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Oosterink, F.M.D.; de Jongh, A.; Hoogstraten, J.; Aartman, I.H.A.

Link to publication

The Level Of Exposure-Dental Experiences Questionnaire (LOE-DEQ): a

measure of severity of exposure to distressing dental events

Floor M.D. Oosterink[1*],

Ad de Jongh, [1],

Johan Hoogstraten[1 2],

Irene H.A. Aartman[1].

[1]Department of Social Dentistry and Behavioural Sciences, Academic Centre for

Dentistry Amsterdam (ACTA), Louwesweg 1, 1066 EA Amsterdam, The Netherlands

[2] Department of Psychological Methods, University of Amsterdam, The Netherlands

Running title: Psychometric properties of the LOE-DEQ

* Correspondence and reprint requests should be addressed to:

Floor Oosterink, Department of Social Dentistry and Behavioural Sciences, Academic

Centre for Dentistry Amsterdam (ACTA), Louwesweg 1, 1066 EA Amsterdam, The

Netherlands. Tel.: +31 20 5188231; Fax: +31 20 5188232.

E-mail address: f.oosterink@acta.nl

Abstract

To understand the development of dental anxiety better and to identify those at increased risk of developing dental anxiety, the Level of Exposure-Dental Experiences Questionnaire (LOE-DEQ) was developed. The aim of the current study was to determine the psychometric properties (i.e., factor structure, reliability and validity) of the LOE-DEQ and to determine its suitability as an additional screening instrument for dentally anxious patients. Five different samples were used: (a) highly dentally anxious patients (n=119), (b) general dental patients (n=480), (c) students (n=186), (d) psychiatric outpatients (n=17) and (e) oral surgery patients (n=34). Results of the factor analysis revealed a four-factor solution. The LOE-DEQ has sufficient internal consistency (Cronbach's alphas ranging from 0.69 to 0.85) and satisfactory test-retest reliability (ICC=0.78). Results further suggest that this instrument has adequate discriminant, concurrent and predictive validity. It is concluded that the LOE-DEQ is a useful tool for assessing patients' background in terms of previous exposure to distressing dental events, which is considered a vulnerability factor in the development of dental anxiety.

Correspondence and reprint requests should be addressed to: Floor Oosterink Department of Social Dentistry and Behavioural Sciences, Academic Centre for Dentistry Amsterdam (ACTA), Louwesweg 1, 1066 EA Amsterdam, The Netherlands. Tel.: +31 20 5188231; Fax: +31 20 5188232. E-mail address: f.oosterink@acta.nl

Conditioning theory and theories on phobia onset suggest that disproportionate anxiety results from exposure to negative life events (1-3). That is, objects and situations that are irrationally feared should resemble previous distressing experiences. A typical example of a context generally associated with terror and anxiety is the dental treatment situation (4). Research among persons who have been exposed to extremely painful or otherwise frightening experiences in the dental surgery shows that acquisition of dental anxiety is consistent with the conditioning theory (5-9). For example, a recent study comparing individuals with high levels of dental anxiety with individuals with relatively low levels of dental anxiety showed that the highly anxious individuals were about eighteen times more likely than their low anxious counterparts to have ever experienced a traumatic dental event in their life (10).

In a study of 37 highly anxious patients (11) more than half of the patients (56.2%) reported an event involving pain or loss of control, while other causal events entailed negative behaviour of the dentist (e.g. a dentist who made belittling remarks; 28.1%), serious treatment errors (e.g. filling or extracting a healthy tooth; 6.3%), or distressing events such as embarrassment (9.4%). Findings from other sources support the notion that exposure to invasive dental treatments (6, 7, 12-16), negative dentist behaviour (5, 13, 14, 17), negative information (e.g., aversive stories and vicarious learning situations (12, 13, 15, 17)), and experiences involving strong negative emotional responses (e.g. feelings of helplessness and/or loss of control (5, 7, 11, 18-20)) may increase the risk for dental anxiety and phobia onset.

