



Dental anxiety among university students at the University of Tromsø: A quantitative study

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Abstract

Objective: To investigate differences in dental anxiety levels between dental-, psychology- and biology students at the University of Tromsø, and to investigate the relationship between dental anxiety and self-focused attention.

Materials and methods: A total number of 510 students at the University of Tromsø, including students from the dental-, psychology- and biology study received a questionnaire consisting of Modified Dental Anxiety Scale (MDAS), Reflective Functioning Questionnaire (RFQ) and additional questions about study year, age, gender and last visit to the dentist/hygienist. One hundred and ninety-three (193) students responded to the questionnaire. Independent Sample T-tests and One-way ANOVA was used to investigate differences between student groups.

Results: The respondents consisted of 72 % females and 23 % males, and had a mean age of 24 years. The dental students showed a significantly lower degree of dental anxiety than both the psychology ($p < .05$) and biology students ($p < .01$). No significant difference in dental anxiety was found between psychology- and biology students. When looking specifically at dental students, a significant difference in dental anxiety level was found between students in the two last years of study and students in the two first years ($p < .05$). No relationship was found between dental anxiety and self-focused attention.

Conclusions: This study demonstrated that dental students have a lower degree of dental anxiety compared to psychology- and biology students. Senior dental students also have less dental anxiety than junior dental students. This indicates that the dentistry programme structure may influence dental anxiety levels.

Introduction

Fear of the dentist is a common problem experienced in dental practice. It can cause treatment difficulties for the practitioner as well as for the patient. The degree of fear can vary between patients. Some experience only slight discomfort, while others experience extreme fear. Obviously not all frightening experiences are severe enough to be classified as pathological. A certain degree of discomfort is normal when pending an unknown and potentially unpleasant situation. This can be viewed as a reflection of the gradual transition between “normal” fear and pathological fear/anxiety. Fear and anxiety are highly related and are often used interchangeably in the literature. A distinction between “normal” dental fear and pathologic dental anxiety must therefore be made. “Normal” fear is a physiological, behavioral and emotional response to a feared object or situation (Armfield, Spencer, & Stewart, 2006). Pathological anxiety is characterized by the loss of the original signaling function of the anxious response – it can be triggered by objectively harmless situations, it is considered too strong and persistent in relation to the dangerous stimulus, or it is related to an unreasonable future threat (Malt, Rettersdøl, & Dahl, 2006).

Pathological fear of the dentist is known by the medical term odontophobia. Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) classifies odontophobia as an anxiety disorder, and subdivides it into the group of specific phobias (300.29) (American Psychological Association, 2000).

The DSM-IV symptoms for a specific phobia include:

- Marked, persistent, and excessive or irrational fear triggered by encountering or anticipating a specific object or situation;
- The fear or anxiety almost always occurs immediately (upon encountering or anticipating the object or situation), and may involve a panic attack;
- The phobic person understands that the fear is irrational or excessive (this may not be true with children);
- The person either endures the situation with significant anxiety or goes out of the way to avoid it;
- The anxiety, fear, or avoidant behavior directly related to the phobia significantly disrupts the person’s life, or having the phobia causes a lot of distress; and
- The symptoms must occur for at least 6 months if the person is less than 18 years old.

A specific phobia is not diagnosed if the symptoms are better explained by another psychiatric disorder, such as social phobia, PTSD, OCD, separation anxiety disorder, panic disorder, or agoraphobia

The primary function of fear and anxiety is to help us avoid life-threatening situations. The response can be divided into three main components: 1) A subjective experience of danger, 2) activation of a psychophysiological response to the threatening stimulus, and 3) a behavioral pattern to cope with, or to avoid the dangerous situation.

The psychophysiological response is also known as the “fight or flight” response. This is an uncontrollable congenital physiological process. The activation of this response is usually short and intense in “normal” fear, and prolonged with variable intensity in patients with pathological anxiety (Malt et al., 2006). A “fight or flight” response will influence the sympathetic nervous system and lead to increased cardiovascular activity and stimulate the excretion of the excitatory neurotransmitters adrenaline/epinephrine and norepinephrine. The discomfort caused by the physiological processes often lead to a behavioral pattern with avoidance of situations stimulating this response. The avoidance of frightening situations can lead to a secondary vicious cycle reinforcing the anxiety.

