal coping model of pain catastrophizing suggests that catastrophizers may show exaggerated pain expression to maximize their interpersonal proximity in order to solicit assistance or receive empathy from those individuals in their social environment (Sullivan et al., 2001). The exaggerated display of pain behaviours and emotions likely leads to their increased attention to pain related stimuli and could account for the increase in reported pain. Increased pain expression may be maladaptive because more pain is perceived but on the other hand adaptive in soliciting social response. Bedard, Reid, McGrath, and Chambers (1997) found that adolescents who catastrophized reported more support-seeking behaviours about their pain symptoms than did those adolescents who did not catastrophize. Social response from others around the individual may maintain, solicit, and/or trigger exaggerated pain expression in individuals who catastrophize. Therefore Sullivan and colleagues (2001) suggest that pain catastrophizing may serve as social communication with the goal of managing catastrophizers' distress within a social or interpersonal context rather than on their own.

### **Treatment Interventions for Catastrophizing**

Pain catastrophizers may have a differential response to treatment interventions. In particular, catastrophizers may have difficulties learning strategies that require

diverting their attention away from pain sensations (Heyneman et al., 1990; Sullivan et al., 1997). Relaxation strategies would require an individual to direct their attention away from their pain. Therefore relaxation may not be as effective for catastrophizers. A cognitive behavioural approach that teaches individuals who catastrophize to examine and challenge their thinking patterns, appraisals, and expectancies about the pain experience may prove useful (Geisser, Robinson, & Riley, 1999; Thorn & Boothby, 1999; Thorn, Boothby, & Sullivan, 2002). The literature examining the effects of relaxation and cognitive behavioural interventions for catastrophizing will be reviewed.

### **Distraction or Relaxation Focused Interventions**

Relaxation is a widely used and reportedly successful psychological intervention for the reduction of pain (Heyneman et al., 1990; Shaw & Ehrlich, 1987). Pevler and Johnston (1986) that reported relaxation therapy results in a decrease in the accessibility of negative cognitions. It would be hypothesized that if catastrophizers decrease the availability of their negative thoughts, experienced pain may be reduced. However, research has raised the question about catastrophizers' ability to employ relaxation strategies (Heyneman et al., 1990). Likely, the ruminatory component of catastrophizing reflects the difficulties to distract attention away from pain-related thoughts and toward relaxation strategies.

Heyneman and colleagues (1990) suggested that catastrophizers were impaired in their ability to use distraction as a coping strategy. Distraction relies on an individual's ability to direct their attention away from the pain sensations. In particular, this study examined the relationship between the frequency of pain catastrophizing and

the effectiveness of two different coping strategies (self-instruction and attention diversion training) during cold pressor immersion. Self-instruction targeted negative thinking, while the goal of attention diversion training was to focus the participant's attention away from their pain sensations. Results indicate that catastrophizers trained with self-instruction showed a greater improvement in their pain tolerance scores than those trained with attention diversion training. However, the opposite was found for non-catastrophizers. Non-catastrophizers trained with attention diversion training improved their pain tolerance scores significantly more than those trained on self-instruction.

In fact, interventions such as a thought challenging and restructuring may promote focusing on pain sensations rather than directing attention away from pain sensations. The sensory focus component of these interventions have been advocated as an effective means of reducing pain intensity and increasing pain tolerance in response to pain (Dar & Leventhal, 1993; Leventhal, Brown, Shacham, & Equist, 1979). This finding has been reported across diverse populations in response to a wide range of aversive stimuli including medical procedures (Johnson & Leventhal, 1974), dental procedures (Baron, Logan, & Hoppe, 1993; Siegel & Peterson, 1980), and childbirth (Leventhal, Leventhal, Schacham, & Easterling, 1989). Interventions which include a sensory focus component may be conceptualized as promoting an accurate description of sensations, which allows for the development of an accurate expectation and appraisal of pain and thus reduces the emotionality and threat value of the pain experience (Cioffi & Holloway, 1993; Cioffi, 1991a; Cioffi, 1991b; Johnson & Leventhal, 1974; Leventhal et al., 1979). Alternatively, it has been suggested that



sensory focus may facilitate a more benign re-interpretation of pain stimuli (Leventhal, 1982). Since the person is attending to other information (i.e., pain information) there is likely less opportunity for the person to attend to the emotionality of the experience. In other words, by orienting the individual to the sensory aspects of the pain experience, the person is provided with fewer resources to attend to the emotionality that the experience may bring about.

Research has not consistently supported the beneficial effects of accurate sensory focus. Some studies have found that sensory focus resulted in an increase in pain experienced (Arntz & de Jong, 1993; Arntz, Dressen, & de Jong, 1994; Barsky & Klerman, 1983; Janssen & Arntz, 1996; Janssen, Arntz, & Bouts, 1998; Morgan, Hortsman, Cymerman, & Stokes, 1983; Williams & Kinney, 1991; Worthington, 1978). Others have found mixed results (Cioffi, 1991a; Baron et al., 1993; McCaul, 1980). Currently factors that contribute to differences in the sensory focus outcome literature remain unclear. Individual-difference variables may predict the effects of sensory focus. Catastrophizers, who take on a sensory focus approach such as a cognitive behavioural intervention targeting catastrophizing, may have a more accurate, less threatening expectation of the pain experience resulting in a decrease in feelings of helplessness and an increase in control over the pain experience.

### **Cognitive Behavioural Interventions**

Cognitive behavioural treatments focus on challenging an individual's appraisals that may be related to fear and associated with avoidance behaviours (Burns, Kubitius, Bruehl, Harden, & Lofland, 2003; Vlaeyen, de Jong, Onghena, Kerckhoffs-Hanssen, &

Kole-Snijders, 2002). Interventions that assess and treat pain catastrophizing may reduce pain intensity, psychological distress, and pain related disability in individuals in pain. These interventions aim at identifying and altering maladaptive perceptions of pain and poor coping strategies to alleviate pain, increasing the individual's sense of control through self-management by reconceptualizing the pain sensation, acquiring skills to successfully reconceptualize, and finally generalizing these skills to other thoughts that may arise. The assumption of cognitive-behavioural models is that pain will be reduced as an individual can conceptualize the pain less as an overwhelming sensation and more as a controllable and manageable sensation. Several reviews and meta analyses have concluded cognitive-behavioural treatment programs as more effective at reducing pain than no treatment at all, waiting list, and single disciplinary treatments (Flor, Fydrich, & Turk, 1992). Many times cognitive behavioural therapy is offered in combination with various other therapies within a multidisciplinary pain treatment program. These programs have proven to be effective in reducing pain, depression, and disability (Flor et al., 1992) as well as returning individuals to work (Cutler, Fishbain, Rosonoff, Abdel-Moty, Khalil, & Rosonoff, 1994). It is presumed that cognitive-behavioural therapy is an active and effective component of multidisciplinary treatment. This presumption was examined in a recent study by Burns and colleagues (2003) in which changes in maladaptive cognitions were examined in isolation from other components of multidisciplinary pain treatment programs. This study reported that changes in negative cognitions affect improvements in pain treatment outcomes. Cognitive behavioural treatments have produced significant changes in pain experience, cognitive coping and appraisal, and behavioural expression

of pain (Morley, Eccleston, & Williams, 1999). In fact, changes in physical performance and disability levels in patients with pain are associated with cognitive and behavioural rather than sensory and biomedical aspects of pain (Linton et al., 2000; Asmudson, Norton, & Norton, 1999; Vlaeyen, & Linton, 2000). Therefore by changing cognitive aspects of their pain, functioning can be improved.

Although cognitive behavioural therapy is often effective for the treatment of pain, unfortunately there are patients who do not benefit from general cognitive behavioural therapy. In fact these patients who are not successful with cognitive behavioural therapy often share characteristics such as anxiety, negative affectivity, external locus of control and pain catastrophizing thoughts (Affleck, Tennen, Urrows, & Higgins; Asghari & Nicholas, 1999; Gatchel & Weisberg, 2000). Thorn, Boothby, and Sullivan (2002) provide the following explanations for these treatment failures. Firstly, a non-targeted or general approach may not address catastrophic thinking thus leaving some of these cognitions unchallenged and unchanged. Secondly, individuals who catastrophize have a limited ability to focus their attention away from stimuli, therefore rendering most imaginal relaxation or imaginal inattention techniques ineffective. As well, individuals who catastrophize tend to ruminate about pain sensations and the severity of the sensations making it difficult to use distraction techniques. Thus these usually effective techniques are rendered ineffective by the thinking patterns that accompany pain catastrophizing. Finally, those individuals who catastrophize may approach treatment with a negative outlook that may lead to a decrease in compliance, as well as doubt in the effectiveness in the intervention.

A specific cognitive behavioural intervention targeted to reduce pain catastrophizing has been suggested. Thorn, Boothby, and Sullivan (2002) provide a cognitive behavioural group intervention specifically designed to reduce pain catastrophizing. In Burns and colleagues' (2003) study, the efficacy of a multidisciplinary intervention with a cognitive behavioural treatment component to reduce pain catastrophizing and pain helplessness was examined. Pain helplessness was defined as 'the perception that suffering and disability from chronic pain ebb and flow despite one's efforts to exert some control'. Both helplessness and catastrophizing are important predictors of pain. Pain catastrophizing and pain helplessness was measured prior to, at the midpoint, and following a 4-week multidisciplinary program. The results were that reductions in pain catastrophizing and helplessness at early treatment stages were related to later treatment changes in pain perception.

Therefore, upon review of the limited literature on the interventions for reducing pain catastrophizing, it appears logical to hypothesize that cognitive rather than relaxation and distraction techniques may better help individuals high in pain catastrophizing effectively manage their pain and emotional discomfort during dental hygiene procedures. Furthermore, an investigation into the relative efficacy of these interventions for catastrophizers would assist in the further development of the theoretical model of the mechanisms that underlie the relationship between pain catastrophizing and pain.

## Dental Pain

There is a high prevalence of avoidance and fear surrounding attending dental visits. In North America, 40% of people are afraid to visit the dentist, 20% are highly anxious, and 5% are so anxious that they avoid dental treatment (Milgrom, Fiset, Melnick, & Weinstein, 1988). The most common way that patients develop fear and avoidance of dental visits is through direct negative experiences in the dental office. One of these salient negative experiences is pain or anticipated pain (Milgrom, Weinstein, & Kleinknecht, & Getz, 1985). In fact, fear of pain is highly predictive of dental fear (Gross, 1992; McNeil & Berryman, 1989; van Wijk & Hoogstraten, 2003; Wardle, 1984). Green, Humphris, Lindsay, Melior, Millar, and Sidebotham (1997) similarly, found that 31-50% of adults report experiencing pain during dental procedures. Mares, Hesova, Skalska, Hubkova, and Chmelarova (1997) concluded that 35% of children experienced pain in dental procedures.

Patients often associate office-based dental care procedures with pain. Pain related to dental office-based treatment can lead patients to avoid or postpone treatment, and make them more difficult to treat and less likely to comply with prescribed dental hygiene practices (Bonner, 1997; Carr & Goudas, 1999). Chung, Bogle, Bernardini, Stephens, Riggs, and Egelberg (2003) reported that most people experience low pain levels during dental hygiene procedures, such as probing and instrumentation. However, 20-30% of patients reported a significant pain experience. Similarly, Tripp, Neish, and Sullivan (1998) examined the types and intensity of pain reported in dental hygiene procedures. Although most procedures were associated with little or no pain, procedures such as probing and scaling were associated with greater pain. One quarter

of the sample reported their pain as being greater than or equal to 7 on 10, where 0 is no pain and 10 is intense pain. Dental status measures and treatment difficulty did not correlate with pain. Rather, individuals high in dental anxiety and pain catastrophizing reported greater pain. A multiple regression analysis showed that these predictor variables combined account for one third of the variance in pain reports. In a study of children undergoing dental treatment, 67% of children had overestimated their expected pain (Mares et al., 1997). Similarly a study with adults reported 92% of patients undergoing root canal therapy stated that pain experienced during the procedure was less or much less than the pain anticipated (Rousseau, Clark, Newcomb, Walker, Eleazer, & Sheetz, 2002).

### **Catastrophizing and Dental Situations**

Pain catastrophizing is highly predictive of distress and pain in the dental situation (Chaves & Brown, 1978; Sullivan & Neish, 1999a&b, 1998, 1997; Tripp et al., 1998). Chaves and Brown (1978) found that individuals who catastrophized during dental hygiene procedures described the procedure as more stressful than those individuals who did not catastrophize. Others have also found that catastrophizers report greater dental anxiety than noncatastrophizers (de Jongh, Muris, ter Horst, Van Zuuren, & De Wit, 1994). Sullivan and Neish (1998) examined the relation between pain catastrophizing and pain in individuals undergoing dental hygiene treatment. The level of pain catastrophizing predicted pain and emotional distress even when controlling for variables such as age, gender, and dental hygiene status. Pain catastrophizing was measured using the Pain Catastrophizing Scale (Sullivan et al.,

1995), which is a self-report measure of pain catastrophizing that has three subscales: helplessness, rumination, and magnification. The rumination subscale of the Pain Catastrophizing Scale demonstrated the strongest correlation with pain ratings in the dental situation (Sullivan & Neish, 1998). This suggests that an excessive negative focus on pain sensations (i.e., rumination) may be one of the most important mechanisms by which pain catastrophizing leads to increased pain experience (Crombez et al., 1998; Eccleston, Crombez, Aldrich, & Stannard, 1997; Rosenstiel & Keefe, 1983; Sullivan et al., 1995).

### **Psychological Interventions for Dental Pain**

Sullivan and Neish (1997) highlighted the need for interventions that would reduce the emotional distress and pain of catastrophizers, specifically during dental hygiene treatment. Given the association between pain catastrophizing and dental pain, additional insight into effective treatment for catastrophizers can be found in the dental literature. Those studies that examine interventions for dental anxiety and fear would be of particular importance due to the strong relationship found between pain catastrophizing and dental anxiety and fear. Although dental anxiety is not equivalent to pain catastrophizing, interventions targeting dental anxiety may provide further direction for effective interventions for catastrophizers. Both cognitive behavioural and behavioural interventions (e.g., relaxation, biofeedback, hypnotherapy) have been used in the treatment of dental anxiety. A recent systematic review of behavioural research in dentistry from 1987 to 1992, illustrated the efficacy of several behavioural treatment

methods for the treatment of dental anxiety (ter Horst & de Wit, 1993). These behavioural treatments included relaxation, systematic desensitization, and modeling.

### **Relaxation Interventions**

Thom, Sartory, and Johren (2000) compared the effects of psychological treatment (consisting of stress management and imaginal exposure) to the administration of benzodiazepine (e.g., midazolam hydromaleate) in individuals with dental phobia in a restricted randomization trial. Participants who received the benzodiazepine were given a dose that was dependent on body weight. Participants received 1 to 2.5 tablets containing 10.2 mg of midazolam hydromaleate equivalent to 7.5 mg of midazolam. Both of the active treatments decreased anxiety during dental surgery compared to the control condition (which received no treatment). However, phobic patients in the benzodiazepine group showed a relapse, measured by discontinued dental treatment at a two-month follow-up, whereas those phobic patients in the psychological treatment condition continued dental treatment at follow-up. More specifically, 70% of those in the psychological treatment condition, 20% in the benzodiazepine condition, and 10% in the control condition returned for continued dental treatment after two months. Hence, both the benzodiazepine and psychological intervention were effective in the short-term, but the psychological intervention was more effective in the long term. A similar pattern of results was found in the study by Johren, Jackowski, Gangler, Sartory, and Thom (2000).

A relaxation intervention with a psychophysiological component (e.g., biofeedback) was examined by Hammarstrand, Berggren, and Hakeberg (1995). A



statistically significant decrease in dental fear as well as a rise in positive mood during dental situations in individuals with dental phobia who underwent psychophysiological therapy (i.e., relaxation and biofeedback training). Those individuals in the hypnotherapy and control group did not report any significant changes on the outcome measures. In a study by Berggren and Carlsson (1984), individuals with severe dental fear underwent a psychophysiological therapy, which included desensitization with electromyography (i.e., EMG) biofeedback and cognitive reattribution. They experienced a decrease in dental anxiety and were able to complete the dental rehabilitation. Similarly, Berggren and Carlsson (1986) examined a relaxation intervention with a psychophysiological component (e.g., biofeedback). In this study, the relaxation with biofeedback intervention was compared with dentistry general anaesthesia in a population of phobic individuals followed by conventional dental treatment (Berggren & Carlsson, 1986). The results indicate significant changes and improved psychological state for the relaxation intervention group compared to the general anesthesia group. The relaxation intervention group also completed a greater number of appointments both at the dental fear clinic and the community dental clinic, reported lower dental anxiety scores, and improved mood.

### **Cognitive Behavioural Interventions in dental anxiety/pain**

Cognitive-behavioural therapies have also received empirical support for the treatment of dental anxiety (Berggren, Hakeberg, & Carlsson, 2000; de Jongh, Muris, Shoemakers, Van Zuuren, Makkes, & ter Horst, 1995; de Jongh, Muris, ter Horst, & Shoemakers, 1995; Harrison, Berggren, & Carlsson, 1989). In particular, cognitive

restructuring and challenging dysfunctional beliefs about dental treatment have been useful (de Jongh et al., 1995). However, comparisons between the various behavioural treatments in treating dental anxiety are scarce. Only one controlled comparison between relaxation and cognitive behavioural interventions to reduce dental anxiety has been completed. Berggren and colleagues (2000) compared an adult sample of fearful dental patients who underwent cognitive behavioural and relaxation interventions. A higher number of patients receiving the cognitive behavioural intervention completed the treatment program. However, those patients receiving relaxation treatment reported a greater reduction in anxiety. The relaxation intervention group had a more significant reduction of dental fear, general fear, and anxiety compared to those in the cognitive behavioural group. Yet, both treatment methods were effective in reducing dental phobic reactions illustrated by pre-post treatment changes.

### **Present Study**

The current study examined the efficacy of two different psychological group interventions, a cognitive challenging and restructuring intervention and a relaxation focused intervention, compared to a wait-list control group, with individuals high in pain catastrophizing in the management of pain and emotional distress during a dental hygiene procedure. Based on previous findings on the relationship between catastrophizing and pain, interventions targeting appraisals or negative thinking patterns were predicted to reduce catastrophizers' distress reactions more effectively than interventions that target catastrophizers' distress through relaxation or attention diversion coping.

Participants were randomly assigned to one of three groups. The pain catastrophizing reduction intervention group had 17 participants who were trained to identify catastrophizing thoughts and develop strategies for reducing the frequency and restructuring these thoughts. The relaxation focused intervention group had 23 participants who learned distraction and relaxation strategies for pain reduction. Both intervention groups received two one-hour group intervention sessions. The wait list control group had 18 participants. After the intervention, participants received a dental hygiene treatment where they rated their physical and emotional distress.

### **Contribution of the Present Study to the Literature**

The present research project represented a contribution to three broad areas in both pain catastrophizing and dental research. Methodologically, this study addressed key research areas, identified in the scientific literature as being in need of further development in the study of pain catastrophizing (Turner & Aaron, 2001). It was the first to study a cognitive-behavioural intervention in the context of dental pain and pain catastrophizing. Given that research investigating the relationship between pain catastrophizing and pain has proceeded without a definitive theoretical framework, this research provided a more definitive understanding of the underlying processes (e.g., expectancies, self-efficacy, beliefs, cognitions, fear) and mechanisms (attention or negative thinking) that may form the relationship between pain catastrophizing and pain. It examined the malleability of the relationship between pain catastrophizing and pain. Finally, the results may have greater generalizability and ecological validity than laboratory based research findings, given that the study involved clinical rather than

experimental pain. The findings of the study may have application to other pain populations and acute pain situations.

### **Hypotheses**

It was hypothesized that both intervention groups would report a post-treatment decrease in physical and emotional distress experienced during dental hygiene procedures. In addition, it was hypothesized that individuals receiving intervention would report a decrease, between the initial and last dental hygiene treatment visit, in pain catastrophizing, dental fear and anxiety, and positive changes in dental beliefs and dental cognitions compared to the wait list control group. Based on previous research, patients in the pain catastrophizing reduction intervention group were expected to report less physical and emotional distress during dental hygiene procedures than the relaxation focused and wait list control group, regardless of their dental hygiene status.

## **Chapter2: Research Methodology and Procedure**

### **Participants**

Participants were enrolled in an introductory psychology course at Dalhousie University. Those students in an introductory psychology course who completed the general screening at the beginning of the school year scoring in the upper third distribution of the Pain Catastrophizing Scale scores (i.e., scores greater than 24; Sullivan et al., 1995) and individuals who reported not receiving dental treatment in the last six months qualified as participants in this study. The use of a Pain Catastrophizing Scale cutoff score of greater than 24 was used by Sullivan and colleagues (1995), who used the same survey methodology for the selection of participants in their study. Participants received credit points towards their Psychology 1000 course grade as well as a dental hygiene assessment, oral hygiene instruction, scaling, polishing, and fluoride free of charge. The figure in Appendix A illustrates the participant flow and study design.

### **Recruitment**

Potential participants completed a general screening package (which was used for several different studies, during the first week of classes in September). The exact number of participants was not recorded. However there were approximately 1000 participants in the screening and an estimate based on anecdotal observation, over half of those contacted agreed to participate. Participants completed the Pain Catastrophizing Scale as well as provided the amount of time that had elapsed since

their last dental hygiene visit. During the screening, participants were asked to provide their name and phone number, if they were interested in being contacted to participate in a variety of psychological studies. The proportion of the participants which agreed to be contacted is unknown as this data was not recorded.

### **Initial Contact**

If on the screening, the potential participant scored greater than 24 on the Pain Catastrophizing Scale, had not received dental hygiene treatment in the last six months, and indicated interest in being contacted for the study, initial contact was made by phone. The script used for the telephone interview can be found in Appendix B. The phone interview began with a brief introduction, followed by an explanation of the procedure of the study and then the participant was asked if she or he wished to take part in the study. If the participant agreed to participate, she or he was asked to come to the Psychology Department at Dalhousie University for the initial meeting.

### **Initial Meeting**

At the initial meeting, participants ( $N = 73$ ) were read the consent form and asked to sign and date it, if they consented. Participants were encouraged to ask any questions they had throughout the study. The consent form can be found in Appendix C. Participants were given a copy of the consent form to keep for their own personal records. Participants completed a series of questionnaires (Pain Catastrophizing Scale, Dental Beliefs Survey, Dental Cognitions Checklist, Dental Fear Survey, and Dental Anxiety Scale –Revised, Expected Pain Scale). After completing the questionnaires,

participants were randomly assigned to one of three groups: a relaxation-focused intervention group ( $N = 28$ ), a pain catastrophizing reduction intervention group ( $N = 23$ ), and a wait list control group ( $N = 22$ ). Participants were randomly assigned by choosing their assigned treatment out of a jar with three pieces of paper, each with an intervention written on it. There were 10 dropouts at this stage of the study (i.e., individuals in the intervention group who did not attend their scheduled intervention session and individuals in the control group who did not attend their dental hygiene treatment appointment): 3 from the pain catastrophizing reduction intervention group, 3 from the relaxation-focused intervention group, and 4 from the wait list control group. An intention-to-treat analysis was conducted in order to ensure that any results of the present study were not due to differential attrition. Participants assigned to one of the two intervention groups (i.e., the relaxation focused intervention group and the pain catastrophizing reduction intervention group) were asked to attend a two-session group intervention over two weeks.

Participants in the relaxation focused intervention group were trained in the use of distraction and relaxation strategies for pain reduction. These participants were provided with education about the body's stress response and the resulting physiological changes. Participants were given skills aimed at decreasing the stress response and increasing the relaxation response. This group intervention aimed to increase the individual's sense of pain control by providing various skills, such as progressive muscle relaxation, abdominal breathing, and guided imagery which can result in pain reduction. These skills were modeled and practiced in session.

Participants were encouraged to use their newly acquired skills during the dental hygiene treatment visit.