Other stressful or traumatic experiences may also influence the development of dental anxiety and phobia. That is,, nearly half of a group comprising 141 treatment-seeking individuals with high levels of dental anxiety did not report any horrific dental history (10). This suggests that there are multiple pathways in the acquisition of dental phobia, and that other distressing events outside the dental surgery may also play a role (2, 3). For example, population studies suggest that exposures to chronic physical or verbal violence during childhood increase specific phobia onset risk (21). Indeed, in one study it was found that highly anxious dental patients were three times more likely than regular dental patients to have ever experienced a violent crime in their life (10).

Since high levels of dental anxiety have been found to be associated with a high degree of social impairment and deteriorating oral health due to avoidance of regular dental care (22, 23), it is important to determine which type of events are critical in the development of anxiety and avoidance behaviour. If it is true that an aversive or distressing experience precipitates dental phobia onset, then a wide range of potentially aversive distressing experiences should significantly increase risk for onset, and should therefore be taken into account in both preventive endeavours and clinical practice. However, the association between the experience of a negative dental event and subsequent anxiety may not be determined simply by exposure to that event, but also by the *degree* of exposure. In other words, it is not clear whether there is a cumulative effect that determines the dose-response relationship to outcome.

Research should therefore aim at developing instruments that are specifically sensitive to assess the degree or severity of aversive exposure, both within and outside the dental setting. As such an instrument was not available, the Level Of Exposure-Dental Experiences Questionnaire (LOE-DEQ) was developed. The aim of the current study was to determine the psychometric properties (i.e. factor structure, reliability, and validity) of the LOE-DEQ, and to determine its suitability as an additional

screening instrument for dentally anxious patients, using five samples of individuals with various levels of dental anxiety.

Method

Development of the Level Of Exposure-Dental Experiences Questionnaire (LOE-DEQ) The items of the LOE-DEQ were based on an extensive literature review of studies reporting on extremely distressing events related to the dental setting (for example: 5, 6, 10, 15, 16, 24-26). This review resulted in a questionnaire containing 23 items. The first 16 items were either directly or indirectly related to the dental setting. Seven items, related to general traumatic life events, and fulfilling the DSM-IV-TR stressor criterion (27), were included as a history of traumatic life events was found to be associated with the occurrence of high levels of dental trait anxiety in previous studies (10, 24). Examples of the latter category were sexual abuse, a severe car accident, and a tragic death of a loved one. A previous, unpublished study on this topic employed the entire list of these 23 potentially traumatic events among 1465 dental patients. Results showed a strong relationship between a positive screen for dental phobia and level of exposure to distressing dental events, while a less strong association was observed with general (non-dental) traumatic events. The next step in the development process was to obtain data on content validity. Content validity was studied using a procedure adopted from KUBANY et al. (28). All items of the LOE-DEQ were presented to a group of experienced dentists (n=8) specialised in the treatment of highly dentally anxious patients. They were asked to rate, by means of a specially prepared form, the relevance and wording of the 23 individual items on 5-point Likert-type scales ranging from '0' (not relevant at all) to '4' (extremely relevant) for relevance; and '0' (not good at all) to '4' (extremely good) for wording. They were also asked to indicate whether important items were missing. The mean for relevance was 3.98 (sd=0.79), and the mean for wording was 4.78 (sd=0.17). All comments and suggestions in terms of wording and readability provided by the dentists were incorporated in several subsequent rounds until they indicated that the LOE-DEQ covered the full range of potentially distressing experiences they encounter in their daily practice.

The above described dynamic construction process resulted in the LOE-DEQ, an instrument assessing the severity of exposure to (i.e., frequency of occurrence) distressing (dental) events. It has two main sections. The first part consists of 16 items pertaining to earlier confrontations with distressing dental situations; that is, events involving experience of extreme pain (e.g. root canal treatments, injections, extractions), or severe distress (e.g. embarrassment, helplessness, nausea). The second part consists of 7 items pertaining to past exposure to general traumatic life events (e.g., serious accidents, natural disasters, sexual assaults). When completing the questionnaire (Table 1), the patient is asked to tick, for each of the 23 items, whether he or she 'never' (0) or 'ever' (1) has been exposed to an event indicated in the item. The LOE-DEQ items are scored and summed to give an overall score ranging from 0 to 23. Higher scores on the LOE-DEQ indicate that the person has been exposed to more distressing events.

