

# **Stress Among Dental Students**

Dr. Abdullah M. Alzahem

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With summary in Arabic

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# **Stress Among Dental Students**

## **Stress bij tandheelkunde studenten**

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# **Stress Among Dental Students**

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# Chapter 1

## Introduction

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This chapter is partly based on:

Van der Molen HT, Alzahem AM. Stress and Stress Management. In: Al Alwan I, Magzoub ME, Elzubeir M, editors. International Handbook of Medical Education: A Guide for Students First ed: SAGE Publications Ltd.; 2012. p. 298-310.

In recent decades stress among dental students has appeared to be a major concern for dental educators. This stress phenomenon among dental students has been reported in different curricula since the 1970s. The dental profession is considered to be one of the most stressful health professions.<sup>(1)</sup> Some stress is desirable to prevent under-stimulation and even boredom, but the persistence of stress-related symptoms may result in mental and/or physical disorder, substance abuse, and diminished efficiency at work or learning.<sup>(2)</sup> Most of the studies concerning stress in dental students have been conducted through surveys using the Dental Environment Stress (DES) questionnaire.<sup>(3)</sup> These studies have shown significant stress among dental students.<sup>(4-23)</sup> In these studies examination and grades appear to be the most stressful elements, along with limited time for relaxation or outside activities.

Stress continues after graduation when students acquire a job as a dentist. Research has shown that stress related illnesses, together with musculoskeletal disorders, were the main factors influencing dentists to retire early.<sup>(24)</sup> In addition, intense interaction between the dentist and patient could precipitate a state of “burnout” that consists of emotional exhaustion, depersonalization, and reduced personal accomplishment.<sup>(25)</sup> The major aspects of stress have been illustrated in many studies conducted in dental schools across the world. These studies have further examined sources of stress among undergraduate dental students.<sup>(5, 7-11, 13, 15, 16, 18, 20, 21, 26-37)</sup>

The first objective of this introductory chapter of this thesis is to define the concept of stress and to present a theoretical stress model. The second objective is to shortly discuss the negative side effects of stress. The third objective is to present the main aims of the studies we have been executing concerning stress among dental students, and to provide the reader with the outline of this dissertation.

## **Definition of the concept of stress**

The word ‘stress’ is quite common in daily language. When people say that they are ‘stressed’, it means that they have difficulties in coping with the demands of the environment.<sup>(38)</sup> Psychologists have tried to give a more specific definition of this concept. Lovallo makes a distinction in two components of stress.<sup>(39)</sup> The first one is the *physical component* that has to do with bodily symptoms like an increased heart-rate or increased secretion of sweat when people are confronted with a difficult situation. The second is the *psychological component* that involves the way people perceive circumstances in their lives. Sarafino describes three ways in which these components can be examined.<sup>(40)</sup> The first approach focuses on the environment. In this approach stress is considered as a *stimulus*. Examples of environmental stress factors are living in a small apartment together with fellow students and the loss of old friends once a student has moved to the university. Such factors are called *stressors*. The second approach considers stress as a *response*. An example of this approach is when students use the word ‘stress’ to

refer to their state of mind, when they are nervous before an exam. Responses can be physiological (for instance, getting cold hands, shivering) or psychological (for instance, when people say: "I feel very nervous"). Together the psychological and physiological response are called *strain*. The third approach considers stress as a *process* that includes stressors and strain, but adds an important dimension: the *relationship* between the person and the environment.<sup>(41)</sup> "This process involves continuous interactions and adjustments - called *transactions* - with the person and environment each affecting and being affected by the other."<sup>(40)</sup> In our definition we follow Sarafino (p. 62) who defines stress as: "*The circumstance in which transactions lead a person to perceive a discrepancy between the physical or psychological demands of a situation and the resources of his or her biological, psychological, or social systems.*"<sup>(40)</sup>

### **Theoretical model**

Below we present a model for the relationship between demands of the study in dentistry, stress, and health (physical and psychological) in dental students. This model is based on a general model that has been developed by Kompier and Houtman within the general framework of work stress.<sup>(42)</sup> The development of stress responses in dental students can be explained on the one hand by characteristics of their study environment, and on the other hand by their personal characteristics. Environmental factors are for example the living accommodation, the financial situation and the degree to which the dental program is well structured. Personal characteristics that can play a part in the development of stress are gender, age, level of education, intelligence, personality structure, and motivation. These individual characteristics determine the coping capacity of the dental student. Within the causes of stress there are three main dimensions: first, the educational and other environmental demands of the study of dentistry, second, the opportunities for the student to control their own study behavior during the curriculum, and third, the amount of social support during their study. When there is no balance between the demands of the study and the coping capacity of the student, this may lead to a situation of stress (see Figure 1.1).

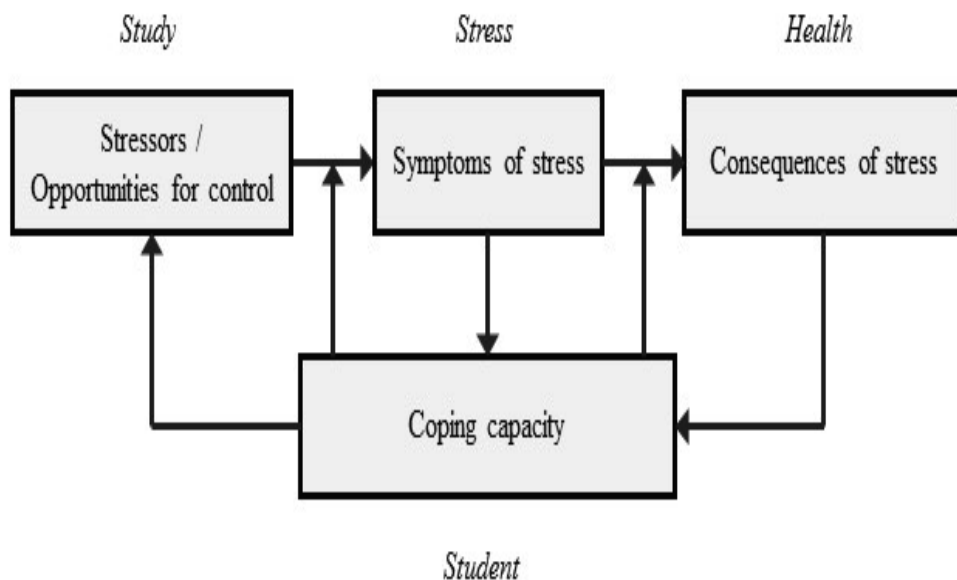


Figure 1.1: Theoretical stress model (based upon Kompier & Marcelissen, 1990)

In the first box left in this figure, we see the concepts *stressors* and *opportunities for control*. In fact these concepts are competing with each other. When a student has a lack of opportunities to control the influence of the stressors, that student may develop physical and psychological *symptoms of stress*. When the opportunities for control can compete with the stressors no symptoms of stress will emerge. When the symptoms of stress stay for a longer period of time, they may have negative *consequences* for the health of the student. These consequences of stress in turn may influence the *coping capacity* of the student negatively. When the coping capacity of the student is reduced this in itself may function as a new stressor for the student, that may lead to a reduction of the opportunities for control. Altogether, the figure shows that there is a *vicious circle* that is difficult to break through once stress has developed.

Stress may harm students' professional effectiveness as it decreases attention, reduces concentration, impinges on decision-making skills, and reduces trainees' abilities to establish good doctor-patient relationships.<sup>(43)</sup> As such, stress is an important factor for the study of dentistry.

## **Objectives and outline of the dissertation**

The main aim of this thesis is to discuss stress among dental students, its sources in dental education, its signs and symptoms, its measurement, and its management. The first specific objective is to systematically review the literature regarding stress among dental students in order to identify the main sources of stress in dental education (Chapter 2). Part of this systematic review is to determine the signs and symptoms of stress among dental students. In this chapter we present an overview of stress-measuring instruments. Since the literature shows that there is relatively little known about the development of stress in dental students during the curriculum, the second objective is to study the effect of the year of study on the stress level of dental students (Chapter 3). The third objective is to present a systematic overview of the literature concerning stress management programs for dental students (Chapter 4). Based on this overview we have developed a new stress management program for dental students. The fourth objective is to present a study concerning the effectiveness of this program; for that objective we have been using a quasi-experimental pretest-posttest-follow-up-control group design (Chapter 5). The main results of the different studies will be summarized, and discussed. Finally, we present recommendations for educationalists in dentistry programs and make suggestions for future research (Chapter 6).

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## Chapter 2

# Stress amongst dental students: A systematic review

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## **Abstract**

The present study was conducted to provide future researchers and dental educators with an overview of stress amongst undergraduate dental students reported in the literature. The review can be used to modify dental curricula to decrease such stress and produce better dentists. Our study consisted of a systematic review of 49 peer-reviewed articles published between 1966 till October 2008 in English, discussing different aspects of stress amongst undergraduate dental students. These aspects are demographic variables of stress, sources of stress, impact of stress, indicators of stress, instruments measuring stress level and management of stress. Major sources of reported stress were related to examinations, clinical requirements and dental supervisors. Studies suggest using signs and symptoms for early detection of stress and proper intervention.

## Introduction

In recent decades, stress amongst dental students has appeared to be a major concern for dental educators. The aim of this study is to present an overview of the literature concerning stress amongst undergraduate dental students. Atkinson et al. stated that the term stress describes external demands (physical or mental) on an individual's physical and psychological well-being.<sup>(1)</sup> This stress phenomenon amongst dental students has been reported in different curricula since the 1970s. The major aspects of that stress have been illustrated in many more studies subsequently conducted in dental schools across the world. These studies have further examined sources of stress amongst undergraduate dental students.<sup>(2-25)</sup> Although most of these studies were cross-sectional in design, they have shown significant increase of stress amongst dental students in relation to different variables. Moreover, stress amongst dental students occurred from different sources and affected them differently, and sometimes was shown to have significant negative effects on their performance.

Stress has been defined by Cox (1978) as '*a stimulus, a response or the result of an interaction between the two, with the interaction described in terms of some imbalance between the person and the environment*'.<sup>(26)</sup> However, some stress is desirable to prevent under-stimulation and even boredom, but the persistence of stress-related symptoms may result in mental and/or physical disorder, substance abuse, and diminished efficiency at work or learning.

In line with Cooper's theory of stress, stress is a continuous cycle in which stressors produce stress and stress affects positively the stressors in return.<sup>(27)</sup> However, no article has been found (to the best of our knowledge) that discussed stress amongst dental students and considered stress outcomes as stressors or stressors' boosters.

The dental profession is considered to be one of the most stressful health professions.<sup>(28)</sup> It was noted that stress-related illnesses, together with musculoskeletal disorders, were the main factors influencing dentists to retire early.<sup>(29)</sup> In addition, intense interaction between the dentist and patient could precipitate a state of "burnout" that consists of emotional exhaustion, depersonalization, and reduced personal accomplishment.<sup>(30)</sup>

Many studies have been conducted in different dental schools across the world (see Table 2.1). Most of these studies have been conducted through surveys using the Dental Environment Stress (DES) Questionnaire and have shown the significant increase of stress amongst dental students.<sup>(2-</sup>

4, 7, 9, 12, 13, 16, 20-22, 24, 31-38) In these studies examinations and grades appear to be the most stressful elements, along with limited time for relaxation or outside activities.

Table 2.1: Different studies in different countries

Country	Measurement Tool	Year	Outcomes				
			Sources	Variables	Impact	Indicators	Management
Australia <sup>(16)</sup>	DES	1999	X	X			
Australia <sup>(38)</sup>	DES	2002		X		X	X
Canada <sup>(34)</sup>	DES	2008		X			
EU <sup>(24)</sup>	MBI, GHQ, DES	2008	X	X	X		
EU <sup>(32)</sup>	GHQ, MBI, DES	2001		X	X		X
Fiji <sup>(22)</sup>	Modified DES	2007	X	X			
Germany <sup>(33)</sup>	GHQ, MBI, DES	2002	X	X	X	X	
Greece <sup>(3)</sup>	Modified DES	2005	X	X			X
India <sup>(31)</sup>	Modified DES	2003	X	X			X
Japan <sup>(36)</sup>	PGWB, DES	2005	X	X		X	X
Jordan <sup>(20)</sup>	Modified DES	2005	X	X			X
Jordan <sup>(35)</sup>	Modified DES	2001	X	X			X
Malaysia <sup>(4)</sup>	Modified DES	2005	X	X	X	X	
Nigeria <sup>(21)</sup>	DES	2006	X	X			X
South Africa <sup>(13)</sup>	DES	1994	X	X			
Trinidad and Tobago <sup>(2)</sup>	Modified DES, BSI	2002	X	X	X		X
UK <sup>(12)</sup>	Modified DES	1999	X	X	X	X	X
USA <sup>(37)</sup>	DES	1993	X	X			
USA <sup>(7)</sup>	DES	1980	X	X			
USA <sup>(9)</sup>	DES	1989	X	X			

Pre-clinical students reported that examinations and fear of failure caused the most stress, while for clinical students the main stressor was the clinical training, particularly factors relating to meeting clinical

requirements. Female students perceived more stress generally than male students did. However, male students were more stressed when faced with certain specific factors related to clinical training.<sup>(4)</sup>

A study amongst dental students across seven European dental schools revealed that they too were deleteriously affected by stress. In particular, it was noted that these students were emotionally exhausted, experienced a high degree of psychological distress, and seemed to perform more poorly than a comparison group of medical students, whose own training is also known to be stressful.<sup>(33)</sup>

Perceptions of stress as due to an underlying tendency towards perfectionism based on an academic history of high achievement and powerful expectations of scholastic excellence have been examined. Once in dental school, where academic excellence is the norm, an adjustment in self-concept is required, whilst a new form of clinical competitiveness also emerges. Such transitions can affect student levels of self-efficacy, which in turn can affect both achievement and psychological health.<sup>(16)</sup>

Others have studied different sources that might be academic, clinic-related, social, and financial or a combination of these factors. However, these sources affected the dental students differently according to gender and year of study.<sup>(39)</sup> In addition, it has been argued that student drop-outs caused by stress may affect the profession of dentistry and future dental manpower.<sup>(40)</sup>

Stress mainly arises from the need to meet clinical requirements, to pass stringent academic assessments, and to deal with clinical and supporting staff.<sup>(12)</sup> It has been shown that the clinical years are more stressful than the pre-clinical years and instructors themselves often create more stress than the treatment of patients. Moreover, uncertainty about dentistry as a career and unhealthy perfectionism may be predisposing factors to stress.<sup>(16, 41)</sup> It has also been found that academic pressure, service, working hours, as well as ongoing clinical events are usually more stressful than personal problems.<sup>(42)</sup>

Although increasing stress may result in declining student performance,<sup>(37)</sup> high levels of stress can result in a wide variety of physical and psychological complaints as well. Therefore, it is recommended to determine the sources of stress amongst dental students to avoid resultant detrimental effects on their physical and mental health.<sup>(20)</sup> Responses to stress are also influenced by a person's system of beliefs and attitudes, another area that invite further inquiry.<sup>(43)</sup>

Other studies have focused on stress amongst dentists and their coping techniques,<sup>(44)</sup> questioning whether stress is more likely to occur during dental school or in practice itself.<sup>(45)</sup>

In sum, the first aim of this study is to present an overview of stress amongst undergraduate dental students through a systematic review of the literature. We will discriminate between biographic variables, sources, signs and symptoms, indicators and management of stress. The second aim is to answer the question what research is further needed for the improvement of dental education. So, future researchers can start thinking of additional measures, including curriculum design and student admission policies. Moreover, an intended outcome of this overview is the construction of a new tool measuring stress amongst dental students. Such a new tool should consider new educational approaches in dentistry and new technology used in dental education which is yet lacking in the DES questionnaire introduced by Garbee in 1980 and that has been frequently used in different studies.<sup>(7)</sup>

## **Method**

This systematic review has been conducted according to an approved protocol by two reviewers, the first author and his colleague. The aim of the evaluation of the original studies was to decide upon inclusion and to assess reliability and accuracy of the data as objectively as possible. The assessment of the quality of the studies includes the study design, sampling (size and frame), survey tool validation, response rate, survey analysis, and outcome measures. The authors assessed the rigor of the studies they identified to minimize the risk of bias by their methodology (i.e. experimental studies are presented prior to quasi-experimental studies), and the rigor was considered by the availability and quality of the study design, study sampling, response rate, measurement tool, and administration of survey tool. Table 2.2 gives an overview of the sources from which the studies have been extracted.