A number of theories have been proposed in order to explain why individuals develop dental anxiety. The theory of classic conditioning explains acquired fear as a result of previous negative or traumatic experiences. Consequently, negative experiences during dental treatment are possible factors promoting dental anxiety. Research supports this theory as Locker, Shapiro, and Liddel (1996) have found that dental anxiety was specially related to invasive or painful treatment. However, many common dental treatment procedures cause some amount of pain, but not all patients who experience pain will develop dental anxiety. This implies that the relationship between pain and anxiety is more complex. Armfield (2010) focuses on cognitions rather than experiences as a vulnerability factor in developing dental fear. Therefore, the perception of an object or situation as disgusting, dangerous, unpredictable and uncontrollable is essential. A multifactorial etiology that combined cognition and conditioning experiences was found by Abrahamsson and colleagues (Abrahamsson, Berggren, Hallberg, & Carlsson, 2002), as the onset of dental anxiety was commonly related to both individual vulnerability and to traumatic dental care experiences.

The prevalence of persons with high levels of dental anxiety in the literature varies. This is mainly due to use of different methods assessing dental fear/anxiety. However, in most studies values below 10% are reported, and a general estimate is about 4-5 % (Hakeberg, Hallonsten, Hägglin, & Skaret, 2003). Previous studies have shown differences in levels of dental anxiety when investigating sociodemographic variables. A study by Enkling, Marwinski, and Jöhren (2006) on a German sample has shown that younger people are more afraid of dental treatment than older ones and women were found to be more anxious than men.

A number of studies have reported findings of psychiatric comorbidity. Depression and other groups of anxiety disorders are the most prevalent comorbid psychiatric disorders. Patients with high dental anxiety are found to be more likely than the non-anxious to have a diagnosis of conduct disorder, agoraphobia, social phobia and simple phobia (Locker, Poulton, & Thomson, 2001). Also, Pohjola and colleagues found a statistical significant association between depression, anxiety disorders and dental fear (Pohjola, Mattila, Joukamaa, & Lahti, 2011).

Consequences of dental anxiety for the patients

Several negative consequences accompany the avoidant behavioral pattern seen in patients with dental anxiety. Some fearful patients may completely avoid seeking dental healthcare. Others will neglect their own teeth, as well as oral hygiene (Kvale, Klingberg, Moore, & Tuutti, 2003). Hence, secondary impaired dental status often accompanies dental anxiety. Accordingly, Armfield, Slade, and Spencer (2009) found that high dental fear was associated with an increased number of decayed and missed teeth. Identifying patients with dental anxiety with the purpose of reducing dental anxiety levels is important in order to improve overall oral health. Impaired oral health can affect the quality of life, and evidence suggests that patients with dental anxiety suffer considerably from impaired quality of life (Mehrstedt, John, Tönnies, & Micheelis, 2007).

The impaired dental status is a great source of shame among patients with dental anxiety. Embarrassment associated with smiling, talking and eating can affect interpersonal interaction, and deterioration of social life can be a consequence (Moore, Brødsgaard, & Rosenberg, 2004). Development of social anxiety due to impaired dental status and embarrassment related to the appearance of one's teeth is not uncommon (Moore & Brødsgaard, 1995). This is an implication of the compound nature of the problem, which includes social and psychological, as well as medical/dental aspects.

Children of patients with dental anxiety may also suffer. Trivial tasks as attendance with children at the dental clinic can represent a big challenge for anxious parents (Kvale et al., 2003). The whole setting can provoke discomfort and unpleasant emotions triggering the avoidant behavioral pattern, despite knowing the fact that they are not receiving any dental treatment themselves. Some parents may transfer their own anxiety onto their children.