Participants in the pain catastrophizing reduction intervention group were trained to identify their pain catastrophizing thoughts and develop strategies for reducing their frequency of occurrences. An introduction to the components of the cognitive behavioural model was provided. Participants were given the opportunity to practice identifying thoughts, feelings and behaviours in various situations in order to familiarize themselves with the cognitive behavioural model. Their thoughts and feelings related to different aspects of dental hygiene treatment were identified, the type of thought was labeled, and thoughts were challenged and restructured. This group intervention focused on the connection between thoughts and feelings, and the resulting pain experienced. Participants were encouraged to use thought challenging and restructured thoughts during the dental hygiene treatment visit.

Participants in the wait list control group were told that there would be a delay in intervention and that they would receive group intervention after the dental hygiene appointment, approximately 3 weeks after the intervention groups had received their intervention.

### **Group Intervention Sessions**

Participants assigned to an intervention attended two one-and-one half hour group intervention sessions once per week over a two-week period. The group intervention sessions took place at a private practice. Interventions were conducted by two registered psychologists who participated in three training sessions with the



experimenter. The clinical psychologists were provided with two manuals, one for each group, to be administered during the group meeting times. The manuals for the relaxation focused and pain catastrophizing reduction group are found in Appendix D and E, respectively. Intervention sessions were audiotaped in order to ensure that all groups received the same instruction. These audiotapes were then coded by an independent rater to ensure the integrity of the intervention administered. Participants were advised that the intervention session were audiotaped for these purposes.

Homework was given at the end of the first intervention session. Those participants in the relaxation focused intervention were asked to write a description of their relaxing scene, while those in the pain catastrophizing intervention were asked to complete a table based on cognitive restructuring and challenging negative beliefs about the dental situation. The relaxation focused and pain catastrophizing reduction group homework assignments, can be found in Appendices F and G respectively. At the end of the second intervention session (i.e., at the end of the intervention), a series of questionnaires (Pain Catastrophizing Scale, Dental Beliefs Survey, Dental Cognitions Checklist, Dental Fear Survey, and Dental Anxiety Scale –Revised, Expected Pain Scale) was completed by participants. Participants were then asked to attend their scheduled dental hygiene treatment appointment. At this stage in the study, there were 5 dropouts (i.e., participants who attended the both intervention sessions and did not attend their scheduled dental hygiene appointment): 3 from the pain catastrophizing reduction group and 2 from the relaxation focused group.

### **Dental hygiene treatment**

Comprehensive dental treatment was provided by 36 senior dental hygiene students. Dental hygiene faculty supervised all procedures and confirmed all clinical assessment data. Participants received two dental hygiene treatment visits at the university dental clinic. Study participants in this study were treated as “regular” dental hygiene patients and were managed as such with the exception of fees which were paid by the researchers.

*First Dental Hygiene Treatment Visit:* At the beginning of the first dental hygiene treatment visit, participants were asked to complete several questionnaires (Pain Catastrophizing Scale, Dental Anxiety Scale –Revised, Dental Fear Survey, Dental Beliefs Questionnaire, Dental Cognitions Scale, Mood Questionnaire, Expected Pain Scale). After completing the questionnaires, participants received a standard assessment protocol consisting of vital signs, intra and extra oral exam, hard and soft tissue exam, plaque index and based on finding a patient education, and a dental hygiene treatment plan were designed. At this point, participants rated their discomfort levels for head and neck as well as hard tissue exams on the Experienced Pain Scale. Following the initial dental hygiene assessment, participants were scheduled for a return appointment to complete the implementation phase of the dental hygiene treatment (approximately 1-week later).

*Second Dental Hygiene Treatment Visit:* At the second visit to the dental clinic, participants reviewed their dental hygiene plan and patient education (i.e., instructed in oral hygiene home care), followed by a dental hygiene treatment including: scaling, polishing, fluoride, and plaque index. Participants were asked to report discomfort levels on the Experienced Pain Scale for the various dental procedures performed and

asked to complete the Experienced Negative Mood Scale. Upon completion of the dental hygiene treatment, those participants in the wait list control group were given the opportunity to participate in one of the two intervention groups of their choice. It can be noted that none of the participants from the wait list control group wished to participate in either of the intervention groups. All participants were asked if they had any questions and thanked for their participation.

## **Measures**

**-Pain Catastrophizing Scale (Sullivan et al., 1995):** The Pain Catastrophizing Scale can be found in Appendix H. The Pain Catastrophizing Scale is a 13 item self-report measure on which participants rated the frequency with which they typically experienced different thoughts and feelings when in pain. Ratings were made on a 5-point scale with the endpoints (0) never and (4) always. The Pain Catastrophizing Scale yields a total score and three subscale scores assessing rumination, magnification, and helplessness. Studies of adult community and undergraduate samples have provided support for the validity (i.e., construct, concurrent, discriminant, predictive, test-retest), reliability (i.e., internal consistency, stability, concurrent), and oblique 3-factor structure of the Pain Catastrophizing Scale (Sullivan et al., 1995; Osman, Barrios, Kopper, Hauptmann, Jones, & O'Neil, 1997; Osman, Barrios, Gutierrez, Kopper, Merrifield, & Grittmann, 2000). Osman and colleagues (2000) examined the reliability and validity of the Pain Catastrophizing Scale in adult community (aged 20-65 yrs) and pain outpatient (aged 19-53 yrs) samples. The Pain Catastrophizing Scale had high internal consistency in both groups as well as good discriminant validity by showing significant

differences between the community and the outpatient samples on the Pain Catastrophizing Scale total and subscales. Sullivan and colleagues (1995) reported the Pain Catastrophizing Scale as having acceptably high internal consistency (coefficient alphas: total Pain Catastrophizing Scale=0.87, rumination=0.87, magnification=0.66, and helplessness=0.78), and as stable over a 6-8 week period (test-retest  $r=0.78$ ). A study on a Dutch adult community sample replicated previous studies of the factor structure, reliability, and validity of the Pain Catastrophizing Scale (Severeijns, van den Hout, Vlaeyen, & Picavet, 2002). Severeijns and colleagues (2002) reported that across different pain subgroups, the reliability of the Pain Catastrophizing Scale total and subscales scores were adequate as well as additional evidence for the concurrent validity of the Pain Catastrophizing Scale was found. The Pain Catastrophizing Scale was included among other measures of catastrophizing in order to measure the level of pain catastrophizing reported by the participants.

**-Dental Anxiety Scale - Revised (Ronis, 1994):** The Dental Anxiety Scale - Revised can be found in Appendix I. The Dental Anxiety Scale -Revised assesses the degree to which participants experienced fear or anxiety in response to imagining different aspects of dental procedures (i.e. preparing for a check-up, waiting while the dentist prepares the drill, and waiting while the hygienist prepares the scaling instruments). The Corah Dental Anxiety Scale was introduced in 1969. Since then, changes in language usage and dental practice have rendered the scale outdated. In 1994, Ronis introduced the Dental Anxiety Scale - Revised, which acknowledged the roles of dental hygienists and female dentists in the dental office. A study examined the psychometric

equivalence of the Dental Anxiety Scale - Revised and the Dental Anxiety Scale (Ronis, Hansen, & Antonakos, 1995). Ronis and colleagues (1995) reported that the two measures were psychometrically equivalent and therefore the Dental Anxiety Scale-Revised can be used in its place. Participants' scores are summed to yield a total score, where higher values reflect greater dental anxiety. Scores greater than 15 are indicative of phobic levels of anxiety (Corah, Gale, & Illig, 1978; Ronis, 1994). Internal reliability estimated by Cronbach's alpha coefficient was 0.82 for the checkup version of the scale (Ronis, 1994). Validity was examined by correlating the revised scale with another measure of dental anxiety and measures of conceptually related variables (Ronis, 1994). Dental anxiety correlated positively with history of dental problems ( $r = .13, p < .01$ ), negatively with frequency of preventive dental visits ( $r = -.28, p < .001$ ), and positively with another measure of dental anxiety ( $r = .61, p < .05$ ), supporting the validity of the scales (Ronis, 1994). In a recent review of anxiety measures in dentistry, Newton and Buck (2000) concluded that the Dental Anxiety Scale has satisfactory reliability and validity.

**-Dental Beliefs Survey** (Milgrom, Weinstein, Kleinknecht, & Getz, 1985): The Dental Beliefs Survey can be found in Appendix J. The Dental Beliefs Survey aimed to assess the patient's perception of the dentist's or dental hygienist's behaviour, and how the process of dental care was delivered, as contributing to the reason for the patient's fear. This measure allows for a greater understanding of the patient's fear and the causes of that fear. The Dental Beliefs Survey identified the degree to which the patient perceives the dental professional as being, or contributing, to the problem. The information is

both diagnostic and prescriptive, and helps to suggest how the health care provider can tailor their service to the client. Three major areas of concern are intended to be explored by this questionnaire: professionalism or ethics, communication, and lack of control. This 3-factor solution has been challenged by current research. An exploratory and confirmatory analysis by Kulich, Berggren, Hakeberg, and Gustafsson (2001) reported a 5-factor solution in a dental phobic population. However the study did report finding a general dimension which suggests that the Dental Beliefs Survey's total score can be used to measure general negative beliefs about dental office visits (Kulich et al., 2001). It is a 28-item questionnaire. Ratings are made on a 5-point scale with the end points (1) never and (5) nearly always. The internal reliability and discriminant validity of the Dental Beliefs Survey total score has been tested and reported in a number of studies (Johansson et al., 1993; Kvale, Berg, Nilsen, Raadal, Nielsen, Johnsen, & Wormnes, 1997; Moore, Berggren, & Carlsson, 1991). Internal reliability estimated by Cronbach's alpha coefficient was greater than .90 (Kvale et al., 1997). Clinically meaningful and statistically significant correlations between the Dental Beliefs Survey and the Dental Anxiety Scale as well as the Dental Fear Survey have been found (Johansson et al., 1993; Kunzelmann & Dunnunger, 1990; Kvale et al., 1997). The Dental Beliefs Survey has been found to be sensitive to clinical changes in adult patients seeking dental-fear treatment (Abrahamsson, Berggren, Hakeberg, & Carlsson, 2003). Abrahamsson and colleagues (2003) reported that following treatment for dental fear, improved dental beliefs during the first two dental visits predicted dental-fear reduction.

**-Dental Cognitions Questionnaire (de Jongh, Muris, ter Horst, & Shoemakers, 1995):**

The Dental Cognitions Questionnaire can be found in Appendix K. This is a 38-item checklist which assesses the frequency and believability of negative cognitions related to dental treatment. The participant is asked to indicate “Yes” or “No” if they have that negative thought which will be referred to as the Frequency Subscale. The participant is then asked to rate the degree to which he or she believes each statement at that moment by filling in a percentage from 0 to 100% where 0% “I don’t believe this thought at all” and 100% “I am absolutely convinced that this thought is true”. This part of the questionnaire will be referred to as the Believability Subscale. The questionnaire is divided into two sections but are not used as separate subscales: negative beliefs pertaining to dentistry in general, and negative self-statements that pertain to the individual’s thinking during treatment. de Jongh and colleagues’ (1995) results indicated that the Dental Cognitions Questionnaire has good internal consistency, high test-retest reliability, good discriminant validity, and satisfactory concurrent validity, as indicated by positive associations with indices of anxiety and other relevant cognitive measures. Internal reliability was estimated by Cronbach's alpha coefficient which was 0.95 for DCQ frequency and 0.95 for DCQ-believability. The Dental Cognitions Questionnaire discriminated strongly between dental phobics and non-phobic participants (de Jongh et al., 1995).

**-Dental Fear Survey (Kleinknecht, Klepac, & Alexander, 1973):** The Dental Fear Survey can be found in Appendix L. The Dental Fear Survey assesses three areas pertaining to dental fear: patient’s avoidance of dentistry, degree of physical arousal

they feel while undergoing dental treatment, and the amount of fear that each dental situation and procedure causes for them. A final question asks about how much fear the person experiences overall in a dental situation. The three factor solution has been confirmed by a factor analysis across demographically and geographically diverse groups (Cesar, de Moracs, Milgrom, & Kleinknecht, 1993; Kleinknecht, Thorndike, McGlynn, & Harkavy, 1984; Milgrom, Kleinknecht, Elliott, Liu, & Teo, 1990). Responses are made on a 5 point scale with the end points (1) never and (5) very much or nearly all the time. Kvale and colleagues (1997) reported good discriminant validity when used to discriminate between fearful and regular (i.e., non-fearful) patients. Data available on the internal consistency, test re-test reliability, and validity of the questionnaire are satisfactory (Moore et al., 1991; Newton & Buck, 2000; Schuurs & Hoogstraten, 1993). Schuurs and Hoogstraten (1993) argued that the Dental Fear Survey is more sensitive compared to six measures of adult dental anxiety, such as the Dental Anxiety Scale - Revised, due to its greater range in scores. Significant correlations have been reported between the Dental Fear Survey and the Dental Beliefs Survey as well as the Dental Anxiety Scale (Johansson, & Berggren, 1992; Kvale et al., 1997).

**-Experienced Negative Mood Scale** (McNair, Lorr, & Droppleman, 1971): The Experienced Negative Mood Scale can be found in Appendix M. Participants completed a brief measure of current mood consisting of 15 adjectives drawn from the Profile of Mood States (McNair et al., 1971) in order to have a measure of emotional distress. Ratings are made on an 11-point scale with the endpoints (0) not at all and



(10) extremely. Participants rated the intensity of different moods they expected to experience during the dental hygiene treatment on an 11-point scale with the endpoints (0) not at all and (10) extremely. Adjectives were chosen to represent three different mood categories: (1) sadness (sad, discouraged, hopeless, joyful (reversed scored), happy (reversed scored), delighted (reversed scored)); (2) anger (angry, hostile, irritable); and (3) anxiety (anxious, tense, worried, afraid, terrified, scared). A composite score for negative mood was computed by summing all fifteen items of the mood scale. The same scale was used by Sullivan and colleagues (2001) who reported a total scale reliability coefficient of 0.81. McNair and colleagues' (1971) results indicated that the Profile of Mood States has good internal consistency, high test-retest reliability, good discriminant validity, and satisfactory concurrent validity, as indicated by positive associations with indices of anxiety and depression. Internal consistency was estimated by Cronbach's alpha coefficient which ranged from 0.84 to 0.95 for the various subscales. The internal consistency estimated by Cronbach's alpha coefficient in the present study ranged from .89 to .90 in the different intervention groups and at different points in time.

**-Experienced Pain Scale:** The Experienced Pain Scale can be found in Appendix N.

The Experienced Pain Scale is a 6 item scale. Each item was rated on an 11-point scale with the end points (0) no pain and (10) extreme pain. This measure was created in order to have participants rate the degree of pain they experienced during several different components of the dental procedures. This scale is typical of numeric rating scales used in pain research. Jensen and colleagues (1993) compared the reliability and

validity of several measures of pain intensity; more specifically comparing the individual 0-10 pain intensity ratings with composite scores of several pain ratings. Both ratings were found to be a reliable measure of the pain experience.

**-Expected Pain Scale:** The Expected Pain Scale can be found in Appendix O.

Participants were asked to rate the pain they expected to experience during the dental hygiene treatment procedure by choosing a number between (0) no pain and (10) extreme pain. Sullivan and colleagues (2000) used the same scale in order to measure pain expectancies.

**-Periodontal Status:** Periodontal Status was determined by the clinical evaluation made by senior dental hygienist students. This included a visual inspection of gingiva (e.g. colour, changes, and inflammation) and a measure of probing depths, bleeding, and radiographic interpretation. On the basis of this information, the hygienist provided a rating on a 5-point severity scale: (1) healthy periodontium, (2) gingivitis, (3) early periodontitis, (4) moderate periodontitis, (5) advanced periodontitis. The measurement of an individual's periodontal status is a common clinical measure of an individual's dental hygiene status (Sullivan & Neish, 1997, 1999a,b).

**-Degree of Scaling Difficulty Scale:** A 4-point severity scale was used to indicate the location and distribution of hard and soft deposits on the teeth; ranging from (1) minimal supra gingival plaque and calculus to (4) heavy supra and/or sub gingival plaque and calculus. Similar to measures of periodontal status, the degree of scaling

difficulty is a common clinical measure of an individual's dental hygiene status (Sullivan & Neish, 1997, 1999a,b).

## Chapter 3: Results

### Sample Characteristics

*General Characteristics.* In total there were 58 participants (47 women and 11 men) who completed the study in its entirety (i.e., all three stages). The ages of the participants ranged from 18 to 49 years old. The average age of a participant was 21 years old ( $SD = 4.6$  years). The mean rating for Periodontal Status was 1.88 ( $SD = .35$ ), indicating that the typical participant was classified as having gingivitis with no radiographic evidence of bone loss from periodontal disease. The mean rating for Degree of Scaling Difficulty was 1.88 ( $SD = .43$ ), indicating above minimal hard and soft deposits on teeth. On average, participants reported flossing two to three times per week ( $X = 2.5$ ,  $SD = 2.8$ ), and reported brushing their teeth two to three times per day ( $X = 2.5$ ,  $SD = 1$ ). The average Pain Catastrophizing Scale score, obtained at screening, was 26.14 ( $SD = 5.50$ ) with a range from 24 to 36. Appendix P shows Table 1 which summarizes the sample characteristics on descriptive variables.

*Group Characteristics.* The 58 participants were randomly assigned to the relaxation focused intervention group ( $N = 23$ ; 21 women and 2 men), the pain catastrophizing reduction intervention group ( $N = 17$ ; 14 women and 3 men), and the wait-list control group ( $N = 18$ ; 12 women and 6 men). The participants were randomly assigned to a group by the researcher blindly choosing one piece of paper out of a possible three

pieces with the name of the group on the paper. Each time a piece of paper was chosen, it was replaced for the next participant.

The mean ages were, for the relaxation focused intervention group participants, 21.5 years old ( $SD = 3.0$ ), for the pain catastrophizing reduction intervention group participants, 22.1 years old ( $SD = 7.3$ ), and for the wait-list control group participants, 20.3 years old ( $SD = 2.8$ ). The mean rating for periodontal status for the relaxation focused intervention group participants was 2.0 ( $SD = .21$ ), for the pain catastrophizing reduction intervention group was 1.8 ( $SD = .45$ ), and for the wait-list control group was 1.8 ( $SD = .39$ ). These scores indicate that in all three groups a typical participant was classified as having gingivitis with no radiographic evidence of bone loss from periodontal disease. The mean rating for the Degree of Scaling Difficulty, for the relaxation focused intervention group was 2.0 ( $SD = .30$ ), for the pain catastrophizing reduction intervention group was 1.9 ( $SD = .50$ ), and for the wait-list control group was, 1.7 ( $SD = .47$ ). On average, participants in all three groups reported flossing two to three times per week (relaxation focused intervention group,  $X = 2.7$ ,  $SD = 2.9$ ; pain catastrophizing reduction intervention group,  $X = 2.1$ ,  $SD = 2.45$ ; wait-list control group,  $X = 2.6$ ,  $SD = 3.0$ ). Participants in all three groups reported brushing their teeth on average two to three times per day (relaxation focused intervention group,  $X = 2.6$ ,  $SD = 1.12$ ; pain catastrophizing reduction intervention group,  $X = 2.4$ ,  $SD = 0.81$ ; wait-list control group,  $X = 2.3$ ,  $SD = 1.03$ ).

The average total Pain Catastrophizing Scale score obtained at screening, for the relaxation focused intervention group was 25.44 ( $SD = 9.6$ ), for the pain catastrophizing

reduction intervention group was 24.47 (SD = 9.6), and for the wait-list control group was 24.77 (SD = 8.9).

*Equivalence of Groups.* Several ANOVA analyses were conducted on the measures given at the initial visit. Analyses revealed no significant differences between groups on any demographics, descriptive, or other variables. Appendix Q has Table 2 which shows the results of the analyses.

According to a Chi-Square analyses, there were no differences in attrition between groups ( $\chi^2 = .63$ , n.s.). After the initial visit, 3 participants withdrew from the pain catastrophizing reduction intervention group, 3 participants withdrew from the relaxation focused intervention group, and 4 participants from the wait-list control group withdrew. After the psychological intervention, 3 participants withdrew from the pain catastrophizing reduction intervention group, and 2 participants withdrew from the relaxation focused intervention group.

### **Intervention Manipulation Checks**

*Equivalence of Psychologists Administering Intervention.* Two provincially registered, doctoral level clinical psychologists administered the group intervention sessions. These psychologists will be referred to as Dr.1 and Dr.2. In the relaxation focused intervention group, Dr.1 and Dr.2 administered treatment to 7 participants and 16 participants, respectively. A Chi-Square analysis revealed that the psychologists

administered the same proportion of each intervention ( $\chi^2 = 2.06$ , n.s.). A two way ANOVA examining potential psychologist differences on the total Pain Scale Score reported at the Dental Hygiene Visit revealed no significant main effect of treatment ( $F = 2.41$ , n.s.), main effect of psychologist ( $F = 2.37$ , n.s.), or interaction ( $F = .39$ , n.s.).

*Intervention Protocol Check.* An independent rater was used to ensure that the intervention protocol had integrity, that is that the intervention was administered fully and correctly by the psychologists. The rater was provided with half of the intervention tapes (10 tapes, 5 from each intervention group) as well as a Criteria Check Sheet with 18 items. The Criteria Check Sheet can be found in Appendix R. These criteria that were generated to represent each intervention (6 items for the relaxation focused intervention group and 6 items for the pain catastrophizing reduction intervention group) as well as 6 items that were not part of either intervention. The rater was blind to the treatment being administered and was asked to rate the presence or absence of the criteria by indicating yes or no. An analysis of the Criteria Check Sheet revealed a 100% agreement between the criteria identified by the rater as present and the type of treatment administered in the given session. In other words, for each tape the rater chose all 6 items which were part of the particular intervention, and did not chose items representing the other intervention or the other items which were not part of either intervention.

### **Primary Intervention Outcome Measures**

*Experienced Pain Scale.* The total Experienced Pain Scale scores obtained after the dental hygiene treatment was, for the relaxation focused intervention group, 14.53 (SD = 8.73), for the pain catastrophizing reduction intervention group, 8.56 (SD = 7.67), and for the wait-list control group, 18.35 (SD = 8.89). Appendix S shows Figure 2 shows a graphic representation of the means of the total Pain Scale score at the Dental Hygiene Treatment Visit across intervention groups. A one way ANOVA revealed significant differences between groups on the measure of pain taken at the dental hygiene treatment ( $F = 5.76, p < .01$ ). *Post hoc* comparisons revealed that the cognitive intervention group reported statistically significant less pain than the wait-list control group (mean difference = 7.15,  $p < .01$ ) and relaxation focused intervention groups (mean difference = 4.88,  $p < .05$ ). There were no significant differences between the relaxation intervention group and wait list control group on the measure of experienced pain (mean difference = 2.27,  $p = .26$ )

Each item on the Pain Scale was entered into MANOVA in order to determine the whether individual items that differed between groups. The analysis revealed significant differences between groups on 2 of the 6 items of the Pain Scale. Appendix T shows Table 3 shows results of the item-by-item MANOVA of each Pain Scale item along with means for each group. *Post hoc* comparisons revealed that the catastrophizing reduction intervention group reported significantly less pain than the relaxation intervention and wait list control group, when the dental hygienist ‘cleaned deposits from their teeth with metal instruments’ and when the dental hygienist flossed their teeth compared to the wait-list control and relaxation focused intervention groups



(Least Significant Difference *post hoc* test,  $p < 0.05$ ). There was a nearly significant difference between groups on the item which asked the participant to rate the overall pain ( $F = 3.14$ ,  $p = .051$ ). Upon examining the means for the various groups, it appears that the trend shows that the pain catastrophizing reduction group reported less overall pain than the relaxation focused and wait-list control groups.