Table 2.2: Sources of studies selected initially

Source	Results
Web of Knowledge	35
Pub Med	979
Science Direct	3
SAGE	0
Yahoo	64
Scholar Google	83
British Library	12
Library of Congress	0
National Library of Australia	0
National Library of Canada	0
National Taiwan Library	0
ERIC	0
Total	1176
Duplicate	497

### Selection of studies

Different key words were used in the literature search as Stress, Dental, Students, Dentistry, and Education. To narrow the search key words have been combined by using AND as follows: "Stress amongst dental students", Stress AND Dental AND Students, Stress AND Dental AND Education, Stress AND Dental AND Undergraduates, Stress AND Dentistry.

This literature search has been executed via searching electronic databases to identify the relevant studies in Pub Med, Google Scholar, Yahoo, MeSH Database, Cochrane Library, ERIC, British Education Index, Australian Education Index, CBCA Education, Education Index, Education: A SAGE Full-text Collection, British Library, Library of Congress, Web of Science, National Library of Canada, National Library of Australia, National Taiwan Library. In addition, reference lists of retrieved articles, proceedings and abstract books of related were checked. Experts, staff from collaborating centers, Non-Governmental Organizations (NGs), and other organizations have been contacted and asked about the subject. The citations identified in the electronic search have been downloaded into EndNote X2, while those retrieved from other sources were entered manually (e.g. hand searching, reference lists). Duplicates have been deleted and to each citation a unique identification was assigned (Primary Author Name and Year of publication). Finally, a codebook has been developed to document the findings of our search (see Table 2.2).

To decide about inclusion of the particular study, a review form has been designed (see Appendix 1A). The inclusion criteria were: studies in English concerning undergraduate dental student that investigated or discussed any aspect of stress and years of publication since 1966-October 2008. When the information provided by titles/abstracts was insufficient to decide on inclusion/exclusion, or the titles/abstracts were significantly relevant to the research question, the full-text was retrieved and evaluated. The list of excluded studies and reasons for exclusion are documented fully and are available from the authors upon request.

Data have been extracted from the included studies by means of a data extraction form (see Appendix 1B). The data-extraction form includes questions distributed in three categories: (i) General Information (Primary author, Year of Publication, Country, Journal), (ii) Specific Information (Study design, Study sample, Response rate, Survey tool, Administration of survey), and (iii) Analysis of Survey Outcomes (Demographic variables of stress, Sources of stress, Signs and symptoms of stress, Indicators of stress, Instruments for measuring or discovering stress, and Management of stress).

A pilot study has been executed for both the review form and the data-extraction form on a small number of studies of different designs. This pilot study resulted in a slight revision of both forms and these were used for all included studies.

Figure 2.1 makes clear that the total number of studies initially selected through electronic databases was 1176. After subtraction of 497 duplicates, another 533 titles were excluded because they did not meet the criteria for inclusion. The abstracts of the remaining 146 articles were reviewed and an additional 89 articles were excluded using the review form during screening (see Appendix 1A). Thus, 57 articles remained for full-text review. These full-text reviews resulted in exclusion of further 13 articles, for example because the title and abstract were misleading, and to an addition of five articles drawn from articles' reference lists. Ultimately, the final number of articles included for this review was 49.

## **Procedure**

Two reviewers reviewed the articles; the primary investigator is a consultant in dental services and student in the master's program in medical education, whilst the other is associate consultant in dental services. The reviewers used the data extraction form (Appendix 1A) and review form (Appendix 1B). In case of difference between the two reviewers, an outside expert was consulted to resolve the difference.

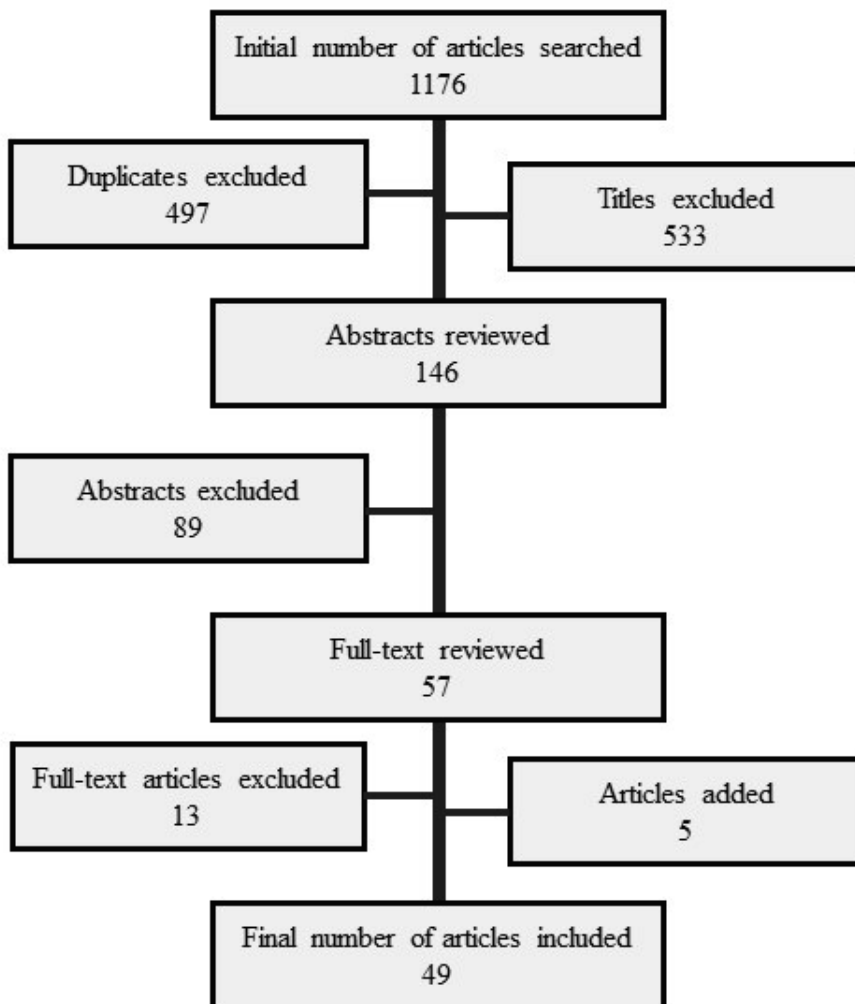


Figure 2.1: Studies selection process

## Data Analysis

The results found from the selected studies were combined and findings reported more frequently were identified and summarized in Tables 2.3-2.12. Aspects of stress were categorized into a number of subclassifications: Demographic variables of stress such as gender and year of study; Sources of stress such as examinations; Impact (Symptoms and signs) of stress such as distress and fatigue; Indicators (Side Effects or Consequences) of stress

such as illicit drug use and cigarettes smoking; Instruments for measuring or discovering stress such as Beck Depression Inventory; and Stress Management such as prevention and intervention. Results in all 49 articles were reviewed to identify duplicate data and contrivers, in addition to developing tables that include the different aspects of stress.

## Results

Most of the previous studies about stress amongst dental students focused mainly on sources of stress and factors influencing the level of stress, such as gender and other demographic variables. Twenty-five of the previous studies mentioned the symptoms of stress and their consequences, 28 articles used instruments and tools for discovering stress or its sequences, and 18 articles discussed the management of these stressors related to stress amongst undergraduate dental students.

### Demographic variables of stress

Demographic variables that may influence stress are listed in Table 2.3. The most frequently mentioned variable is year of dental program where the junior and senior dental students differ in reporting level of stress.<sup>(2, 3, 9, 13, 16, 20-22, 24, 31, 34, 35, 37, 46-49)</sup> Female dental students generally reported significantly more stress than male dental students, whilst senior dental students generally have more stress than junior dental students.<sup>(2-4, 8, 12, 16, 20-22, 24, 31, 33-38, 46, 49-54)</sup> Other demographic variables are country,<sup>(24, 49, 52)</sup> nationality,<sup>(16, 20)</sup> and race and ethnicity.<sup>(22, 38)</sup> Moreover, first choice for dentistry as choice for admission affected the stress level where students choosing dentistry as first choice for admission reported less stress.<sup>(20, 21, 31, 35, 36)</sup>

Other less frequently mentioned variables discussed were tuition payment,<sup>(22)</sup> marital status,<sup>(34)</sup> support,<sup>(34)</sup> student debt,<sup>(19)</sup> predental education,<sup>(19, 52)</sup> social class,<sup>(55)</sup> age,<sup>(46, 52)</sup> and stage of course.<sup>(38)</sup>

Table 2.3: Demographic variables

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Year of study	(2, 3, 9, 13, 16, 20-22, 24, 31, 34, 35, 37, 46-49)
Age	(46, 52)
Gender	(2-4, 8, 12, 16, 20-22, 24, 31, 33-38, 46, 49-54)
Marital status	(34)
Country	(24, 49, 52)
Nationality	(16, 20)
Race and ethnicity	(22, 38)
Tuition payer	(22)
First choice for admission	(20, 21, 31, 35, 36)
Support	(34)
Student debt	(19)
Predental education	(19, 52)
Social class	(55)
Stage of course	(38)

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### Sources of stress

Most of the studies identifying sources of stress came up with a list of stressors affecting dental students. The major stressor was different amongst different studies or different countries, but the following major five groups of stressors appeared in most studies: (i) living accommodation factors, (ii) personal factors, (iii) educational environment factors, (iv) academic factors and (v) clinical factors. These five groups will be discussed below.

#### Living accommodation factors

Factors related to living accommodation are presented in Table 2.4. Studies conducted in countries where government and family support dental students financially reported problems with accommodation as major factor resulting in stress for dental students.<sup>(2, 12, 33, 53)</sup> However, the results do not point in the same direction. One study revealed that students living at home were less stressed than those living away,<sup>(33)</sup> whilst another study reported that students living with their parents had higher stress scores than students living away from home.<sup>(19)</sup> Lack of recreation facilities within the accommodation also appeared as a source of stress for some, especially male dental students.<sup>(13, 53)</sup>

Table 2.4: Living accommodation factors

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Problem with accommodation	(2, 12, 33, 53)
Home residence	<sup>(19)</sup>
Lack of recreation facilities	<sup>(13, 53)</sup>

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### Personal factors

Personal factors that can be a source of stress for dental students are summarized in Table 2.5. Most frequently mentioned personal factors in countries where dental students support themselves financially (for example in USA and Canada) were financial problems.<sup>(7, 9, 12, 22, 25, 53)</sup> Sometimes students just cannot afford the costs that are incurred studying dentistry. Apparently, studying dentistry is also time consuming. Students usually need to spend more than 40 hours weekly in dental school to attend their lectures and training sessions. Moreover, they need ample time for self-study activities and to satisfy practical requirements. Several dental educational programs use the student study time insufficiently which may lead to inadequate time for social activity,<sup>(13, 56, 57)</sup> lack of time for relationships,<sup>(19)</sup> reduced holidays,<sup>(12, 53)</sup> lack of time for relaxation,<sup>(16, 21, 35, 37)</sup> lack of free time to complete assignments,<sup>(13, 19, 37, 49)</sup> late work-session ending time,<sup>(31)</sup> other time constraints,<sup>(58)</sup> and limitation of leisure time.<sup>(25, 56)</sup> Personal factors less frequently mentioned in the literature are personal problems,<sup>(2, 7)</sup> family problems,<sup>(7)</sup> self-efficacy beliefs,<sup>(3, 16)</sup> lack of social recognition,<sup>(57)</sup> worry propensity,<sup>(57)</sup> time management,<sup>(58)</sup> personality traits,<sup>(59)</sup> emotional intelligence,<sup>(46, 52)</sup> satisfaction to study dentistry,<sup>(52)</sup> and mental distress.<sup>(53)</sup>

Sometimes a language barrier causes stress,<sup>(31)</sup> for example when students come from a different country or study dentistry in a language that is different from their mother tongue language.