Mentalization and self-focused attention

Mentalization refers to the ability to understand own and others' thoughts and feelings and the capacity to understand others' behaviors as expressions of various mental states. It is developed through close attachment between a child and its caregivers. Mentalization is mainly an automatic and unconscious process, which can make individuals resistant against stressful experiences. It can be argued that good mentalization capacity is a protecting factor against mental disorders, while dysfunctional mentalizing creates vulnerability for psychopathology (Blakstad, Eide, & Johnsen, 2008).

Self-focused attention can prevent the process of mentalizing others' thoughts, feelings and behaviors. The concept has been defined by Ingram (1990, p.156) as "an awareness of self-referent, internally generated information that stands in contrast to an awareness of externally generated

information derived through sensory receptors”. Ingram (1990) also proposed a model of self-focused attention which describes self-focused attention in psychopathology as “self-absorption”. The term “self-absorption” refers to a dysfunctional quality of maladaptive self-focused attention.

A number of studies have shown a link between self-focused attention and a variety of psychological disorders. Self-focused attention has previously been proved to play a role in maintaining social anxiety (Spurr & Stopa, 2002), while Ingram (1990) has suggested that self-focused attention is a non-specific process in psychopathology. However, little research has been done on the subject self-focused attention related to dental anxiety, which this study will investigate.

Treatment

Several different therapies are available for treating dental anxiety. Most commonly used are psychological behavioral techniques and pharmacological agents as benzodiazepines and nitrous oxide (Raadal, Kvale, & Skaret, 2003). Conscious sedation with pharmacological agents is eligible when psychological approaches alone are not sufficient to perform the desired treatment (Løkken & Hanem, 2003). It can be considered as a valuable adjunct that can affect odontophobic patients to be more susceptible towards a psychological approach and can reinforce the effect of behavioral therapy (Løkken & Kvalestad, 2002).

A number of psychological treatment methods can be used in treating patients with dental anxiety. Research has shown successful outcome of a variety of psychological approaches relieving dental fear (Berggren, 2001). Cognitively or behaviorally oriented psychotherapeutic interventions are most commonly used. Cognitive therapy aims to modify maladaptive thinking through alteration and restructuring of the content of negative cognitions, and to enhance control over these thoughts (Kvale, Berggren & Milgrom, 2004). Behavioral therapy aims to modify symptoms in patients’ behavior that interfere with their adaptive functioning. Behavioral therapy often includes components of systematic desensitization (Kvale et al., 2004). Systematic desensitization uses relaxation to counteract and weaken the fear response during gradual exposure. The patient is gradually exposed to a hierarchy of fearful situations, starting with the least threatening situations and progressing to successively more frightening situations. The general success rate for this approach is reported as 70 – 80 % (Berggren, 2001).

Objectives and hypotheses

The aim of our study was to reveal any differences in self-reported levels of dental anxiety between dental-, psychology- and biology students at the University of Tromsø. In addition we

wanted to investigate the relationship between dental anxiety and self-focused attention in these student groups.

Dental students are a student group who get gradual experience and training in different dental procedures during their studies. This can be considered as a type of exposure therapy that will be advantageous for dental students with dental anxiety. One can imagine that this environmental habituation in addition to the dental education received will have positive effects on reducing the dental anxiety level of dental students. It would also be logical to assume that the dental anxiety levels will decrease in the clinical part of the study (last two years) compared to the pre-clinical part of the study (the first two years). This suggestion was supported by the longitudinal study of Peretz and Mann (2000), who found a reduction in dental anxiety levels of female dental students during their dentistry studies.

Psychology students have acquired knowledge of the psychological mechanisms of anxiety through their field of study. They are also familiar with different psychological treatment approaches which could make them better able to cope with dental anxiety. Hence, we suggest that psychology students will have a lower level of dental anxiety compared to a student group not holding this knowledge. A comparison of dental anxiety between different student groups has previously been done by Al-Omari and Al-Omiri (2009). They found that dental students had lower levels of dental anxiety than engineering- and medical students.