*Experienced Negative Mood Scale.* The total Experienced Negative Mood Scale score obtained after the dental hygiene treatment visit, for the relaxation focused intervention group was 29.70 (SD = 13.97), for the pain catastrophizing reduction intervention group was 20.35 (SD = 11.87), and for the wait-list control group was 40.83 (SD = 21.99). It should be noted that the catastrophizing reduction group reported marginally better mood than the relaxation focused group. A one way ANOVA revealed significant differences between groups on the measure of negative mood taken after the dental hygiene treatment ( $F = 6.87$ ,  $p < .002$ ). *Post hoc* comparisons revealed that both intervention groups, the pain catastrophizing reduction intervention group and the relaxation focused intervention, reported statistically significant better mood than the wait-list control group (Least Significant Difference *post hoc* test,  $p = .001$  and  $p = .04$  respectively). There were no significant differences between the two intervention groups (pain catastrophizing reduction group and the relaxation-focused group). Appendix U shows Figure 3 which is a graphic representation of the means of the total Experienced Negative Mood Scale score at the dental hygiene treatment visit across the groups.

Each subscale on the Experienced Negative Mood Scale was entered into a MANOVA in order to determine which subscales differed among groups. The analysis revealed significant difference on 1 of the 3 subscales of the Experienced Negative Mood Scale. Groups differed on the anxiety scale. Appendix V shows Table 4 which contains the results of the subscale analysis of the Experienced Negative Mood Scale as well as the means for each group on the various subscales. *Post hoc* comparisons revealed that the catastrophizing reduction intervention group and the relaxation focused intervention group reported being significantly less anxious than the wait-list control.

*Intention to Treat Analysis.* An intention to treat analysis was completed in which all of the participants regardless of subsequent withdrawal from the study were included in the analysis of the primary outcome data (e.g., pain and mood ratings). This analysis is to ensure that the clinical effectiveness of the intervention provided is not overestimated as an artifact of attrition. The last observation carried forward (LOCF) method was used in which the missing responses on the primary outcome measures were replaced with the last available values on those variables for the participant (Hollis & Campbell, 1999). When the primary outcome data were re-analyzed using the intention-to-treat methodology, all previously significant outcomes remained. Please refer to Appendix W for the results of the intention-to-treat analysis.

### **Comparisons of Groups at the Dental Hygiene Treatment Visit on Psychological Process Measures**

Several one-way ANOVA analyses were conducted in order to examine any significant differences between groups on the measures obtained at the dental hygiene treatment visit. All analyses revealed no significant difference between groups on all measures. Appendix X shows Table 5 which displays the results of the one-way ANOVA analyses and descriptive statistics on secondary outcome measures at the Dental Hygiene Visit.

### **Comparisons of Groups at the Initial Visit and the Dental Hygiene Treatment Visit on Secondary Outcome Measures**

A mediator model was examined. Although, there was a significant relationship between intervention and experienced pain, there was no significant relationship between intervention and mediator variables (i.e., dental anxiety, catastrophizing). Therefore the results of this study do not support a mediation model. The small sample size of this study would decrease the power to detect a mediator.

A mixed model repeated measures ANOVA was conducted in order to investigate the relationship between time (pre and post dental hygiene treatment), treatment (three groups), and secondary process measures (Pain Catastrophizing Scale, Dental Anxiety Scale –Revised, Dental Fear Survey, Dental Beliefs Questionnaire, Dental Cognitions Scale, Mood Questionnaire, Expected Pain Scale). The ANOVA analysis examining changes in secondary outcome measures over time and intervention revealed a significant main effect of time ( $F = 17.20, p < .01$ ), main effect of secondary outcome measures ( $F = 14.35, p < .01$ ), and an interaction between time and secondary

outcome measures ( $F = 3.92, p < .01$ ). There were no significant main effect of intervention ( $F = .39, n.s.$ ), interaction between time and intervention ( $F = 1.47, n.s., p = .24$ ), secondary outcome measures and intervention ( $F = .70, n.s.$ ), and interaction between secondary outcome measures, time, and intervention ( $F = .70, n.s.$ ). This analysis revealed that many of the secondary outcome measures changed over time. Although there were no significant interactions between time and treatment on secondary outcome measures, the trend of the means pre and post intervention supported the pursuit of *a priori* post hoc tests.

Planned *a priori* comparisons were chosen to analyze differences between groups between the initial and dental hygiene treatment visit on various outcome measures, using conventional alpha levels, as recommended by Tabachnick and Fidell (2001). Paired sample t-tests were conducted to investigate within group comparisons between visits to examine any significant changes occurring within groups. Therefore each variable will be presented independently.

**Pain Catastrophizing Scale.** A series of paired sample t-tests on the various groups revealed no significant differences within the relaxation focused intervention group ( $t = 1.96, n.s., \eta^2 = .15$ ) and wait-list control group ( $t = 1.76, n.s., \eta^2 = .15$ ). However, the pain catastrophizing reduction intervention group had a significant decrease between their scores on the Pain Catastrophizing Scale at the initial visit and the dental hygiene treatment visit ( $t = 3.13, p < .01, \eta^2 = .38$ ). Appendix Y shows Figure 4 which is a graph of the mean scores on the Pain Catastrophizing Scale for each group.

**Dental Anxiety Scale -Revised.** A series of paired sample t-tests on the various groups revealed no significant differences within the relaxation focused intervention group ( $t = 1.63$ , n.s.,  $\eta^2 = .11$ ) and wait-list control group ( $t = .38$ , n.s.,  $\eta^2 = .01$ ) group. However, the pain catastrophizing reduction intervention group had a significant decrease between scores on the Dental Anxiety Scale -Revised at the initial visit and the dental hygiene treatment visit ( $t = 2.35$ ,  $p < .05$ ,  $\eta^2 = .26$ ). Appendix Z shows Figure 5 which is a graph of the mean scores on the Dental Anxiety Scale –Revised for each group.

**Dental Beliefs Survey.** A series of paired sample t-tests on the various groups revealed no significant differences within the wait-list control group ( $t = 1.74$ , n.s.,  $\eta^2 = .15$ ). However, the pain catastrophizing reduction intervention group and relaxation focused intervention group had a significant difference between scores on the Dental Beliefs Survey at the initial visit and the dental hygiene treatment visit ( $t = 3.62$ ,  $p < .01$ ,  $\eta^2 = .45$ ;  $t = 4.03$ ,  $p < .001$ ,  $\eta^2 = .43$ , respectively). Appendix AA shows Figure 6 which is a graph of the mean scores on the Dental Beliefs Survey for each group.

**Dental Fear Survey.** A series of paired sample t-tests on the various groups revealed no significant differences within the pain catastrophizing reduction intervention ( $t = 1.96$ , n.s.,  $\eta^2 = .19$ ) and wait-list control group ( $t = 1.14$ , n.s.,  $\eta^2 = .07$ ) group. However, the relaxation focused intervention group had a significant difference between their scores on the Dental Fear Survey at the initial visit and the dental hygiene

treatment visit ( $t = 3.44, p < .01, \eta^2 = .35$ ). Appendix BB shows Figure 7 which is a graph of the mean scores on the Dental Fear Survey for each group.

**Experienced Negative Mood Scale.** A series of paired sample t-tests on the various groups revealed no significant differences within the pain catastrophizing reduction intervention group ( $t = .78, n.s., \eta^2 = .04$ ), relaxation focused intervention group ( $t = .87, n.s., \eta^2 = .03$ ), and the wait-list control group ( $t = .06, n.s., \eta^2 = .00$ ) group. Appendix CC shows Figure 8 which is a graph of the mean scores on the Experienced Negative Mood Scale for each group.

**Dental Cognitions Questionnaire –Frequency Subscale.** A series of paired sample t-tests on the various groups revealed no significant differences within the wait-list control group ( $t = 1.94, n.s., \eta^2 = .20$ ). However, the pain catastrophizing reduction group and the relaxation focused intervention group had a significant difference between their scores on the Dental Cognitions Questionnaire –Frequency Subscale at the initial visit and the dental hygiene treatment visit ( $t = 4.02, p < .01, \eta^2 = .54$ ;  $t = 2.33, p < .03, \eta^2 = .22$ ; respectively). Appendix DD shows Figure 9 which is a graph of the mean scores on the Dental Cognitions Questionnaire –Frequency Subscale for each group.

**Dental Cognitions Questionnaire –Believability Subscale.** A series of paired sample t-tests on the various groups revealed no significant differences within the pain catastrophizing reduction intervention group ( $t = .12, n.s., \eta^2 = .01$ ), relaxation focused

intervention group ( $t = .39$ , n.s.,  $\eta^2 = .04$ ), and the wait-list control group ( $t = .40$ , n.s.,  $\eta^2 = .01$ ). Appendix EE shows Figure 10 which is a graph of the mean scores on the Dental Cognitions Questionnaire –Believability Subscale for each group.

**Expected Pain Scale.** A series of paired sample t-tests revealed no significant differences within the pain catastrophizing reduction intervention group ( $t = 1.19$ , n.s.,  $\eta^2 = .09$ ), relaxation focused intervention group ( $t = 1.10$ , n.s.,  $\eta^2 = .06$ ), and wait list control group ( $t = 1.61$ , n.s.,  $\eta^2 = .14$ ). Appendix FF shows Figure 11 which is a graph of the mean Expected Pain Scale scores for each group.

Appendix GG shows Table 6 which is a summary of the *apriori* paired sample t-test results for the secondary outcome measure results for all three groups.

### **Correlations Among Measures**

This section illustrates correlations among measures which are commonly reported in the literature.

*Correlations Between the Mood Scale and Psychological Process Measures at the Initial Visit.* A partial correlational analysis controlling for age, degree of scaling difficulty and periodontal status found that the Pain Catastrophizing Scale was significantly positively correlated with the total Negative Mood Scale score, the Dental Anxiety Scale –Revised, the Dental Beliefs Survey, and the Dental Fear Survey.

Participant's score on the Dental Anxiety Scale -Revised was significantly correlated with the Dental Beliefs Survey, Dental Fear Survey, Dental Cognitions Questionnaire – Frequency Subscale, and the Mood Scale. Table 7 shows the correlational matrix for the above measures can be found in Appendix HH.

*Correlations Between the Pain Scale, Mood Scale, and Psychological Process*

*Measures at the Dental Hygiene Treatment Visit.* A partial correlational analysis controlling for age, degree of scaling difficulty, and periodontal status found that the Pain Catastrophizing Scale was significantly positively correlated with the total Experienced Negative Mood Scale score, the Dental Anxiety Scale –Revised, and the Dental Fear Survey. The correlation between the Pain Catastrophizing Scale and the Experienced Pain Scale was not significant. Participant's score on the Dental Anxiety Scale -Revised was significantly correlated with the Dental Beliefs Survey, Dental Fear Survey, Dental Cognitions Questionnaire –Frequency Subscale, the Experienced Negative Mood Scale. Table 8 shows the correlational matrix for the above measures can be found in Appendix II.



## Chapter 4: Discussion

### Hypotheses

Based on previous research examining pain catastrophizing and dental pain, patients in the pain catastrophizing reduction intervention group were expected to report better mood and less pain during the dental hygiene procedures than the relaxation focused and wait list control groups, regardless of their dental hygiene status (e.g., degree of difficulty and periodontal status). On the measure of mood, both the pain catastrophizing reduction intervention group and the relaxation focused intervention group reported better mood than the wait list control. The pain catastrophizing reduction intervention group and the relaxation focused intervention group reported feeling less anxious than the wait-list control group. However, on the measure of pain, it was only the pain catastrophizing reduction group that reported less pain than the wait list control group. In addition, the pain catastrophizing reduction group reported less pain than the relaxation focused group. The catastrophizing reduction intervention group reported less pain when the dental hygienist 'cleaned deposits from their teeth with metal instruments', and when the dental hygienist flossed their teeth, compared to the wait-list control and relaxation focused intervention groups. Cleaning deposits from teeth is reportedly one of the more painful procedures completed in a dental hygiene treatment (Tripp et al., 1998).

It was hypothesized that individuals receiving either psychological intervention would report a decrease in pain catastrophizing, dental fear and dental anxiety, and a decrease in negative dental beliefs and dental cognitions compared to the wait-list control group. There were no differences between the initial visit and the dental

hygiene treatment visit in mood (prior to the dental hygiene treatment) and expected pain. When comparing responses on dental beliefs at the initial visit to the dental hygiene visit, both intervention groups but not the wait list control group reported a decrease in the degree they perceived the dental hygienist's behaviour and the process of how dental care was delivered as contributing to their dental fear. In addition, both intervention groups but not the wait list control group reported a decrease between the initial visit and the dental hygiene treatment visit in the amount of negative dental beliefs and dental cognitions. Only the pain catastrophizing reduction intervention group reported decreases between the initial visit and the dental hygiene treatment visit in both pain catastrophizing and dental anxiety. Only the relaxation focused intervention group reported a decrease between the initial visit and the dental hygiene treatment visit in dental fear.

The changes reported on the various process measures indicate a different pattern of results for each intervention group. The catastrophizing reduction group reported a decrease in pain catastrophizing, and dental anxiety. In contrast, the relaxation focused group reported a decrease in dental fear. Both groups reported a decrease in the degree of negative dental beliefs and the number of negative dental cognitions. When examining the effect size for each group on the measure of dental beliefs, there is no difference between groups. However the effect size for catastrophizing reduction group on the measure of results for the decrease in negative dental cognitions was much larger than the effect size for the relaxation focused intervention group.

Since the catastrophizing intervention group targeted the three main components of pain catastrophizing, a reduction in pain catastrophizing would be expected. Likewise negative dental cognitions and dental beliefs, which involved catastrophizing thoughts, would be reduced as a result of the intervention. The reduction of dental anxiety in this group would be anticipated given its close relationship with pain catastrophizing (Sullivan & Neish, 1999, 2000; Tripp et al., 1998; de Jongh et al., 1994).

A reduction in dental fear in the relaxation focused intervention group would be supported by the various studies which document a reduction of dental fear when relaxation strategies are used (Berggren & Carlsson, 1984; Hammarstrand et al., 1995; Johren et al., 2000; Thom et al., 2000). The changes in dental cognitions and dental beliefs in the relaxation focused group could have resulted by reducing dental fear.

In summary, the hypotheses of the study were partially confirmed in that both psychological intervention groups showed less emotional distress and improvement on various psychological measures (i.e., dental fear and dental anxiety) in comparison with the wait-list control group. However only the catastrophizing reduction group reportedly experienced less pain compared to the other groups. In addition, the catastrophizing reduction group reported marginally better mood than the relaxation focused group at the dental hygiene treatment visit. Thus, it is clear that brief group interventions can have significant impact on dental pain and other measures, for individuals high in pain catastrophizing.

### **Intervention for Pain in Dental Treatment**

The results of this study could help the significant number of individuals high in pain catastrophizing and more specifically those individuals who experience more pain and emotional distress during dental procedures. Sullivan and Neish (1997) highlighted the need for an intervention targeting catastrophizing specific to dental situations, given the association between pain catastrophizing and dental pain. The present study together with Sullivan and Neish (1997) highlights the utility of the Pain Catastrophizing Scale as a time efficient screening tool which can identify those individuals in need of treatment for their worries/fear surrounding dental treatment.

Both cognitive-behavioural and relaxation therapies have been successfully used as interventions for the treatment of dental anxiety and fear (de Jongh et al., 1995, Berggren et al., 1984, 2000, Thom et al., 2000, ter Horst & de Wit, 1993). Therefore, the results of this study are somewhat comparable and in agreement with the results reported in the literature since both intervention groups were shown to be successful. The present study is the first study to date, in the dental and psychological literature, which examines the effect of interventions on pain and mood in individuals high in pain catastrophizing. As such, it can provide the impetus to conduct research creating interventions which aim to reduce pain catastrophizing in a variety of age groups, and pain experiences, both acute and chronic.

### **Dental Pain**

The results of this study can be useful for dentists and dental hygienists in their everyday clinical practice. There is a high prevalence of avoidance and fear surrounding dental hygiene treatment visits, sometimes leading to avoidance of dental

treatment (Milgrom et al., 1989). The most common way that patients develop fear and avoidance of dental hygiene treatment visits is through direct negative experiences, such as experiencing pain, in the dental office (Milgrom et al., 1989). In fact, fear of pain is highly predictive of dental fear (Gross, 1992; McNeil, & Berryman, 1989; van Wijk, & Hoogstraten, 2003; Wardle, 1984). Patients often associate dental care with pain. Both Chung and colleagues (2003) and Tripp and colleagues (1998) reported that although most people experience low pain levels during dental hygiene procedures, 20-30% of patients reported a significant pain experience. Neither dental status measures nor treatment difficulty correlate with experienced dental pain. Rather dental anxiety and pain catastrophizing accounted for 1/3 of the variance in pain reports. In the present study, dental pain was reduced in the pain catastrophizing reduction intervention which also reduced pain catastrophizing.

Pain related to dental treatment can lead patients to avoid or postpone treatment, partially or completely, until an emergency occurs, often resulting in poor dental hygiene, and are at greater risk for developing gingivitis and other related dental diseases (Carr & Goudas, 1999). Patients who avoid treatment may be more difficult to treat and less likely to comply with prescribed dental hygiene practices (Bonner, 1997). Individuals who are not attending dental hygiene visits create a financial loss for the dental professional. This problem may be solved by providing cost-efficient and efficacious group interventions, such as the brief pain catastrophizing reduction intervention in the present study. By targeting pain catastrophizing, pain experienced could be decreased during a dental hygiene treatment visit and as a result likely promote better attendance to dental services.

## **Psychological Interventions for Reducing Pain Experienced by Pain**

### **Catastrophizers**

These results are important for the treatment of individuals high in pain catastrophizing. Pain catastrophizers have been reported to show higher levels of disability, health care use, and are at increased risk for developing chronic pain conditions. By having an intervention that can reduce pain and emotional distress, it would be possible to intervene with those individuals high in pain catastrophizing and as a result aim to reduce their degree of disability, prevent the development of chronic conditions, and decrease their use of health care. These results are important for those experiencing acute pain, such as undergoing dental procedures, certain surgeries, and headaches. These individuals can experience less pain and emotional distress, and as a result remain productive, decrease avoidance of various procedures, and generally manage their pain more effectively. The results for the pain catastrophizing intervention group indicated positive changes in variables associated with dental experience and more generally a decrease in pain catastrophizing. The decrease in pain catastrophizing is an important result in that it supports the generalizability of the intervention to other pain populations. The treatment in this study is easily implemented due to its short duration, cost effectiveness (i.e., due to group format and brief duration), and would be readily generalizable to a variety of pain populations and pain conditions.

The research on interventions, both relaxation and cognitive behavioural therapy, for the treatment of dental fear and dental anxiety have received support in the

literature as effective for reducing pain, both acute and chronic. In the present study, both interventions helped individuals high in pain catastrophizing manage their emotional discomfort during dental hygiene procedures. However the results for the cognitive behavioural group were more favorable as these participants experienced less pain and negative mood, as well as a reduction in pain catastrophizing. The present study's results are in agreement with the literature which has reported positive outcomes for those individuals involved in cognitive behavioural therapy. More specifically, the present study supports the hypothesis that individuals high in catastrophizing derive greater benefit from cognitive behavioural therapy compared to relaxation therapy.

Catastrophizers' greater therapeutic benefit from cognitive behavioural interventions than relaxation focused interventions may be explained by the hypothesis that individuals high in catastrophizing have difficulty learning strategies that require diverting their attention away from pain sensations. A relaxation intervention would require an individual to direct their attention away from their pain sensations and towards implementing various strategies, such as guided imagery. Thorn and colleagues (2002) concluded that catastrophizers' limited ability to direct their attention away from pain sensations, renders most imaginal relaxation or imaginal inattention techniques ineffective. As well, individuals who catastrophize tend to ruminate about pain sensations and the severity of the sensations making it difficult to use distraction techniques. Thus, these usually effective techniques are rendered ineffective by the thinking patterns which accompany pain catastrophizing. The attention needed to employ distraction and relaxation techniques may not be available due to the attention being consumed by the pain experience and the attention required to engage in

catastrophic thinking. In contrast, specific pain catastrophizing reducing cognitive interventions capitalize on a catastrophizer's tendency to focus on pain sensations by having the individual identify the underlying negative thinking and feelings associated with pain.

Thorn and colleagues (2002) discussed the need for a targeted approach in cognitive behavioural interventions to address catastrophizing. The present study's cognitive behavioural group intervention is similar to the cognitive behavioural group treatment approach specifically designed to reduce pain catastrophizing for chronic pain suggested by Thorn et al. (2002). Although Thorn and colleagues (2002) have yet to empirically test their proposed group treatment approach, they make a number of suggestions as to why a specific approach would best treat/reduce pain catastrophizing. They argue that a specific intervention targeting catastrophizing is necessary since not all patients benefit from general cognitive behavioural interventions or cognitive interventions not specific to pain catastrophizing for the treatment of pain. In fact, those patients who were not successful with general cognitive behavioural intervention could often be characterized as having pain catastrophizing thoughts (Affleck et al., 1992; Asghari & Nicholas, 1999; Gatchel & Weisberg, 2000). The present study incorporated this suggestion by focusing the cognitive behavioural intervention specifically on catastrophizing and its components (i.e., magnification, rumination, and helplessness). Unlike non-targeted or general approaches which may not address catastrophic thinking about pain, the cognitive behavioural approach used in this study challenged, and set out to change and restructure cognitions specific to pain catastrophizing.



### **Theoretical Models of Pain Catastrophizing**

An investigation into the efficacy of various interventions to assist pain catastrophizers may further develop the theoretical model of the mechanisms that underlie the relationship between pain catastrophizing and pain. Five theoretical models have been proposed in order to account for the relationship between pain and pain catastrophizing: a classical schema activation model, a general schema activation model, an appraisal model, an attention model, and a communal coping model (Sullivan et al., 2001). Providing empirical support for these models was not the main purpose of the present study. In order to test these models, the present study would have had to incorporate more specific measures than those used in the present study. However, the present study's results lends the most support to the attention model.

As discussed in the introduction, the general schema activation model, is a less typical application of the classical schema activation model, which can better explain the relationship between pain catastrophizing and pain. The general schema-activation model views catastrophizers as possessing a "pain schema" that contains excessive negative information about pain and the individual's ability to cope with pain which may influence emotional functioning which in turn leads to heightened pain experience. In the present study, pain catastrophizing was correlated with high levels of emotional distress and emotional distress was correlated with heightened pain experience. The thoughts recorded in the pain catastrophizing reduction group contained evidence of a pain schema exemplified by negative thoughts about pain and a perceived inability to cope with pain. The cognitive-behavioural intervention could have resulted in modifying the contents of the pain schema, whereby the new revised pain schema

would result in lower levels of pain intensity and emotional distress. However in order to evaluate changes in the pain schema, pain schemas would need to be examined pre and post intervention. Since these evaluations did not occur, it is unknown whether changes in the individual's pain schema took place.

In terms of support for the appraisal model, the present study did find a relationship between positive changes in dental beliefs, dental cognitions, dental anxiety, and pain catastrophizing by the participants at the initial visit (before the intervention) and at the dental hygiene treatment (post intervention). Therefore, the changes in pain and emotional experience reported as a function of treatment in this study may be mediated by changes in appraisals. Previous studies have shown that changes in pain-related appraisals and coping strategy use are associated with improvement in pain intensity and psychological and physiological functioning (Keefe et al., 1990; Turner & Clancy, 1986). Both the relaxation focused and catastrophizing reduction group reported decreases in negative dental beliefs and the frequency of negative dental cognitions. The decrease in pain catastrophizing can also represent changes in the individual's appraisals, as this concept is based on beliefs/cognitions about the individuals ability to assess, manage, and cope with a pain experience. Numerous studies of pain patients have shown that an individual's appraisals about pain can effect their pain intensity and psychological and physiological functioning (Geisser et al., 1994; Keefe et al., 1987; Keefe et al., 1992; Turner & Clancy, 1986). Pain catastrophizer's excessively negative focus may be sustained by efficacy appraisals (Parker et al., 1989; Turner & Clancy, 1986; Rosenstiel & Keefe, 1983). It can be argued that the pain catastrophizing reduction group successfully decreased the

‘negative focus’ as evidenced by the changes in appraisals (i.e., dental beliefs, pain catastrophizing, dental anxiety).

