A PSYCHOLOGICAL INTERVENTION FOR REDUCING PAIN DURING DENTAL HYGIENE TREATMENT

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ABSTRACT

Previous research has shown that individuals who "catastrophize" are more likely to experience high levels of pain and emotional distress during dental treatment. In the present study, we examined the effects of emotional disclosure on the pain and emotional distress experienced by "catastrophizers" and "noncatastrophizers" during dental hygiene treatment. Eighty undergraduate students were randomly assigned to a dental-worry disclosure condition or a control condition prior to scaling. In the disclosure condition, participants were asked to write about their dental worries before having dental hygiene treatment. In the control condition, participants were asked to write about their activities of the previous day. Consistent with previous research, catastrophizers in the control condition reported significantly more pain and emotional distress than noncatastrophizers, F (1, 76) = 9.86, P < .001. Disclosure reduced the pain and emotional distress of catastrophizers, but increased the pain and emotional distress of noncatastrophizers, F (1, 76) = 6.1, P < .01. While catastrophizers benefited from disclosure in regard to their immediate physical and emotional experience, their levels of catastrophizing and dental anxiety remained essentially unchanged. Clinical implications of the findings are discussed.

INTRODUCTION

There are indications that individuals differ in their experience of physical and emotional distress in response to dental treatment. In an early study, Chaves and Brown1-2 reported that individuals who catastrophized during a dental surgery procedure reported that the experience was more stressful than individuals who did not catastrophize. Catastrophizing has been broadly defined as an exaggerated response to pain that involves excessive attention to painful sensations, magnification of the threat of pain, and perceived inability to control pain.1-3

In a recent study, Sullivan and Neish4 examined the relation between catastrophizing and pain in individuals undergoing routine dental hygiene treatment. Results showed that catastrophizing was a strong predictor of pain and emotional distress, even when controlling for variables such as age, gender, the distribution of deposits on the teeth and periodontal status. The authors suggested that catastrophizing may lead to high levels of dental anxiety and consequently, contribute to poor oral hygiene habits and avoidance of dental care. The authors also highlighted the need to develop effective interventions for reducing the pain and emotional distress of catastrophizers during dental hygiene treatment.

There are indications that emotional disclosure may help reduce the pain and emotional distress associated with dental hygiene treatment. To date, numerous investigations have shown that emotional disclosure can lead to reductions in emotional distress in individuals who have experienced severe stresses such as personal trauma or loss.5-7 The results of a recent investigation showed that emotional disclosure in patients with rheumatoid arthritis led to significant reductions in affective disturbance and physical symptoms.8 Recent research has also shown that efforts to suppress thoughts about pain lead to heightened pain experience.9,10

It is possible that the benefits of emotional disclosure may depend on the level of catastrophizing. For catastrophizers, emotional disclosure may reduce tension or facilitate coping, which in turn may reduce the pain and emotional distress they experience during dental hygiene treatment. However, for noncatastrophizers, disclosure may have no significant effect on physical and emotional distress. If noncatastrophizers typically experience minimal pain or emotional distress in response to dental hygiene procedures, then strategies for reducing distress may have no appreciable effect. It is also possible that
disclosure may have a negative impact on the distress levels of noncatastrophizers. If noncatastrophizers approach aversive situations with few or no negative thoughts or feelings, requiring them to engage in emotional disclosure may raise their level of tension, and in turn, compromise their efforts to cope with the dental hygiene experience.

**STUDY DESIGN**

The effects of disclosure on pain were examined by randomly assigning subjects to a disclosure condition or to a control condition prior to their scaling appointment. In the disclosure condition, subjects were asked to write about their dental worries and concerns; in the control condition, subjects were asked to write about an emotionally neutral topic unrelated to dental worries. Individuals were classified as catastrophizers or noncatastrophizers on the basis of their scores on the Pain Catastrophizing Scale (PCS) 4. Therefore, the design of the study was quasi-experimental with two levels of treatment condition (disclosure, control) and two levels of catastrophizing (catastrophizer, noncatastrophizer). The primary dependent variables were the levels of pain and emotional distress subjects reported following the scaling procedure. Periodontal status was assessed in order to control for cross-subject variations in oral health status that may have had an impact on pain experience. The study also examined whether the effects of disclosure influenced subsequent levels of catastrophizing and dental anxiety. The research was approved by the Ethics Committees of the Faculties of Science and Dentistry at Dalhousie University.