In the present study, three measures were used to assess the psychometric properties (i.e. reliability and validity) of the LOE-DEQ:
1. The short version of the Dental Anxiety Inventory (S-DAI) (29) contains nine items, which are rated on a 5-point Likert-type scale. The items of the S-DAI are summed to give a total score, which can range from 9 to 45. Higher scores on the S-DAI indicate higher anxiety levels. The instrument has good reliability and satisfactory construct validity (29).
2. The Traumatic Experiences Checklist (TEC) (30) is a self-report questionnaire inquiring about 29 types of potential trauma and other potentially overwhelming

events. The format of the TEC allows for calculating trauma area presence scores with respect to emotional trauma (six items, range 0-6), sexual trauma (six items, range 0-6), and bodily threat (six items, range 0-6). In this study, only the TEC total score was used, which ranges from 0 to 29. Higher scores on the TEC are indicative of a higher frequency of traumatic experiences. The psychometric properties of the TEC are good (30).

3. The Dutch version of the Impact of Event Scale-Revised (IES-R) (31) is a 22-item self-report questionnaire, which is widely used to assess the intensity of post traumatic stress-related phenomena. Subjects are asked to indicate how frequently the symptoms have been present during the past seven days. The frequency of each symptom is scored on a four-point scale, ranging from 'not at all' (0), 'rarely' (1), 'sometimes' (3) to 'often' (5). The scores are summed to produce three IES-R scores: one for intrusions (7 items, range: 0-35), one for avoidance (8 items range: 0-40), and a total IES-R score (range 0-75). Only the IES-R total score was used in the present study. Higher scores on the IES-R are indicative of more trauma-related phenomena. The IES-R has satisfactory psychometric properties (32).

For psychometric evaluation, the LOE-DEQ was applied to the following five samples:

1. *General dental patients* were approached while visiting the dentist at five general dental practices located across The Netherlands. They were invited to participate by an advanced graduate student. The patients received from the student a questionnaire booklet consisting of both the LEO-DEQ and the S-DAI. They were requested to complete this booklet at home and to return it in an enclosed self-addressed stamped envelope by mail. Of the initially 717 questionnaires handed out, 480 (289 from women) were returned. For privacy reasons, no data on the non-response group was collected. The mean age in this sample was 45.7 yr (sd=14.5, range=19-85). Mean S-DAI score was 18.2 (sd=9.6, range=9-45). The proportion of items of the LOE-DEQ that remained unanswered was less than 5%.

2. *Students* consisted of 186 first year undergraduate students of the University of Amsterdam (149 women). As part of their study requirements, the students completed a large set of questionnaires (pertaining to personality characteristics, emotions, mood, and cognitive capacities) of which the LOE-DEQ was only one. They received course credit points for their participation. No one refused to participate. The sample had a mean age of 20.0 yr (sd=2.9, range=17-39). The LOE-DEQ was completed in a classroom of the university building. This was done twice within a three wk interval. The response rate for all LOE-DEQ items was 100%.

3. *Highly anxious dental patients* comprised 119 patients (73 women) suffering from high levels of dental anxiety, who were on the waiting list of a dental fear clinic (Centre for Special Dental Care) in Amsterdam. No data were available on patients who refused to participate. Most patients were referred by a dentist because conventional dental treatment had either failed, appeared impossible or was refused. As part of the standard intake procedure the patients received the same questionnaire booklet as presented to the general dental patients by mail (sample 1) containing the LEO-DEQ, and the S-DAI and were asked to return the questionnaire by mail. The mean age of patients in this sample was 41.4 yr (sd=13.1, range=18-87). The mean S-DAI score of this sample was 39.1 (sd=7.0, range=9-45). The proportion of items of the LOE-DEQ that remained unanswered was less than 1%.