Based on these assumptions related to the different student groups we suggest the following hypotheses:

- 1) Dental students show lower dental anxiety levels than the other student groups.
- 2) Psychology students show lower dental anxiety levels than the biology students.
- 3) Dental students in their last two years of study have lower dental anxiety levels than dental students in their first two years of study.
- 4) Dental students with dental anxiety are more self-centered than dental students without dental anxiety.

Materials and methods

Study population

The study population consist of 510 students at the University of Tromsø, including students from the dental- ($N=180$), psychology- ($N=171$) and biology study ($N=159$). The dental and psychology study are both professional studies spanning five years, and the bachelor study in

fisheries and aquaculture science is a three-year program. Both undergraduates and senior students participated in the study.

Procedure

The data collection was carried out in the autumn 2012, using three standardized questionnaires; The Modified Dental Anxiety Scale (MDAS) (Humphris, Freeman, Tutti, & Desouza, 2000; Humphris, Morrison, & Lindsay, 1995; Corah, Gale, & Illig, 1978) and Reflective Functioning Questionnaire (RFQ) (Moulton-Perkins, Rogoff, Fonagy, & Luyten, 2011). In addition to the two standardized questionnaires, students were asked about gender, age, year of study, when they had their last visit to the dentist/hygienist, and if they go regularly to the dentist/hygienist.

A systematic search of the literature was performed via PubMed. We used the search terms: “dental anxiety”, “self-focused attention”, “aetiology + dental anxiety”, “comorbidity + dental anxiety”, “modified dental anxiety scale”, “therapy + dental anxiety”, “dental students + dental anxiety” and “reflective functioning + mentalization”. Supervisors also contributed with relevant literature.

A link to the questionnaire was sent to students by e-mail. The questionnaire was made available online through use of a web-based survey tool called “LimeSurvey”. All responses were recorded anonymously. After about two weeks a reminder was sent by e-mail to the different students groups.

Before the study could be initiated, we sent an application to REK (Regional Committee for Medical and Health Research Ethics) to make sure that the study was ethical to implement. All the data collected was anonymous so the project could be started without conflicting with the health research law. Permission to send the survey to students at the University of Tromsø was obtained by sending requests to the different study consultant or other people responsible for the students in the program.

Instruments

Measuring of students’ dental anxiety or phobic symptoms was conducted using a Norwegian version of The Modified Dental Anxiety Scale (MDAS). This survey is a modified version of the well-known Corah’s Dental Anxiety scale (DAS) (Cora et al., 1978). MDAS is a 5-item questionnaire, containing questions about the respondent’s anxiety level when visiting the dentist, with a measuring scale ranging from 1 (not anxious) to 5 (extremely anxious). Total score ranging is from minimum 5 to maximum 25. A person scoring 5-11 can be considered to be not anxious at all, while a moderate/severe anxiety level would be between 11-18 (Freeman, Clarke, & Humphris, 2007). An extremely anxious and possibly phobic person would have a scoring on 19 or

above. Compared to DAS, MDAS contains an additional question about the responder's anxiety towards injections with local anesthesia (Humphris et al., 1995).

A Norwegian version of The Reflective Functioning Questionnaire (RFQ) was used to measure whether a person has the ability to reflect on their own and others' feelings, thoughts, intentions and wishes. It contains of 54 statements, divided in two subscales measuring "internal-self" and "internal-other" mentalization ability. The responder can choose from six options that range from 1 (disagree totally) to 6 (agree totally). The questionnaire consists of statements such as; "Peoples thoughts are a mystery to me" (internal-other) or "I am aware of my emotions" (internal-self). Scores to the RFQ was submitted to a factor analysis in order to identify items belonging to either internal-self or internal-other category. An explorative principal components factor analysis was run with Varimax rotation. Based on the initial factor structure and visual inspection of the Scree plot, two factors were deemed theoretically interesting. In order to construct subscales for the internal-self and internal-other dimensions the five highest loading items ($> .30$) without considerable side-loadings were chosen from each of the theoretically corresponding dimensions. Out of the 54 statements, 5 items were chosen to represent the dimensions "internal-self" (7, 27, 34, 38, 42) and "internal-other" (21, 31, 46, 48, 54 - reversed). The internal reliability of the subscales was investigated by Cronbach's alpha. The internal-self subscale has a reliability of .84 and the internal-other subscale has .69, which indicates adequate reliability levels.