**SUBJECTS**

Eighty students (54 women, 26 men) volunteered to participate in exchange for course credit and free comprehensive dental hygiene treatment. There were 20 subjects in each cell of the design (disclosure-catastrophizer, control-catastrophizer, disclosure-noncatastrophizer, control-noncatastrophizer). All participants were enrolled in Introductory Psychology at Dalhousie University. Students were only considered for participation if they had not received dental treatment within the last six months.

**MEASURES AND METHODS**

**PERIODONTAL STATUS**

Periodontal status was determined by clinical evaluation that included visual inspection, probing depths, bleeding, and radiographs. Interpretation on the basis of this information, the dental hygienist provided a rating on a five-point severity scale: (1) healthy periodontium, (2) gingivitis, (3) early periodontitis, (4) moderate periodontitis, (5) advanced periodontitis. A similar clinical rating scale for grading periodontal disease has been used in previous research. 4

**CATASTROPHIZING**

Participants completed the Pain Catastrophizing Scale (PCS) 4 on two separate occasions. The PCS is a 13-item self-report measure on which respondents rate the frequency with which they typically experience different thoughts and feelings when in pain (see Sullivan and Neish, 1997 for a more detailed description of the PCS). Participants scoring above and below the median (Md = 16) were classified as catastrophizers and noncatastrophizers, respectively.

**DENTAL ANXIETY**

The Dental Anxiety Scale—Revised (DAS-R, check-up version) 11 assesses the degree to which participants experience fear or anxiety in response to imagining different aspects of dental procedures. Participants' responses were summed to yield a total score where higher values reflect more intense dental anxiety.

**PAIN**

Participants were asked to rate the degree of pain they experienced during the scaling procedure on an 11-point scale with the endpoints (0) no pain and (10) extreme pain. This scale is typical of analog rating scales used in pain research. 4, 5

**EMOTIONAL DISTRESS**

Participants completed a brief measure of current mood consisting of 12 adjectives drawn from the Profile of Mood States (POMS) 12. Ratings were made on an 11-point scale with the endpoints (0) not at all and (10) extremely. The measure of mood consisted of 12 mood adjectives (sad, discouraged, hopeless, angry, hostile, irritable, anxious, tense, worried, afraid, terrified, scared). A composite score for negative mood was computed by summing all 12 items of the mood scale. The reliability coefficient for the total scale was .81.

**DENTAL HYGIENE TREATMENT**

Comprehensive dental hygiene treatment was provided by 40 senior dental hygiene students. Dental hygiene faculty supervised all procedures and confirmed clinical assessment data.

**INITIAL VISIT**

Dental hygiene students contacted potential participants and scheduled their appointments. Participants were told that the purpose of the study was to examine the thoughts and feelings people experience during dental hygiene treatment. All participants were aware that they were taking part in an experimental investigation.
Upon arrival at the dental clinic, participants completed a consent form, the PCS, and the DAS-R. The dental hygienist then collected information relevant to the participant’s health history (e.g., previous illnesses, hospitalizations, medications), and performed an oral examination. The dental hygienist measured probing depths, recorded the location and distribution of plaque and calculus deposits, and screened for abnormalities such as swollen lymph nodes or lesions that may require referral to a specialist for further investigation. The red disclosing solution was applied to the teeth to derive the plaque index. Participants were then scheduled for a return appointment to complete the dental hygiene treatment.

SECOND APPOINTMENT
During the return visit, scaling was performed for all participants. At the termination of treatment, participants were asked to rate the pain they experienced during scaling, and completed the measure of emotional distress, the PCS, and the DAS-R.