4. *Psychiatric outpatients* included 17 subjects (14 women) attending group psychotherapy for a variety of psychiatric disorders, including major depression,

eating disorder, and anxiety disorders at the department of Psychiatry and Psychology of the Mesos General Hospital in Utrecht. They were invited by their psychotherapist to participate in the study. Of all eligible participants thirteen (32.5%) refused to participate. Following one of their weekly meetings the patients received a questionnaire booklet from their therapist containing the LOE-DEQ and the TEC. They were asked to complete the questionnaires at home and return them using a sealed free return envelope. The subjects in this sample had a mean age of 37.4 yr (sd=8.6, range=23-52). The response rate for all items of the LOE-DEQ was 100%.

5. *Oral surgery patients* included: 34 subjects (21 women) attending the department of Oral Surgery at a General Hospital in Amsterdam, for lower 3rd molar removal. All patients on the waiting list (n=124) received a telephone call from the secretary and were asked whether they would be willing to participate in a study involving the effects of third molar removal on psychological health. Only patients requiring invasive surgical removal of a third molar in the lower jaw, partially or totally embedded in bone, were included. Thirty four patients were eligible or willing to participate. They were asked by a graduate student to complete the LOE-DEQ and the S-DAI (two to seven days prior to the 3rd molar removal), and to return the questionnaires on the day of treatment. Immediately post-surgery the patients received the IES-R and were asked to complete it at home 3 days after the treatment and to return it to the research assistant by mail using a sealed free return envelope. Given the importance uniformity of time since treatment, all patients received a telephone call to check whether the questionnaires were filled out and mailed back. The subjects in this sample had a mean age of 26.3 yr (sd=6.0, range 15-41). The mean S-DAI score in this sample was 21.8 (sd=10.3, range=9-42). The response rate was 100% for all items of the LOE-DEQ.

Statistical analyses In order to assess the factor structure of the dichotomous data in the questionnaire a matrix of tetrachorical correlations was first established using the statistical program Tetcorr version 2.1 (33). For all subsequent statistical analyses SPSS version 14.0 (SPSS, Chicago IL, USA) was used. First, an *exploratory factor analysis* with varimax rotation was conducted on the tetrachorical correlation matrix in sample 1. Next, the *internal consistency* was computed for the total score and subscales scores of the LOE-DEQ for each of the five samples. *Test-retest reliability* was assessed using Intraclass Correlation Coefficients (ICC; one-way random effects model, testing for consistency between pre-test scores and the post-test scores) in sample 2. To test different aspects of *validity,* three distinct procedures were used. Firstly, the LOE-DEQ scores of the general dental patients (sample 1), the students (sample 2) and the highly anxious dental patients (sample 3) were compared using one-way ANOVA *(discriminant validity).* Secondly, *concurrent validity* was assessed by calculation of the Pearson correlation coefficients between the total score of the LOE-DEQ and S-DAI anxiety in samples 1 and 5. An *a priori* hypothesis regarding the expected magnitude of the correlation between the different instruments was that the total scores on the LOE-DEQ and the S-DAI would correlate significantly in each of the samples. In addition, it was hypothesized that the total score of the LOE-DEQ dental events items and the S-DAI total score would correlate significantly, whereas the correlation between the total score of the LOE-DEQ general traumatic life events items and the S-DAI total score would be non-significant. The relationship between the total scores the LOE-DEQ and the total scores on the TEC were assessed in sample 4. It was expected that the LOE-DEQ would correlate significantly with the total score on the TEC. Finally, a regression analysis was conducted to assess the

extent to which the LOE-DEQ total score contributed to the prediction of trauma-related symptomatology (IES-R; *predictive validity*) in sample 5.

Results

Exploratory factor analysis Barlett's test of sphericity was significant (χ^2=5548.25, df=253; p< 0.001), indicating that the data was appropriate for a factor analysis. Exploratory factor analysis with varimax rotation was performed on the matrix of tetrachorical correlations of the 23 LOE-DEQ items. To be included on a factor, a loading $\geq$ 0.25 was required (34). The initial solution revealed five factors with an eigenvalue $\geq$ 1 explaining 61.7% of the variance. Subsequent inspection of the Scree plot suggested a four-factor solution. In addition, the five-factor solution was difficult to interpret, because the fourth factor seemed to split into two factors. The four-factor solution was also found to produce the most meaningful factors and was therefore preferred on grounds of parsimony (34). The four factors (see Table 1), explaining 56.2% of the variance, were (a) *dentist's behaviour and patient's emotions* including items covering distressing events relating to the dentist as a person as well as distressing emotional responses (8 items), (b) *distressing dental procedures*: covering items related to distressing dental treatment experiences (5 items), (c) *other distressing dental events* covering other dentistry-related distressing experiences (3 items) and (d) *general traumatic events* covering distressing not dentistry-related experiences (7 items).