Table 2.5: Personal factors

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Financial problems	(7, 9, 12, 22, 25, 53)
Limitation of leisure time	(25, 56)
Reduced holidays	(12, 53)
Lack of time for relaxation	(16, 21, 35, 37)
Lack of free time to do assignments	(13, 19, 37, 49)
Late ending time	(31)
Time constraints	(58)
Time management	(58)
Lack of time for relation	(19)
Inadequate time for social activity	(13, 56, 57)
Personal problems	(2, 7)
Family problems	(7)
Self-efficacy beliefs	(3, 16)
Lack of social recognition	(57)
Worry propensity	(57)
Language barrier	(31)
Mental distress	(53)
Personality traits	(59)
Emotional intelligence	(46, 52)
Satisfaction to study dentistry	(52)

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### Educational environment factors

Educational environment factors related to stress are presented in Table 6. Dental students consider patient tardiness or no show as a major source of stress.<sup>(4, 9, 16, 35, 37)</sup> In addition, some educational environment factors are related to student support such as approachability of staff,<sup>(12, 21)</sup> work environment including rules and regulations,<sup>(12, 48)</sup> and home and family environment.<sup>(48)</sup> Prolonged frequent strikes by faculty which resulted in cessation of education could be a source of stress because students were delayed in their graduation.<sup>(53)</sup>

Table 2.6: Educational environment factors

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Patient tardiness or no show for appointments	(4, 9, 16, 35, 37)
Approachability of staff	(12, 21)
Work environment	(12, 48)
Home and Family environment	(48)
Prolonged frequent strikes by faculty	(53)

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### Academic factors

Academic factors, listed in Table 2.7, are mostly related to performance results, workload and fear. The most frequently reported source of stress for dental

students is examination and grades, which relate to students performance.<sup>(4, 9, 12, 13, 16, 20-22, 25, 35, 37, 49, 56)</sup> Other factors in this category relate to workload and pressure and include amount of assigned class work,<sup>(3, 19, 22, 31, 37, 57)</sup> heavy work days,<sup>(4, 22, 35)</sup> academic overload,<sup>(25, 33)</sup> workload,<sup>(57, 58)</sup> overextended work,<sup>(57)</sup> study pressure,<sup>(24)</sup> study obligation,<sup>(24)</sup> difficulty of class work,<sup>(37)</sup> and peer competition.<sup>(4, 8, 37)</sup> Female dental students suffer more than male students from lack of confidence,<sup>(12, 31)</sup> or worry about competence.<sup>(56)</sup>

Quite a number of studies mentioned fear as a source of stress. First, students often had a fear of failing,<sup>(4, 8, 12, 16, 20-22, 49)</sup> and second, a fear of being unable to catch up once they got behind.<sup>(4, 16, 49)</sup> Third, students are anxious about employment after graduation in their future career,<sup>(20, 22, 31)</sup> especially in places that featured high competition in dental practice. Fourth, some students (in India and Fiji) had fear of parents after failure.<sup>(22, 31)</sup> Finally, students had fear of postgraduate study,<sup>(31)</sup> doubting whether they had the capacities to be admitted in their desired postgraduate program.

Other academic factors less frequently mentioned in the literature included implementation of a new curriculum,<sup>(12, 21)</sup> curriculum design or system of study,<sup>(33)</sup> expectation versus reality of school,<sup>(12)</sup> securing proper study materials,<sup>(21)</sup> faculty-student relationships,<sup>(25)</sup> faculty and administration,<sup>(7)</sup> rules and regulations,<sup>(37)</sup> manual skills,<sup>(7)</sup> concern about good marks,<sup>(19)</sup> attitude of staff,<sup>(31)</sup> lack of positive feedback,<sup>(8)</sup> lack of tutor input,<sup>(37)</sup> inconsistency of professors' feedback,<sup>(9)</sup> high demand of the course,<sup>(20)</sup> and amount of cheating in dental school.<sup>(37)</sup>

Table 2.7: Academic Factors

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Examination and Grades	(4, 9, 12, 13, 16, 20-22, 25, 35, 37, 49, 56)
Fear of failing	(4, 8, 12, 16, 20-22, 49)
Fear of being unable to catch up if getting behind	(4, 16, 49)
Fear of parents after failure	(22, 31)
Fear of employment after graduation or unemployment	(20, 22, 31)
Fear of postgraduate study	(31)
Amount of assigned class work	(3, 19, 22, 31, 37, 57)
Full loaded day	(4, 22, 35)
Overextended work	(57)
Peer competition	(4, 8, 37)
Lack of confidence	(12, 31)
New curriculum	(12, 21)
Academic overload	(25, 33)
Workload	(57, 58)
Curriculum design	(33)
Study pressure	(24)
Expectation versus reality of school	(12)
Study obligation	(24)
Difficulty of class work	(37)
Worry about competence	(56)
Getting study materials	(21)
Faculty-student relations	(25)
Faculty and administration	(7)
Rules and regulations	(37)
Manual skills	(7)
Ensuring getting good marks	(19)
Attitude of staff	(31)
Lack of positive feedback	(8)
Lack of input	(37)
Inconsistency of professor's feedback	(9)
High demand of the course	(20)
Amount of cheating in dental school	(37)

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### Clinical factors

Clinical factors of stress mostly relate to requirements, patients and staff. These factors are listed in Table 2.8. The major factor in this category causing stress was fear of failure to complete clinical requirements.<sup>(4, 9, 19, 35, 37, 49, 56)</sup> Other factors related to criticism by the supervisors,<sup>(4, 21, 22, 31)</sup> patient contact,<sup>(32, 33)</sup> responsibility for comprehensive patient care,<sup>(7, 16, 25)</sup> the atmosphere created by clinical faculty,<sup>(9, 37, 49)</sup> patient-related aspects,<sup>(24)</sup> and difference in opinion amongst staff.<sup>(20)</sup> Other clinical factors resulting in stress were shortage of allocated clinical time,<sup>(4)</sup> performance pressure,<sup>(3, 57)</sup> and excessive work.<sup>(53)</sup>

Table 2.8: Clinical Factors

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Completing clinical requirements	(4, 9, 19, 35, 37, 49, 56)
Criticism by supervisor	(4, 21, 22, 31)
Patient contact	(32, 33)
Responsibility for comprehensive patient care	(7, 16, 25)
Atmosphere created by clinical faculty	(9, 37, 49)
Patient-related aspects	(24)
Difference in opinion between staff	(20)
Excessive work	(53)
Performance pressure	(3, 57)
Shortage of allocated clinical time	(4)

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### Signs and symptoms of stress

Students affected by stress show various signs and symptoms, as shown in Table 2.9. Stressed dental students may show anxiety,<sup>(11, 12, 39)</sup> depression,<sup>(11, 12, 39, 56)</sup> upset stomach,<sup>(24)</sup> sweating,<sup>(24)</sup> psychological distress,<sup>(32, 33, 53)</sup> burnout,<sup>(33, 58)</sup> environmental stress,<sup>(33)</sup> emotional exhaustion,<sup>(32, 56)</sup> and low academic achievement.<sup>(4, 60)</sup> Grandy et al. reported in detail various signs and symptoms of stress of students such as worry, tension, being upset, nervousness, discomfort, regret, lack of confidence, crying, indecision, unhappiness, avoidance, turmoil, insecurity, sadness, guilt, blame, irritability, apathy, weight loss, physical complaints, and fatigue.<sup>(10, 61)</sup>

Other signs and symptoms reported less frequently in the literature were low exam performance, where stressed dental students showed lower performances in exams than non-stressed students.<sup>(51)</sup> Other signs included hostility,<sup>(39)</sup> social life effects,<sup>(53)</sup> physical ill-health,<sup>(48)</sup> mental ill-health,<sup>(48)</sup> denial,<sup>(54)</sup> substance use,<sup>(54)</sup> gastrointestinal symptoms,<sup>(61)</sup> sleeplessness,<sup>(61)</sup> and psychosocial disturbance.<sup>(4)</sup>

Table 2.9: Signs and symptoms of stress

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Anxiety	<sup>(11, 12, 39)</sup>
Depression	<sup>(11, 12, 39, 56)</sup>
Upset stomach	<sup>(24)</sup>
Sweating	<sup>(24)</sup>
Psychological distress	<sup>(32, 33, 53)</sup>
Burnout	<sup>(33, 58)</sup>
Environmental stress	<sup>(33)</sup>
Emotional exhaustion	<sup>(32, 56)</sup>
Low academic achievement	<sup>(4, 60)</sup>
Worry, Tension, Being Upset, Nervousness, Discomfort, Regret, Lack of confidence, Fatigue, Crying, Indecision, Unhappiness, Avoidance, Turmoil, Insecurity, Sadness, Guilt, Blame, Irritability, Apathy, Weight loss, Physical complaints	<sup>(10, 61)</sup>
Exam low performance	<sup>(51)</sup>
Hostility	<sup>(39)</sup>
Social life effects	<sup>(53)</sup>
Physical ill-health	<sup>(48)</sup>
Mental ill-health	<sup>(48)</sup>
Denial	<sup>(54)</sup>
Substance use	<sup>(54)</sup>
Gastrointestinal symptoms	<sup>(61)</sup>
Sleeplessness	<sup>(61)</sup>
Psychosocial disturbance	<sup>(4)</sup>

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### Indicators (effects) of stress

One can use the indicators or effects of stress, listed in Table 2.10, for early intervention. Stress of students can be predicted by noticing their behaviors and habits such as illicit drug use,<sup>(47)</sup> cigarettes smoking,<sup>(36, 47, 48)</sup> alcohol consumption,<sup>(48)</sup> and low-standard professional attitudes.<sup>(55)</sup>

Grades and marks,<sup>(38, 51)</sup> in addition to academic achievement<sup>(55)</sup> can also be used as indicator of stress, where stressed students may have low grades and low achievement.

Stressed students who have relationship problems indicated lack of social integration and depersonalization,<sup>(56)</sup> and this affected students' relationship to patients and staff in a negative manner.

The literature reported the use of some indicators to examine stress amongst students such as mood (whether depressed or not),<sup>(58)</sup> and memory, the latter being affected negatively by stress.<sup>(51, 58)</sup>

Table 2.10: Indicators of stress

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Low Grades and Marks <sup>(38, 51)</sup>
Low Academic achievement <sup>(55)</sup>
Unprofessional attitudes <sup>(55)</sup>
Illicit drug use <sup>(47)</sup>
Cigarettes Smoking <sup>(36, 47, 48)</sup>
Lack of social integration and depersonalization <sup>(56)</sup>
Depressed Mood <sup>(58)</sup>
Memory Problems <sup>(58)</sup>
High General Health Questionnaire (GHQ) score <sup>(53)</sup>
High Salivary cortisol, <i>Immunoglobulin A</i> and <i>Chromogranin A</i> level <sup>(51)</sup>
Alcohol consumption <sup>(48)</sup>

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### Instruments for the measurement of stress

Only a few articles discussed instruments to discover stress amongst dental students. These are listed in Table 2.11. Most frequently used instruments in detecting stress amongst dental students were the DES questionnaire and modified versions of it,<sup>(2-4, 7, 9, 12, 13, 16, 19-22, 24, 31-38, 42, 49, 52, 62)</sup> the General Health Questionnaire,<sup>(33, 53)</sup> the State-Trait Anxiety Inventory,<sup>(10, 11)</sup> the Maslach Burnout Inventory,<sup>(33, 63)</sup> and the Beck Depression Inventory.<sup>(10, 11)</sup>

Less used instruments for detecting psychological stress amongst dental students in the literature are the Visual Analog Scale,<sup>(54)</sup> the General Well-Being Inventory,<sup>(64)</sup> the Perceived Stress Scale (PSS),<sup>(65)</sup> the Brief Symptoms Inventory (BSI),<sup>(2)</sup> and the Symptoms Questionnaire (SQ).<sup>(39)</sup>

Table 2.11: Instruments for the measurement of stress

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State-Trait Anxiety Inventory <sup>(10, 11)</sup>
Beck Depression Inventory <sup>(10, 11)</sup>
Visual Analog Scale <sup>(51)</sup>
General Well-Being Inventory <sup>(64)</sup>
Dental Environment Stress Questionnaire (DES) <sup>(2-4, 7, 9, 12, 13, 16, 20-22, 24, 31-38)</sup>
General Health Questionnaire (GHQ) <sup>(29, 50)</sup>
Perceived Stress Scale <sup>(65)</sup>
Maslach Burnout Inventory <sup>(28, 29)</sup>
Symptoms Questionnaire <sup>(30)</sup>
Brief Symptoms Inventory (BSI) <sup>(2)</sup>

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### Management of stress (prevention and intervention)

Few studies discussed the prevention or intervention of stress as compared to studies that reported sources of stress. These prevention and intervention procedures are illustrated in Table 2.12 and have been classified into six categories.

The first category relates to supporting students effectively and academically by explaining the expected outcomes and motivation to access available students' services. Female dental students especially need more effective support than male students to ensure that they have realistic expectations about the curriculum. Also, encouragement of students is needed to access student services in a proactive manner and using social support as a coping strategy. Moreover, providing a conducive learning environment and added support during periods of transition <sup>(12, 25, 39, 48, 53)</sup> is recommended.

The second category is providing counseling services for dental students. <sup>(12, 25, 36, 53, 66)</sup> Dental school should hire full-time psychologist who should provide counseling and help students to overcome any stress source or effect.

The third category consists of stress management procedures through providing a student-friendly approach and student-centered learning or curricula. <sup>(3, 12, 38, 66)</sup> This will address students concerns <sup>(20)</sup> which will decrease stress level. Finally, one article gives the advice to eliminate unit requirements, <sup>(3)</sup> in order to remove the fear of failure to complete the requirements.

The fourth category is related to instructors. The recommendation is that they should promote physical exercise and interaction with a psychologist, <sup>(31, 36)</sup> while students should carefully select the instructor to be approached for comments. <sup>(8)</sup> Moreover, the provision of orientations, study guides, syllabuses, formative assessments, ample time, elimination of quotas, and team assignment are suggested. <sup>(25)</sup>

The fifth category of procedures for stress reduction consists of relaxation via synchro-energizer and progressive relation training, <sup>(67)</sup> training workshops that include aspects of academic problem solving, <sup>(50)</sup> relaxed teaching method, <sup>(2)</sup> early patient contact and residing at home, <sup>(32)</sup> small group meeting which provides stress relief, <sup>(53)</sup> deep breathing and Progressive Muscular Relaxation (PMR), <sup>(54)</sup> and introducing stress-management training over time which is effective in stress reduction and coping. <sup>(61)</sup>

The sixth category related to stress prevention is student selection and development of admission criteria. Student selection can be based on different tests, like an emotional intelligence test, <sup>(52)</sup> and personality inventories. <sup>(59)</sup>

Finally, one interesting study done in India recommends that parents should be advised not to force their children to study something against their will, <sup>(31)</sup> since they found fear of parents after failure is a major source of stress particularly in that part of the world. Promoting interactions with other students and associated peer support may serve as a stress buffer. <sup>(39)</sup>

Table 2.12: Management of stress

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1.	Effective support	(12, 25, 39, 48, 53)
2.	Counseling services	(12, 25, 36, 53, 66)
3.	Student-friendly approach, address students concerns, eliminate unit requirements	(3, 12, 38, 66)
4.	Instructors promote physical exercise and provide orientations, study guides, syllabuses, formative assessments, ample time, and elimination of quotas, team assignment, and periodic interaction of the dental faculty with psychologists. Students advised to select carefully which instructor should be asked for comments.	(31, 36)
5.	Stress reduction and assertiveness training workshops that include aspects of academic problem solving, synchro-energizer and progressive relation training, deep breathing and PMR, relaxed teaching method, early patient contact and residing at home.	(2, 32, 50, 53, 54, 61, 67)
6.	Student selection should be based on emotional intelligence score, personality traits.	(52, 59)

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## Discussion

This study to the best of our knowledge is the first systematic review of the literature about stress amongst undergraduate dental students. In this review we made a distinction between different aspects of stress, namely demographic variables, stressors, signs and symptoms, indicators, measuring instruments, and finally the management of stress.