DISCLOSURE INTERVENTION
Prior to scaling, all participants were provided with a clipboard holding a closed envelope which included instructions and a thought record booklet. Participants were told that the dental hygiene student would return in five minutes to proceed with treatment. In the disclosure condition, participants were asked to write about the thoughts and feelings they typically experienced during dental treatment, focusing on the aspects of dental treatment they found most distressing. In the control condition, participants were asked to describe their activities of the previous day. Participants were asked to replace the thought booklet in the envelope and return the envelope to the dental hygiene student. Participants were asked not to discuss the contents of the envelope with the dental hygiene student.

Statistical analyses included computation of means and standard deviations for describing sample characteristics, t-tests for comparing gender differences on dependent measures, and two-way analyses of variance for examining the effects of disclosure on pain ratings and emotional distress. Minimum level of significance considered was \( p < .05 \).

**FINDINGS**

**SAMPLE CHARACTERISTICS**

The mean age of the sample was 22.0 years (SD = 5.0). The mean rating of periodontal status was 2.04 (SD = .30) indicating that the typical participant was classified as having gingivitis (i.e., 1 to 3 mm probing depths, evidence of bleeding upon probing, with no radiographic evidence of bone loss due to periodontal disease). Participants reported brushing their teeth 2.4 (SD = .83) times per day and flossing 1.9 (SD = 2.3) times per week.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>WOMEN (N = 54)</th>
<th>MEN (N = 26)</th>
<th>TOTAL (N = 80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE</td>
<td>22.2 (5.4)</td>
<td>21.7 (4.7)</td>
<td>22.0 (5.0)</td>
</tr>
<tr>
<td>PERIODONTAL STATUS</td>
<td>2.0 (.3)</td>
<td>2.0 (.3)</td>
<td>2.0 (.3)</td>
</tr>
<tr>
<td>PCS</td>
<td>17.4 (8.9)</td>
<td>14.1 (6.2)</td>
<td>16.4 (8.3)</td>
</tr>
<tr>
<td>DAS-R</td>
<td>8.0 (2.8)</td>
<td>8.6 (2.5)</td>
<td>8.2 (2.7)</td>
</tr>
<tr>
<td>PAIN</td>
<td>3.4 (2.2)</td>
<td>2.8 (2.0)</td>
<td>3.2 (2.2)</td>
</tr>
</tbody>
</table>

*NOTE: Numbers in parentheses are standard deviations.*

The mean pain rating for the scaling procedure (for the entire sample) was 3.22 (SD = 2.2) indicating that the procedure was associated with mild to moderate pain. Men and women did not differ significantly for pain ratings made during the scaling procedure, \( t(78) = 1.1, p = .28 \). There were no significant gender differences for scaling difficulty, periodontal status, or plaque distribution. Women (\( \bar{X} = 17.9, SD = 8.9 \)) scored marginally higher than men (\( \bar{X} = 14.1, SD = 6.2 \)) on the PCS, \( t(78) = 1.7, p < .09 \). Women (\( \bar{X} = 2.5, SD = .93 \)) reported brushing their teeth significantly more often than men (\( \bar{X} = 2.1, SD = .33 \), \( t(78) = 2.2, p < .05 \)).

**RELATION AMONG VARIABLES**
Correlational analyses are presented in Table 2. As expected, age was associated with more advanced periodontal disease (\( r = .55, p < .01 \)). Consistent with previous research, catastrophizing (used as a continuous variable in correlational analyses) was positively correlated with dental anxiety (\( r = .33, p < .01 \)), and negatively correlated with age (\( r = -.32, p < .01 \)).

**TABLE II**

**SAMPLE CHARACTERISTICS**

<table>
<thead>
<tr>
<th>PC</th>
<th>DAS</th>
<th>PRST</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE</td>
<td>- .30*</td>
<td>.03</td>
</tr>
<tr>
<td>PCS</td>
<td>----</td>
<td>.33**</td>
</tr>
<tr>
<td>DAS</td>
<td>----</td>
<td>-.23</td>
</tr>
<tr>
<td>PRST</td>
<td>----</td>
<td>----</td>
</tr>
</tbody>
</table>

*NOTE: N = 80. PCS = Pain Catastrophizing Scale; DAS = Dental Anxiety Scale; PRST = Periodontal Status; * = p < .05, ** = p < .01.
Participants in the disclosure and control conditions did not differ significantly in age, $t(78) = .40, ns$, or ratings of periodontal status, $t(78) = .33, ns$. Since periodontal status did not vary as a function of treatment condition or level of catastrophizing, it was not included as a covariate in the analyses reported below.