The correlations between the subscales[1] and the correlation with the total score (factor correlation matrix) are presented in Table 2. All correlations were statistically significant (p<0.01). The highest correlation was between *distressing dental procedures* and *dentist's behaviour and patient's emotions* (r=0.49). The lowest correlation was found between *other distressing dental events* and *general traumatic events* (r=0.21).

Reliability The *internal consistency* of the LOE-DEQ total score and its four subscales were estimated by calculating Cronbach's alpha in all samples. In Table 4, Cronbach's alphas for the total scores and on the four subscales for the five samples are presented. The reliability of the total score of the instrument was found to be satisfactory, with alphas ranging from 0.69-0.85. In addition, the Cronbach's alphas were also acceptable for the four subscales with a range from 0.33 (*general traumatic events* in the student sample) to 0.77 (*dentist's behaviour and patient's emotions* in the *general dental patients sample*). The factor structure, as reported here, was used in the remainder of the study.

In Table 3, the mean and standard deviations of the total score and the subscales of the LOE-DEQ are presented for each of the five samples. Test-retest reliability for sample 2 indicated reasonable stability, i.e., the Intraclass Correlation Coefficient (ICC) between the total score of measurement one and measurement two was 0.75 with the following ICC's for the subscales: *dentist's behaviour and patient's emotions* [ICC=0.74], *distressing dental procedures* [ICC=0.87], *other distressing dental events* [ICC=0.51], and *general traumatic events* [ICC=0.67]. All ICC's were statistically significant [p <0.001].

Validity Evidence for *discriminative validity* was derived by distinguishing between individuals with varying levels of dental anxiety; that is, samples of highly anxious

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[1] The four factors found in the factor analysis are as from this point on referred to as the subscales

dental patients, general dental patients and students (first measurement). The LOE-DEQ total score and LOE-DEQ subscale scores were subjected to a series of ANOVA analyses. A significant main effect for group on the total score on the LOE-DEQ was found [$F(2,779)=96.94$, $p<0.001$]. *Post hoc* analyses revealed that the total score on the LOE-DEQ of the extremely anxious dental patients was significantly higher than the total scores on the LOE-DEQ of the other two samples. In addition, the total score on the LOE-DEQ of general dental patients was significantly higher than the total score of the student sample.

The ANOVA analyses of the LOE-DEQ subscale scores also indicated main effects for groups on all four subscales (Table 4). The subsequent *post hoc* analyses revealed that the mean scores of the highly anxious dental patients were significantly higher on three of the four subscales than the mean scores of the other two samples (Table 4). The only exception was the mean score on the subscale *other distressing dental events*, which was significantly higher in the student sample than in the other two samples. In addition, the mean scores of the normal patient sample, and the student sample did not differ significantly on the *general traumatic events* subscale.

Evidence for *concurrent validity* was derived by computing Pearson correlation coefficients between the LOE-DEQ total score, the LOE-DEQ dental events (i.e., the sum of the three dentistry related subscale scores: *dentist's behaviour and patient's emotions*, *distressing dental procedures*, and *other distressing dental events*), *general traumatic events* and the S-DAI. Significant correlations between the frequency of distressing experiences (i.e., LOE-DEQ total score) and the sum of dentistry-related distressing experiences (LOE-DEQ dental events) on the one hand, and dental anxiety (S-DAI) on the other, were found in both the normal sample and the oral surgery patients sample (Table 5). As expected, no significant correlations ($r<0.30$, $p>0.05$) were found between the LOE-DEQ 'general traumatic events' and the S-DAI. Furthermore, a significant correlation was found in the outpatient sample between the number of distressing experiences (LEO-DEQ total score) and the total number of traumas reported (TEC total score) [$r=0.60$, $p=0.01$].