Previous studies about stress amongst dental students showed significant stressors mostly related to examinations, clinical requirements, patients, financial problems, lack of time for relaxation, and faculty feedback or criticism. Moreover, fear of parents after failure,<sup>(31)</sup> getting material for study, clinical requirements<sup>(21)</sup> and overcrowded accommodation<sup>(53)</sup> were a major source of stress for dental students in a few countries. Many studies reported that female dental students showed more stress than male, and sometimes the literature shows that there is a difference between preclinical and clinical years. Preclinical years stress affect female more than male, but clinical years affect male more than female students.<sup>(4)</sup> Some sources of stress were found more often in female than male, such as lack of confidence in clinical decision making, and doubt to be a successful dentist.<sup>(12)</sup>

First choice for admission has been reported as an important demographic variable and it has been shown that there is more stress amongst those students who were admitted in dentistry against their first choice.<sup>(21, 31, 35, 36)</sup> In addition, stress differs according to the year of study, where it was reported that more stress exists in senior years generally.<sup>(2-4, 8-10, 15, 17, 20-22, 24, 31, 33-37, 46, 47, 49, 51-53, 56)</sup> Dominant stressors of junior students in preclinical years differ from those of senior dental students in the clinical years, and the stress level is increasing over time.<sup>(2)</sup>

According to Cooper's theory,<sup>(27)</sup> stress may cause symptoms of mental illness such as anxiety, depression and somatic complaints which may act as stressors. However, all previous studies did not study (to our knowledge) the level of stress amongst dental students without mental illness. We recommend future researchers to screen dental students for mental illness before inclusion in their study to record perceived stress and stressors.

When we oversee the results and put them into perspective the following conclusions may be extracted. First, stress amongst dental students and stressors seem in general not to be dependent on the period of study. For example, we found comparable results of studies in the 1990s of the last century and first decade of the present century. Second, specific stressors seem to differ in different parts of the world. Stressors related to fear of parents were found more significant in India, stressors related to the financial situation of the students were more significant in western countries than in eastern countries, and stressors related to resources and dental material supply were more significant in poor countries in Africa.<sup>(9, 19, 21, 31)</sup>

Stress amongst dental students can be discovered early by looking closely at signs and symptoms of stress including student performance. Instruments of stress are useful for early detection so that stress issues can be immediately addressed.<sup>(24, 50, 68)</sup>

Prevention and intervention of stress has been reported in three articles,<sup>(24, 54, 69)</sup> including ways of supporting students, counseling services, stress reduction methods, and revising criteria for admission. For future studies, it is recommended to investigate the influence of new educational approaches such as two-way learning and a student-centered curriculum on the level of stress, as compared to more traditional lecture-based educational programs.

This overview of the literature was concentrated on dental students. To investigate the specificity of the results a comparison was made with comparable studies amongst medical students.<sup>(70-79)</sup> Interestingly, Tyssen showed in his study concerning relationship between personality and stress amongst medical students that a specific combination of personality traits can predict medical school stress. For example, he found that the combination of high neuroticism and high conscientiousness were predisposing for the development of psychological complaints.<sup>(80)</sup> This has not been found in the present overview for dental students. Moreover, medical students experience the highest degree of pressure during their first year when studying theoretical information and during the transition to clinical care rotations. Comparable to our finding concerning stress levels was that these were higher for female medical students than for male medical students. Medical students had higher depression rates than the general population, and female students had higher depression rates than male students.<sup>(81, 82)</sup>

Management of stress has been studied more amongst medical than dental students. Studies amongst medical students recommended prevention of stress, and intervention via different modalities. These include counselling,<sup>(83)</sup> student-led

stress management programme,<sup>(84)</sup> introducing mind-body elective,<sup>(85)</sup> using pass-fail grading instead of traditional grading,<sup>(71)</sup> encouraging students' socialization,<sup>(86)</sup> peer counseling at the campus,<sup>(87)</sup> increasing student feedback and teaching effective coping strategies.<sup>(88)</sup>

The outcome of this literature review will be used for the development of a new questionnaire that is directed at the measurement of aspects in the educational system influencing the level of stress amongst dental students. In addition to the above, these aspects include new dental technology and the students' mental health. More focus will be needed on the process of dental education, the learner and the environment.<sup>(43)</sup>

Measuring stress level before admission and personality identification will help in knowing the actual increase of stress subsequent to undertaking dental education. Also, more studies are needed for programs or courses for prevention and intervention of stress. New innovative dental curricula or modification of traditional curricula should be encouraged when attending stress in dental education. Successful reduction or intervention of stress before graduation will be considered as preventive measure for stress after graduation and may decrease early retirement or dropout from work in dentistry.

### **Limitations of this review and recommendations for future research**

There are several limitations of this systematic review. First, whilst it covered studies that met the inclusion criteria some of these studies were old, or were only published in local journals.<sup>(6, 89, 90)</sup> The generalizability of these findings from the later can be questioned, because they may reflect only local problems.

Second, in general, there is a lack of information concerning the stress level of students before they enter the dental education program. Not any study measured the level of stress before admission to the dental school. Longitudinal research could be helpful to investigate the amount of stress (increase or decrease) amongst students during their academic career. Such information will be relevant to the people who are responsible for the dental education programs.

Third, most of the reported studies only used subjective measures of the stress level, whereas more objective data were lacking. So, for future research and for educational practice, it is recommended to monitor the level of stress of the students, whether at the beginning of their study or at various intervals during the curriculum as a longitudinal survey. A meta-analysis of the studies might be encouraged to quantify the stressors level in studies that used DES questionnaire as measuring tool. The information coming from this monitoring system may be used for prevention or intervention. Finally, it might be useful to try to gather more objective information about the stress levels of students to complement the subjective information, for example by measuring their cortisol levels in different phases of the curriculum.

Of course, we do not want to suggest that the stress during the dental study should be reduced to zero. The study of dentistry and the profession of the dentist are exciting and some 'normal' stress remains necessary to optimal performance when both studying dentistry and treating patients. However, too high stress levels may have detrimental effects, first on study achievements and ultimately for dental outcomes of real patients.

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# Appendix 1

□

**Study ID:** .....

□

## A. Review Form

### Screening Questions:

- |   |     |    |
|---|-----|----|
| 1. Does the study include data on stress among dental students? | Yes | No |
| 2. Has the study been done on undergraduate dental students?    | Yes | No |
| 3. Is the study has been written in English?                    | Yes | No |

Note: If any answer with No, that study will be excluded.

### Assessment:

- |  |     |    |
|--|-----|----|
| 4. Exclude following initial screening (Title/Abstract). | Yes | No |
| 5. Exclude following full text screening.                | Yes | No |

If excluded why .....

□

## B. Data Extraction Form

### I. General Information

- |                             |
|-----------------------------|
| a. Primary author.....      |
| b. Year of Publication..... |
| c. Journal .....            |
| d. Country.....             |

### II. Specific Information

- |                                   |
|-----------------------------------|
| a. Study design .....             |
| b. Study Sample .....             |
| c. Response Rate .....            |
| d. Survey tool.....               |
| e. Administration of survey ..... |

### III. Outcomes

- |  |
|--|
| Demographic variables of stress.....                   |
| Sources of stress.....                                 |
| Impacts of stress (Symptoms & Signs) .....             |
| Indicators of stress .....                             |
| Instruments of measuring or discovering stress .....   |
| Management of stress (Prevention & Intervention) ..... |

□

Reviewer Signature: ..... Date: .....

## Chapter 3

# Effect of the year of study on the stress level among male undergraduate dental students

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## **Abstract**

Stress among dental students can be a significant threat, resulting in physical and/or mental illness, and have a negative effect on students' performance and the professional practice of dentistry. Stress can occur from different sources. The purpose of this study is to test whether the year of study has an effect on the stress levels of dental students. Our study consisted of a cross-sectional survey using a modified version of the Dental Environment Stress (DES) questionnaire. The questionnaires were filled out by male undergraduate dental students at King Saud University in Riyadh City during the 2010-2011 academic year (N = 214). The results show the most common sources of stress: examinations and completing clinical requirements. Moreover, in the five-year lecture-based traditional curriculum, the third year students reported the highest level of stress, whereas the first year reported the lowest level of stress. Third year undergraduate dental students reported the highest level of stress. This stress could be reduced by reviewing and modifying the dental curriculum by allowing students to have contact with patients more gradually, starting from the first year. In addition to adding stress prevention and intervention programs in dental curricula.

## Introduction

The dental profession is one of the most stressful health professions.<sup>(1)</sup> Stress-related illnesses, together with musculoskeletal disorders, are the main factors that influence dentists' early retirement.<sup>(2)</sup> A literature review on potential stressors and coping techniques in dentistry suggests that this stress begins in dental school.<sup>(3)</sup> Studies in dental schools around the world examined sources of stress among undergraduate dental students,<sup>(4)</sup> and have indicated a significant increase in stress among dental students during the last decades since 1980. Academic factors, such as examinations and faculty relationships with students, were also shown to create considerable amounts of stress.<sup>(5)</sup>

Some stress is desirable to prevent boredom and understimulation, but the persistence of stress-related symptoms may result in a decrease in mental and/or physical health, diminished efficiency at work or learning, or even substance abuse. Stress is a significant threat that can result in physical and/or mental illness, and may have a significant negative effect on students' performance and professional practice of dentistry.<sup>(4)</sup> The major sources of stress that have been reported are the following: examinations, grades and fear of failure,<sup>(6, 7)</sup> clinical requirements,<sup>(6, 7)</sup> limited time for relaxation,<sup>(6)</sup> clinical competitiveness,<sup>(8)</sup> clinical and supporting staff.<sup>(7, 9)</sup> These stressors have been categorized into different factors, i.e. academic, clinic-related, social, and financial or a combination of these factors. These stressors affect dental students differently according to their year of study.

Many studies have been conducted in dental schools around the world,<sup>(7-30)</sup> including Jordan, Malaysia, Australia, India, Nigeria, Fiji, Japan, Trinidad and Tobago, the US, Israel, Canada, and some European countries. Most of these studies have been cross-sectional surveys using an original version or a modified version of the Dental Environment Stress (DES) questionnaire. The most significant sources of stress among undergraduate dental students differ from one study to another. For example, in Western countries the most significant stressors are financial stressors,<sup>(26)</sup> whereas in India the most significant stressors are related to parents forcing their kids to study dentistry against their will.<sup>(13)</sup> Although each student experiences the stress of professional training somewhat differently, the cumulative effects of these stressors can have a serious impact on students' psychological health.<sup>(31)</sup> In addition, intense interaction between the dentist and patients may precipitate a state of "burnout" that consists of emotional exhaustion, depersonalization, and reduced personal accomplishment.<sup>(32)</sup> The burnout syndrome occurs not only as a result of face to face contact, but also as a consequence of chronic stress in general. The Burnout Clinical Subtype Questionnaire, measuring overload, lack of development and neglect, is proposed as a brief means of identifying the different ways in which this disorder is expressed.<sup>(33)</sup> It has been shown that the clinical years are more stressful than the preclinical years; however, clinical instructors create more stress than the treatment of patients. Moreover, uncertainty about dentistry as a career and unhealthy

perfectionism may predispose students to stress.<sup>(34)</sup> Students who receive support from teachers and other students, both within and outside dental school, have lower adjusted total stress scores on dental stress questionnaires.<sup>(27)</sup>

As mentioned, the sources of stress among dental students have been reported frequently in the literature; however, only a few articles studied the impact of the year of study on these sources of stress.<sup>(17, 35-37)</sup> For example, a study in Greece showed that dental students in their first, third, and fifth years showed more stress than second-year and fourth-year students in a 5-year Doctor of Dental Surgery curriculum.<sup>(38)</sup>

The main aim of the current study was to identify the effect of year of study on the level of stress among dental students in a 5-year Bachelor of Dental Surgery (B.D.S.) curriculum. An additional aim was to identify the main sources of stress in our sample, which was from a religious culture studying in a traditional curriculum.

## **Materials and Method**

### **Participants, Instrument, and Procedure**

A cross-sectional design was chosen to achieve the objective of the study; this choice was based on the fact that the majority of the studies on the subject of stress among dental students using the validated DES questionnaire also used a cross-sectional design. The survey was performed using a self-report questionnaire to assess the effect of year of study on the level of stress. Our sample consisted of male undergraduate dental students (n=214) with a mean age of 21 years who were enrolled in the College of Dentistry at King Saud University in Riyadh City, Saudi Arabia. Because of the limited number of male students, all students were invited to participate in the study. The College of Dentistry at King Saud University is the oldest and largest dental school in Saudi Arabia and follows a traditional lecture-based 5-year curriculum. The estimated number of students in each class is approximately 75 males. The education system in Saudi Arabia is sex-based, where males and females study in different locations and buildings. Ethical approval to conduct this study was obtained through the internal review board and King Abdullah International Medical Research Center.

A modified version of the US DES questionnaire was used.<sup>(5)</sup> The questionnaire contains 38 items to be scored on a six-point scale (from 0 = not stressful, to 5 = extremely stressful). This questionnaire yields scores on five different factors, (ie, Factor-I: a living accommodation factor; Factor-II: a personal factor, Factor-III: an educational environment factor; and Factor-IV: an academic factor; and Factor-V: a clinical factor).

The DES questionnaire was delivered by the class leaders to all five classes of male dental students and was filled out anonymously; 214 of the 345 students returned the completed questionnaire (response rate = 60.3%). Students' participation in the survey varied according year of study, with the highest

participation rate by students in their third year (38%) and the lowest by students in their fifth year (6.5%), see Table 3.1.

Table 3.1: Number of participants for each study year

Year of Study	Students	Percentage of total	Response rate
First year	41	19.2%	63.0 %
Second year	57	26.6%	83.8 %
Third year	83	38.8%	95.4 %
Fourth year	19	8.9%	30.1 %
Fifth year	14	6.5%	22.6 %

## Data Analysis

The means and standard deviations were computed for all items and categories. To assess the reliabilities of the five different factors, we calculated Cronbach's alpha coefficients. These were .93 for the clinical factor, .92 for the academic factor, .88 for the educational environment factor, .82 for the personal factor, and .85 for the living accommodation factor.

To identify any significant differences between years in the curriculum, the sources of stress were tested using one-way analysis of variance comparing the level of stress across the different academic years, from year 1 through year 5. A pair-wise comparison using the post hoc Tukey's test was also conducted to identify pairs of study years that were significantly different. All statistical tests were declared to be statistically significant at a level of .05 or less.