**CATASTROPHIZING, DISCLOSURE AND DISTRESS**

Pain ratings were analyzed as a two-way factorial with level of catastrophizing (high, low) and condition (disclosure, control) as the between groups factors. A two-way ANOVA revealed a main effect for level of catastrophizing, $F(1, 76) = 9.86, P < .001$, qualified by a significant condition by level of catastrophizing interaction, $F(1, 76) = 6.1, P < .01$. Pairwise comparisons were computed using the Newman Keuls procedure with significance level set at $P < .05$. As shown in Figure 1, catastrophizers in the control condition reported significantly more pain than noncatastrophizers. However, in the disclosure condition, catastrophizers and noncatastrophizers did not differ in their pain ratings. Furthermore, catastrophizers in the disclosure condition reported significantly less pain than catastrophizers in the control condition. The difference in pain ratings between noncatastrophizers in the control and disclosure conditions was not significant.

A similar pattern of findings emerged for participants’ ratings of emotional distress. A two-way ANOVA (condition X level of catastrophizing) revealed a significant interaction, $F(1, 76)$ = 4.6, $P < .05$. As shown in Figure II, in the control condition, catastrophizers reported significantly more emotional distress than noncatastrophizers. In the disclosure condition, the difference in emotional distress between catastrophizers and noncatastrophizers was markedly less.

**FIGURE 1: Ratings of Pain Made by Participants in the Disclosure and Control Conditions**

**FIGURE 2: Ratings of Emotional Distress Made by Participants in the Disclosure and Control Conditions**

**NOTE:** Pairwise comparisons significant at $P < .05$:
- Catastrophizer-Control > Noncatastrophizer-Control,
- Catastrophizer-Disclosure < Catastrophizer-Control,
- Noncatastrophizer-Disclosure > Noncatastrophizer-Control

Analyses were also conducted to determine whether the effects of disclosure influenced participants’ level of catastrophizing and their level of dental anxiety. For these analyses, change scores were computed by subtracting PCS and DAS-R scores obtained at the termination of treatment from those obtained at the initial visit. A two-way (condition X level of catastrophizing) ANOVA on the PCS change scores revealed no significant main effects or interaction. A two-way (condition X level of catastrophizing) ANOVA on the DAS-R change scores revealed only a marginally significant main effect for level of catastrophizing, $F(1, 76) = 2.9, P < .09$, where catastrophizers showed a slightly greater reduction in dental anxiety than noncatastrophizers. This effect may be due in part to catastrophizers’ higher DAS-R scores at the time of the initial evaluation.

In summary, while catastrophizers benefited from the disclosure manipulation in regard to their immediate physical and emotional experience, their levels of catastrophizing and dental anxiety remained essentially unaffected.
DISCUSSION AND IMPLICATIONS

The findings indicate that, for catastrophizers, the dental situation is particularly distressing. Correlational analyses revealed that even prior to treatment, catastrophizing was associated with higher levels of dental anxiety. During treatment, catastrophizers in the control condition experienced significantly more pain than noncatastrophizers, with several participants providing pain intensity ratings greater than 8/10. Catastrophizers in the control condition also reported higher levels of emotional distress even following termination of treatment.

Consistent with predictions, catastrophizers derived significant benefit from the disclosure manipulation. While catastrophizers reported significantly more pain and emotional distress than noncatastrophizers in the control condition, the two groups did not differ significantly from each other following the disclosure manipulation. The absence of group differences in the disclosure condition was the result of catastrophizers reporting decreased pain and emotional distress and noncatastrophizers reporting increased pain and emotional distress.