The cognitive-behavioural intervention in the present study focused on challenging an individual’s negative appraisals associated with dental care. The key ingredients to this intervention was to identify and alter maladaptive perceptions specific to pain catastrophizing about pain and the dental situation, increasing the individual’s sense of control through reconceptualizing the pain sensation or other dental fears, and finally to generalize these skills to other thoughts that may arise. This intervention resulted in less pain experienced and less psychological distress. Cognitive behavioural treatments have produced changes in pain experience, appraisal, and reduced behavioural expression of pain (Morley, Eccleston, & Williams, 1999). In fact studies have reported that changes in physical performance and disability levels in patients with pain are associated with cognitive and behavioural rather than sensory and biomedical aspects of pain (Asmundson, Norton, & Norton, 1999; Linton, 2000; Vlaeyen & Linton, 2000).

It has been hypothesized that catastrophizers relate past pain experiences to heightened pain, and that they may develop expectancies about pain experiences, threat value of pain sensations, and their ability to manage the stress associated with painful experiences (Thorn & Boothby, 1999; Turk & Rudy, 1992). Therefore repeated exposure to the pain situation would likely result in further challenging negative beliefs and as a result pain expectancies or appraisals changed. In the present study, participants who experienced a decrease in pain and emotional distress began to correct their over appraisal of the negative aspects of pain related to the dental situation as

evidenced in their decrease in pain catastrophizing, dental beliefs, and dental anxiety. It is hypothesized that upon future dental hygiene treatment visits, these individuals would adjust their appraisal and expectancy of pain and emotional distress further.

The attentional model of pain catastrophizing is closely related to the appraisal model of catastrophizing. The attentional model states that the pain schema held by catastrophizers may lead to attention directed toward the pain-related information. It follows from the appraisal model that an individual who exaggerates the threat value of pain would likely increase their attention towards the pain. In the present study, the tendency to direct their attention towards the pain-related information was capitalized on by the cognitive-behavioural intervention which directed the participants attention towards their pain sensations and pain related thoughts. The cognitive behavioural intervention evaded the difficulty catastrophizers have evidenced when using distraction coping strategies and suppressing pain related thoughts (Heyneman et al., 1990; Sullivan et al., 1997). This difficulty likely results from the catastrophizer's difficulty in redirecting their attention away from the pain sensations. The cognitive behavioural intervention directed their attention towards their pain sensations and thoughts. The most effective interventions may be those that focus on the appraisals that catastrophizers have about pain rather than redirecting their attention away from their pain sensations. The relaxation intervention would require the participant to direct their attention away from the pain by imagining a relaxation scene and distancing themselves from the dental situation. In support of the attentional model of catastrophizing, the present study found a more favorable response to the cognitive behavioural intervention, which would be conceptualized as being less demanding on the attentional

resources of an individual high in pain catastrophizing, than the relaxation focused intervention.

It has been hypothesized that the proposed attention difficulties in pain catastrophizing result from an excessively negative focus on the pain experience. Individuals who exaggerate the threat value of pain stimuli or sensations will allocate more attention to pain sensations. Individuals with greater appraisals of threat will direct their attention toward the source of the threatening information, such as their pain experience (Crombez, Eccleston, Baeyens, & Eelen, 1998). Grisart and der Linden (2002) linked the attentional interference in pain situations to the attention consumed by the pain experience, catastrophizing thoughts, and fear related thoughts. Unfortunately, since there were no measures of attentional interference in the present study, it is not possible to know the impact of the interventions on the attention of participants. Common measures of attentional interference are reaction time to a particular task such as detecting tones.

The communal coping model of pain catastrophizing suggests that catastrophizers may show an exaggerated pain expression to maximize their interpersonal proximity in order to solicit assistance or receive empathy from those individuals in their social environment (Sullivan et al., 2001). The social communication goal of catastrophizing may be thought of as the individual's attempt to manage their distress within a social or interpersonal context rather than on their own. It is possible that the dental hygienist may have inadvertently created a social environment in which the pain catastrophizing dental patients set out to maximize their interpersonal response or proximity by displaying pain behaviours and reporting

heightened pain. An exaggerated display of pain behaviours and emotions may have been present, and according to the theory would likely lead to an increase in pain reported. If this is the case, it can be concluded that the pain catastrophizing reduction intervention was not affected by the social presence of the dental hygienist. To be just, an empirical examination of the communal coping model was not the focus of the present study, therefore the empirical measurement of the effect of social presence, as measured by pain behaviour rated by an independent observer and by varying the type of social presence (i.e., familiar (such as a friend or partner) or unfamiliar (such as the dental hygienist), was not incorporated into the present study's design.

### **Pain Catastrophizing and Heightened Pain Experience**

Individuals high in pain catastrophizing report more intense pain and increased emotional distress (Heyneman et al., 1990; Keefe et al., 1989; Sullivan et al., 1995; Turner et al., 2002). Participants in the present study were individuals high in pain catastrophizing who reported lower pain and emotional distress scores after receiving a cognitive-behavioural intervention compared to a relaxation intervention group and a wait-list control group. This study has demonstrated that the relationship between catastrophizing and heightened pain experience is malleable and mutable.

The author acknowledges that results of this study may be specific to the dental situation. However, the relationship between pain catastrophizing and heightened pain experience has been found in a variety of pain populations (e.g., spinal cord injury, arthritis, chronic back pain), using a variety of procedures (e.g., cold pressor tasks), and in both children and adults (Gil et al., 1989; Jensen et al., 1992; Keefe et al., 1989;

Parker et al., 1989; Severreijns et al., 2001; Turner et al., 2002; Turner et al., 2001; Turner & Clancy, 1986). It would be important for further research to be conducted within these varied pain populations in order to assess the generalizability of the present study's results. Intervention for reducing catastrophizing is of ever more importance given the recent finding by Pincus and colleagues (2002) identifying pain catastrophizing, among other psychological factors, as playing a critical role in the progression from an acute to a chronic pain condition.

### **Pain Catastrophizing and Other Psychological Factors**

Pain catastrophizing has been significantly correlated with a variety of psychological factors. In fact, researchers have speculated that pain catastrophizing may act as a mediator between pain and pain-related fear and avoidance (Crombez et al., 1998; Sullivan et al., 1995). A significant correlation between pain catastrophizing and dental fear was found in the present study. The relaxation focused intervention group reported significant differences between their measure of dental fear before and after treatment.

Pain catastrophizing has been linked to both actual and anticipated pain experiences or pain expectancies (Sullivan et al., 1991; Sullivan et al., 2001). The threat value or expectancy of threat is an important variable that likely mediates the relationship between pain catastrophizing and pain. However in the present study, there were no changes in participant's pain expectancies before and after treatment.

## **Pain Catastrophizing and The Influence of Psychological Factors on Pain and the Definition of Pain**

There are many psychological factors that have been identified as influencing the pain experience. However, pain catastrophizing has emerged as one of the most important psychological predictors of the pain experience (Sullivan et al., 1995). The present study used the most widely accepted definition of pain catastrophizing in order to design the pain catastrophizing reduction group. Catastrophizing is defined as an exaggerated negative orientation toward pain that is characterized by magnification, rumination, and helplessness (Sullivan et al, 1995). Each of these components were targeted in the cognitive intervention.

The inclusion of psychological factors, such as pain catastrophizing, as partially determining the pain experience is relatively new in the scientific literature. Current definitions of pain reflect the acceptance of the role of the emotional experience of pain (i.e. psychological factors) in enhancing the perception of pain. Melzack and Wall's (1965) Gate Control Theory provided the place, impetus, and significance of psychological factors in the experience of pain. When applying this theory to the present study, cognitive processes such as challenging catastrophizing thoughts or employing positive thoughts may "close" while alternatively catastrophizing thoughts may "open", the gating mechanisms in the spine, thereby decreasing or increasing pain, respectively (Melzack & Wall, 1965). Therefore pain catastrophizing may effect the cognitive evaluation of pain and as a result the intensity of the pain experienced. Future



research will continue to shed light on the influence of psychological factors, such as catastrophizing, on the experience of pain.

## **Limitations and Suggestions of Future Avenues of Investigation**

### **Improving the Generalizability of the Results**

This study is limited by the demographic characteristics of the sample of participants. The sample used in the present study was restricted to undergraduate students or young adults who were well educated and mostly from a middle class background. A broader range of participants might offer greater generalizability. In addition, the small number of participants may also affect the generalizability of the outcomes of the present study. A larger sample size would be more sensitive to changes on process measures (such as dental cognitions and dental beliefs) and provide greater generalizability. Finally, the present study only included individuals high in pain catastrophizing. The exclusion of individuals with mild to moderate levels of pain catastrophizing limits the generalizability of these results to individuals with varying degrees of catastrophizing. However the present study's results may be beneficial for a variety of pain conditions and populations.

The number of the individuals in the screening as well as the number of individuals contacted was not recorded. Since this information is not available, it is possible that a selection bias may have occurred. However an estimate based on anecdotal observation would state that over half of the eligible participants contacted agreed to participate.

### **Examining the Role of Mediation**

Although, the present study did not support a mediation model, future research could investigate the role of mediation in the relationship between psychological interventions and pain experiences. Other mediator variables could involve general measures of the pain experience such as measures of coping, and fear of pain.

### **Addressing the Development of Theoretical Mechanisms of Catastrophizing**

In order to better examine the models of pain catastrophizing, a series of measures could be added (Sullivan et al., 2001). The schema activation model could be empirically investigated by examining the pain catastrophizing reduction intervention's thought logs, which were completed as a homework assignment. In order to assess the impact of interventions on the pain schema, changes in the pain schema could be examined by evaluating individual's pain schema pre and post intervention.

In order to assess the appraisal model within the present study's framework, additional numbers of in vivo exposures (i.e., additional dental hygiene appointments) could be added. It is possible that a different pattern of changes in appraisals may emerge when following patients over a series of dental visits. More in vivo experiences would provide additional opportunities for the individual to correct/change/adjust their appraisals. It is multiple in vivo experiences that have shown to be most effective in reducing anxiety as well as addressing fear of pain in chronic pain patients (Vlaeyen et al., 2002). Arntz, van Eck, and Heijmans (1990) found that anxious participants undergoing extensive dental treatment expected more

pain and anxiety than they experienced, and needed more experiences before their predictions became accurate. However at a 5 month follow-up, the inaccuracy of their expectations returned. The effects of repeated exposure on catastrophizing is unknown. However it may be hypothesized that repeated exposure would serve to: provide more opportunities to develop the efficacy of coping skills learned in the interventions, and decrease anxiety and fear likely resulting in lower levels of catastrophizing and less pain. In addition, further exposures would provide an opportunity to measure the long-term effects of the intervention.

In the same regard, it has been argued that systematic application of graded exposures produce disconfirmations of expectations of pain, and consequently result in changes of expectancies. In fact in Vlaeyen, de Jong, Onghena, Kerckhoffs-Hanssen, and Kole-Snijders' (2002) application of cognitive behavioural techniques with graded activity exposure with or without pain coping skills training only modestly reduced pain related fear and fear of movement or reinjury. Yet in their second study which examined the effectiveness of systematic in vivo exposure with cognitive behavioural training found substantial decreases in pain-related fear and pain catastrophizing (Vlaeyen et al., 2002).

Further investigation of the attentional model of catastrophizing could be accomplished by including an attentional task and a measure of attentional interference within the study. For example, an attentional task such as detecting tones as used by Crombez and colleagues (1998), could be preformed while undergoing a dental hygiene procedure.

The communal coping model could have been examined by having the dental hygienist or an independent observer complete a measure about the participants' behaviours exhibited in combination with an experimental condition in which a familiar or unfamiliar person is present. The communal coping model of catastrophizing would predict that by having a friend/family member/partner present, the extent and quality of pain behaviours and pain reports would be different than if there was no person present. It would be assumed from the communal model of catastrophizing that those with a familiar person present would display more pain related behaviours and perhaps heightened pain ratings than with a non-familiar person present.

### **Expanding the Usefulness of the Intervention**

Future investigations could broaden the usefulness of the intervention by investigating the delivery of interventions by non-psychologists (i.e., nurses, physiotherapists, occupational therapists), examining the efficacy of shorter interventions, and integrating the interventions into a clinic or hospital setting.

### **Addressing the Optimal Intervention**

Most intervention studies have several sessions. Additional sessions may be required for those individuals who do not benefit initially from the brief intervention. Future studies could have additional intervention sessions in order to increase the participant's skill level, and offer further opportunities for skills practice. For example, the relaxation focused intervention group could add a psychophysiological component

in which biofeedback on a variety of physiological measures (e.g., temperature, electrodermal response) is provided in order to increase the efficacy of relaxation strategies. As an aside, measures of psychophysiological reactions have been reported to reflect the degree of dental fear and anxiety. Therefore including psychophysiological measures may be good outcome measures in order to measure the effects of various interventions on the body's physiological stress response (Lundgren, Berggren, & Carlsson, 2001). In particular, Lundgren and colleagues (2001) reported heart rate and electromyography to be superior measures to skin conductance in distinguishing dental phobic patients from control patients. In the pain catastrophizing reduction group, an in vivo exposure component could be added in order for the individuals to practice their cognitive behavioural skills and provide an opportunity to engage in problem solving.

However longer interventions, such as those suggested above, may result in the intervention being less used due to it being cumbersome and costly. Further research could investigate the optimum number of sessions needed for the interventions to be most effective both in terms of cost and benefit.

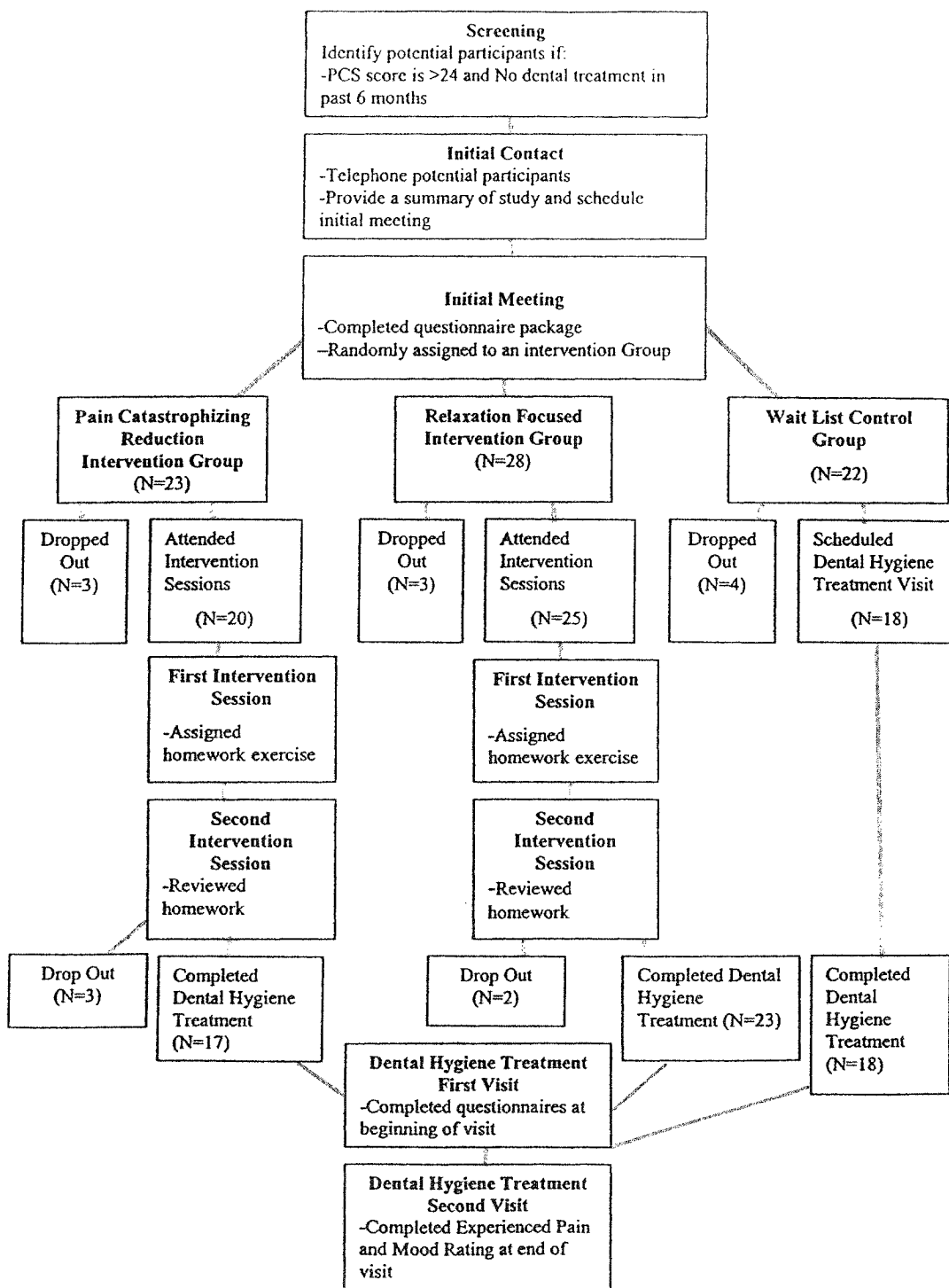
### **Overall Summary of Findings**

Pain catastrophizing is one of the most important psychological predictors of the pain experience. Individuals high in pain catastrophizing report more intense pain and increased emotional distress (Heyneman et al., 1990; Keefe et al., 1989; Sullivan et al., 1995; Turner et al., 2002). The objective of this randomized controlled trial was to

determine if two different psychological interventions would impact on pain catastrophizing and thus on pain perception in comparison with a wait-list control condition. Both intervention groups reported a decrease in negative mood relative compared to the wait-list control group. The pain catastrophizing reduction intervention group, a cognitive behaviourally focused intervention, reported significantly less pain during dental hygiene procedures than the other two groups. In addition, reductions in pain catastrophizing and dental anxiety scores were identified in the cognitive behavioural intervention specifically targeted to reduce pain catastrophizing. The pain catastrophizing reduction intervention trained participants to identify catastrophizing thoughts and develop strategies for reducing the frequency of, and restructuring, these thoughts are effective in reducing and managing pain. This study has demonstrated that the relationship between catastrophizing and heightened pain experience is malleable and mutable with psychological intervention.

## Appendix A

Figure 1. Design of Study



## Appendix B

### Telephone Interview

Hello, my name is \_\_\_\_\_, and I am calling from the Psychology Department at Dalhousie University. Earlier this term, during one of your Psychology 1000 classes, you were asked to fill out a number of questionnaires for possible participation in psychology experiments.

We are one of the labs currently conducting experiments, and we are hoping that you will agree to participate in our study. In exchange for your participation, you will receive 4 credit points towards your final grade in Psychology 1000. In addition, you will receive one free dental hygiene assessment, oral hygiene instruction, cleaning, polishing, and fluoride.

Let me tell you a bit about our study and then you can tell me whether you are interested in participating. Our study is examining the different effects of various interventions on minimizing distress associated with receiving dental treatment.

You will first be asked to come to the Psychology Department at Dalhousie University. You will be read the consent form and if you decide that you would like to participate you will be asked to sign and date it. You will be asked to fill out a series of questionnaires. Then you will be randomly assigned to one of three intervention groups. Intervention groups involve learning about various techniques to help decrease distress related to dental procedures. Some participants will receive intervention before the dental hygiene visit and others will receive intervention after the dental hygiene visit.

*Intervention Group Meetings:* Intervention groups will meet for one and one half hours once a week over a period of two weeks for a total of two meetings. The intervention group meetings will take place at Fenwick Psychological Services and will be administered by a trained clinician.



*Dental hygiene treatment:* Comprehensive dental treatment will be provided by a senior dental hygiene student. Dental hygiene faculty will supervise all procedures and confirm all clinical assessment data.

*Follow-Up Phone Interview:* At the end of the dental hygiene treatment you would be asked to participate in a follow-up phone interview. If you agree to do so, one month after your dental hygiene treatment visit, you will be called and asked to answer a series of questions about your dental hygiene, and thoughts and feelings related to dental hygiene treatment. The interview will take approximately 15 minutes.

You will be called in order to make an appointment for dental hygiene treatment. The dental hygiene treatment includes assessment, implementation of the dental hygiene treatment plan, scaling, polishing, fluoride, and a plaque index. The dental hygiene treatment takes place over two visits. At each visit, you will be asked to complete several questionnaires. Finally, at the end of the second visit, you will be able to ask any questions that you may have.

Are you interested in participating in this project and are you available during any of these times?

If no, then say:

Thank you for your time and have a nice day.

If yes, then say:

Ok great. When was your last dental hygiene appointment?

If the potential participant has had a dental hygiene appointment within the last six months they are not to be included in the study. Thank them for their time and say good-bye.

If the potential participant has NOT had a dental hygiene appointment within the last six months then ask...Let's book your time to come to the Department of Psychology for your first meeting.

Thank you for agreeing to participate in this study. I am looking forward to meeting you on....(date, time of appointment)

**Introduction:**

We invite you to take part in a research study at Dalhousie University. Taking part in this study is voluntary and you may withdraw from the study at any time. Your performance evaluation from this course or any other course will not be affected by your desire not to participate. The study is described below. This description tells you about the risks, inconvenience, or discomfort that you might experience. Participating in the study may not benefit you, but we may learn things that will benefit others. You should discuss any questions you have about this study with the people who have explained it to you.

**Purpose of the Study:**

Many people experience physical and emotional distress during dental procedures. This study examines the different effects of various interventions to minimize distress associated with dental treatment.

**Study Design:**

This study is a blind randomized controlled trial. This means that each participant is randomly assigned to a group and that there is a group of participants that are in a control group. The control group receives treatment after the dental treatment. Blind refers to the fact that the researcher does not know which intervention group each participant is assigned.

**Who Can Participate in the Study?**

Introductory Psychology 1000 students, who participated in the Fall screening, may participate in this study.

**Who will be Conducting the Research?**

Nadine Rossy will be conducting the data collection along with other volunteers. Intervention groups will be directed by qualified clinical psychologists. Participants should feel free to contact Nadine Rossy in the event of any unusual occurrences or difficulties related to the research, or to receive more information or clarification about the study procedure at any time. She can be contacted a / email

This research has been supervised by Dr. Sullivan, Psychology Department and Nancy Neish, School of Dental Hygiene.

### **What you will be asked to do?**

*First Meeting:* As you were told on the phone, you will first be read the consent form and if you decide that you would like to participate you will be asked to sign it and date it. You will be given a copy of the consent form to keep for your own personal records. You will complete a series of questionnaires. Then you will be randomly assigned to one of three intervention groups. Intervention groups involve learning about various techniques that help decrease distress related to dental procedures. Some participants will receive intervention before the dental hygiene visit and others will receive intervention after the dental hygiene visit.

Those assigned to an intervention group before the dental visit will be asked to attend a series of two intervention sessions over the next two weeks. Those participants receiving intervention after the dental hygiene visit will be contacted in order to make a dental hygiene appointment.

At the end of the dental hygiene appointment you will be asked if you would like to participate in a follow-up phone interview. This interview will take approximately 15 minutes and will occur one month after dental hygiene treatment.

*Intervention Group Meetings:* Intervention groups will meet for one and one half hours once a week over a period of two weeks. The intervention group meetings will take place at Fenwick Psychological Services (5595 Fenwick Street, Halifax, Nova Scotia) and be

administered by a trained clinician. Intervention group meetings will be videotaped in order to ensure that all groups receive the same instruction.

*Dental hygiene treatment:* Comprehensive dental hygiene treatment will be provided by a senior dental hygiene student. Dental hygiene faculty will supervise all procedures and confirm all clinical assessment data.

*First Visit:* You will be called in order to make an appointment for dental hygiene treatment. You will be asked to attend your visit at the Dalhousie Dental Clinic located 5981 University Avenue, Halifax, Nova Scotia. During the first visit, you will be asked to complete several questionnaires. As well, you will undergo a standard assessment protocol consisting of vital signs, intra and extra oral exam, hard and soft tissue exam, plaque index, patient education, and a dental hygiene treatment plan. At this point, you will be asked to report discomfort levels for head and neck as well as hard tissue exams. Following the initial evaluation, you will be scheduled for a return appointment to complete the dental hygiene treatment (approximately 1-week later).

*Second Visit:* At the second visit to the dental clinic, you will be asked to complete some questionnaires. You will undergo the implementation of the dental hygiene treatment plan, plaque index, patient education review, scaling, polishing, fluoride, and plaque index. You will be asked to report discomfort levels for the various dental procedures performed. At the end of the second visit, you are invited to ask any questions that you may have.