## Results

For all sources of stress, the means and standard deviations were computed and placed in order from the highest scores to the lowest scores (see Table 3.2). On the item level, examinations ( $3.38 \pm 1.28$ ) and completing clinical requirements ( $3.28 \pm 1.51$ ) were reported as the highest stressors. The next stressors reported with high scores were references and information resources ( $3.07 \pm 1.32$ ), insufficient treatment time ( $3.04 \pm 1.36$ ), and the system of the study ( $2.98 \pm 1.40$ ). On the factor level, the highest scores were found for the clinical factor ( $2.92 \pm 1.25$ ) and the academic factor ( $2.64 \pm 1.00$ ), whereas the living accommodation factor caused the least stress ( $1.36 \pm 1.09$ ). Third-year students reported greater stress than students in other years ( $2.74 \pm 0.71$ ), and first-year students reported the least stress ( $1.48 \pm 0.96$ ), as shown in Table 3.3.

One-way analysis of variance shows the scores for factors across years. Scores on the DES were lowest for first-year students ( $1.48 \pm 0.96$ ) and highest for third-year students ( $2.74 \pm 0.71$ ). Third-year students had the highest stress scores on the academic factor ( $2.93 \pm 0.80$ ), the educational environment factor ( $2.78 \pm 0.94$ ), and the personal factor ( $2.47 \pm 1.10$ ). However, second-year students had higher scores on the clinical factor ( $3.38 \pm 0.99$ ), and fourth-year students had the highest relative score on the living accommodation factor ( $1.80 \pm 1.09$ , see Table 3.3). DES scores were significantly different across years of study ( $F [4, 142] = 10.70, p < 0.01$ ). We also analyzed scores for the individual factors. All factors were significantly different across years of study (Factor-I  $F [4, 141] = 3.30, p < 0.05$ , Factor-II  $F [4, 142] = 3.96, p < 0.01$ , Factor-III  $F [4, 141] = 9.93, p < 0.01$ , Factor-IV  $F [4, 141] = 8.88, p < 0.01$ , Factor-V  $F [4, 139] = 18.72, p < 0.01$ ).

The above mentioned differences in DES scores were found to be mainly between first-year students and students from the other years. Scores on the educational environment factor, the academic factor, and the clinical factor of first-year students were lower than the scores for students in the other years.

Results from post hoc Tuckey's tests with Bonferroni correction showed significant differences. For the living accommodation factor, there was a significant difference between scores in the third year and the first year ( $1.095, p < 0.05$ ), second year ( $1.364, p < 0.05$ ), and fifth year ( $1.024, p < 0.05$ ). Scores on the personal factor show a significant difference between the third year and first year ( $1.502, p < 0.05$ ), second year ( $1.265, p < 0.05$ ), and fourth year ( $0.970, p < 0.05$ ). The personal factor showed a significant difference between the fifth year and the first year ( $1.005, p < 0.05$ ). Scores on the educational environment factor show a significant difference between the first year and the second year ( $-0.849, p < 0.05$ ), third year ( $-1.588, p < 0.05$ ), fourth year ( $-1.288, p < 0.05$ ), and fifth year ( $-1.516, p < 0.05$ ). In addition, the educational environment factor showed a significant difference between the second year and third year ( $-0.739, p < 0.05$ ). Scores on the academic factor showed a significant difference between the first year and second year ( $-1.266, p < 0.05$ ), third year ( $-1.533, p < 0.05$ ), fourth year ( $-1.129, p < 0.05$ ), and fifth year ( $-1.204, p < 0.05$ ). Finally, scores on the clinical factor revealed a significant difference between the first year and the second year ( $-2.084, p < 0.05$ ), third year ( $-1.760, p < 0.05$ ), fourth year ( $-1.844, p < 0.05$ ), and fifth year ( $-1.944, p < 0.05$ ). Third-year students reported the most stress compared with other years of study.

Table 3.2: Means (*M*), standard deviations (*Sd*), and 95% Confidence Interval (*CI*) of the difference of the items of the questionnaire

Questionnaire Items	<i>M</i>	<i>Sd</i>	95% <i>CI</i> *	
			<i>Lower</i>	<i>Upper</i>
Examinations	3.38	1.28	3.21	3.56
Completing clinical requirement	3.28	1.51	3.10	3.52
References and information resources	3.07	1.32	2.89	3.24
Insufficient treatment time	3.04	1.36	2.87	3.26
The system of study	2.98	1.40	2.79	3.17
Differences in opinion between clinical staff	2.97	1.35	2.80	3.17
Transition from pre-clinical to clinical staff	2.87	1.36	2.70	3.08
Competition for grades	2.85	1.29	2.68	3.02
Difficulty in managing difficult cases	2.82	1.35	2.64	3.02
Compliance of patients (patients turn up to appointment)	2.81	1.54	2.60	3.03
Inadequate time for relaxation	2.79	2.02	2.51	3.06
Confidence in own clinical decision making	2.74	1.44	2.55	2.95
Communication with patients	2.73	1.38	2.55	2.93
The amount of information given	2.71	1.27	2.54	2.89
Uncertainty about the field of study as a future career	2.71	1.44	2.51	2.91
Reduced holidays	2.69	1.45	2.50	2.89
Health hazard at work	2.68	1.40	2.50	2.88
Rules and regulations at work	2.66	1.43	2.47	2.86
Difficulty in learning and mastering precision manual skill	2.66	1.34	2.48	2.85
Adequacy of clinical supervision	2.54	1.44	2.34	2.74
New curriculum topics	2.53	1.27	2.36	2.70
Manual dexterity and manual skill	2.51	1.43	2.32	2.71
Self confidence	2.40	1.43	2.20	2.60
Conducive environment for teaching	2.38	1.29	2.20	2.55
Communication with and approachability of the staff	2.37	1.37	2.18	2.55
The teaching language	2.34	1.38	2.15	2.53
Receiving criticism at work	2.22	1.53	2.00	2.43
Social demands (married or unmarried, family, social expectation)	2.16	1.71	1.92	2.39
The teaching and communication language at work	2.12	1.45	1.92	2.31
Financial problem: travel, accommodation, fees, clothes, food etc	2.06	1.66	1.84	2.29
Discrimination between students	1.99	1.58	1.78	2.20
Lack of recreation places within the accommodation	1.82	1.42	1.61	2.00
Accommodation is not appropriate environment for study	1.78	1.39	1.59	1.97
Discrimination by origin, color or race	1.75	1.69	1.52	1.98
Living away from home	1.72	1.53	1.50	1.92
Personal health (chronic disease, drugs ,others)	1.71	1.60	1.48	1.92
Difficulty in making friends	1.57	1.40	1.38	1.75

Staying with flat mates	1.54	1.36	1.35	1.72
<b>Total</b>	2.46	0.91	2.34	2.58

Table 3.3: Stress through years of study: Means (M), standard deviations (Sd), and 95% Confidence Interval (CI) of the difference of the five factors of the questionnaire

Year	Factor I		Factor II		Factor III		Factor IV		Factor V		Total	
	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd	M	Sd
First	1.51	1.11	1.56	1.18	1.26	1.13	1.70	0.98	1.34	1.40	1.48	0.96
Second	0.99	1.07	1.65	1.05	2.18	0.99	2.87	0.94	3.38	0.99	2.43	0.75
Third	1.69	1.07	2.47	1.10	2.78	0.94	2.93	0.80	3.08	0.90	2.74	0.71
Fourth	1.80	1.09	1.94	1.11	2.62	0.87	2.74	0.93	3.13	0.91	2.56	0.79
Fifth	1.37	0.83	2.41	1.07	2.77	1.04	2.81	0.70	3.23	0.78	2.69	0.63
95% Lower	1.54		2.00		2.16		2.58		2.70		2.34	
CI Upper	1.87		2.33		2.46		2.85		3.02		2.58	

Abbreviations: Factor I, living Accommodation Factor; Factor II, personal factor; Factor III, educational environment factor; Factor IV, Academic Factor; Factor V, clinical factor.

## Discussion

The principal aim of this study was to investigate differences in stress levels among dental students across 5 years of their academic curriculum, and the second aim was to identify the most important sources of stress among the students in our sample.

With regard to the principal aim, third-year students generally reported the highest stress levels, while first-year students reported the lowest stress levels. An explanation for this finding is that third-year students are in the transfer phase from the preclinical to clinical years, in which they start to see patients and have to meet clinical requirements. With regard the second aim, examinations and clinical requirements were reported to be the highest stressors for dental students.

Previous studies have reported that examinations and completing clinical requirements are the highest sources of stress among dental students.<sup>(7, 8, 12, 16, 26, 38-45)</sup> These results were confirmed by this study. In addition, previous studies have reported that perceived stress differs by year of study, with the first and the last year producing the most stress for dental students. In contrast with these findings, in our study, the third year of a 5-year lecture-based traditional curriculum was reported as the most stressful, whereas the first year was reported as the least stressful.

Because of the differences in response rates, e.g. between the third year and fifth year, generalizations from the entire sample should be made with caution. Also, the results for the fourth and fifth years should be interpreted carefully because of the relatively low numbers of participants from these years.

Our findings regarding stress levels in third-year students led us to take a closer look at the curriculum for the first 3 years in order to redistribute or reduce

stress in these students. Introducing clinics gradually from the first year onwards might help to reduce stress in third-year students. Examinations and clinical requirements in the curriculum need to be modified to reduce the stress level among dental students. We also suggest incorporating a stress management program into the dental curriculum in order to teach students to deal better with the stress involved in their program.

A limitation of this study is that it did not include information on academic achievement (e.g. the grade point average of the students), so we were not able to identify the effect of the different stress factors on academic achievement. However, it has been reported in the literature that academic achievement is negatively affected by higher stress levels among dental students.<sup>(46)</sup> Another limitation of this study is that only male students could be involved, due to local sex-based education system.

Some stress is inherent to studying dentistry. Nevertheless, stress prevention and intervention measures, e.g. deep breathing and progressive muscle relaxation, can reduce or eliminate many sources of stress, and appropriate support services should be available for dental students.<sup>(47)</sup>

Future research should highlight students' level of stress prior to admission, for comparison with stress levels during the different years of study. In this way it will be possible to identify any increase in the level of stress due to the dental curriculum. Furthermore, research into differences between stress levels among dental students with different personality types (e.g. thinker or risk-taker personality types) might bring about new ideas for the development of stress prevention and intervention programs for students.<sup>(48)</sup> A thinker personality type does not take risks, because of serious worrying the consequences of their actions, which creates more stress. On the other hand, a risk-taker personality type is more inclined to take risks and not worry about the consequences, so may suffer less from stress.

Future research is needed to resolve the impact of the third-year program on stress in our sample, which might encourage dental educators to distribute educational materials through the dental curriculum in a way that can reduce stress in these students. Further research is recommended using qualitative methods like interviews and focus groups for in depth exploration of sources of stress and how they may be managed best, based on the views of the stakeholders. A comparable study including female students should be done by female colleagues who can access the female dental school in King Saud University.

## **Conclusion**

Third year undergraduate dental students reported the highest level of stress, which is the transfer zone from the preclinical phase to the clinical phase of the curriculum, in which dental students start to see patients. This stress could be reduced by reviewing and modifying the dental curriculum and

allowing students to have contact with patients more gradually, starting from the first year. To manage the most common sources of stress in dental students, we suggest including stress prevention and intervention programs within the dental curriculum.

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## Chapter 4

# Dental students stress management: A systematic review

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## **Abstract**

This study was conducted to compare the effectiveness of stress management programs in dental education, through a systematic review of the literature. The number of studies concerning stress management programs for dental students is limited, compared to studies discussing the sources of stress among dental students. Different types of programs for stress management have been reported, and they differ in their duration content, and outcomes. Two main strategies have been used to help stressed students: 1) decrease the number of stressors and 2) increase coping with stress. The first strategy includes several actions, such as reducing fear of failure and workload pressure due to examinations and requirements. The second strategy includes stress coping techniques, such as deep breathing exercises. Although positive effects have been reported for most of the programs, these results have mainly been found using self-report subjective measures. There is a need for more research to suggest the most effective stress management program.

## Introduction

Dental students have 100% prevalence of stress.<sup>(1)</sup> Perception of stress is due to the tendency of dental students toward perfectionism based on their history of high achievement and excellence in previous schools, while excellence is the norm in dental school.<sup>(2)</sup> Effect of year of study on stress level has been found significant, where the third year in five-year curriculum considered the most stressful.<sup>(3)</sup> Increasing stress may result in decreasing student's performance.<sup>(4)</sup> Stress can be a significant threat and cause bad effects on physical and/or mental health of students.<sup>(5)</sup> Stress may also harm trainees' professional effectiveness: it decreases attention, reduces concentration, impinges on decision-making skills, and reduces trainees' abilities to establish good doctor–patient relationships.<sup>(6)</sup>

In relation to the serious side effects of stress in health profession students, more than two decades ago Tisdelle reported the deficiency in the stress management research and the need of stress management programs for dental students.<sup>(7)</sup> This recommendation has not been followed sufficiently, despite numerous articles that reported the negative consequences of stress and recommendations to develop stress management programs for intervention and prevention. Although there is a large literature on stress management, its specific application to dental education has been largely unexplored. Compared to studies that reported different sources of stress, the number of studies discussing the prevention or management of stress in dental education is limited. However, a few researchers have studied the specific effects of stress-management programs in dental education and some have provided empirical data. There are 38 sources of stress reported in five groups: stressors related to living accommodation, stressors related to personal factors, stressors related to educational environment, stressors related to academic work, and stressors related to clinical factors.<sup>(5)</sup>

The prevention and intervention procedures have been classified in six categories.<sup>(5)</sup> Apart from these six categories, one study done in India recommends that parents should be advised not to force their children to study something against their will,<sup>(8)</sup> since they found fear of parents after failure is a major source of stress particularly in that part of the world.

Summarizing the literature, one can help stressed students either by decreasing the number of stressors or by increasing their coping skills with regards to stress.<sup>(9)</sup> Decreasing the number of stressors can be achieved by several actions, such as reducing fear of failure and workload pressure due to examinations and requirements.<sup>(9)</sup> In addition, the content of dental

curricula could be reduced, or the design of these curricula changed.<sup>(10)</sup> Clinical requirements can be reduced to decrease the number of stressors.<sup>(9)</sup> Dodge et al. found lower level of stress among the students in the clinical program based on the patient needs compared to the students in the clinical program based on the requirements. Furthermore, students in programs without requirements have higher productivity and academic performance.<sup>(11)</sup> Increasing the length of curricula in order to lower students' workload can help, this may also reduce their fear of failure.<sup>(9)</sup> Stress caused by uncertainty during transition periods can be reduced by scheduling information sessions between the students and their classmates from one year ahead, who can be a good source of information to their juniors.<sup>(9, 12)</sup>

Increasing students stress coping skills is important as well, as it may help students in their future professional activities. Kay and Lowe suggest implementing stress management and wellness courses for students.<sup>(13)</sup> Topics such as coping with stress, time management, and choosing realistic goals could be addressed. Moreover, overall wellness should be emphasized by discussing the importance of sleep, diet, exercise, and other stress relievers like yoga and meditation. Positive outcomes have been observed among dental and medical students in previous studies.<sup>(14-17)</sup>

The purpose of the present study is to systematically review the literature to identify stress management programs in dental education and to determine their effectiveness. We focused on programs that provide students with coping techniques, such as meditation, hypnosis, imagery, and muscle relaxation, education regarding the psychological and physiological effects of stress, affiliation with peers and opportunities for emotional expression (support groups), and intensified relationships with faculty. After the review of the literature we will discuss implications for the integration of stress management in dental education provide practical suggestions for decreasing and alleviating stress, and make suggestions for future research.