Noncatastrophizers in the disclosure condition reported more pain and more emotional distress than noncatastrophizers in the control condition. The basis for noncatastrophizers’ negative response to the disclosure manipulation is unclear. One possibility is that disclosure may have interfered with noncatastrophizer’ preferred mode of coping. For example, there is research to suggest that noncatastrophizers are particularly effective in making use of distraction strategies to reduce pain. Requiring noncatastrophizers to focus on their dental concerns and worries may have compromised their efforts to engage in distraction. However, in the absence of information about the coping strategies that were used by participants to cope with the dental hygiene procedure, it is not possible to evaluate further the tenability of this explanation.

Horowitz has suggested that the experience of intense emotional distress is frequently associated with intrusive thoughts and images and increased attention to emotion-relevant information. It is perhaps as a function of mood-related processes such as selective attention, and thought intrusions that catastrophizers experience more pain than noncatastrophizers. In situations that do not foster disclosure, the more intense negative emotional experience of catastrophizers may lead them to focus excessively on pain-related stimuli and experience a higher frequency of thought intrusions. These factors may combine to magnify the unpleasantness of the pain situation or interfere with the individual’s ability to make effective use of pain reducing coping strategies.

In real world situations, it is likely that disclosure interacts with social relational processes, and may not always yield the beneficial effects observed in empirical investigations. Outside the clinical laboratory, when individuals disclose, they are typically disclosing to another person. On the positive side, disclosure may increase the proximity of potential caregivers, enhance feelings of social support, or foster the sharing of coping-relevant information. Disclosure may also bring about negative social responses. Under some circumstances, disclosure of concerns or worries may be met with criticism or rejection, and impact negatively on well-being. Pennebaker suggested that the fear of criticism or rejection may be one of the factors that lead individuals to inhibit the disclosure or expression of their distress.

There are indications that men and women may differ in the degree of benefit they derive from disclosure. In the present study, the emotional disclosure was written and private. As noted above, in natural settings, disclosure is likely to take place within a social context. Unruh has argued that gender differences in pain and distress that are frequently observed in clinical studies may arise from the discomfort that men feel when disclosing their distress to others. Unruh noted that while women report feeling more at ease after disclosing about their pain or physical symptoms, men report feeling embarrassed. Ongoing research by the authors is examining gender differences in the effects of an interview-based emotional disclosure intervention.

CLINICAL IMPLICATIONS

The results of the present study indicate that disclosure of dental worries can lead to meaningful reductions in pain and emotional distress during dental hygiene procedures. However, the beneficial effects of disclosure were observed only for individuals who catastrophized. For individuals who did not catastrophize, disclosure led to increases in pain and emotional distress. Extending these findings to clinical settings, providing catastrophizers with the opportunity to disclose about their dental worries and concerns may have a significant impact on the degree of physical and emotional distress they experience. Reducing the distress of catastrophizers during dental hygiene treatment may prevent the development of high levels of dental anxiety as well as the development of maladaptive avoidance behaviour.

Unfortunately, while catastrophizers benefited from the disclosure manipulation, disclosure did not lead to significant changes in levels of dental anxiety or catastrophizing. Perhaps the benefits of disclosure were not sufficient to counteract the effects of a history of distressing dental treatment experiences.
It may require several positive dental experiences before levels of dental anxiety or catastrophizing can be meaningfully changed. It is also possible that disclosure manipulations may not be sufficient in themselves to alter dental anxiety or catastrophizing. Other intervention strategies that aim at altering participant's expectations or beliefs about dental treatment may need to be considered.

For noncatastrophizers, no intervention may be the best intervention. Noncatastrophizers reported minimal pain and emotional distress in the control condition. Noncatastrophizers may approach the dental treatment situation equipped with effective pain coping strategies. Efforts to alter or interfere with their strategies may produce only deleterious results.

A number of limitations of the present study must be considered. First, the current sample consisted of first-year university students. As such, the sample differs from typical clinical samples in that it consists of younger individuals with lower levels of periodontal disease. In addition, the disclosure manipulation was somewhat "artificial" in that it involved writing about, as opposed to talking about, dental worries and concerns. While maximizing experimental control, the use of a written disclosure manipulation may have compromised the clinical relevance of the findings. In order to draw confident conclusions about validity of generalizations of the present findings, it will be important to replicate the findings using a diverse sample that is more representative of the client population typically seen in clinical settings.

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