At all times, you are encouraged to ask any questions you may have and you will be reminded that you may discontinue your participation at anytime throughout the study.

*Follow-Up Phone Interview:* At the end of the dental hygiene treatment you would be asked to participate in a follow-up phone interview. If you agree to do so, one month after your dental hygiene treatment visit, you will be called and asked to answer a series of

questions about your dental hygiene, and thoughts and feelings related to dental hygiene treatment. The interview will take approximately 15 minutes.

#### **Possible Risks and Discomforts:**

Although unlikely, the possibility exists that damage to your teeth, restorations/prosthesis in place, and/or gums may occur. In the event of such damage, you will be offered reparative therapy in the Faculty Service Clinic of the Faculty where a graduate dentist will address your needs. Fees charged by the Faculty Service Clinic will be paid by the researchers.

Also unlikely, but possible is the development of a dental emergency related to or not related to the conduct of this research during the time parameters of the clinical phase of the study. Such an emergency will be managed by undergraduate dental students during their Multi-Service Clinic service. Such an emergency should be reported to the Dalhousie Dental Clinic by telephoning (902) 494-2102.

Participants in this study may wish to become comprehensive (dental hygiene and dentistry) care patients of the Dalhousie Dental Clinic. Should you wish additional information in becoming a comprehensive care patient, please contact Patient Services at 494-2101 or request a brochure at the main reception desk.

You will be asked to receive a dental hygiene procedure referred to as scaling (cleaning). This is a procedure that involves cleaning deposits from the surfaces of the teeth. The dental hygiene appointments will also include an oral examination and comprehensive oral health education. The dental hygiene procedures will be carried out by senior dental hygiene students under the supervision of dental hygiene faculty members at the Dalhousie Dental Clinic. A graduate dentist will be in attendance within the Clinic during treatment sessions.

You will also be asked to complete questionnaires that assess the thoughts and feelings you may experience prior to and following the dental hygiene appointments. This process should not cause any discomfort or risks.

**Possible Benefits:**

Participating in this research project entitles you to receive one free dental hygiene assessment, oral hygiene instruction, cleaning, polishing, and fluoride. You will also be advised that you may require additional dental treatment, however, thorough assessment and additional dental treatment will not be provided as part of this study.

**Confidentiality of Research and Treatment Records:**

Information in the study will be confidential. Research records will be available only to researchers and assistants involved in the study. Research records will be stored in a locked laboratory. You will not be identified in any reports or publications.

As is done for all Dalhousie Dental Clinic patients, your treatment records will be kept confidential in your treatment chart within the Records Department of the Clinic.

**Compensation:**

You will receive a total of 4 credit points towards their Psychology 1000 course grade as well as a dental hygiene assessment, oral hygiene instruction, cleaning, polishing, and fluoride.

**Questions:**

Participants should feel free to contact Nadine Rossy in the event of any unusual occurrences or difficulties related to the research, or to receive more information or

clarification about the study procedure at any time. She may be contacted by telephone

**Termination:**

You may discontinue the study at anytime during the course of the research project without loss of credit. Your performance in the study is voluntary and you may withdraw from the study at any time. Your performance evaluation from this course or any other course will not be affected by your desire not to participate.

**Problems or Concerns:**

In the event that you have any difficulties with, or wish to voice concern about, any aspect of your participation in this study, you may contact Human Research Ethics / Integrity Coordinator at Dalhousie University's Office of Human Research Ethics and Integrity for assistance: ( ) This study has been reviewed by the Psychology Ethics Committee.



**Title of Study: The Efficacy of Various Intervention Strategies for the Management of Pain in Dental Hygiene Treatment**

**I have read the explanation about this study. I have been given the opportunity to discuss it and my questions have been answered to my satisfaction. I hereby consent to take part in this study. However I realize that my participation is voluntary and that I am free to withdraw from the study at anytime.**

**Signature:**

**Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Witness:** \_\_\_\_\_

## Appendix D

### Relaxation Focused Intervention Group Session 1

Take Attendance

Make Sure they Have a Dental Appointment

Tape Session

Why are You not Going to the Dentist? (5 minutes)

For some people going to the dentist is a dreaded event. Dental procedures can be painful as well as anxiety and fear provoking.

Some people decide not to attend the dentist regularly or at all. Of course, people who do not go to the dentist know they should be going regularly to maintain good oral health.

When people do not attend regular dental visits, they can have cavities, tooth pain, or in some cases serious gum disease. However many people do maintain good oral health.

Although you may not attend the dentist regularly for personal reasons, approximately 50% of the population do receive regular dental care and maintain good oral health.

We would like you to feel comfortable receiving regular dental care.

Relaxation: Imagery Training and Breathing (5 minutes)

I am sure many of you have heard of relaxing. Most of us relax by going out to a movie, watching television, or going for a walk. However we will concentrate on two relaxation techniques you can perform during your dental visit: guided imagery and deep breathing.

Guided imagery is a relaxation technique in which you imagine a scene is unrelated to the experience that you are undergoing.

Breathing is a necessity of life and usually taken for granted. By learning how to breathe abdominally, you can be able to reduce muscle tension and anxiety. These techniques have been proven to release the muscular tension your body experiences during times of stress.

During relaxation, you will find your thoughts slow down and feelings of anxiety and fear decrease. In fact, when your body is completely relaxed it is not possible to physiologically feel stressed or anxious.

Although relaxation techniques may seem natural and practice unnecessary, they are actually new skills that need to be developed and practiced in order for you to become effective at using them.

*[At this point, have all group members take a deep breath. Point out to each of them that they are breathing from their chest rather than their abdomen.]*

#### Mind-Body Connection (5 minutes)

When we are psychologically stressed by a situation our bodies respond with tense muscles, increased heart rate, and faster breathing.

*What physiological changes or what does your body feel like when it is stressed?*

These physiological changes add to the stress of the situation and in turn increase your anxiety, fear, pain and negative thinking. Relaxation techniques help decrease those physiological reactions as well as act as a method of distraction for your thoughts.

When you use guided imagery you are relaxing your body and distracting your thoughts which results in a decrease in the unpleasantness of a stressful situation.

Likewise with breathing, it relaxes your body and distracts your thoughts which decreases your physiological distress and in turn decreases both your psychological and physiological distress.

#### Breathing (5 minutes)

There are two ways people typically breath. One is chest breathing and the other is abdominal breathing.

Chest breathing is the most common way people breathe. It is usually shallow, irregular and rapid.

When air is inhaled, the chest expands and the shoulders rise to take in the air. You can test this out by placing your hand on your belly and noting that if your hand does not move while you are breathing you are likely chest breathing.

*[Practice with them.]*

On the other hand, abdominal breathing is the natural breathing of newborn babies and sleeping adults.

Inhaled air is drawn into the lungs and exhaled as the diaphragm contracts and expands. Breathing is even and less rapid than chest breathing. You can place your hand on your tummy and when you breathe in concentrate on filling your

tummy with air (like a balloon). When you exhaling, pull your tummy toward your diaphragm holding it in tight. *[Practice with them.]*

#### Practice Breathing (10 minutes)

1. Scan your body for tension and assume a relaxed position. Close your eyes. Put your right hand on your abdomen and your left hand on your chest.
2. Without changing how you breathe, just note how you are breathing. [For each member of the group ask them which hand rises the most as they inhale. Have them tell you whether they are chest or abdominal breathing.]
3. A trick to abdominal breathing is making your tummy fill up with air like a balloon and then when you exhale emptying that balloon of air. If you are having difficulties with this, you could try to press your hand down on your stomach when you exhale and pushing your hand back up when you inhale.
4. Breathe through your nose.\*

\* = Some people are "mouth breathers" and breathing through their nose may not be possible for them. The interventionist should check to see if anyone has this condition. These people will have to breathe through their mouth. This can sometimes be an added factor for why they are uncomfortable with dental procedures.

5. [At this point, tell the group members to try to envision themselves in the dental chair. Relax their body and place their hand on their abdomen. Ask them what they feel like? They should feel relaxed.]

*Practice the breathing exercise and give them encouragement and reinforcement or all their efforts.*

You could have the participants breathe in on the count of 5 and breathe out on the count of 5 to fully exhale. Repeat 4 times.

*Ask them what they feel like in comparison to before they started to breathe like this?*

#### Imagery (35 minutes)

Imagery is one of the most powerful tools that can be used to decrease the unpleasantness associated with a situation. Imagery has been used in for many centuries in a variety of settings.

Imagery works because it allows for both your mind and body to communicate with each other, instructing your body to relax (decreasing physiological; reactions to the stressor) as well as instructing your mind to change your thoughts.

You are likely effected by imagery everyday in your life that you do not realize.

For example, as you walk by Harvey's, you see the picture of a burger and fries. All of the sudden you realize that you are hungry. The image prompted you to feel hungry.

If you passed by a picture of a cyclist you may be prompted to go to the gym.

When you are in the dentist chair you may recall unpleasant memories of being at the dentist, which would make you feel anxious and fearful.

If you thought of walking in a meadow or sitting on a beach instead, you would decrease your anxiety and fear if those were pleasant images for you.

In order to use imagery to guide you through stressful situations you need to:

1. Select a pain symbol: think about being in a dental situation and allow your self to think about the thoughts, pain, fear, or concerns you may have. These images help you to remember the stress you experience within the dental situation. As well, these images can allow you to start from a point that is representative of what you feel in the dental situation.

Examples: injections, needles, sound of the drill, smell of the dental office, feel of the sharp metal instruments, choking

*[Ask what their symbol would be?]*

2. Distract yourself away from the feelings you have during a dental situation: once you have clearly imagined the dental situation think of replacing your stressful thoughts or images with a pleasant image. This image will differ for each person. That is because what one person may find relaxing another may not or some images are easier to access than others. We will practice with several images until you have found the image that is easiest for you to use for relaxation during the dental situation.

*[Ask members to tell you their dental image or thought and the image they would like to try to use.]*

3. Replace it with a pleasant image: Create an image that you can access and feel yourself relaxed and at peace. As you gain experience, you may be able to make your image more vivid, easier to think of, or you may have more than one image that increases relaxation when you are thinking about it.
4. Finding an image: In order to find an image, you will need to relax and let images flow. Almost like looking through a photo album and choosing the scene that is best suited for you. Do not be discouraged if you feel your mind is blank or you can only think of one image. You can think of any image and if you have only one image try to develop it more and add detail to it. The more vivid and easier to imagine the image

the more you can use this technique to help you with the stress you relate to the dental situation.

*Ask which images they would like to try.*

5. You can use the simplified three step program to help you practice your imagery techniques as well as use the audio-tape provided to practice your techniques.

1. Imagine the dental situation as well as your thoughts and feelings.
2. Find a pleasant image.
3. Develop and make the image more vivid.

Once these 5 points are taught begin with the three step program.

1. Help the participants to imagine the dental situation. Imaging the dental situation includes past experiences, thoughts and feelings generated by dental experience, as well as sensory experiences. Members can help other members by sharing with the group some of the images as well as thoughts and feelings they have during a dental procedure. Perhaps direct the participants to close their eyes and imagine the dental situation. The therapist should talk in a slow relaxed manner in order to get the patients to engage as many senses and memories as possible. Senses may include touch, hearing, seeing, smell, and taste. Memories will include stories of past experiences as well as thoughts and feelings directed at the dental situation.
2. Finding a pleasant image. Some participants may have more difficulty than others to find a pleasant image. It is important for each participant be able to agree on a mental image that he or she can have easily access. The therapist may want to start with an image such as walking by the ocean and try to help the members of the group develop and increase the intensity of the image.

The Walk Along the Beach: After taking off your shoes, walk along a wood plank path that leads to the sandy trail leading to the beach. The walk along the wooden path makes your feet warm and relaxes them. You can see the sandy path approaching and in the distance you see the beautiful blue sea. You reach the sandy path and suddenly you smell the wonderful salty air as well as feel your feet sinking into the sand. The sand is a pure white and is soft to the touch of your feet. You reach the water and let get your feet wet. You sit down by the ocean and relax.

The scene chosen should be one that the participant can enter when in the stressful situation.

The scene should be interesting and appealing. It is a place that makes you feel safe and secure when you imagine it. The image becomes a place where you can relax.

You and the participant should agree on an image. In order to find the pleasant image you can have the members of the group sit quietly with eyes closed to allow them to generate a scene. Make sure they are relaxed in order to benefit for the image.

If the participant has difficulty choosing a pleasant image try to choose a place or activity that appeals too them. Where would they like to be now? Or what would they like to be doing?

Once they find a scene, ask them to notice the objects around the scene. Parts of the scene may not be clear but this is normal. Sometimes with more practice imagining a scene the scene becomes more clear and vivid. You deliberately lead the participants to remember the images and add detail to them. Allow each member to talk about their image and describe it in as much detail as possible.

3. Adding detail to the image. Go through the practice image and add details to it. Detail include, shapes, colours, smells, touch, scenes, sounds and other details. You may want to ask questions such as: What do you hear? Can you smell anything? What colour is the (choose an object in the scene)? Do you feel (choose an object)? What does it feel like?

The Walk Along the Beach (with more detail): After taking off your shoes to walk along a wood plank path that leads to the sandy trail leading to the beach. The walk along the wooden path makes your feet warm and relaxes them. You are thinking about the beautiful scenery and your thoughts are consumed with your surroundings. You can see the sandy path approaching and in the distance you see the beautiful blue sea. You reach the sandy path and suddenly you smell the wonderful salty air as well as feel your feet sinking into the sand. The sand is a pure white and is soft to the touch of your feet. You begin to think about walking along the beach. The wind blows through your hair. You reach the water and walk along the shore. Your feet are wet and feel soothed by the salt water. You sit down by the ocean and relax. You look out and all you can see, for as far as you can see is ocean. You hear the waves crash and you see the white bubbly water drizzle up the shore just short of your feet. You feel the warm sun heating your body and the cool breeze making you the perfect temperature. You feel completely relaxed.

Tell the participants not to be disappointed if they cannot see their scene in 3-D or walk around in their scene. This will allow the participants to understand what adding detail to their images means and how it helps them to have better access to the image. For a homework exercise, the participant's chosen image should be in greater detail and easier to access by the next group session.

Allow the participants to practice their image and then interrupt them. This will allow them to practice being interrupted or experiencing intruding thoughts and returning to the image. This is important since outside stimuli will inevitably intrude when they are practicing their scenes and when they are experiencing the dental hygiene appointment.

### Improving Your Imagery Skills (10 minutes)

*[You can help each individual group member or one member (depending on time constraints) and use these points to improve their image.]*

It is important to remember that imagining an image is a skill. Some people are better at it than others. You may be a person who can sit down and recreate a scene or you may find it difficult to see anything at all. Even if you have difficulty imagining scenes you can develop the skill with practice. Here are some tips to make your images more vivid.

1. Think of something you would like to be doing or a place you would like to be? Perhaps you are hiking through a scenic trail, sitting on the rocks at Peggy's Cove, playing a game of baseball or football, or lying in a field of grass. Try to generate ideas for a scene by thinking of an activity or place that makes you feel relaxed. List the top 5 and try to imagine them.
2. Once an image appears, try to visualize it. Perhaps it is like a snapshot or postcard, or it may be 3-D so that you can walk through it. If it is like a snapshot or postcard, try to envision yourself walking through the scene. What do you see, smell, feel, or hear? If parts of the image seem unclear or hazy try to concentrate on those parts and add more detail to clarify them.
3. Your next step is to make the scene as real as possible. An easy way to do this is adding details. Fill in the sound, colours, feelings, thoughts, touch, visions. Try to see everything in the image to make it as real as possible.
4. Think of the perspective from where you see your image. Perhaps you are seeing it from an outsider looking in which means you can see yourself in the scene. This is almost like watching the scene on a television. It is important for you to be waling through the scene and experiencing it first hand. By being in the scene, you will be better able to envision the scene and experience the scene as close to reality as possible.
5. When unrelated thoughts, and stimuli intrude on the scene, as they will, notice their content and return your attention to the scene that you are in.

#### **Dealing with Intrusive Thoughts (10 minutes)**

There is no doubt that outside sounds, smells, people, and/or thoughts will interrupt you while you are relaxing and thinking of your image. You need to acknowledge that thought or sound and concentrate on it. Then let it fade away and begin scanning your body for tension, start deep breathing, and enter your scene. If another thought interrupts again, recognize it and let it fade.

**To practice:** Start participants by scanning their body for tension, followed by deep breathing, and leading them into their scene. Then make a noise. Guide them back to their relaxed state.

#### **Explain Homework (10 minutes)**



- Listen to tapes for a minimum of 3 times before the next session and practice your imagery skills.
- The tapes will begin with scanning the body for tension and deep breathing.
- Explain that tapes will have two parts. One part will have a beach scene being described. The second part will be for those who did not choose a beach scene. This part of the tape gives you general instruction to guide your imagery.
- The second part of their homework is to write a short but detailed description of their scene.
- Participants need to choose an image and be able to describe that image in detail for next session.
- Please remind them to bring in their written description for the next session.

#### **Handout Tapes and Homework**

- Handout tapes and homework (in envelopes).

**Ask if they have something to play the tape in. Walkman or ghetto blaster? Can they borrow one from someone?**

- Review the instructions to their homework.

***NOTE: Please remind them to bring their homework with them for the next session.***

**Remind Them of next Session Time**

Relaxation Focused Intervention Group  
Session #2

Take Attendance

Tape Session

Review Homework (10 minutes)

During the review of their homework, each member should answer these questions:

- 1) *Did they have any difficulties with abdominal breathing?*
- 2) *What effects did they notice with abdominal breathing?*
- 3) *What image they chose?*
- 4) *How often were they able to practice it with the tapes?*
- 5) *Did they have any problems or questions?*

Important Questions to Ask the Participants?

*Ask if anyone is having a difficult time finding an image?*

*Ask if anyone is having a difficult time adding detail to their image?*

*Ask if anyone is having a difficult time returning to their image once interrupted?*

So we will review what we learnt last session. However let's see how these skills work once practiced.

Relaxation: Imagery Training (10 minutes)

We spoke about two ways to relax: guided imagery and deep breathing.

These techniques have been proven to release muscular tension, which your body has during times of stress.

*How did the practice effect your body physiologically?*

*How did it effect you pscyhologically?*

*Did you notice any different effects between deep breathing and guided imagery?*

Mind-Body Connection (5 minutes)

Body's Stress Response → Increases Stressful Thinking → Increases Body's Stress Response  
(heart rate, muscle tension) (I cannot make it through a dental appointment.)

Stressful Thinking → Increases Body's Stress Response → Increases Stressful Thinking  
(The dentist will hurt me.) (heart rate, muscle tension)

### Scanning Your Body for Tension (5 minutes)

*Where was body tension most apparent for you?*

*What does scanning the body for tension help you to do (physically)?*

*Does it make deep breathing and guided imagery harder or easier?*

### Practice Breathing (10 minutes)

Ask them to go through the steps with you when they practice their breathing. Allow them to think of the steps before you give the answer to them.

1. Scan your body for tension and close your eyes. Put your right hand on your abdomen and your left hand on your chest.
2. Without changing how you breathe, just note how you are breathing. [For each member of the group ask them which hand rises the most as they inhale. Tell them whether they are chest or abdominal breathing.]
3. A trick to abdominal breathing is making your tummy fill up with air like a balloon and then when you exhale emptying that balloon of air. If you are having difficulties with this, you could try to press your hand down on your stomach when you exhale and pushing your hand back up when you inhale.
4. Breathe through your nose.
5. [At this point, tell the group members that they can try to envision themselves in the dental chair. Relax their body and place their hand on their abdomen. Ask them what they feel like? They should feel relaxed.]

*Practice the breathing exercise and give them encouragement and reinforcement or all their efforts. Make sure they are all able to breathe with their abdomen.*

### Imagery (10 minutes)

*Ask them to go through the steps with you when they practice their guided imagery.*

*Allow them to think of the steps before you give the answer to them*

### Three Step Programme:

- 1) Imagine the dental situation as well as your thoughts and feelings.
- 2) Find a pleasant image.
- 3) Develop and make the image more vivid.

Do not forget to remind them to scan their body for tension and start deep breathing *BEFORE* they begin their guided imagery.

### Dealing with Intrusive Thoughts (10 minutes)

There is no doubt that outside sounds, smells, people, and/or thoughts will interrupt you while you are relaxing and thinking of your image. You need to acknowledge that thought or sound and concentrate on it. Then let it fade away and begin scanning your body for tension, start deep breathing, and enter your scene. If another thought interrupts again, recognize it and let it fade.

*Ask the participants what types of intrusive thoughts they had or intrusive stimuli interrupted them?*

*Were they able to return to their image?*

*What types of intrusive thoughts or intrusive stimuli will effect them during the dental hygiene appointment?*

*Allow each member to say what there image is and describe it. Interrupt them so that they can practice returning the image quickly and comfortably.*

### What to Expect? (5 minutes)

In order for you to make the best of the skills you have just learned, it is important for you to practice them while imagining being at the dental hygiene appointment. In order for you o imagine the hygiene appointment we will provide with a brief description.

You will go to the dental hygiene appointment at the Dalhousie University dental Clinic. Once registered, you will be asked to wait in the waiting room until the hygienist will come to greet you. While waiting you may hear, smell, or see things that are typical of a dental situation. Such as hearing the sound of a drill or smelling fluoride. Once the hygienist comes to greet you, he/she will bring you into the clinic here you will be brought to a booth and asked to sit in the a dental chair. You will be asked to complete some questionnaires and then the hygienist will start the dental hygiene treatment.

You are encouraged to use the tools we have practiced over these past two intervention sessions during your dental hygiene treatment visits.

**Homework**

- Practice the imagery techniques learned. Listen to the tapes.
- Attend the dental appointment.

**Photocopy homework****Handout Questionnaires (25 minutes)****Homework**

- Ask them to review and practice their image they have created.
- Attend the dental appointment

Remind them of that they will soon be contacted to make their dental hygiene appointment.

## Appendix E

### Pain Catastrophizing Reduction Intervention Group Session 1

#### Take Attendance

Make sure they have a dental appointment.

#### Tape Session

#### Why are You Not Going to the Dentist? (5 minutes)

For some people going to the dentist is a dreaded event. Dental procedures can be painful as well as anxiety and fear provoking.

Some people decide not to attend the dentist regularly or at all. Of course, people who do not go to the dentist know they should be going regularly maintain good oral health.

When people do not attend regular dental visits, they can have cavities, tooth pain, or in some cases serious gum disease.

Although you may not attend the dentist regularly for personal reasons, approximately 50% of the population do receive regular dental care and maintain good oral health.

We would like you to feel comfortable receiving regular dental care.

The difference between people who attend the dentist and those who do not is likely to be the thoughts that each person has about the dental experience.

Basically, people who regularly attend dental visits think differently about the dental appointment than those people who do not routinely attend dental visits.

Research has shown that people who do not attend the dentist are more likely to be very frightened or anxious about what the dentist will do whereas regular attenders look forward to the appointment or not care either way.

There are differences in how a person may react in the dental chair.

A fearful or anxious patient may be thinking about how much pain the procedures will cause, while others who are not fearful, will be relaxed and thinking about their daily events or what they will be doing that evening or other neutral, possibly pleasant thoughts.

If you have not been to a dentist for more than 6 months, you may be experiencing some negative thoughts about the dental situation.

*Have you had any negative thoughts about attending dental appointments?*

We hope to help you evaluate those thoughts, modify your thoughts, to allow you to be able to enjoy your dental visit.

The following sessions are designed to examine your thoughts about dental visits, procedures, and dental cleanings.

We hope to make you feel more comfortable in the dental situation.

#### Uncovering Thoughts (15 minutes)

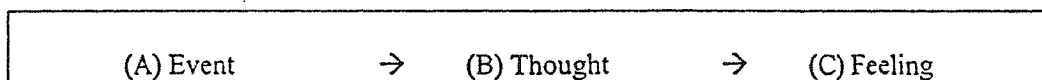
The first step in changing your thoughts is to identify them.

The reason why identifying thoughts is so important is because our thoughts cause feelings.