## **Method**

This systematic review has been conducted after the approval of the protocol by the Institutional Review Board (IRB) of the King Abdullah International Medical Research Center. Two reviewers, the first author and the third author, evaluated different studies on dental students stress management for inclusion in the present research. The aim of the evaluation was to assess the quality of the studies as objectively as possible. The assessment of the quality includes the study design, sampling (size and frame), measured outcomes, and reliability and accuracy of the data. The authors assessed the rigor of the studies to minimize the risk of bias by

their methodology (i.e. experimental studies are presented prior to quasi-experimental studies), and the rigor considered by the availability and quality of the study design, study sampling, response rate, measurement tool, and stress-management program.

## **Selection of studies**

The literature search has been executed primarily by searching PubMed (NLM), Library of Congress, LISTA (EBESCO), and Web of Science (TS). Different key words have been used in our literature search are Dental, Dentistry, Education, Management, Stress, and Students. To narrow our search key words have been combined by using AND as follows: "Dental Students Stress Management", Dental AND Students AND Stress AND Management, Dental AND Undergraduates AND Stress AND Management, Dental AND Students AND Stress, Dental AND Undergraduates AND Stress, Dental AND Education AND Stress, Dental AND Education AND Stress AND Management, Dentistry AND Stress AND Management. In addition, reference lists of retrieved articles were checked. Furthermore, experts in stress management and behavioral psychology have been contacted and asked about the subject. The citations identified in the electronic search have been downloaded into EndNote X2, while those retrieved from other sources were entered manually (e.g. hand searching, reference lists). Duplicates have been deleted and to each citation a unique identification was assigned (Author name and Year of publication) in the review form.

A review form has been designed (see Appendix S1) to help determine which papers should be included in the study. A paper was included if it was published in the English language between January 1966 and November 2013, included undergraduate dental students, and investigated or discussed any stress management program. When the information provided by the title and abstracts was found to be relevant to the present research, or when this information was insufficient to decide on inclusion, the full text article was retrieved and evaluated. All remaining articles were read in their entirety and a final selection was made.

Data were extracted from the selected studies using a data extraction form (see Appendix S2). The data extraction form included questions organized in three categories: general information (primary author, year of publication, country, journal); specific information (study design, study sample, stress management program); and analysis of outcomes (prevention, intervention). The review and data extraction forms were tested in a pilot study of a small number of papers. Based on the findings of the pilot, the forms were revised prior to use for identification of the articles included in the present study.

## **Procedure**

The two reviewers (AMA, AHA) reviewed all the articles; the primary investigator was a consultant in dental services, program director, and a PhD student in a medical education program, and the other was a dental consultant interested in

stress among dental professionals and students. The reviewers used the review and data extraction forms, and in case of difference of opinion between the two reviewers, an expert was consulted to resolve the matter.

### **Data Analysis**

The results of the selected studies were combined and the findings reported most frequently were identified and summarized in tables. Aspects of stress management were categorized according to whether they were prevention or intervention programs. The results of all the papers included articles were reviewed to identify duplicate data, and a table was developed that included all aspects of stress management.

### **Results**

Most of the literature addressing stress in dental students focused on the sources of stress and factors influencing the level of stress, such as gender and other demographic variables. Despite the call for stress management among dental students, only a small number of articles were found that discussed programs for managing these stressors in undergraduate dental students.

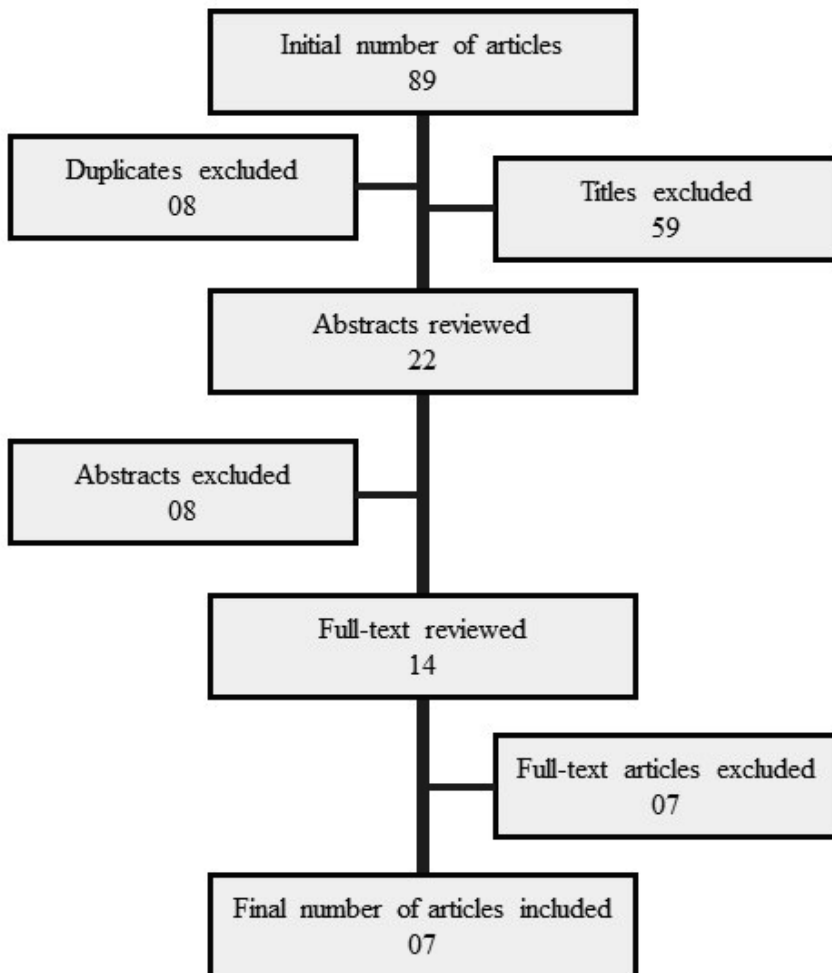


Figure 4.1: Number of articles during the review

The initial electronic search by the key words revealed 89 papers; after excluding duplicates and irrelevant papers by review of titles, this number was reduced to 22 (Figure 4.1). The reviewers went through these 22 papers by reading the abstract, and after checking if the papers measured the effects of stress management programs in dental students, the number of papers was reduced further to 14. After reading the full text of these 14 papers, more papers were excluded according to the selection criteria, finally leaving seven papers for analysis (see Table S1).

Four of the studies selected were controlled trials,<sup>(18-20)</sup> the fifth was a cross-sectional survey, the sixth was a case report, and the seventh was a

systematic review addressing stress in dental students.<sup>(5), (21), (1)</sup> These selected studies discussed different stress management programs, ranging from a short (one sixty-minute session) program to a rather intensive (six sixty-minute to ninety-minute sessions) program. Five of the selected studies reported intervention programs for stress management and the other two reported prevention programs.<sup>(1, 5, 18-22)</sup> For six of the seven programs the authors report significant effects on stress reduction; in only one study no significant effect was found.<sup>(18)</sup>

The stress management programs were varied in type; there are programs that train students to use specific relaxation strategies or techniques (i.e. Deep breathing, Progressive Muscle Relaxation, Synchro-Energizer, Yoga).<sup>(1, 18-20)</sup> Other programs introduce an interpersonal approach to dentistry (i.e. faculty advising system, counseling system, study and test-taking skills program, stress management workshop),<sup>(21)</sup> and another program applies multiple stress-management seminars.<sup>(22)</sup>

Outcomes of the stress management programs were measured by multiple measurement tools including; Visual Analog Scale (VAS),<sup>(18, 19)</sup> Spielberger State-Trait Anxiety Inventory (STAI),<sup>(18-20, 22)</sup> COPE questionnaire,<sup>(18)</sup> Dental Environment Stress (DES) questionnaire,<sup>(1)</sup> Expectancy,<sup>(22)</sup> Stress Knowledge Inventory,<sup>(22)</sup> Profile of Mood States,<sup>(20)</sup> Observer Rating Inventory,<sup>(20)</sup> Thurstone Temperament Schedule and Stanford Stress Questionnaire.<sup>(20)</sup>

The variety of the stress management programs (Table 4.1) revealed there is no golden standard yet for the duration, or the outcome measurement tools. There are no stress management programs that deal with all sources of stress that are known from the literature.

Table 4.1: Summary of Selected Studies

Reference	Year	Study Sample	Study Design	Outcomes Measurement	Effectiveness
Shankarapillai et al <sup>(19)</sup>	2012	100 students	Controlled Trial	VAS, STAI	Significant stress reduction
Alzahem et al <sup>(5)</sup>	2011	49 articles	Systematic review	Data collection form	Not Applicable
Ahmad et al <sup>(1)</sup>	2012	291 students	Cross-sectional	EDS questionnaire	90.3 % stress reduction
Piazza-Waggoner et al <sup>(18)</sup>	2003	26 students	Controlled Trial	VAS, STAI, COPE	No significant effect
Howard et al <sup>(20)</sup>	1986	23 students	Controlled Trial	PMS, STAI, ORI, Symptoms Questionnaire	Stressed students benefited the most
Schwartz et al <sup>(21)</sup>	1984	Dental students	Case Report	Not Available	Not Available
Tisdelle et al <sup>(22)</sup>	1984	17 Students	Controlled Trial	Stress Knowledge Inventory, STAI, Symptom Checklist, Physiological Assessment	Effective in reducing dental students physiological and self-reported stress level

## Discussion

This study was conducted to identify stress management programs in dental education, and to determine their effectiveness. For that aim we executed a systematic review of the literature. Seven articles were selected and reviewed, however only four articles showed significant stress reduction in students after the suggested stress management programs. In almost all programs, the participants found the programs useful.

The number of studies discussing the content and effectiveness of stress management programs for dental students is limited, compared to the studies discussing the sources of the stress among dental students. The stress management programs reported in the literature for medical students were limited too, and included self-hypnosis, meditation, mindfulness-based stress-reduction, changes in the grading system as pass/fail grading, feedback on various health habits, educational discussion, changes in the length and type of curriculum.<sup>(23)</sup> There are

other studies discussing different stress management programs but these do not focus on dental students specifically. Online stress management programs are effective if participants feel enjoyment, and are proven to be more easily accessible and to decrease the cost compared to traditional programs.<sup>(24-26)</sup> Cognitive-behavioral stress management programs have been shown to be effective in reducing dysfunctional thought and decreasing stress.<sup>(27, 28)</sup> These general findings about stress management programs could be used for designing programs for dental students specifically.

Different types of programs about stress management for dental students have been reported, and they differ in their duration, content, and effect. These programs are either single or multiple sessions and contain relaxation techniques or information about stress. The shortest stress management program consisted of a one-hour session, while the longest consisted of six sixty-minute to ninety-minute sessions. The stress management programs either help to reduce the number of stressors or enhance the stress coping skills including relaxation techniques as deep breathing and yoga. Stress management programs offering stress prevention tried to reduce the stressors through stress awareness lectures.

The reported stress management programs were not following one concept. These programs either used one measure or combination of measures. For instance some studies improved the interprofessional relation to reduce stress among dental students or used yoga, and the other studies used the SE and PMR, or combination of awareness and stress-reduction exercise in multiple sessions. Most of these programs were liked by the students and helped them to manage their stress, and do not follow a golden standard.

The huge impact of stress on dental students requires stress management programs in dental education. Effective stress management programs can be introduced in dental curricula, and for example a clinical psychologist can be recruited for dental students in dental schools. Based on our review, the following considerations should be incorporated into future research: (1) rigorous study design, including a Randomized Control Trial; (2) precise study of varying durations and frequencies of interventions (e.g., single-session versus multiple-session programs); (3) more objective outcome measures next to self-reports; and (4) long term follow up of the effectiveness.

A limitation of this review might be the restricted number of studies selected. Therefore, future studies are needed in which effectiveness of stress management programs for dental students are investigated.

This review has described the importance of stress-management programs, the promising start made by those already implemented and investigated, and the great unexplored territory that must be charted if these interventions are to efficiently and effectively succeed in the twin goals of benefiting future dentists and their patients and establishing a sound scientific base for future research.

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23. Shiralkar MT, Harris TB, Eddins-Folensbee FF, Coverdale JH. A systematic review of stress-management programs for medical students. *Acad Psychiatry.* 2013;37(3):158-64.
24. Morledge TJ, Allexandre D, Fox E, Fu AZ, Higashi MK, Kruzikas DT, et al. Feasibility of an online mindfulness program for stress management--a randomized, controlled trial. *Ann Behav Med.* 2013;46(2):137-48.
25. Williams A, Hagerty BM, Brasington SJ, Clem JB, Williams DA. Stress Gym: Feasibility of deploying a web-enhanced behavioral self-management program for stress in a military setting. *Mil Med.* 2010;175(7):487-93.
26. Kawai K, Yamazaki Y, Nakayama K. Process evaluation of a web-based stress management program to promote psychological well-being in a sample of white-collar workers in Japan. *Ind Health.* 2010;48(3):265-74.
27. Moeni B, Hazavehei SM, Hosseini Z, Aghamolaei T, Moghimbeigi A. The Impact of Cognitive-Behavioral Stress Management Training Program on Job Stress in Hospital Nurses: Applying PRECEDE Model. *J Res Health Sci.* 2011;11(2):114-20.
28. Leung SS, Chiang VC, Chui YY, Mak YW, Wong DF. A brief cognitive-behavioral stress management program for secondary school teachers. *J Occup Health.* 2010;53(1):23-35.

# Supplementary material

## Appendix S1: Study Review Form

Study ID: .....

### Study Review

#### I. Screening Questions:

- |    |   |     |    |
|----|---|-----|----|
| a. | Does the study include data on stress management?         | Yes | No |
| b. | Has the study been done on undergraduate dental students? | Yes | No |
| c. | Is the study has been written in English?                 | Yes | No |

Note: If any answer with No, that study will be excluded.

#### II. Assessment:

- |    |  |     |    |
|----|--|-----|----|
| a. | Excluded following initial screening (Abstract). | Yes | No |
| b. | Excluded following full text screening.          | Yes | No |

If excluded why

.....

## Appendix S2: Data Extraction Form

### I. General Information

- a. Primary author.....
- b. Year of Publication.....
- c. Journal .....
- d. Country.....