The *predictive validity* was determined by means of a number of regression analyses in the sample of oral surgery patients. First, the extent to which the LOE-DEQ total score contributed to the prediction of trauma-related symptomatology was calculated. The total score on the LOE-DEQ accounted for 39.6% of the variance in IES-R total scores. Next, four separate regression analyses were conducted to determine the contribution of each of the subscales to the total IES-R scores. The subscales were entered one by one in separate regression analyses, due to the small sample size. The separate regression analyses revealed that the subscale scores, '*dentist's behaviour and patient's emotions*', '*distressing dental procedures*', '*other distressing dental events*' and '*general traumatic events*' accounted for 22.7%, 26.8%, 19.6% and 12.1% of the variance in the IES-R total score, respectively (Table 6). The '*general traumatic events*' subscale was the only non-significant predictor [$p=0.06$].

Discussion

The most important result of the present study was that the LOE-DEQ proved to possess sufficient internal consistency, satisfactory test-retest reliability and demonstrated adequate discriminant, concurrent and predictive validity. The exploratory factor analysis revealed a four-factor solution with a *dentist's behaviour and patient's emotions* factor, a *distressing dental procedures* factor, an *other distressing dental events* factor and a *general traumatic events* factor. The factors derived are generally in line with the notion of multiple pathways of fears (2, 3). Only two previous studies have assessed categories of distressing dental events. LIDDEL & GOSSE (5) predicted that dental events, experienced as unpleasant, would fit into four categories of events. These categories of events were those related to specific dental procedures and stimuli, to injuries, to emotional responses and to dental personnel behaviour. However, these categories of events were not empirically derived; that is, these categories were constructed using both the conditioning theory and REISS's expectancy theory of fear as a basis (35), while classifications were based on answers to open-ended questions. In the study by DE JONGH *et al.* (11), four categories of distressing events were found ('pain or loss of control', 'negative behaviour or personality of the dentist', 'serious treatment failures' and 'miscellaneous'), but again classifications in this study were based on face validity. The results of the present study are generally in line with these earlier, non-empirically derived classifications of distressing events, which is supportive of the content validity of the subscales of the LEO-DEQ.

With regard to the discriminant validity, the instrument discriminated well between the highly anxious dental patients, the general dental patients and the student sample. In other words, the LOE-DEQ total score showed good overall diagnostic accuracy in predicting pathological forms of dental anxiety. To use the LOE-DEQ as an additional predictive screening instrument, the identification of a high proportion of patients who - based on distressing dental experiences - are at risk for developing high levels of dental anxiety would be an important goal. To this end, the results suggest that the LOE-DEQ is more suitable in detecting dentally anxious subjects than in detecting non-dentally anxious subjects.

The only exception, contrary to our *a priori* set predictions with regard to the discriminant validity of the LOE-DEQ, is the subscale 'other dentistry-related events'. These events were reported significantly more often by students than by patients in the other two samples. One explanation for this finding may be that a large part of the students had not yet been exposed to many dental treatments themselves (36), which is strengthened by the finding that younger people generally have lower DMFS scores (decayed, missing, and filled surfaces) than older people (37, 38). Furthermore, based on their age and a phenomenon referred to as recall bias (39), the students may have been better able to recall negative dentistry-related information transmission from the media, parents or peers than the patients in the other samples.

Probably the most important finding is that individuals who reported having been exposed to distressing experiences in the past reported higher levels of dental anxiety and more other distressing experiences. This finding, suggesting a dose-response relationship between distressing experiences and the development of dental anxiety, is in line with the Pavlovian fear conditioning theory, which predicts that objects and situations that are irrationally feared resemble experiences in which adversity previously occurred. Another related, and interesting, finding is that particularly dentistry-related distressing experiences (i.e., each of the three dentistry-related scales; *dentist's behaviour and patient's emotions*, *distressing dental*

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procedure, and *other distressing dental events*) proved to be associated with a higher level of trauma-related symptomatology, which is supportive of the predictive validity of the LOE-DEQ. However, the *general traumatic events* subscale was the only scale, which failed to predict trauma-related symptomatology in patients attending an oral surgeon. A plausible explanation could be that patients attending an oral surgeon constitute a relatively healthy subgroup primarily referred for their specific dental problem, whereas, for example, among dentally anxious patients co-morbid anxiety disorders have been found to be highly common (40).