Most emotions a person feels are preceded and caused by a thought even though that thought may go unnoticed.

In other words, events by themselves have no emotional content, it is the interpretation of an event that causes your emotions.

This is often represented as the ABC model of emotions:



For example:

1. Event: You enter your car and turn it on with the key and nothing happens.
2. Thought: "Oh my battery may be dead. I will be late."
3. Feeling: You feel upset and anxious about being late.

If you change the thought, you can then change the feeling. For example, if you had thought, "My sister must have left the lights on in the car."

*That is the THOUGHT. What would you feel after thinking this thought?*

You may have felt anger towards your sister.

*That is the FEELING.*

If you thought, "I will have a cup of coffee, and wait for the tow truck to give me a boost." You may have felt mild annoyance at most.

*Therefore you can see how changing the thought changes how you feel.*

Now you can see how events bring about thoughts, which in turn result in feelings.

Uncovering automatic thoughts is the first step in changing our thoughts and feelings associated with situations.

Once you have recognized your automatic thoughts related to dental visits, you may or may not feel some immediate reduction in anxiety. It is more likely that you will not experience any improvement in symptoms. Don't worry, this is an early step in feeling better.

*Let's now examine some thoughts you have about or during a dental visit.*

[Ask each group member for a dental example of an event (dental in nature), thought, and feeling associated with that thought. Encourage other members to help each other to find a dental thought.]

If they cannot think of any, here is an example:

Event: Dental appointment

Thought: "I am going to break into a sweat and be physically ill if I go to the dentist."

Feeling: Anxiety, avoidance, anger, or you may experience a feeling as a physiological reaction such as heart speed up, or you may breathe faster, or physiological processes may slow down

Both your emotion and the accompanying bodily sensations trigger an evaluation process. You start trying to interpret and label what you feel.

The emotion, in this case fear or anxiety, becomes attached to the situation, a dental visit. Therefore if you became anxious during the dental visit you may attribute anxiety to the dental situation.

Alternatively, you could identify and modify the negative feeling or thought, change the label given to the dental situation, and thereby changing the resulting feeling.

*What could we change this thought to? How would you feel then?*

Answer: I will see how it goes this time. What does that thought make you feel?



### Identifying Your Thoughts (20 minutes)

Let's start by identifying our thoughts about the dental situation. Being able to identify your automatic thoughts is the first step to gaining control of your unpleasant emotions.

Most of your internal dialogue is harmless but some automatic thoughts are potentially harmful because they cause you to feel anxious, angry, sad, or fearful.

To identify automatic thoughts that are causing these unpleasant emotions, think of the thoughts you had just prior to feeling that emotion. Automatic thoughts are often fleeting, that is they pass through our minds quickly and usually go unnoticed.

Two ways of coping with the speed of your thoughts are:

1. Reconstruct the problem situation, in this case, the dental hygiene visit, until the negative emotion reemerges.
2. Write out a detailed statement. For example, "feeling sick" may be stated as "I'm feeling sick and I know I am going to get worse. ....I can't stand it." Hearing the shorthand version is not detailed enough. You need to understand your internal dialogue to understand the distorted logic from which the emotions emerge and are sustained.

*Can someone give me an example of what they think or feel at the dentist?*

In the homework we will ask you to record 5 different thoughts in a thought journal. These thoughts will be related to a dental situation.

*Show them what the table looks like.*

The event or situation, feelings, and the automatic thoughts that occurred will be recorded in the following table.

1) The form has a column to identify the situation or event. We would ask you to describe the event by identifying when, where, who (referring to a person who was the target or source of the thought), and what happened.

*Let's think of different dental events or situations.*

Once they finish use some of these examples to remind them.

Examples:

-waiting room (seats, sounds, smells, and waiting for the dental hygienist)

-dental office (chair, tools, devices (rubber dam, cotton swabs), suction, floss, needles)

-procedures (someone being in your mouth, bleeding, scraping)

-dental hygienist qualities (rubber gloves, white lab coat, the way they talk or what they say)

-diagnosis about oral health (feedback about dental health (brush, floss, cavities, and gums), suggestions (how to change dental practices)

2) You will then be asked to identify the feeling(s) you experienced and to rate the intensity (strength) of that feeling on a scale from 0 to 100.

*What types of feelings could you have from these situations?*

Review some and give examples of what you could be feeling.

3) Finally you will be asked to identify your automatic thoughts. That is those thoughts you were thinking just before and during the unpleasant emotion.

*What thoughts could you have about the situations and feelings we listed?*

Use your thought journal during the next week to identify these thoughts.

*It is important to identify these thoughts that create and sustain your unpleasant emotions. Remember what you think ultimately controls what you feel.*

*Can anyone think of a dental experience that was anxiety or fear provoking?*

*What was it? What were you thinking to make you feel this way?*

### Changing Your Patterns of Thinking (20 minutes)

Once you can identify these thoughts you need to know how to change them to make them more benign or positive.

Let's consider this example:

A woman walks up to a dental office and thinks, "I have never understood what is good about going to the dentist. Some of the procedures are painful, and I hate the feeling of the instruments in my mouth. I could not handle the discomfort at the last appointment. Therefore I will not go to another dental appointment since there is nothing good about going to the dentist."

The progression of logic goes like this:

1. I find the dental procedures a completely negative experience.

2. I do not see why I should attend dental appointments.
3. Therefore, I will not go to regular dental appointments.

The problem with this conclusion is that her assumptions are based on the negative aspects of the dental situation, while disregarding the positive aspects of attending dental appointments.

Her pattern of thinking is concentrating on the negative aspects of a dental appointment. This pattern of thinking will likely keep her from attending dental appointments.

With this thinking pattern she will continue to sabotage her efforts to maintain good oral health.

We will now examine four limited thinking patterns and give you practice with identifying them. Once you notice your automatic thoughts, you can classify them.

You will learn how to compose alternative statements that are balanced and free you from limited thinking patterns.

(Each of these thinking patterns should be given with a dental example.)

#### 1. Catastrophizing:

You expect, and visualize a disaster.

You notice and may suspect a problem and begin thinking what if there is a problem and what will happen to me.

Catastrophic thoughts usually begin with "what if's".

- What if I go to the dental hygiene appointment and I faint in the chair?
- What if the dental hygienist finds a tooth that has to be pulled?

*Can you think of a catastrophizing thought?*

#### 2. Magnifying:

When you magnify, you exaggerate things out of proportion to their actual significance. As well, you exaggerate the frequency, intensity, and seriousness of the situation.

A person may think the pain during the dental hygiene treatment is unending throughout the procedure.

The same person may think that the intensity of the pain is unbearable to the point that it feels life threatening.

*Can you think of a magnifying thought?*

### 3. Helplessness:

You feel you cannot cope with the situation. You think there is no way to help yourself in the situation. All hope is lost.

- I cannot cope with the pain of the dental hygiene procedure.
- I will not be able to attend one whole session of dental hygiene treatment.

*Can you think of a helpless thought?*

### 4. Rumination:

You have reoccurring thoughts about a situation. You find it difficult not to think about the discomfort or fear the situation.

- Now that I know I am going to the dental hygienist, I cannot stop thinking about what the dental office will look like and smell like. I think about it all the time.

*Can you think of a ruminating thought?*

In addition to labeling your thought, you will also want to examine the evidence supporting your thought, uncovering evidence that contradicts your thoughts, and synthesizing the two to gain a healthier, more realistic perspective.

Gathering evidence on both side of a question is important to understanding your experiences objectively.

*Therefore both labeling your thought and examining the evidence (for and against) is part of composing alternative thoughts.*

### Composing Alternative Thoughts (20 minutes)

Now that we have had some practice at identifying our automatic thoughts and how they are classified, we need to think of alternative thoughts.

Alternative thoughts will suggest actions you can take to change your thoughts by challenging your assumptions, gathering information, and changing your viewpoint.

(→ In this section, each automatic thought detailed above should be repeated and an alternative thought suggested. ←)

#### 1. Catastrophizing

*Ask them to think of alternative thoughts before giving them a solution.*

*Ask them to develop other alternative thoughts to some of their own catastrophizing thoughts.*

Thoughts	Alternative Thoughts
Assuming the worst will happen	consider the odds, assess the situation, are your fears justified?

Thought: What if I go to the dental hygiene appointment and I faint in the chair? What if the dental hygienist finds a tooth that has to be pulled?

*What would you use as an alternative thought?*

Alternative Thought: Is it likely that I will faint in the dental chair? I have never fainted at a dental appointment before. In fact, I have attended dental appointments and they have been just fine. I doubt the hygienist will find a tooth that has to be pulled since I have never had a cavity before and I brush everyday.

## 2. Magnifying

*Ask them to think of alternative thoughts before giving them a solution.*

*Ask them to develop other alternative thoughts to some of their own magnification thoughts.*

Thoughts	Alternative Thoughts
Enlarging difficulties and minimizing positive	put things into perspective, consider the positives, stop using words like terrible, awful, intolerable

Thought: A person may think the pain during the dental hygiene treatment is unending throughout the procedure. The pain makes the experience awful and almost intolerable.

*What would you use as an alternative thought?*

Alternative Thought: Firstly, the entire dental hygiene treatment cannot be painful since it consists of educational components, and fluoride treatment, which is not painful. In fact there are many positives about the dental situation (as listed above).

## 2. Helplessness

*Ask them to think of alternative thoughts before giving them a solution.*

*Ask them to develop other alternative thoughts to some of their own helplessness thoughts.*

Thoughts	Alternative Thoughts
Feeling that you cannot cope	think about getting through the procedure, remember that many others have successfully completed a dental appointment

Thought: I cannot cope with the pain in the dental hygiene procedure. I will not be able to attend one whole session of dental hygiene treatment.

*What would you use as an alternative thought?*

Alternative Thought: Remember that other people have successfully underwent the same procedures. I can use my thinking strategies to change my thoughts and make them more positive.

#### 4. Rumination

*Ask them to think of alternative thoughts before giving them a solution.*

*Ask them to develop other alternative thoughts to some of their own rumination thoughts.*

Thoughts	Alternative Thoughts
Difficulty not thinking about the discomfort or fear about the situation	think about other things, change those thoughts into something positive

Thought: Now that I know that I am going to the dental hygienist, I cannot stop thinking about what the dental office will look like and smell like. I think about it all the time.

*What would you use as an alternative thought?*

Alternative Thought: When you notice you are thinking about the dental situation you can either think about it in a more positive way or think of other things. It may be important to have a thought you can easily replace these reoccurring thoughts, such as thinking about the events of your day instead. As well you can think of the fact that you are becoming an active participant in maintaining optimal oral health.

### Steps Towards Changing Your Negative Thoughts

1. Select the automatic thought
2. Identify which type of thought you are having (catastrophizing, helplessness, rumination, and magnification).
3. Identify evidence that supports the thought. This includes past and present evidence.
4. Uncover evidence that contradicts your thought. This is the hardest part of the technique and your mind will likely be blank when trying to think of evidence.  
Therefore there are a list of questions to help you generate alternative evidence.
5. Write your alternative thoughts.
6. Practice your alternative thoughts.

#### Exercises:

Ask the participants to fill out thought journals. Show them the entire table and explain it to them using the instructions given to them and they appear below. Ask them to think of examples.

Remember these thoughts are to be related to a dental situation or experience.

#### Handout Homework (10 mintues)

##### Instructions

Please complete the attached thought journal.

Remember these thoughts are to be related to a dental situation or experience.

You are asked to:

- 1) Identify the situation (when, where, what, and who) that lead up to the thought.
- 2) Identify the feeling associated with the situation and rate the intensity of the feeling on a scale of 0-100 (0 = not at all to 100 = very intense).
- 3) Identify thoughts (what you were thinking before or during the unpleasant thought).

- 4) Identify which limited thinking pattern (catastrophizing, helplessness, rumination, and magnification).
- 5) Examine the evidence for and against this thought.
- 6) Think of alternative thoughts.
- 7) Re-rate the feelings you had previously with this thought. Again the rating is on a scale of 0-100 (0 = not at all to 100 = very intense).

#### Identifying Limited Thinking Patterns and Composing Alternative Thoughts

##### 1. Catastrophizing

###### *Thoughts*

Assuming the worst will happen

###### *Alternative Thoughts*

consider the odds, assess the situation, are your fears justified?

##### 2. Magnifying

###### *Thoughts*

Enlarging difficulties and minimizing positive

###### *Alternative Thoughts*

put things into perspective, consider the positives, stop using words like terrible, awful, intolerable

##### 3. Helplessness

###### *Thoughts*

Feeling that you cannot cope

###### *Alternative Thoughts*

think about getting through the procedure, remember that many others have successfully completed a dental hygiene appointment

##### 4. Rumination

###### *Thoughts*

Difficulty not thinking about the discomfort or fear about the situation

###### *Alternative Thoughts*

think about other things, change those thoughts into something positive

**Note:** Please remind them to bring their homework with them for the next session.

Remind them of Next Session Time



## Pain Catastrophizing Reduction Intervention Group Session 2

Take Attendance

### Review Homework (10 minutes)

\*Review homework within the review of Session 1.\* [Use each person's examples to illustrate points taught last session.]

*Use this time to ask if the participants have any problems, questions, or comments?*

It is important to tell them that most people have difficulty with these thought journals the first time they complete one. Remind them that it is important to change our thoughts because that will in turn change our feelings towards the dental situation.

*Have the participants pass in their thought journals and use examples (anonymously) to illustrate what was taught last session.*

*Make sure to review their charts and allow the participants to ask questions.*

*Reinforce all participation.*

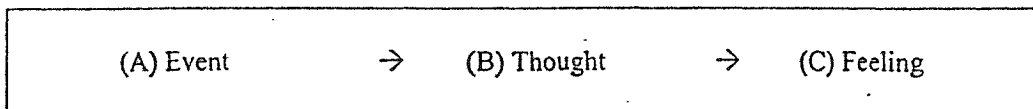
We will now review what we did last session. However we will use the review to see how these techniques change your negative thoughts.

### -Review Session 1- (55 minutes)

#### Uncovering Automatic Thoughts (5 minutes)

Remember what we learned last week about thoughts causing feelings. Many emotions we feel are preceded and caused by a thought even though that thought may go unnoticed.

In other words, events by themselves have no emotional content, it is the interpretation of the event that causes your emotions. This was represented as the ABC model of emotions. Let's review:



For example:

(A) Event: You schedule your dental hygiene appointment.

(B) Thought: "Oh I hate going to the dental hygienist."

(C) Feeling: You feel sad and anxious about attending the appointment.

*Can anyone give me an example, using one of your thoughts of this ABC model?*

If not look at their homework and choose an example from there.

#### Identifying Your Automatic Thoughts (5 minutes)

*Did you have any problems identifying your automatic thoughts?*

The reason why we ask you that is because automatic thoughts are often fleeting, that is they pass through our minds quickly and usually go unnoticed.

*What were some of the thoughts that you recorded? Ask each member to give an example of a thought or take it from their homework.*

*Did any of you:*

- i) Reconstruct the problem
- ii) Write down the statement that preceded your feeling and try to extract the automatic thought.

In the first exercise we asked the participant to record 5 or more different dental situations or pain situations. It is important to identify these thoughts since they create and sustain your unpleasant emotions.

Remember what you think ultimately controls what you feel.

#### Changing Your Automatic Thoughts: (15 minutes)

Now that we have reviewed identifying thoughts, the next step was to label them.

We examined 4 thinking patterns and gave you practice identifying them. Now you can notice your automatic thoughts, and classify them. You also learned to compose alternative statements that balanced and gave you a different perspective on your automatic thoughts.

Thinking Patterns were:

Giving the dental examples of each by using their examples.

1. Catastrophizing: You expect, and visualize a disaster.

2. Magnifying: You perceive things out of proportion to their actual significance.

1. Helplessness: You feel that you cannot go on and that you cannot improve the situation.
2. Rumination: You have re-occurring thoughts about a situation.

*Have the group members give examples of each thinking pattern.*

*How did labeling your thoughts help you?*

#### Examining Thoughts (10 minutes)

In addition to classifying your automatic thoughts, you can examine the evidence supporting your thought, uncovering evidence that contradicts your thoughts, and synthesizing the two to gain a healthier, more realistic perspective. Gathering evidence on both side of a question is important to understanding your experiences objectively.

#### Steps Towards Changing Your Thoughts

- 1) Select the automatic thought
- 2) Identify evidence that supports the thought.
- 3) Uncover evidence that contradicts your thought.
- 4) Practice your balanced thoughts.

*What types of evidence did you find when you examined your thoughts?*

#### Composing Alternative Thoughts (15 minutes)

After identifying your automatic thoughts, classifying them, and examining the evidence for and against them, we now want looked at how to compose alternative thoughts. Alternative thoughts will suggest actions you can take to change your thoughts by challenging your assumptions, gathering information, and changing your viewpoint.

*Go through each of their thoughts and give an example of how the thought can be changed.*

*What do you think alternative thoughts help do?*

- change feelings                      → discount negative thoughts
- allow you to approach the situation differently

#### What To Expect? (5 minutes)

In order for you to make the best of the skills you have just learned, it is important for you to practice them while imagining being at the dental hygiene appointment. In order for you to imagine the hygiene appointment we will provide a brief description.

You will go to the dental hygiene appointment at the Dalhousie University Dental Clinic. Once registered, you will be asked to wait in the waiting room until the hygienist comes to greet you. While waiting you may hear, smell, or see things that are typical of a dental situation, such as hearing the sound of a drill, tasting the fluoride solution, or smelling antiseptic solutions. Once the hygienist comes to greet you, he/she will bring you into the clinic here you will be brought to a booth and asked to sit in the a dental chair. You will be asked to complete some questionnaires and then the hygienist will start the dental hygiene treatment.

During your dental hygiene treatment visits, you are encouraged to use the techniques of altering thoughts we have practiced over these past two intervention sessions.

Handout Questionnaire Package (25 minutes)

Photocopy Their Homework and Give it Back to Them

Homework

- Ask them to review the thoughts and how to change them –practice twice per week
- Attend the dental hygiene appointment

Remind them of that they will soon be contacted to make their dental hygiene appointment

## Appendix F

### Homework

-Please listen to the tape a minimum of 4 times before next session and practice imagery skills you learnt this session.

-Please have a chosen image and be able to describe that image in detail for the next treatment session.

The tape will provide you with two sessions of guided imagery practice.

- 1) The first part of the tape will be for those of you who wish to use a beach scene.
- 2) The second part of the tape will be for those of you who have created your own scene.

-In the following pages, we will ask you to provide a written description of the image you have chosen. Please describe it in as much detail as possible.

***NOTE: Please remember to bring your homework with you for the next session.***

Please describe the scene that you have created in as much detail as possible. Remember to include sounds, smells, visual descriptions and textures.

This image shows a single page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or printed text on the page.

## Appendix G

### Homework

Please complete the attached thought journal.

Remember these thoughts are to be related to a dental situation or experience.

You are asked to:

- 1) Identify the situation (when, where, what, and who) that lead up to the thought.
- 2) Identify the feeling associated with the situation and rate the intensity of the feeling on a scale of 0-100 (0 = not at all to 100 = very intense).
- 3) Identify the automatic thought (what you were thinking before or during the unpleasant thought).
- 4) Identify which limited thinking pattern.
- 5) Examine the evidence for and against this thought.
- 6) Think of alternative thoughts.
- 7) Re-rate the feelings that you had previously with this thought. Again the rating is on a scale of 0-100 (0 = not at all to 100 = very intense).

*Note: Please remember to bring your homework with you for the next session.*

Situation When, where, what, and who?	Feelings One word Summaries Rate 0-100	Automatic Thoughts What were you thinking before or during this unpleasant thought?



Limited Thinking Pattern	Evidence For	Evidence Against	Alternative Thoughts	Re-Rate Feelings 0-100

## Appendix H

*Pain Catastrophizing Scale*

Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery.

We are interested in the types of thoughts and feelings that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain by using the corresponding letter for your responses on the right hand section of the bubble sheet.

(0)- not at all (1)- to a slight degree (2)- to a moderate degree (3)- to a great degree (4)- all the time

---

When I'm in pain...

- \_\_\_ I worry all the time about whether the pain will end.
- \_\_\_ I feel I can't go on.
- \_\_\_ It's terrible and I think it's never going to get any better.
- \_\_\_ It's awful and I feel that it overwhelms me.
- \_\_\_ I feel I can't stand it anymore.
- \_\_\_ I become afraid that the pain will get worse.
- \_\_\_ I keep thinking of other painful events.
- \_\_\_ I anxiously want the pain to go away.
- \_\_\_ I can't seem to keep it out of my mind.
- \_\_\_ I keep thinking about how much it hurts.
- \_\_\_ I keep thinking about how badly I want the pain to stop.

\_\_\_ There's nothing I can do to reduce the intensity of the pain.

\_\_\_ I wonder whether something serious may happen.

## Appendix I

## Dental Anxiety Scale -Revised

1. If you had to go to the dentist tomorrow for a check-up, how would you feel about it?

- A) I would look forward to it as a reasonably enjoyable experience.
- B) I wouldn't care one way or the other.
- C) I would be a little uneasy about it.
- D) I would be afraid that it would be unpleasant and painful.
- E) I would be very frightened of what the dentist would do.

2. When you are waiting in the dentist office for your turn in the chair, how do you feel?

- A) Relaxed
- B) A little uneasy
- C) Tense
- D) Anxious
- E) So anxious that I sometimes break out in a sweat or almost feel physically sick

3. When you are in the dentist chair waiting while the dentist gets the drill ready to begin working on your teeth, how do you feel?

- A) Relaxed
- B) A little uneasy
- C) Tense
- D) Anxious
- E) So anxious that I sometimes break out in a sweat or almost feel physically sick.

4. Imagine that you are in the dentist's chair to have your teeth cleaned. While you are waiting, the dentist or hygienist is getting out the instruments which will be used to scrape your teeth around the gums, how do you feel?

- A) Relaxed
- B) A little uneasy
- C) Tense
- D) Anxious
- E) So anxious that I sometimes break out in a sweat or almost feel physically sick.

## Appendix J

## Dental Beliefs Survey

The items in this questionnaire refer to various situations, feelings, and reactions related to dental work. Please rate your feelings or beliefs on these items by *circling the number* (1, 2, 3, 4, or 5) of the category which most closely corresponds to your feelings about *dentistry in general*.

	1	2	3	4	5
	never	once or twice	a few times	often	nearly always
I am concerned that the dentists recommend work that is not really needed.	1	2	3	4	5
I believe dentists say/do things to withhold information from me.	1	2	3	4	5
I worry if the dentist is technically competent and is doing quality work.	1	2	3	4	5
I have had dentists say one thing and do another.	1	2	3	4	5
I am concerned that dentists provide all the information I need to make good decisions.	1	2	3	4	5
Dentists don't seem to care that patients sometimes need a rest.	1	2	3	4	5
I've had dentists seem reluctant to correct work unsatisfactory to me.	1	2	3	4	5
When a dentist seems in a hurry I worry that I'm not getting good care.	1	2	3	4	5
I am concerned that the dentist is not Really looking out for my best interests.	1	2	3	4	5
Dentists focus too much on getting	1	2	3	4	5

the job done and not enough on the patient's comfort

I'm concerned that dentists might not be skilled enough to deal with my fears or dental problems.	1	2	3	4	5
I feel dentists do not provide clear explanations.	1	2	3	4	5
I am concerned that dentists do not like to take the time to really talk to patients.	1	2	3	4	5
I feel uncomfortable asking questions.	1	2	3	4	5
Dental professionals say things to make me feel guilty about the way I care for my teeth.	1	2	3	4	5
I am concerned that dentists will not take my worried (fears) about dentistry seriously.	1	2	3	4	5
I am concerned that dentists will put me down (make light of my fears).	1	2	3	4	5
I am concerned that dentists do not like it when a patient makes a request.	1	2	3	4	5
I am concerned that dental personnel will embarrass me over the condition of my teeth.	1	2	3	4	5
I believe that dentists don't have Enough empathy for what it is really like to be a patient.	1	2	3	4	5
When I am in the chair I don't feel like I can stop the appointment for a rest if I feel the need.	1	2	3	4	5
Dentists don't seem to notice that patients sometimes need a rest.	1	2	3	4	5

Once I am in the chair I feel helpless (that things are out of my control).	1	2	3	4	5
If I were to indicate that it hurts, I think that the dentist would be reluctant to stop and try to correct the problem.	1	2	3	4	5
I have had dentists not believe me when I said I felt pain.	1	2	3	4	5
Dentists often seem in a hurry, so I feel rushed.	1	2	3	4	5
I am concerned that the dentist will do what he wants and not really listen to me while I'm in the chair.	1	2	3	4	5
Being overwhelmed by the amount of work needed (all the bad news) could be enough to keep me from beginning or completing treatment.	1	2	3	4	5

## Appendix K

**-DCQ-**

Each item below describes a thought that some patients think to themselves about dental care.