Data analysis

Data collected through questionnaires in Lime Survey was transferred to IBM SPSS Statistics 19 (IBM, 2010). Descriptive statistics was measured to compare gender and age. Mean values and standard deviation in all the groups together and separately was recorded. The respondents' scores on the MDAS were summed together and made into a new variable. MDAS sum-scores for dental-, biology- and psychology students were compared using Independent Sample T-tests and One-way ANOVA. In this way we could assess whether the between-group differences in MDAS sum-scores were statistically significant, according to Hypotheses 1 and 2. Statistical significance was based on the probability values of $p = .05$.

To reveal any differences within the dental students group for year of study, as we suggested in Hypothesis 3, we conducted a new t-test analysis in which we compared dental anxiety levels for the two first years of study ($n = 30$) with the two last years of study ($n = 36$).

All students were divided in two groups with MDAS scores <12 and >12 . This was done to investigate a possible correlation between dental anxiety and reflective functioning/ self-focused attention, as stated in Hypothesis 4.

Results

Five hundred and ten (510) students were contacted and invited to participate in the study. 193 responded, and of these 38 gave incomplete responses. This resulted in a total response rate of 38 %. Excluding the incomplete responses, the response rate was 30 %. Dental students had the highest response rate, 54 %, while the biology students had the lowest, 23 %. In the psychology student group the response rate was 34 %.

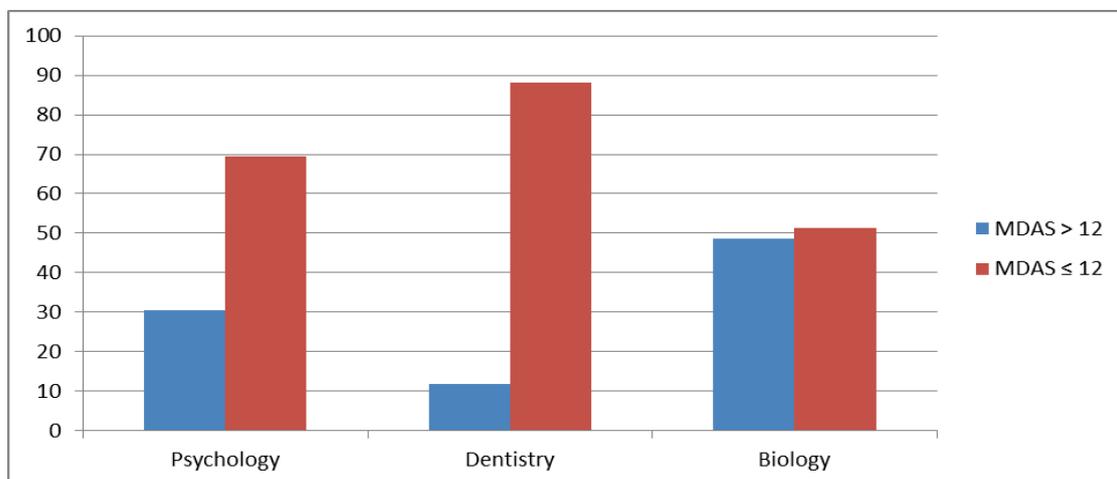
Analyses of demographic variables (age and gender) yielded a mean age of 24 ($SD = 4.86$) years, and a gender distribution of 138 (72%) females and 43 (23 %) males.

MDAS

When investigating sociodemographic variables we found a significant difference between gender and MDAS score; $t(167) = 1.43, p < .05$. Females showed a higher mean value ($M = 10.08, SD = 4.21$) than the males ($M = 9.05, SD = 2.72$). No difference in dental anxiety levels relative to age was found.