The results of this study should be interpreted in the light of several limitations. Firstly, because of the retrospective design of the present study, questions can be raised about the validity of the information obtained on traumatic life events. Yet, in a review on the influence of psychopathology on memory BREWIN *et al.* (41) concluded that claims concerning the general unreliability of retrospective reports are often exaggerated. These authors, therefore, state that there is very little reason to link psychiatric pathology with less reliable or less valid recall of earlier life experiences. Similarly, and in contrast with the frequently held belief that traumatic experiences are poorly remembered, SHOBE & KIHLSTROM (42) found that traumatic experiences are extremely well remembered. This makes it less likely that the retrospective design used here would have strongly undermined the reliability of the response of the patients. Clearly, in the ideal situation, longitudinal studies should be used in order to prevent recall bias, but this is often difficult due to financial and practical reasons.

A second limitation is the fact that we did not obtain independent verification or documentation of the participant's self reports of exposure to distressing experiences. We assume that false-positive reports of exposure to distressing events may be less of a threat to the validity of the LOE-DEQ than the false reports of non-exposure. With regard to the false positive and false negative reporting, it may be important to note that the LOE-DEQ is meant to be a screening instrument in the clinical setting, and that during follow-up there is sufficient opportunity for assessment using more reliable procedures. Another limitation of the current study is the fact that the classification of distressing events was assessed only exploratively in the general dental patients sample as the other samples were too small to conduct confirmatory factor analyses. Therefore, future studies should focus on confirmation of the current classification in different patient samples.

The present findings suggest that the LOE-DEQ fills a gap in the dental anxiety literature as an instrument that is capable of systematically measuring the frequency of occurrence of distressing or traumatic events in the past. The LOE-DEQ has adequate psychometric properties and may have utility in etiological and epidemiological research, as it allows comparability between different patient samples. Another advantage of the LOE-DEQ is that by providing patients with the opportunity to disclose such events, dentists break down an important barrier to treatment by legitimising particular incidents as a valid explanation for their symptoms is provided. As a clinical instrument, the uniqueness of this instrument lies particularly in its ability to screen for various 'damaging' aspects of the dental setting in terms of 'psychological scars' or impact on patients' functioning within the dental setting. To this end, the LOE-DEQ can be used to enhance the understanding of the clinician of the patient's clinical presentation, to determine which individuals may be most vulnerable to the development of a pathological form of dental fear, and for planning and provision of adequate care. For example, with regard to the treatment of dentally anxious patients both clinical experience and research data demonstrate that the general practitioner is capable of treating mild forms of dental anxiety effectively

by means of exposure based interventions combined with establishing a trusting relationship (43). Conversely, treatments of severe forms of anxiety often require more specialist interventions (44, 45). One explanation for the differential treatment response might be that phobias with a trauma-related etiology such as dental phobias, have a number of commonalties with post-traumatic stress disorder (10). In these instances conventional interventions such as direct exposure to the anxiety provoking stimulus may be less effective, as it just activates distressing memories of the traumatic event (45). In this respect it would be enlightening to investigate whether patients with relatively low scores on the LOE-DEQ would respond most favourable to exposure *in vivo*, while those with high score would respond better to evidence-based treatment for the processing of traumatic memories, such as for example Eye Movement Desensitization and Reprocessing (EMDR; 44, 46).

In conclusion, the present results suggest that the LOE-DEQ is a useful tool for assessing patients' background in terms of previous exposure to distressing dental events. Future studies are needed to demonstrate the potential benefits of using the LOE-DEQ within the dental setting. Not only with regard to the prediction of dental anxiety, but also of other debilitating symptoms (e.g., avoidance tendencies, anger and difficult behaviours) adversely impinging on dental treatment.

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