Please read each statement and indicate whether the thought has occurred by choosing "yes" or "no".

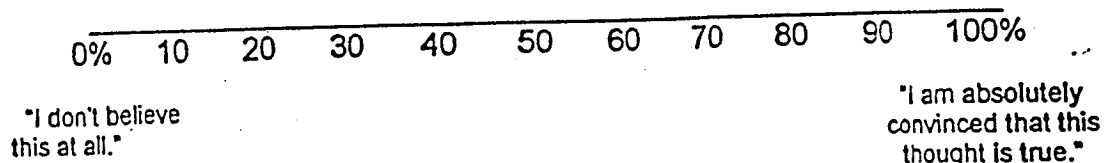
**When knowing that I have to undergo dental treatment very soon, I think...**

- |  |    |     |
|--|----|-----|
| 1. Dentists do as they please            | NO | YES |
| 2. Dentists are often impatient          | NO | YES |
| 3. The dentist does not care if it hurts | NO | YES |
| 4. Dentists do not understand you        | NO | YES |
| 5. Dentists are often incapable          | NO | YES |
| 6. Dentists think you act childish       | NO | YES |
| 7. Treatments often fail                 | NO | YES |
| 8. My teeth can't be saved               | NO | YES |
| 9. I should be ashamed about my teeth    | NO | YES |
| 10. My teeth might break                 | NO | YES |
| 11. I can't stand pain                   | NO | YES |
| 12. I am a tense person                  | NO | YES |
| 13. I am a difficult person              | NO | YES |
| 14. I am someone with very long roots    | NO | YES |



Please read each statement and indicate whether the thought has occurred by ticking "yes" or "no".

As well, please rate the degree to which you believe each statement at this moment by filling in a percentage (0% = "I don't believe this thought at all" to 100% = "I am absolutely convinced that this thought is true")



### While being treated I think...

- |   |    |     |       |
|---|----|-----|-------|
| 1. Everything may go wrong              | NO | YES | ____% |
| 2. This treatment will hurt             | NO | YES | ____% |
| 3. My teeth will break                  | NO | YES | ____% |
| 4. Something surely will go wrong       | NO | YES | ____% |
| 5. It never runs smoothly               | NO | YES | ____% |
| 6. I am helpless                        | NO | YES | ____% |
| 7. I can't control myself               | NO | YES | ____% |
| 8. I can't escape, I'm locked in        | NO | YES | ____% |
| 9. Anesthetics often do not work        | NO | YES | ____% |
| 10. The sound of the drill frightens me | NO | YES | ____% |
| 11. The dentist will drill              |    |     |       |
| my gums, tongue, or cheek in            | NO | YES | ____% |
| 12. The nerve will be touched           | NO | YES | ____% |
| 13. I have no control over what happens | NO | YES | ____% |
| 14. I will die during treatment         | NO | YES | ____% |

15. I will panic during treatment	NO	YES	____%
16. I will faint during treatment	NO	YES	____%
17. I will panic suffocate treatment	NO	YES	____%
18. I can't stand this treatment for long	NO	YES	____%
19. I will certainly have pain afterwards	NO	YES	____%
20. The filling will fall out and has to be done again	NO	YES	____%
21. This treatment fails	NO	YES	____%
22. I become sick	NO	YES	____%
23. The dentist will lose control over his drill	NO	YES	____%
24. The dentist believes that I am a difficult person and act childish in	NO	YES	____%

## Appendix L

## Dental Fear Survey

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. Use numbers 1-5, from the following scale and circle the appropriate number. (If it helps try to imagine yourself in each of these situations and describe what your common reaction is.)

	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
	not at all	a little	somewhat much		very much
Making an appointment for dentistry	1	2	3	4	5
Approaching the dentist's office	1	2	3	4	5
Sitting in the waiting room	1	2	3	4	5
Being seated in the dental chair	1	2	3	4	5
The smell of the dentist's office	1	2	3	4	5
Seeing the dentist walk in	1	2	3	4	5
Seeing the anesthetic needle	1	2	3	4	5
Feeling the needle injected	1	2	3	4	5
Seeing the drill	1	2	3	4	5
Hearing the drill	1	2	3	4	5
Feeling the vibrations of the drill	1	2	3	4	5
Having your teeth cleaned	1	2	3	4	5
All things considered, how fearful are You of having dental work done	1	2	3	4	5

## Appendix M

## Experienced Mood Scale

Please read each question, and choose the item that best describes how you currently feel.

## AT THIS MOMENT, I FEEL...

## 1. SAD

0	1	2	3	4	5	6	7	8	9	10
not at all									extremely	

## 2. ANGRY

0	1	2	3	4	5	6	7	8	9	10
not at all									extremely	

## 3. HAPPY

0	1	2	3	4	5	6	7	8	9	10
not at all									extremely	

## 4. ANXIOUS

0	1	2	3	4	5	6	7	8	9	10
not at all									extremely	

## 5. DISCOURAGED

0	1	2	3	4	5	6	7	8	9	10
not at all									extremely	

-----

## AT THIS MOMENT, I FEEL...

### 6. HOSTILE

0	1	2	3	4	5	6	7	8	9	10
									extremely	

not at all

### 7. DELIGHTED

0	1	2	3	4	5	6	7	8	9	10
									extremely	

not at all

### 8. AFRAID

0	1	2	3	4	5	6	7	8	9	10
									extremely	

not at all

### 9. HOPELESS

0	1	2	3	4	5	6	7	8	9	10
									extremely	

not at all

### 10. IRRITABLE

0	1	2	3	4	5	6	7	8	9	10
									extremely	

not at all

### 11. JOYFUL

0	1	2	3	4	5	6	7	8	9	10
									extremely	

not at all

### 12. WORRIED

0	1	2	3	4	5	6	7	8	9	10
									extremely	

not at all

**AT THIS MOMENT, I FEEL...**

13. Tense

0	1	2	3	4	5	6	7	8	9	10
not at all									extremely	

14. Terrified

0	1	2	3	4	5	6	7	8	9	10
not at all									extremely	

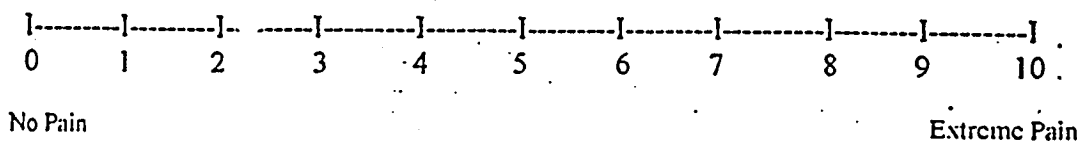
15. Scared

0	1	2	3	4	5	6	7	8	9	10
not at all									extremely	

## Appendix N

## Pain Rating for Dental Hygiene Procedures

Using the scale below, where 0 refers to no pain and 10 refers to extreme pain, please rate the degree of pain you experienced when the dental hygienist performed the following procedures on this appointment. Use the letters "NA" to indicate the procedures that were not performed.



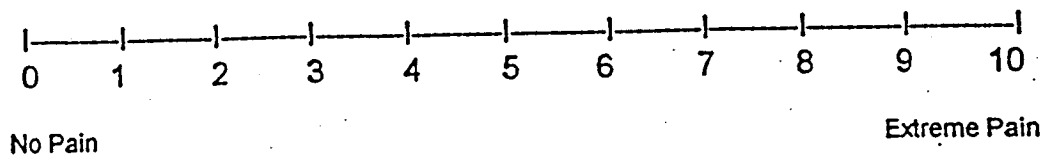
How much pain did you have when the dental hygienist...

- \_\_\_ 1. Cleaned deposits from your teeth with metal instruments?
- \_\_\_ 2. Used a sonic or ultrasonic scaler to remove deposits from your teeth?
- \_\_\_ 3. Polished your teeth with a rotating rubber cup and polishing paste?
- \_\_\_ 4. Flossed your teeth?
- \_\_\_ 5. If you received "freezing" during this appointment, how much pain did you experience when the needle was inserted in your gums?
- \_\_\_ 6. Overall, how would you rate the pain you experienced during this appointment?

## Appendix O

***PE Scale***

Using the scale below, please rate the degree of pain you expect to experience when the dental hygienist performs the following procedures at the appointment.



\_\_\_ 1. Probes under your gums to check for gum disease?

\_\_\_ 2. Cleans the deposit from your teeth with the metal instruments?

\_\_\_ Overall, how much pain do you expect to experience in the dental hygiene assessment?



## Appendix P

Table 1.

Descriptive Statistics for Degree of Difficulty Scale, Periodontal Status, Flossing Per Week, Brushing Per Day, and Pain Catastrophizing Scale

	Mean	<u>SD</u>	Min.	Max.
<b>Degree of Difficulty Scale</b>				
	1.88	.43	1	3
<b>Periodontal Status</b>				
	1.86	.35	1	2
<b>Floss Per Week</b>				
	2.47	2.78	0	7
<b>Brush Per Day</b>				
	2.46	1.00	0	6
<b>Pain Catastrophizing Scale</b>				
	26.14	5.50	24	43

## Appendix Q

Table 2.

One Way ANOVA and Descriptive Statistics of Baseline Measures by InterventionGroup at the Initial Visit.

	1	2	3	
<b>Age</b>				
Mean	21.52	22.06	20.28	
<u>SD</u>	2.95	7.34	2.82	$F = .69, p = n.s.$
<b>Degree of Difficulty Scale</b>				
Mean	2.00	1.88	1.71	
<u>SD</u>	.30	.50	.47	$F = 2.42, p = n.s.$
<b>Periodontal Status</b>				
Mean	1.96	1.75	1.82	
<u>SD</u>	.21	.45	.39	$F = 1.77, p = n.s.$
<b>Brushing Per Day</b>				
Mean	2.61	2.38	2.33	
<u>SD</u>	1.12	.81	1.03	$F = .45, p = n.s.$
<b>Flossing Per Week</b>				
Mean	2.65	2.13	2.56	
<u>SD</u>	2.90	2.45	3.01	$F = .18, p = n.s.$
<b>Pain Catastrophizing Scale</b>				
Mean	25.44	23.47	24.78	
<u>SD</u>	9.62	9.68	8.90	$F = .22, p = n.s.$
<b>Dental Anxiety Scale –Revised</b>				
Mean	9.88	9.51	10.17	
<u>SD</u>	4.76	4.04	3.03	$F = .11, p = n.s.$
<b>Dental Beliefs Scale</b>				
Mean	58.78	55.29	58.61	
<u>SD</u>	23.87	23.56	21.24	$F = .13, p = n.s.$

Table 2. (continued)

One Way ANOVA of Baseline Measures by Intervention Group at the Initial Visit.

	1	2	3	
<b>Dental Fear Survey</b>				
Mean	35.26	31.06	34.61	
<u>SD</u>	15.54	13.98	11.99	$F = .48, p = n.s$
<b>Dental Cognition Questionnaire –Frequency Subscale</b>				
Mean	9.09	6.27	7.79	
<u>SD</u>	6.58	5.59	5.95	$F = .43, p = n.s.$
<b>Dental Cognitions Questionnaire – Believability Subscale</b>				
Mean	29.40	21.20	23.24	
<u>SD</u>	24.20	19.71	19.80	$F = 1.18, p = n.s.$
<b>Experienced Negative Mood Scale</b>				
Mean	41.83	36.76	44.61	
<u>SD</u>	26.85	21.38	17.44	$F = .54, p = n.s.$
<b>Expected Pain Scale</b>				
Mean	12.48	14.44	13.76	
<u>SD</u>	6.81	9.26	4.94	$F = .64, p = n.s.$

*Note:* 1 = Relaxation focused intervention group; 2 = Pain catastrophizing reduction intervention group; 3 = Wait-list control group; \* =  $p < .05$ ; \*\* =  $p < .01$ .

## Appendix R

## Criteria Check Sheet

Tape #: \_\_\_\_\_

Coder Initials: \_\_\_\_\_

For the following items, please indicate whether the therapist discusses the certain topic in the session. Indicate 'Y' for Yes, and 'N' for No.

## Therapist Discusses:

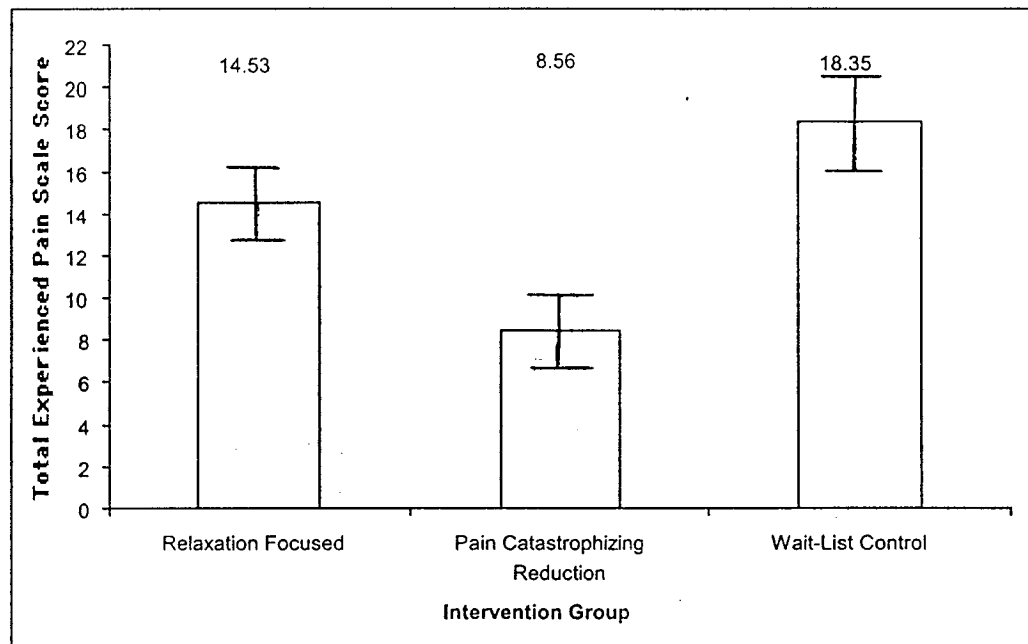
- 1) \_\_\_\_\_ In detail the negative thoughts related to dentistry.
- 2) \_\_\_\_\_ The A-B-C's –event, thoughts, and feelings.
- 3) \_\_\_\_\_ How to identify thoughts by reconstructing the situation or by writing out the thought.
- 4) \_\_\_\_\_ The impact of the participant's childhood experiences with pain on their current experiences with pain.
- 5) \_\_\_\_\_ How to identify feelings.
- 6) \_\_\_\_\_ Techniques which specifically aim to decrease tension in various muscles in the body (progressive muscle relaxation).
- 7) \_\_\_\_\_ And Practices Deep breathing and abdominal breathing.
- 8) \_\_\_\_\_ Introduces the idea of relaxing and relaxation by using deep breathing and guided imagery.
- 9) \_\_\_\_\_ The impact of their family relationships (i.e., with their mother or father) on their perception of pain.

- 10) \_\_\_\_ How to find a pleasant image or scene.
- 11) \_\_\_\_ Using family and friends as support through pain experiences.
- 12) \_\_\_\_ Techniques to deal with intrusive thoughts, in particular to acknowledge the thought and let it fade away.
- 13) \_\_\_\_ The participant's family/medical history of experiences with pain.
- 14) \_\_\_\_ How to imagine the dental situation.
- 15) \_\_\_\_ The influence of interpersonal relationships on their pain experience.
- 16) \_\_\_\_ How to identify catastrophizing thoughts and label them –rumination, helplessness, and magnification
- 17) \_\_\_\_ How to create alternative thoughts.
- 18) \_\_\_\_ Adding detail to a pleasant image or scene.

## Appendix S

Figure 2.

Total Experienced Pain Scale Score During Dental Hygiene Treatment.



Note: Error bars are representative of the standard error.

## Appendix T

Table 3.

MANOVA and Descriptives of Experienced Pain Scale Items by Group at the Dental Hygiene Treatment Visit.

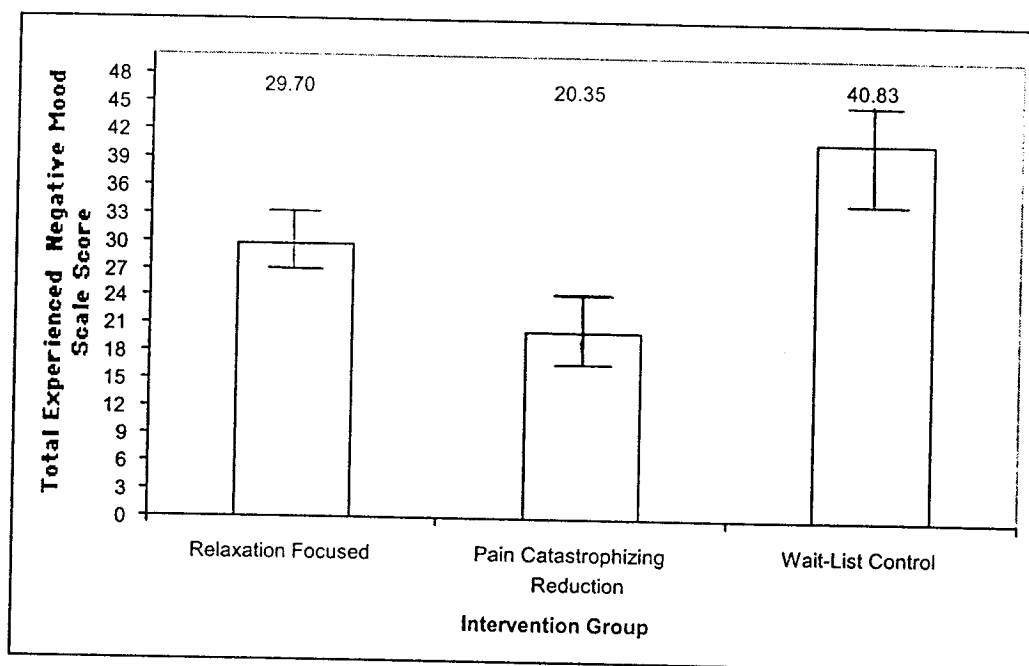
Item	1	2	3	
1. Cleaned deposits from teeth with metal instrument				
Mean	3.61	1.94	4.39	
SD	2.43	1.71	1.91	$F = 6.30, p < .01^{**}$
2. Used sonic or ultrasonic scaler to remove deposits from teeth				
Mean	3.30	2.67	3.35	
SD	1.89	1.70	1.71	$F = .82, p = n.s.$
3. Polished teeth with a rotating rubber cup and polishing paste				
Mean	.78	.65	1.17	
SD	.80	1.00	1.15	$F = 1.37, p = n.s.$
4. Flossed teeth				
Mean	1.74	.47	2.47	
SD	1.42	.62	1.80	$F = 9.30, p < .01^{**}$
5. If received freezing, pain experienced when needle was inserted into your gums				
Mean	---	---	---	
SD	---	---	---	
6. Overall pain experienced				
Mean	3.17	2.00	3.50	
SD	1.80	1.94	1.89	$F = 3.14, p = .051$

*Note:* Item 5 is blank since there were no participants who received freezing during the dental hygiene treatment. 1 = Relaxation focused intervention group; 2 = Pain catastrophizing reduction intervention group; 3 = Wait-list control group; \* =  $p < .05$ ; \*\* =  $p < .01$ .

## Appendix U

Figure 3.

Total Experienced Negative Mood Scale Score During Dental Hygiene Treatment.



Note: Error bars are representative of the standard error.



## Appendix V

Table 4.

MANOVA and Descriptives of Experienced Negative Mood Subscales by Group at the Dental Hygiene Treatment Visit.

Item	1	2	3
<b>Angry</b>			
Mean	1.91	.59	3.83
<u>SD</u>	2.50	1.06	4.46
			$F = 3.40, p = .05$
<b>Anxious</b>			
Mean	7.83	3.82	13.94
<u>SD</u>	5.37	5.98	13.10
			$F = 5.98, p = .01$
<b>Sadness</b>			
Mean	19.96	15.94	22.39
<u>SD</u>	9.57	6.85	8.86
			$F = 2.89, p = .07$

*Note:* 1 = Relaxation focused intervention group; 2 = Pain catastrophizing reduction intervention group; 3 = Wait-list control group; \* =  $p < .05$ ; \*\* =  $p < .01$ .

## Appendix W

## Oneway

## ANOVA

		Sum of Squares	df	Mean Square
DMOODTOT	Between Groups	3959.828	3	1319.943
	Within Groups	19285.652	69	279.502
	Total	23245.479	72	
PAINTOT	Between Groups	863.641	3	287.880
	Within Groups	4716.406	69	68.354
	Total	5580.047	72	

		F	Sig.
DMOODTOT	Between Groups	4.722	.005
	Within Groups		
	Total		
PAINTOT	Between Groups	4.212	.009
	Within Groups		
	Total		

## Post Hoc Tests

## Multiple Comparisons

## LSD

Dependent Variable	(I) TRMT	(J) TRMT	Mean Difference (I-J)	Std. Error	Sig.
DMOODTOT	1.00	2.00	9.3427	5.3473	.085
		3.00	-11.1377*	5.2612	.038
		4.00	-5.5043	5.5485	.325
	2.00	1.00	-9.3427	5.3473	.085
		3.00	-20.4804*	5.6541	.001
		4.00	-14.8471*	5.9224	.015
	3.00	1.00	11.1377*	5.2612	.038
		2.00	20.4804*	5.6541	.001
		4.00	5.6333	5.8448	.338
	4.00	1.00	5.5043	5.5485	.325
		2.00	14.8471*	5.9224	.015
		3.00	-5.6333	5.8448	.338
PAINTOT	1.00	2.00	5.9657*	2.6444	.027
		3.00	-3.8196	2.6018	.147
		4.00	-.5362	2.7439	.846
	2.00	1.00	-5.9657*	2.6444	.027
		3.00	-9.7853*	2.7961	.001
		4.00	-6.5020*	2.9288	.030
	3.00	1.00	3.8196	2.6018	.147
		2.00	9.7853*	2.7961	.001
		4.00	3.2833	2.8904	.260
	4.00	1.00	.5362	2.7439	.846
		2.00	6.5020*	2.9288	.030
		3.00	-3.2833	2.8904	.260

## Multiple Comparisons

LSD

Dependent Variable	(I) TRMT	(J) TRMT	95% Confidence Interval	
			Lower Bound	Upper Bound
DMOODTOT	1.00	2.00	-1.3249	20.0103
		3.00	-21.6335	-.6419
		4.00	-16.5733	5.5646
	2.00	1.00	-20.0103	1.3249
		3.00	-31.7601	-9.2007
		4.00	-26.6619	-3.0322
	3.00	1.00	.6419	21.6335
		2.00	9.2007	31.7601
		4.00	-6.0267	17.2933
	4.00	1.00	-5.5646	16.5733
		2.00	3.0322	26.6619
		3.00	-17.2933	6.0267
PAINTOT	1.00	2.00	.6903	11.2411
		3.00	-9.0100	1.3709
		4.00	-6.0101	4.9376
	2.00	1.00	-11.2411	-.6903
		3.00	-15.3634	-4.2072
		4.00	-12.3447	-.6592
	3.00	1.00	-1.3709	9.0100
		2.00	4.2072	15.3634
		4.00	-2.4828	9.0495
	4.00	1.00	-4.9376	6.0101
		2.00	.6592	12.3447
		3.00	-9.0495	2.4828

\*. The mean difference is significant at the .05 level.