Fifteen (15) of 49 (30.61%) psychology students, 10 of 85 (11.76%) dental students and 17 of 35 (48.57%) biology students showed a MDAS score > 12 (Figure 1), which is considered a moderate level of dental anxiety. Table 1 shows the mean and standard deviation of MDAS scores within the tree student groups: psychology, biology and dentistry. The mean value of the biology students was 12.46 ($SD = 4.65$). Dental and psychology students' MDAS scores were within the normal range (MDAS < 12). The mean value of all students was 9.85 ($SD = 3.94$). Oneway ANOVA showed a significant difference in dental anxiety level between the student groups; $F = 19.14, p < .01, df = 2$. The difference was further investigated in accordance with the hypotheses (1-3) by conducting t-tests.

Figure 1. Distribution of MDAS scores > 12 and ≤ 12 in percent between the student groups



Hypotheses 1 proposed that there would be lower dental anxiety levels among dental students than among the other student groups. T-tests reveal statistically significant differences in MDAS scores between dental students ($M = 8.27, SD = 2.87$) and psychology students ($M = 10.73, SD = 3.79$); $t(132) = -4.25, p < .05$. Also, there was a significant difference between dental students and biology students ($M = 12.46, SD = 4.65$); $t(118) = -5.99, p < .01$. The results show that dental students report lower levels of dental anxiety than the other student groups in the study, which is consistent with Hypothesis 1.

Hypothesis 2 proposed that there would be a difference in anxiety levels between psychology and biology students, however a t-test did not show a significant difference in MDAS scores; $t(82) = 1.87, p = .10$.

Hypothesis 3 stated that dental students in their last two years of study have lower dental anxiety levels than dental students in their first two years of study. Table 2 shows the mean and SD of MDAS scores between 1st - 2nd year and 4th - 5th year dental students. A significant difference in dental anxiety level was found between the groups; $t(64) = 4.39, p < .05$.

Table 1. Means (M) and standard deviations (SD) for the MDAS within the three student groups: psychology, biology and dentistry

Variable	Psychology (N=49)		Biology (N=35)		Dentistry (N=85)	
	M	SD	M	SD	M	SD
MDAS	10.73	3.79	12.46	4.6	8.27	2.87

Table 2. Means (M) and standard deviations (SD) for the MDAS between junior and senior dental students

Variable	1 st -2 nd year of study (N=30)		4 th - 5 th year of study (N=36)		Mean difference
	M	SD	M	SD	
MDAS	9.97	3.39	7.11	1.77	2.86*

* $p < .01$, Independent samples t-test

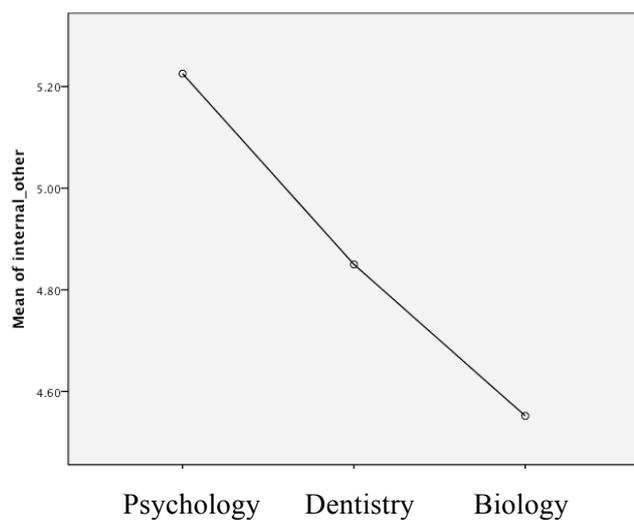
RFQ

According to Hypothesis 4 it was proposed that dental students that were high in dental anxiety would also show higher levels of self-centredness, as measured by the “internal-self”

subscale on the RFQ. However, the results showed no significant differences regarding ‘internal self’, thus Hypothesis 4 was not supported by our analysis. In fact, the number of participants with moderate to high levels of dental anxiety (MDAS > 12) was negligible in the dental student group (n=10).