### II. Specific Information

- a. Study design .....
- b. Study Sample .....
- c. Stress Management Program .....

### III. Outcomes

- a. Prevention .....
- b. Intervention .....
- c. Duration .....
- d. Outcomes measurement .....
- e. Effectiveness .....

Reviewer Signature: ..... Date: .....

Table S1: References Checklist

Reference	Title	Abstract	Full-text	Exclusion reason
1. *Shankarapillai R, Nair MA, George R. The effect of yoga in stress reduction for dental students performing their first periodontal surgery: A randomized controlled study. <i>Int J Yoga</i> 2012;5(1):48-51.				
2. Divaris K, Polychronopoulou A, Taoufik K, Katsaros C, Eliades T. Stress and burnout in postgraduate dental education. <i>Eur J Dent Educ</i> 2012;16(1):35-42.	X			Not on undergraduate students
3. *Ahmad MS, Md Yusoff MM, Abdul Razak I. Stress and its relief among undergraduate dental students in Malaysia. <i>Southeast Asian J Trop Med Public Health</i> 2012;42(4):996-1004.				
4. Tangade PS, Mathur A, Gupta R, Chaudhary S. Assessment of Stress Level among Dental School Students: An Indian Outlook. <i>Dent Res J (Isfahan)</i> 2011;8(2):95-101.	X			No management program
5. Pani SC, Al Askar AM, Al Mohrij SI, Al Ohali TA. Evaluation of stress in final-year Saudi dental students using salivary cortisol as a biomarker. <i>J Dent Educ</i> 2011;75(3):377-84.	X			No management program
6. Jurkat H, Hofer S, Richter L, Cramer M, Vetter A. [Quality of life, stress management and health promotion in medical and dental students. A comparative study]. <i>Dtsch Med Wochenschr</i> 2011;136(23):1245-50.		X		No management program
7. Huth KC, Chen HY, Mehl A, Hickel R, Manhart J. Clinical study of indirect composite resin inlays in posterior stress-bearing cavities placed by dental students: results after 4 years. <i>J Dent</i> 2011;39(7):478-88.	X			Not related to students stress management
8. *Alzahem AM, Van der Molen HT, Alaujan AH, Schmidt HG, Zamakhshary				

	MH. Stress amongst dental students: a systematic review. <i>Eur J Dent Educ</i> 2011;15(1):8-18.		
9.	Abu-Ghazaleh SB, Rajab LD, Sonbol HN. Psychological stress among dental students at the University of Jordan. <i>J Dent Educ</i> 2011;75(8):1107-14.	X	No management program
10.	Silverstein ST, Kritz-Silverstein D. A longitudinal study of stress in first-year dental students. <i>J Dent Educ</i> 2010;74(8):836-48.	X	No management program
11.	Polychronopoulou A, Divaris K. A longitudinal study of Greek dental students' perceived sources of stress. <i>J Dent Educ</i> 2010;74(5):524-30.	X	No management program
12.	Manhart J, Chen HY, Mehl A, Hickel R. Clinical study of indirect composite resin inlays in posterior stress-bearing preparations placed by dental students: results after 6 months and 1, 2, and 3 years. <i>Quintessence Int</i> 2010;41(5):399-410.	X	Not related to students stress management
13.	Hinshaw KJ, Richter LT, Kramer GA. Stress, burnout, and renewal activities of dental hygiene education administrators in six U.S. Midwestern States. <i>J Dent Educ</i> 2010;74(3):235-50.	X	Not related to dental students
14.	Dahan H, Bedos C. A typology of dental students according to their experience of stress: a qualitative study. <i>J Dent Educ</i> 2010;74(2):95-103.	X	No management former students
15.	Polychronopoulou A, Divaris K. Dental students' perceived sources of stress: a multi-country study. <i>J Dent Educ</i> 2009;73(5):631-9.	X	No management program
16.	Peker I, Alkurt MT, Usta MG, Turkbay T. The evaluation of perceived sources of stress and stress levels among Turkish dental students. <i>Int Dent J</i> 2009;59(2):103-11.	X	No management program
17.	Laurence B, Williams C, Eiland D. Depressive symptoms, stress, and social support among dental students at a historically black college and university. <i>J Am Coll Health</i> 2009;58(1):56-63.	X	No management program

18. Kumar S, Dagli RJ, Mathur A, Jain M, Prabu D, Kulkarni S. Perceived sources of stress amongst Indian dental students. <i>Eur J Dent Educ</i> 2009;13(1):39-45.	X	No management program
19. Schmitter M, Liedl M, Beck J, Rammelsberg P. Chronic stress in medical and dental education. <i>Med Teach</i> 2008;30(1):97-9.	X	No management program
20. Muirhead V, Locker D. Canadian dental students' perceptions of stress and social support. <i>Eur J Dent Educ</i> 2008;12(3):144-8.	X	No management program
21. Gorter R, Freeman R, Hammen S, Murtomaa H, Blinkhorn A, Humphris G. Psychological stress and health in undergraduate dental students: fifth year outcomes compared with first year baseline results from five European dental schools. <i>Eur J Dent Educ</i> 2008;12(2):61-8.	X	No management program
22. Muirhead V, Locker D. Canadian dental students' perceptions of stress. <i>J Can Dent Assoc</i> 2007;73(4):323.	X	No management program
23. Morse Z, Dravo U. Stress levels of dental students at the Fiji School of Medicine. <i>Eur J Dent Educ</i> 2007;11(2):99-103.	X	No management program
24. Sofola OO, Jeboda SO. Perceived sources of stress in Nigerian dental students. <i>Eur J Dent Educ</i> 2006;10(1):20-3.	X	No management program
25. Sugiura G, Shinada K, Kawaguchi Y. Psychological well-being and perceptions of stress amongst Japanese dental students. <i>Eur J Dent Educ</i> 2005;9(1):17-25.	X	No management program
26. Rosli TI, Abdul Rahman R, Abdul Rahman SR, Ramli R. A survey of perceived stress among undergraduate dental students in Universiti Kebangsaan Malaysia. <i>Singapore Dent J</i> 2005;27(1):17-22.	X	No management program
27. Rasmussen JK, Frederiksen JA, Hallonsten AL, Poulsen S. Danish dentists' knowledge, attitudes and management of procedural dental pain in children: association with demographic characteristics, structural factors, perceived stress during the administration of local analgesia and their tolerance towards pain. <i>Int J Paediatr Dent</i>	X	Not related to dental students stress management

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2005:15(3):159-68.			
28. Polychronopoulou A, Divaris K. Perceived sources of stress among Greek dental students. J Dent Educ 2005:69(6):687-92.	X		No management program
29. Pohlmann K, Jonas I, Ruf S, Harzer W. Stress, burnout and health in the clinical period of dental education. Eur J Dent Educ 2005:9(2):78-84.		X	No management program
30. Friedlander AH, Friedlander IK, Marder SR. Posttraumatic stress disorder: psychopathology, medical management, and dental implications. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2004:97(1):5-11.	X		
31. Cardoso CL, Loureiro SR, Nelson-Filho P. Pediatric dental treatment: manifestations of stress in patients, mothers and dental school students. Braz Oral Res 2004:18(2):150-5.	X		
32. *Piazza-Waggoner CA, Cohen LL, Kohli K, Taylor BK. Stress management for dental students performing their first pediatric restorative procedure. J Dent Educ 2003:67(5):542-8.			
33. Acharya S. Factors affecting stress among Indian dental students. J Dent Educ 2003:67(10):1140-8.	X		
34. Newbury-Birch D, Lowry RJ, Kamali F. The changing patterns of drinking, illicit drug use, stress, anxiety and depression in dental students in a UK dental school: a longitudinal study. Br Dent J 2002:192(11):646-9.		X	
35. Naidu RS, Adams JS, Simeon D, Persad S. Sources of stress and psychological disturbance among dental students in the West Indies. J Dent Educ 2002:66(9):1021-30.	X		
36. Humphris G, Blinkhorn A, Freeman R, Gorter R, Hoad-Reddick G, Murtomaa H, O'Sullivan R, Splieth C. Psychological stress in undergraduate dental students: baseline results from seven European dental schools. Eur J Dent Educ 2002:6(1):22-9.		X	
37. Rajab LD. Perceived sources of stress	X		

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among dental students at the University of Jordan. J Dent Educ 2001;65(3):232-41.				
38. Sanders AE, Lushington K. Sources of stress for Australian dental students. J Dent Educ 1999;63(9):688-97.	X			
39. Heath JR, Macfarlane TV, Umar MS. Perceived sources of stress in dental students. Dent Update 1999;26(3):94-8, 100.	X			
40. Peretz B, Rosenblum A, Zadik D. Stress levels and related variables among dental students in Jerusalem, Israel. Eur J Dent Educ 1997;1(4):162-6.	X			
41. Newton JT, Baghaienaini F, Goodwin SR, Invest J, Lubbock M, Marouf Saghakhaneh N. Stress in dental school: a survey of students. Dent Update 1994;21(4):162-4.	X			
42. Hendricks SJ, Joshi A, Crombie K, Moola MH. Perceived sources of stress among black dental students in South Africa. J Dent Educ 1994;58(6):406-10.	X			
43. Reyes RE. Stress management in pediatric dentistry. N Y State Dent J 1993;59(2):22-3.	X			
44. Lopez Rendon JM, Ochoa Garcia JD, Velez Betancur JC. [Diagnosis and proposed solutions to causes of stress in students in the clinic of the C.E.S. Health Science Institute Dental School]. CES Odontol 1990;3(2):83-94.	N A	X		In Spanish
45. Sgan-Cohen HD. Stress among Israeli dental students: a two-year longitudinal study. Int J Psychosom 1989;36(1-4):69-71.	X			
46. Rubenstein LK, May TM, Sonn MB, Batts VA. Physical health and stress in entering dental students. J Dent Educ 1989;53(9):545-7.		X		No management program
47. Grandy TG, Westerman GH, Combs CE, Turner CH. Perceptions of stress among third-year dental students. J Dent Educ 1989;53(12):718-21.	X			
48. Sgan-Cohen HD, Lowental U. Sources of stress among Israeli dental students. J Am Coll Health 1988;36(6):317-21.	X			

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49. Grandy TG, Westerman GH, Lupo JV, Combs CG. Stress symptoms among third-year dental students. J Dent Educ 1988;52(5):245-9.	X		
50. Friedlander AH, Mills MJ, Wittlin BJ. Dental management considerations for the patient with post-traumatic stress disorder. Oral Surg Oral Med Oral Pathol 1987;63(6):669-73.	X		
51. Cecchini JJ, Friedman N. First-year dental students: relationship between stress and performance. Int J Psychosom 1987;34(3):17-9.	X		
52. Westerman GH, Grandy TG, Lupo JV, Mitchell RE. Relationship of stress and performance among first-year dental students. J Dent Educ 1986;50(5):264-7.	X		
53. Register J. Dental students today. Feeling pressure/stress. Fla Dent J 1986;57(2):6-7, 58-9.	X	No management program	
54. *Howard CE, Graham LE, 2nd, Wycoff SJ. A comparison of methods for reducing stress among dental students. J Dent Educ 1986;50(9):542-4.			
55. Management of stress in the dental practitioner. Dent Clin North Am 1986;30(4 Suppl):S1-146.	X	Not on students	
56. Musser LA, Lloyd C. The relationship of marital status and living arrangement to stress among dental students. J Dent Educ 1985;49(8):573-8.	X		
57. Lloyd C, Musser LA. Stress in dental students. J Am Coll Dent 1985;52(2):11-9.	X	No management program	
58. *Tisdelle DA, Hansen DJ, St Lawrence JS, Brown JC. Stress management training for dental students. J Dent Educ 1984;48(4):196-202.			
59. Sebor RJ. Stress: inherent to dentists or taught to dental students? Dent Stud 1984;63(1):14-20.	X	No management program	
60. *Schwartz RM, Eigenbrode CR, Cantor O. A comprehensive stress-reduction program for dental students. J Dent Educ			

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1984:48(4):203-7.			
61. Ravins H. Dental orthopedics--stress management. Basal Facts 1984:6(1):30-1.	X	Not study (note)	
62. Grandy TG, Westerman GH, Mitchell RE, Lupo JV. Stress among first-year dental students. J Dent Educ 1984:48(10):560-2.	X	No management program	
63. Cohen H, Hurwitz M, Lanesman B, Myburg N, Prinsloo B. The perception and response to stress by dental students of the University of Witwatersrand. Diastema 1982:10:16-21.	X		
64. Garbee WH, Jr., Zucker SB, Selby GR. Perceived sources of stress among dental students. J Am Dent Assoc 1980:100(6):853-7.	X		
65. Goldstein MB. Sources of stress and interpersonal support among first-year dental students. J Dent Educ 1979:43(12):625-9.	X	No management program	
66. Jackson E, Mealiea WL, Jr. Stress management and personal satisfaction in dental practice. Dent Clin North Am 1977:21(3):559-76.	X		
67. Lobene RR, Fredericks M, Mundy P. The relationship between social class stress--anxiety responses, achievement, and professional attitudes of dental hygiene students. J Am Dent Hyg Assoc 1972:46(2):113-7.	X		
68. Lobene RR, Fredricks MA, Mundy P. The relationship between social class, stress anxiety responses, academic achievement and professional attitudes of students of dental assisting. Dent Assist 1971:40(8):11-5.	X		
69. Fredericks MA, Mundy P. Relations between social class, stress-anxiety responses, academic achievement, and professional attitudes of dental students. J Dent Educ 1969:33(3):377-84.	X		
70. Fredericks MA, Mundy P. Dental students: relationship between social class, stress, achievement, and attitudes. J Am Coll Dent 1967:34(4):218-28.	X		

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\* Selected study

## Chapter 5

# Effectiveness of a dental students stress management program

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This chapter has been accepted for publication in Health Professions Education as:  
Alzahem AM, Van der Molen HT, De Boer BJ. Effectiveness of a dental students  
stress management program.

## **Abstract**

The dental education stress effects and sources were explored thoroughly in the literature, but the effectiveness of stress management programs received less attention. This study introduced a new stress management program, named Dental Education Stress Management (DESM) program. It showed its effectiveness in a quasi-experimental pretest-posttest-follow-up-control group design. The new program was based on the principle of psychoeducation and consisted of three 90-minute sessions, to teach dental students how to better deal with their stress symptoms and to reduce their general stress level. Two instruments were used to assess the level of stress of the dental students, namely the Dental Environment Stress questionnaire (DES), and the Psychological Stress Measure (PSM-9). Results show that the DESM program has the desired effect of decreasing the stress levels of its participants, and these effects lasted for at least two weeks. Because of several methodological limitations of the study more research is needed to draw more generalizable conclusions.