## Appendix X

Table 5.

One way ANOVA and Descriptive Statistics of Secondary outcome measures at the Dental Hygiene Treatment Visit.

	1	2	3
<b>Pain Catastrophizing Scale</b>			
Mean	22.70	18.29	22.00
<u>SD</u>	12.10	9.68	9.04
			$F = .93, p = n.s.$
<b>Dental Anxiety Scale –Revised</b>			
Mean	8.78	7.80	9.98
<u>SD</u>	3.16	2.31	3.34
			$F = 2.32, p = n.s.$
<b>Dental Beliefs Scale</b>			
Mean	47.48	43.91	54.24
<u>SD</u>	17.29	14.20	16.52
			$F = 2.01, p = n.s.$
<b>Dental Fear Survey</b>			
Mean	29.60	25.88	32.72
<u>SD</u>	12.10	10.57	10.92
			$F = 1.60, p = n.s.$
<b>Dental Cognition Questionnaire –Frequency Subscale</b>			
Mean	5.15	3.89	5.18
<u>SD</u>	5.41	4.83	5.36
			$F = .38, p = n.s.$
<b>Dental Cognitions Questionnaire – Believability Subscale</b>			
Mean	25.78	17.99	23.98
<u>SD</u>	33.99	25.97	26.28
			$F = 1.41, p = n.s.$
<b>Experienced Negative Mood Scale</b>			
Mean	39.09	33.06	44.39
<u>SD</u>	22.43	17.28	22.86
			$F = 1.25, p = n.s.$

Table 5. (continued)

One way ANOVA and Descriptive Statistics of Secondary outcome measures at the Dental Hygiene Treatment Visit.

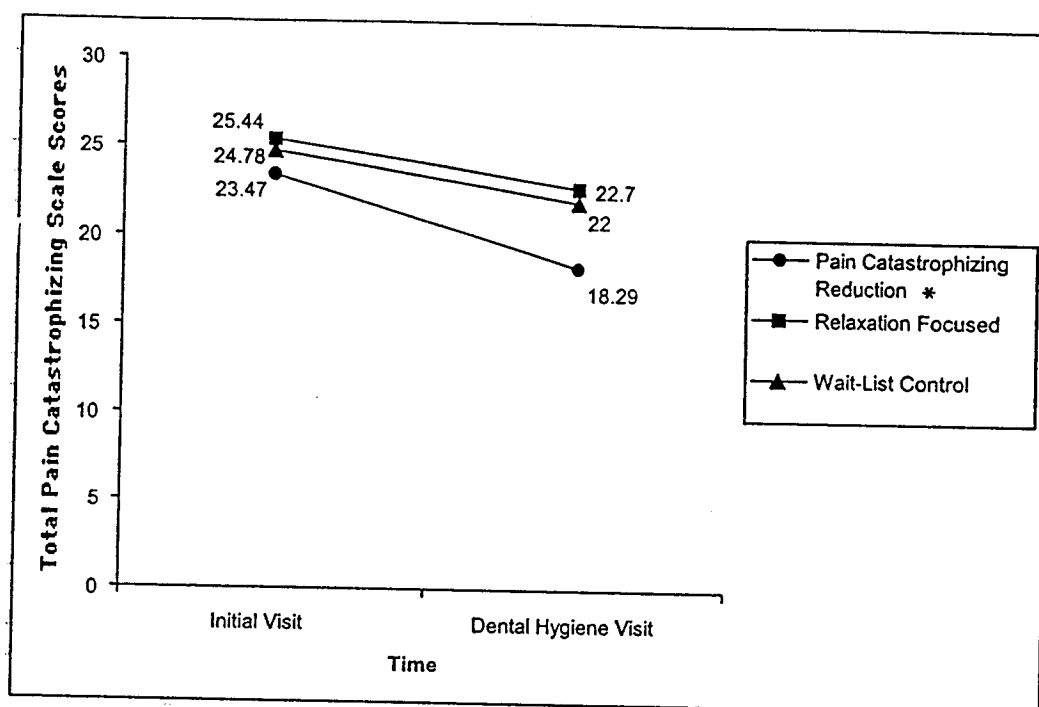
	1	2	3
<b>Expected Pain Scale</b>			
Mean	10.83	11.06	12.56
<u>SD</u>	6.46	7.33	6.96
$F = .36, p = \text{n.s.}$			

*Note:* 1 = Relaxation focused intervention group; 2 = Pain catastrophizing reduction intervention group; 3 = Wait-list control group; \* =  $p < .05$ ; \*\* =  $p < .01$ .

## Appendix Y

Figure 4.

Total Pain Catastrophizing Scale Score At Initial Visit and Before Dental Hygiene Treatment.

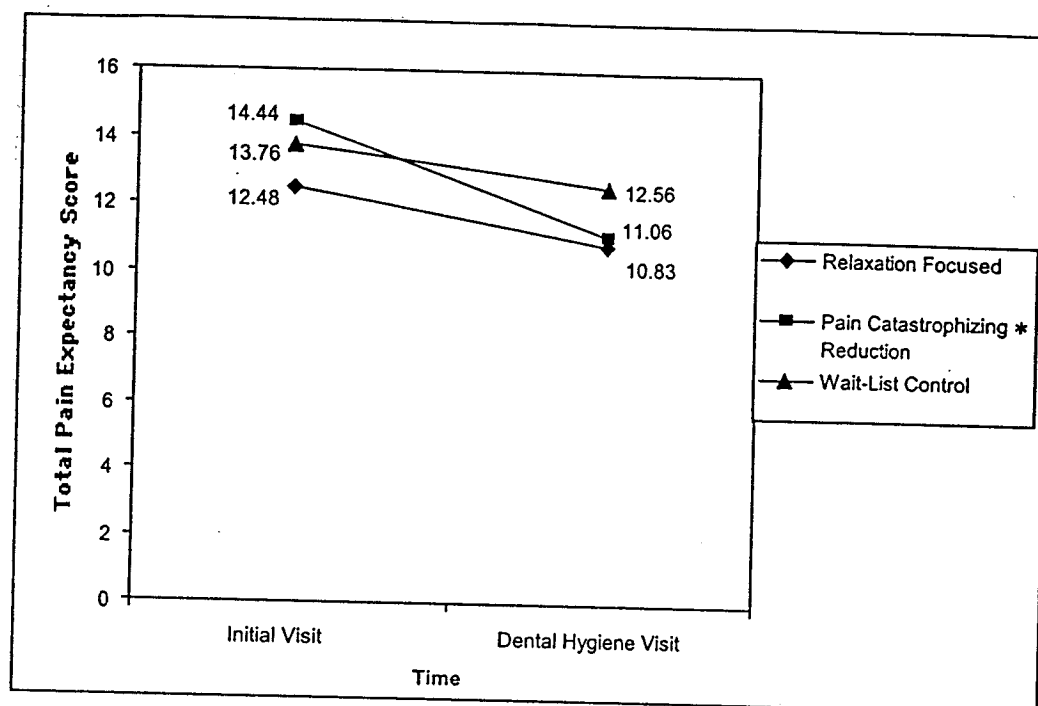


Note: \* = Significant difference between Initial and Dental Hygiene Visit

## Appendix Z

Figure 5.

Total Dental Anxiety Scale –Revised Score At Initial Visit and Before Dental Hygiene Treatment.

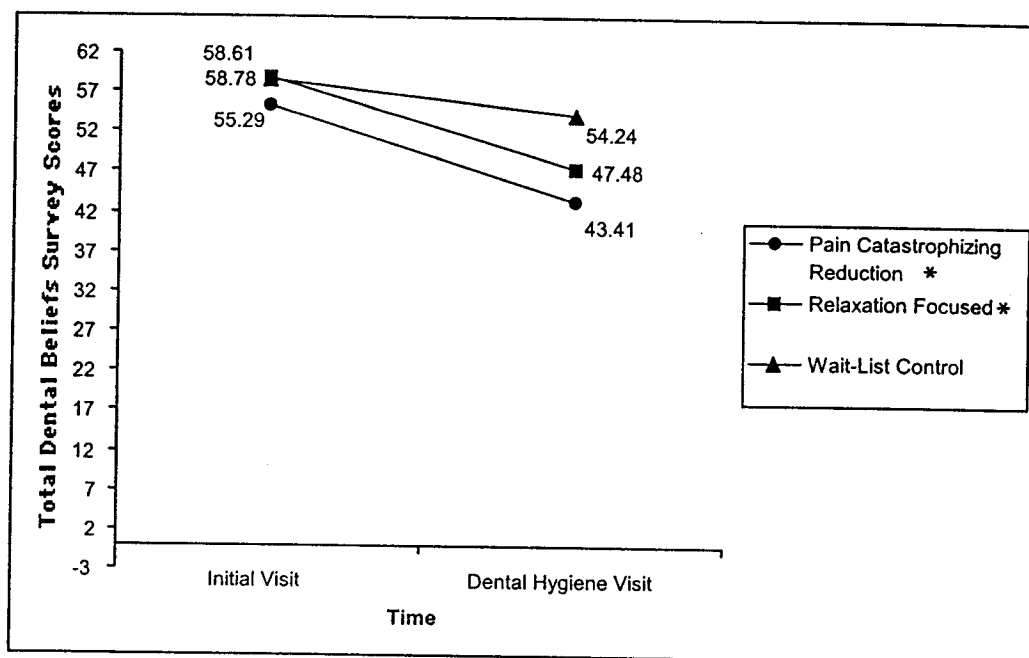


Note: \* = Significant difference between Initial and Dental Hygiene Visit

## Appendix AA

Figure 6.

Total Dental Beliefs Survey Score At Initial Visit and Before Dental Hygiene Treatment.



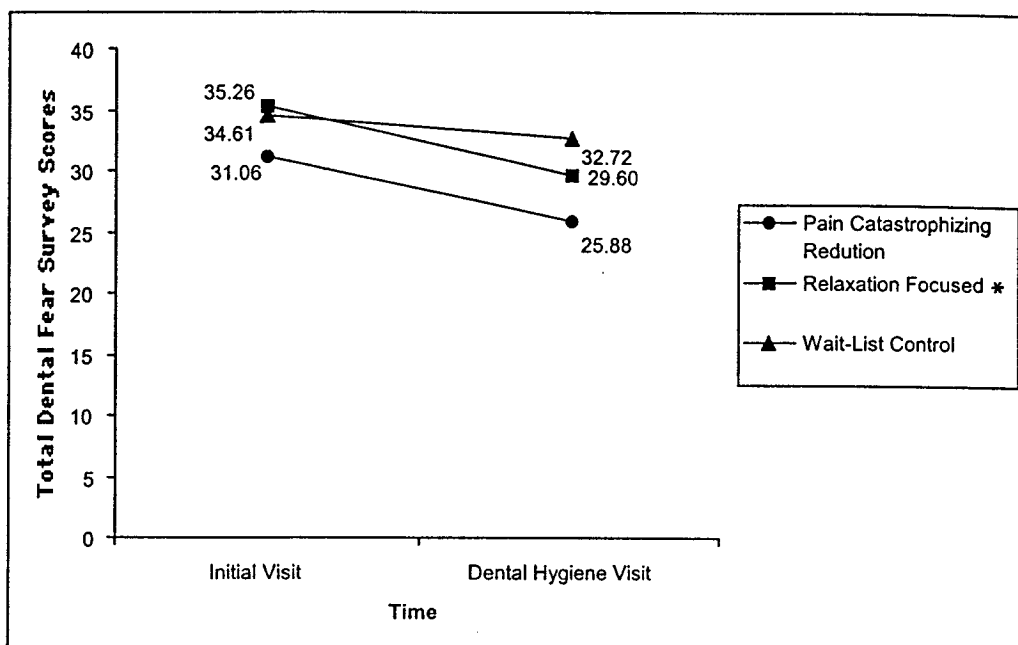
Note: \* = Significant differences between Initial and Dental Visit.



## Appendix BB

Figure 7.

Total Dental Fear Survey Score At Initial Visit and Before Dental Hygiene Treatment.

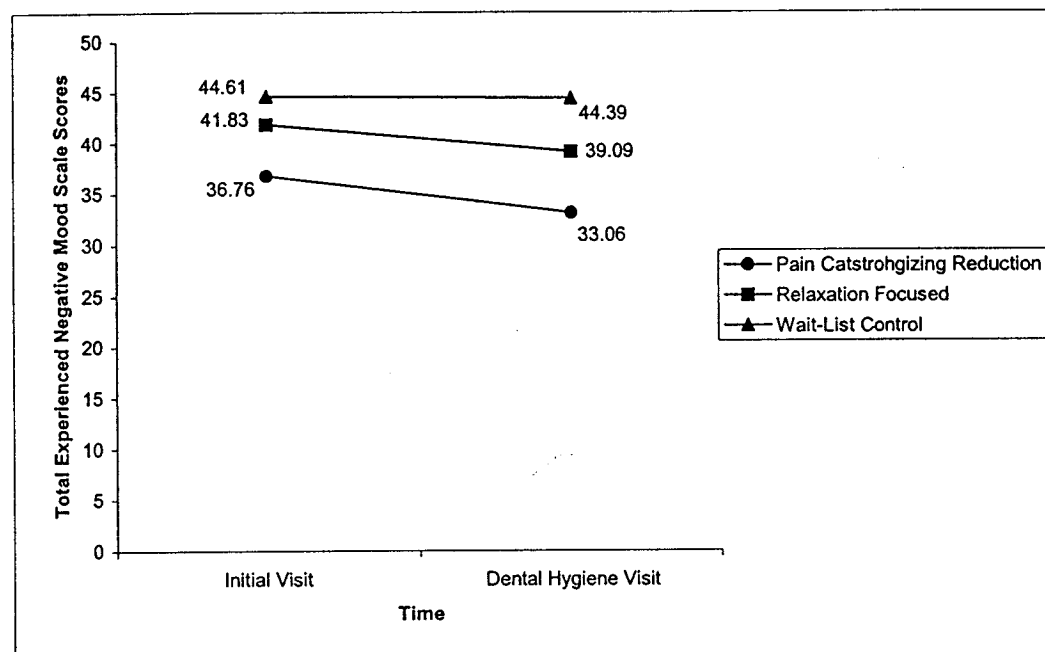


Note: \* = Significant differences between Initial and Dental Visit.

## Appendix CC

Figure 8.

Total Experienced Negative Mood Scale Score At Initial Visit and Before Dental Hygiene Treatment.

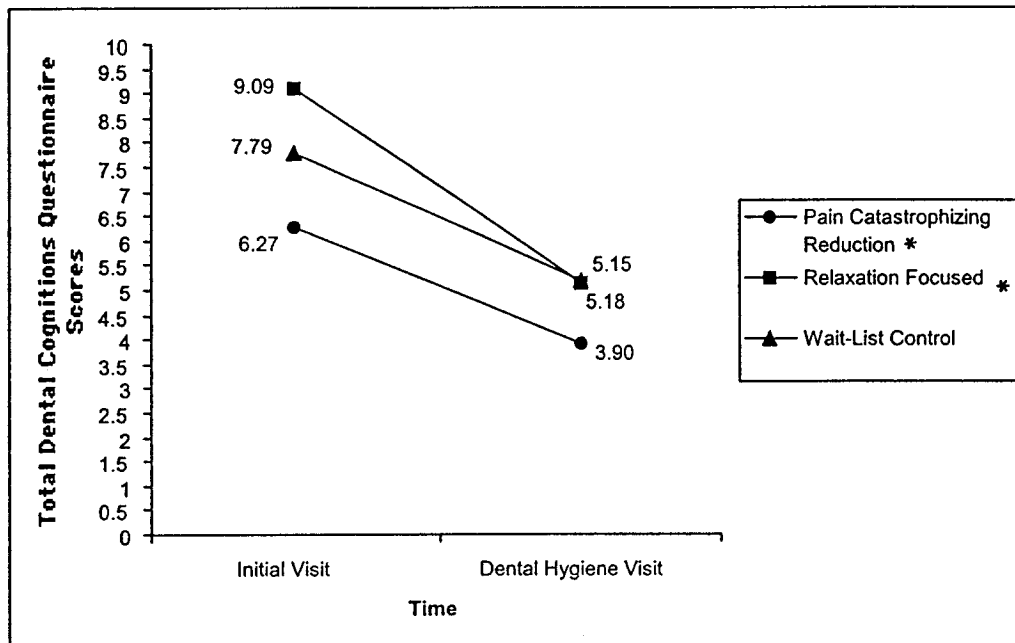


Note: \* = Significant differences between Initial and Dental Visit.

## Appendix DD

Figure 9.

Total Dental Cognitions Questionnaire- Frequency Subscale Score At Initial Visit and Before Dental Hygiene Treatment.

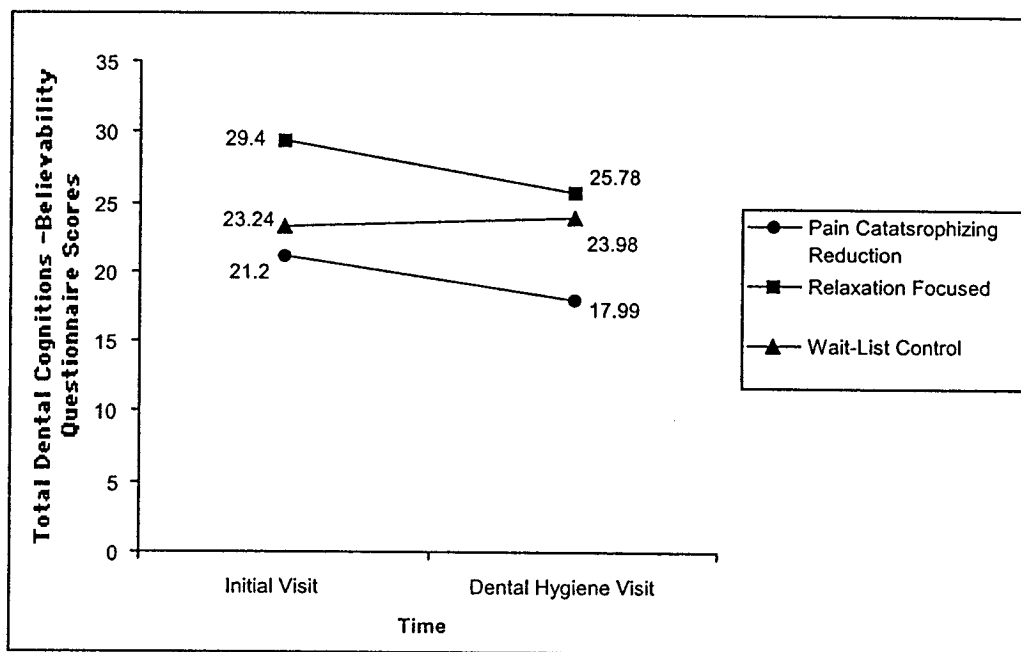


Note: \* = Significant differences between Initial and Dental Visit.

## Appendix EE

Figure 10.

Total Dental Cognitions Questionnaire-Believability Score At Initial Visit and Before Dental Hygiene Treatment.

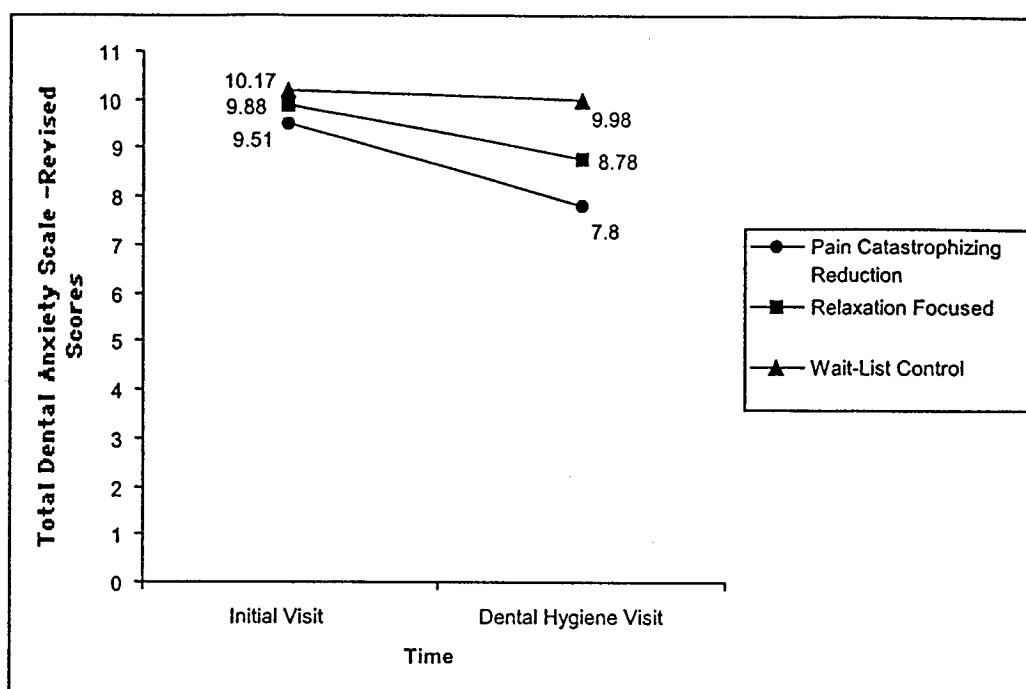


Note: \* = Significant differences between Initial and Dental Visit.

## Appendix FF

Figure 11.

Total Pain Expectancy Score At Initial Visit and Before Dental Hygiene Treatment.



Note: \* = Significant difference between Initial and Dental Hygiene Visit

## Appendix GG

Table 6.

Summary of the *A priori* Paired Sample T-tests Results for the Secondary Outcome Measures for all Three Groups

Measure	Relaxation FocusedGroup	Pain Catastrophizing Reduction Group	Wait-List Control
Pain Catastrophizing Scale		√	
Dental Anxiety Scale – Revised		√	
Dental Beliefs Survey	√	√	
Dental Fear Survey	√		
Experienced Negative Mood Scale			
Dental Cognitions Questionnaire -Frequency -Believeability	√	√	

Note: √ = Statistically significant differences ( $p < .05$ ) on paired sample t-tests.

## Appendix HH

Table 7.

Correlations Between the Pain Catastrophizing Scale, and Dental Anxiety Scale - Revised scores, Experienced Pain Scale and Experienced Mood Scale at the Initial Visit.

	1	2	3	4	5	6
1	---	.54**	.41**	.49**	.26	.34*
2	---	---	.45**	.77**	.68**	.72**
3	---	---	---	.55**	.56**	.50**
4	---	---	---	---	.72**	.75**
5	---	---	---	---	---	.78**
6	---	---	---	---	---	---

*Note.* 1 = Pain Catastrophizing Scale, 2 = Dental Anxiety Scale –Revised, 3 = Experienced Negative Mood Scale, 4 = Dental Fear Survey, 5 = Dental Cognitions Questionnaire –Frequency Subscale, 6 = Dental Beliefs Survey; \*= $p < .05$ , \*\*= $p < .01$ .

## Appendix II

Table 8.

Correlations Between the Pain Catastrophizing Scale, and Dental Anxiety Scale - Revised scores, Experienced Pain Scale and Experienced Negative Mood Scale at the Dental Hygiene Treatment.

	1	2	3	4	5	6	7	8
1	---	.57**	.46*	.41**	.22	.26	.27	.31*
2	---	---	.50**	.77**	.65**	.56**	.29	.42*
3	---	---	---	.27	.38*	.34*	.13	.61**
4	---	---	---	---	.68**	.80**	.18	.27
5	---	---	---	---	---	.66**	.06	.24
6	---	---	---	---	---	---	.09	.35*
7	---	---	---	---	---	---	---	.55**
8	---	---	---	---	---	---	---	---

*Note.* 1 = Pain Catastrophizing Scale, 2 = Dental Anxiety Scale –Revised, 3 = Mood Scale, 4 = Dental Fear Survey, 5 = Dental Cognitions Questionnaire –Frequency Subscale, 6 = Dental Beliefs Survey, 7 = Experienced Pain Scale, 8 = Experienced Negative Mood Scale; \*= $p < .05$ , \*\*= $p < .01$ .



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