In general, the psychology students ($M = 5.23$, $SD = .45$) scored higher on the “‘internal other” subscale than the dental ($M = 4.85$, $SD = .51$; $t(121) = 4.09$, $p < .001$) or biology students ($M = 4.55$, $SD = .89$; $t(74) = 4.36$, $p < .001$) (see Figure 2). This indicates that psychology students are better able to reflect on other peoples feeling and emotions. A marginal significant difference ($p = .06$) was found between dental- and biology students for internal-other scores.

FIGURE 2. Mean scores of ‘internal other’ within the student groups



Discussion

This study shows that dental students have lower levels of dental anxiety than biology and psychology students. The findings therefore support the first hypothesis. Further, there was no significant difference in dental anxiety between the psychology and biology students, as suggested in the second hypothesis. The dental students in the two last years of study had lower dental anxiety than students in the two first years. Finally, no difference was found in self-centeredness between dental students with high dental anxiety and dental students with low dental anxiety.

The finding that dental students have lower anxiety levels than psychology and biology students could be related to the fact that dental students have more practical dental knowledge than the other two groups. At the University of Tromsø the dental students start the practical training already in the third year with artificial teeth models. Later in the same year students move on to do

simple treatment tasks on each other, like applying anesthesia, and start to have their own patients. This is experiences the other two groups lack.

As earlier mentioned, systematic desensitization is a part of behavioral therapy used for treating phobic patients. The therapy involves exposure of fearful situations. The effect of the therapy is reducing the fear of the frightening stimuli by eliminating avoidant behavior and decreasing the experience of stress in previous feared situations. This is important because avoidant behavior can be seen as a crucial mechanism for maintaining the anxiety level. As in systematic desensitization, dental students will gradually be exposed to a hierarchy of fearful situations, beginning with reading theory on the subject (such as dental anatomy), training on phantom dolls, and performing dental examination and anesthesia on other students (including oneself). Another aspect with the dental study is that the students learn how to manage fearful patients, especially children. There is a focus on preventing development of dental anxiety among children. The children are approached by means of verbal and visual procedures before the treatment is started. This method is known as the “tell, show, do” method.

The theory proposed here of gradual exposure to fear provoking stimuli as part of the dentistry programme can also be related to the fact that dental students in their early years have more signs of dental fear than senior students. In the two first years no practical training is conducted, and thus no behavioral therapeutic effect from exposure can be expected. Other explanations for differences in dental anxiety could be that dental students in the first years are more vulnerable to stress/anxiety because they are in an unfamiliar study environment. As the students “grow” more into their field of subject and study environment they become more secure and confident, and therefore, less anxious. It is not necessarily the practical part of the study that make students increasingly secure, but the rather the experience as a whole, which include individual and developmental processes.

To our knowledge the only study examining the development of dental anxiety among dental students was the previous study mentioned study by Peretz and Mann (2000). This longitudinal study showed that the dental students’ DAS score went from 10.4 to 8.0 over a four-year period, compared to our cross-sectional study that showed mean MDAS scores of 9.9 (1st-2nd year) and 7.1 (4th-5th year).

The findings regarding our first hypothesis are also consistent with the study by Al-Omari and Al-Omiri (2009), where significantly lower levels of dental anxiety were found among the dental students compared to the medical- and engineering students. They concluded that lack of dental education could be seen as an unfortunate factor in dental anxiety. Dental knowledge and practical experience can be favorable to counteract dental anxiety, particularly the practical part containing a behavioral component can have a therapeutic effect.

The biology students had the highest dental anxiety score among the student groups, and is the only group having a mean MDAS score above 12, indicating a moderate dental anxiety level. The MDAS score for the psychology students was 10.73 compared to 12.46 for the biology students. However, the psychology students did not have significant lower level of anxiety than the biology students, as we suggested. The biology study is not a health education like the psychology and dental study. The psychology students at University of Tromsø start their clinical practice in the fourth year of study, which will enable them to be familiar with the mechanisms of anxiety and behavioral therapeutic approaches (similar to those used in treatment of dental anxiety). The results could indicate that the theoretical knowledge acquired during the psychology study is not as important as assumed. But it could also be that the students not yet possessing clinical knowledge (1st - 3rd year) influence the results negatively. A Brazilian study showed that 13% of undergraduate psychology students exhibited a high degree of dental fear (Cesar, de Moraes, Milgrom, & Kleinknecht, 1993).

It should be noted that the number of female students was approximately 10 % higher among psychology students than among those studying biology. As research show that females have higher levels of dental anxiety (Armfield et al., 2006, Enkling et al., 2006, Hakeberg et al., 2003) this may contribute to an increase in the general level of anxiety in the psychology student group, which will minimize the differences between the groups.

The study by Al-Omari and Al-Omiri (2009) also compared dental anxiety levels between health related and not health related studies, respectively medical and engineering studies. Uniform with our findings no statistical significant difference between the health related (psychology) and the non-health related (biology) studies were found, when excluding dental students.

An alternative explanation for the low MDAS score in dental students may be due to a selection between field of study and personality traits. Dentistry is a varied study where the students are continuously exposed to both theoretical and practical requirements. Students could therefore be able to cope with psychological stress in a better way, and this can make them less vulnerable to dental anxiety. On the other hand the psychology students also experience a stressful academic life, but despite this they still have higher dental anxiety levels. Hence, the practical part of the dental education may be the key factor for reducing the level of anxiety. It can also be argued that individuals prone to dental anxiety would avoid choosing a field of study which could provoke their anxiety. Anxious individuals would be naturally excluded from dentistry, although many students choose a field of study based on prestige and not by personality traits (Onoyase & Onoyase, 2009). An Irish study of undergraduate dental students showed that factors influencing on their decision to choose dentistry was ease of employment, being self-employed, working regular hours, good income and opportunity to help people (Hallissey, Hannigan, & Ray, 2000).

The Reflective Functioning Questionnaire revealed that psychology students had a higher degree of 'internal other' mentalization ability than the two other student groups. This involves a good capacity to reflect on others' feelings, thoughts, intentions and wishes. In their professional career as a psychologist this is an important quality to possess. Both psychology and dental students are used to work with clients, and this could make them better equipped to interpret and understand other people. The lowest value of 'internal other' mentalization ability was seen among the biology students, and this is also the only group not seeing patients on a regular basis.

We assumed that a connection between dental anxiety and high 'internal self' (i.e., self-centeredness) would be found, since research has shown that self-focused attention plays a role in anxiety (Spurr & Stopa, 2002). However, our results did not reveal such a connection as no difference was found in self-centeredness between anxious and non-anxious students. It could be that the dental program structure with emphasis on patient relations prevents/counteracts self-centered behavior among dental students. A change in focus of attention could possibly take place, from a self-centered focus to an external focus on patients instead. Patients with dental anxiety are particularly vulnerable for the dentist's professional behavior. A negative and unsupportive dentist behavior is reported as a significant factor in development of dental fear (Abrahamsson et al., 2002), and a more empathic behavior is associated with decreased dental fear (Corah, O'Shea, Bissell, Thines, & Mendola, 1988). Dental students with dental anxiety will be familiar with the negative consequences of an unfortunate dentist behavior, which may contribute to change their self-focused attention for the benefit of their patients.

A critical view of the results of this study must be kept in mind due to the differences between the sample sizes. The results can be affected by the large group of dental students relative to the two other smaller groups. In addition the number of individuals with dental anxiety was considerable lower in the dental student group versus the two other groups. Another bias could be the uneven gender distribution between the groups, as research shows a higher prevalence of anxiety among females.

The study by Peretz and Mann (2000) followed the same student group over a 4-year period. Since our study is not longitudinal, the results could not be directly compared. However, our findings can indicate that the dental program structure can be a significant factor in reducing dental anxiety.

To our knowledge there are no current studies investigating correlations of dental anxiety between biology and psychology students. Further research on the subject is needed.

Conclusions

This study indicates that the dental program structure may influence dental anxiety levels. Compared to psychology- and biology students the dental students demonstrated a lower degree of dental anxiety. Senior dental students with clinical experience also show a lower dental anxiety level than junior dental students. Psychology students show a higher ability to understand others' thoughts and emotions compared to dental- and biology students.

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