## Introduction

Besides positive aspects as the development of a useful and profitable career, health professions education, especially medical and dental education may also have serious negative aspects. Students may suffer from high levels of stress, which sometimes leads to alcohol and drug abuse, interpersonal relationship difficulties, depression and anxiety. Stress may also harm students' professional effectiveness: it decreases attention, reduces concentration, impinges on decision-making skills, and reduces students' abilities to establish adequate physician-patient or dentist-patient relationships.<sup>1</sup> Academic factors and faculty relationships with students are the sources that create the most stress.<sup>2</sup> Some stress is desirable to prevent boredom and under-stimulation, but the persistence of stress-related symptoms may result in mental and/or physical ill health, substance abuse, and diminished efficiency at work or learning.<sup>3</sup> Despite the obvious negative consequences of stress in health profession education, little research has been done into possible ways to reduce stress in these programs. One way would be the implementation of special stress management programs. The aim of the present study is to describe an investigation into the effects of such a newly developed stress management program.

Descriptions of stress management programs are limited in the literature; in a systematic review we only found seven studies discussing such stress management programs for dental students.<sup>4</sup> This systematic review made clear that only a few studies have been discussing the prevention or management of stress as compared to studies that reported sources of stress. Instructors recommended to promote physical exercise by students and interaction with a psychologist,<sup>5, 6</sup> while students should carefully select the instructor to be approached for comments. Procedures for stress reduction consist of different training programs that are intended to reduce stress. Examples hereof are relaxation via Synchro-Energizer,<sup>7</sup> training workshops that include aspects of academic problem solving,<sup>8</sup> deep breathing and Progressive Muscular Relaxation (PMR),<sup>9</sup> and introducing stress-management training over time which is effective in stress reduction and coping.<sup>10</sup>

Based on those previous studies we decided to develop a new stress management program for dental students, incorporating elements that have been proved to be useful previously. We named the program the Dental Education Stress Management program (DESM program). The site where we have developed this program was the College of Dentistry, King Saud

bin Abdulaziz University for Health Sciences in Riyadh, Saudi Arabia. The main question in this study is concerned with the effectiveness of this stress management program.<sup>11</sup> This question will be answered with the use of a quasi-experimental design in which students' stress levels before and after completing the program are compared. We expected that the new stress management program would lead to a reduction of stress in the dental students.

A quasi-experimental pretest-posttest-follow-up-control group design was used to study the effectiveness of the stress management program (see Figure 6.1).

## Method

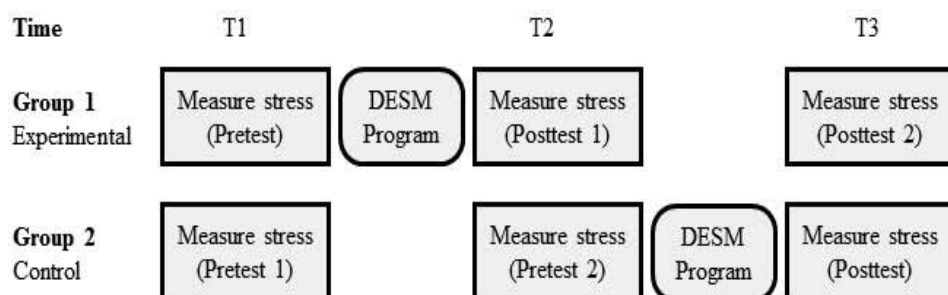


Figure 6.1: Study Design

### *Design of the research*

From Figure 6.1 it becomes clear that there were three moments during which the tests were applied: T1, T2 and T3. After the pretest (T1) the experimental group followed the stress management program, whereas the control group had to wait. After following the stress management program respectively after the waiting period, both groups had to fill out the tests again at T2. This was two weeks after the experimental group finished the program and one day before the members of the waiting list control group started to follow the stress management program. For the experimental group this was posttest 1; for the waiting list control group this was pretest 2. After that, Group 2 followed the DESM program. This period served as a follow-up period for the experimental group. At T3 (two weeks after ending of the DESM program) members of both groups had to fill out the tests again. For Group 1 this was posttest 2; for Group 2 this was posttest 1. A design in which we had used a control group that had not received any stress management program might have been preferable; however, we

considered this as unethical with respect to the students who were willing to be the members of the waiting list control group.

### *Participants*

The College of Dentistry, King Saud bin Abdulaziz for Health Sciences in Riyadh, Saudi Arabia, started accepting male students in 2010. So far it has admitted three cohorts of male students. The fact that only male students are admitted to the College has to do with the regulation concerning participation of the different sexes in one building in Saudi Arabia.

Of the three cohorts in the College of Dentistry, two cohorts of students were selected to participate in this study. This selection was based on their timetable and availability of free time. In total, 42 students were invited by the students' affairs officer to participate in the study. Of these 42 students, 31 students (73.8%) accepted the invitation. Then, the students were informed about the aim of the study and signed a consent form. Group 1 served as the experimental group (15 third year students who started their study in 2011). These students were in the first year of the preclinical phase, which is accompanied by laboratory assignments, and had a mean age of 20.47 ( $SD=0.74$ ). Group 2 served as the waiting list control group (16 second year students who started their study in 2012). These students were in the second year of the pre-professional phase, where they mainly study basic sciences, such as biology, physiology, histology, and anatomy, and had a mean age of 19.88 ( $SD = 0.50$ ). Third year students have to spend more time in the lab than second year students.

### **Dental education stress management program (DESM)**

The new program was based on the principle of psychoeducation and consists of three 90-minute sessions.<sup>12, 13</sup> The aim of the program was to teach dental students how to better deal with their stress symptoms and to reduce their general stress level. Therefore we included exercises to become more aware of stress signs and symptoms and a deep breathing exercise to reduce stress (session 1). Moreover, we included a seven-step cognitive behavioral approach to better deal with irrational thoughts (session 2). To our knowledge, this is the first study in which this seven-step approach has been applied in a stress management program for dental students. Finally, we taught students how they can manage their time with practicing new techniques and skills for studying, and how to also keep time for relaxing activities (session 3).

The three sessions took place over a period of three weeks, with one session per week. A stress management program manual has been developed as a guide for conducting the three 90-minute sessions DESM program (available from the first author upon request). The first author has executed the DESM program on

dental students in the academic year 2013-2014. Below we describe the aims and the content of the sessions in more detail.

### *Session 1*

The aims of the first session were to get acquainted with the other participants and the trainer, to create an atmosphere in which the students were daring to talk freely, to give information about the phenomenon of stress (psychoeducation), to raise the awareness of the relevance of stress management, and to practice a relaxation exercise. Students were welcomed and a lecture about the phenomenon of stress was delivered with the use of a power point presentation. To enhance their commitment, after that the students were asked why they themselves thought it was relevant to know more about this phenomenon. Since admission to a dental school is only possible for students who received high grades at high school, they are often rather self-confident about their achievements, because in the past they belonged to the best group of students. However, once they have entered the dental school students are often confronted with more difficult subjects and practical situations, which can cause stress. Therefore, the students were requested to mention their personal symptoms of stress during their dental education. These different symptoms were listed on a flip over, and then they were requested to point out for themselves the major sources of stress. During the last part of the session the students received information about the diagnosis and management of stress. Finally, they were encouraged to practice a deep breathing exercise for ten minutes daily. The aim of that exercise is to relief physical and mental stress and to feel more relaxed.

### *Session 2*

The aims of the second session were to follow up the deep breathing exercise and to practice the seven-step cognitive behavioral approach for stress management. Students were welcomed and were asked to give their feedback about the assignment (deep breathing exercise) from the first session. Then a lecture was given to explain the seven-step cognitive behavioral approach for managing stress by changing their irrational thoughts and behaviors. After that students received an exercise with the use of a worksheet (see Appendix 1) in which they were asked to mention specific situations in which they suffered from stress. By the use of those specific situations their thoughts and behaviors were explored, and students acquired some insight in the connection between their (irrational) thoughts, their own physical reactions, moods and behaviors. For example: "If I will not pass my examination on Anatomy, I think that I am a big failure." Consequent feelings: stress and depression. Consequent behavior: inactivity. Once they had acquired insight in the nature of their irrational thoughts, they were prompted to try to replace those thoughts by more rational thoughts. ("If I do not pass my examination, that indeed is a pity, but that does not mean I am a complete failure. Let me now do my best. I can always do a resit exam."). Finally, students were requested to re-rate their stress levels after they had identified the alternative, more rational thought. Then, the different examples of the individual students were

discussed with the other group members. The reduction in stress rating was discussed with the group. At the end of the session students received two homework assignments. First, they were requested to practice again the deep breathing exercise daily for 10 minutes. Secondly, they were asked to apply the seven-step cognitive behavioral approach in their own situations.

### *Session 3*

The aims of the third session were to follow up on the deep breathing exercise, and on the seven-step cognitive behavioral approach. The new topic was time management. Students were welcomed and asked to give their feedback about previous exercises (deep breathing and the seven-step thought and behavior change exercise). The session covered the importance of time management, time management skills, identifying the undefined time, prioritizing tasks, making a “to do” list, and planning. The first exercise was to list their daily activities and their time duration. Students were requested to identify the undefined time by subtracting the total time for all activities from 24 hours. The second exercise was to list all their tasks in a priority matrix to identify the most important tasks that need immediate action and other tasks that can be done later. The third exercise was to create a “to do” list on paper or in their smart phones with deadlines and priority order. Finally, the students received information about recommended readings and they were advised to read books related to time management as "*The Seven Habits of Highly Effective People*" by Stephen Covey. At the end of this final session the students were thanked for their participation and advised to apply all what they had learned in this stress management program.

### *Instruments*

Two instruments were used to assess the level of stress of the dental students, namely the Dental Environment Stress questionnaire (DES), and the Psychological Stress Measure (PSM-9).<sup>2, 14, 15</sup>

The DES questionnaire consists of 38 items that are scored on a 6-point scale ( $0 = \text{not stressful}$ ,  $5 = \text{extremely stressful}$ ). It has five factors, namely Living accommodation (e.g. Living away from home), Personal factors (e.g. Difficulty in making friends), Educational environment (e.g. The teaching language), Academic work (e.g. Examinations), and Clinical factors (e.g. Adequacy of clinical supervision). Means, standard deviations of the DES are presented in Table 6.1. The DES had a Cronbach's Alpha of .89 at T1, .84 at T2, and .87 at T3.

The PSM-9 questionnaire consists of nine items that are scored on an 8-point scale ( $1 = \text{not at all}$ ,  $8 = \text{extremely}$ ). Items include: I feel calm, and I feel full of energy and keen. Previous research has shown the PSM-9 to have a good reliability (Cronbach's  $\alpha = .89$ ).<sup>15</sup> Means, standard deviations of the PSM-9 are presented in Table 5.1.

## *Procedures*

The first measurement was conducted at T1 before the DESM program had begun for both groups. The questionnaires were given by the researcher (first author) to the students' affairs officer to be distributed to the participants. Each group completed the questionnaires at two different days within the same week simultaneously in two separate rooms at the university. The same procedure was applied at T2 and T3.

During the research, all participants were taking classes as usual. The period between measurements and during the DESM program was therefore filled with a normal class schedule, whether the participants completed the DESM program or not.

## *Data analysis*

Data were entered in the statistical analysis software (SPSS 20.0) for both questionnaires, both groups and all three times of measurement. Two separate ANOVAs with repeated measures were performed, one for each dependent variable of stress levels (DES or PSM-9). The ANOVAs had a two by three design; two groups measured at three times. The research question was the same for both analyses: Does the interaction effect of Group and Time combined explain a significant amount of variance in stress levels?

Hypothesis 1: "The interaction effect of Group and Time shows a significant decrease of average DES scores."

Hypothesis 2: "The interaction effect of Group and Time shows a significant decrease of average PSM-9 scores."

Confirming these hypotheses would mean that, regardless of cohort, the stress management program is successful in reducing the overall stress levels of the participants over time. This approach was chosen because the research focuses on a mean change in stress levels while completing the DESM program, not on absolute stress levels of the participants. Based on previous research,<sup>3</sup> we already expected the cohorts, and thus Group 1 and Group 2 to differ in their stress levels at T1. However, as part of the complete analyses, the difference between the groups in stress levels is investigated post-hoc.

The effect of the training itself will also be investigated, by combining the scores of both groups into one pretest (Group 1 T1 and the average of Group 2 T1 and T2) and one posttest (Group 2 T3 and the average of Group 1 T2 and T3). We expected the training to have a significant effect on stress levels, showing that the posttest stress levels are lower for the total group.

## Results

Stress levels for all participants are presented in Table 5.1. Contrary to our expectations, Group 1 and Group 2 did not have significantly different stress levels. Average DES score at T1 for Group 1 was 1.62 ( $SD = 0.56$ ), while Group 2 had an average DES score of 1.33 ( $SD = 0.53$ ),  $t(29) = 1.48$ ,  $p > .05$ . Average PSM-9 score at T1 for Group 1 was 4.91 ( $SD = 0.69$ ), while Group 2 had an average PSM-9 score of 4.47 ( $SD = 1.15$ ),  $t(29) = 1.30$ ,  $p > .05$ .

Table 5.1: Means ( $M$ ) and standard deviations ( $Sd$ ) of the dependent variables over both groups and times of measurement

Time	Variable	Group 1		Group 2	
		$M$	$Sd$	$M$	$Sd$
T1	DES, Living accommodation	1.33	0.96	0.95	0.97
	DES, Personal factors	2.20	0.89	1.75	1.02
	DES, Educational environment	1.83	0.90	1.29	0.97
	DES, Academic work	2.44	0.72	2.30	0.82
	DES, Clinical factors	0.16	0.54	0.06	0.22
	DES (Complete)	1.62	0.56	1.33	0.52
	PSM-9	4.92	0.69	4.47	1.15
T2	DES, Living accommodation	1.13	1.19	1.06	0.96
	DES, Personal factors	1.76	0.83	1.90	1.07
	DES, Educational environment	1.29	0.77	1.28	0.86
	DES, Academic work	1.83	0.82	2.58	0.72
	DES, Clinical factors	0.10	0.23	0.06	0.22
	DES (Complete)	1.22	0.47	1.44	0.48
	PSM-9	4.00	0.76	4.69	0.97
T3	DES, Living accommodation	1.37	1.28	0.73	0.91
	DES, Personal factors	1.92	0.67	1.24	0.78
	DES, Educational environment	1.44	0.93	0.74	0.74
	DES, Academic work	2.01	0.88	1.90	0.73
	DES, Clinical factors	0.17	0.49	0.03	0.14
	DES (Complete)	1.37	0.52	0.99	0.39
	PSM-9	4.30	0.95	4.21	0.98

### *Hypotheses testing*

Two ANOVAs were conducted that examined the effect of Group and Time on stress levels of the participants during their dental education. There was a statistically significant interaction between the effects of Group and Time on DES scores,  $F(2, 58) = 10.36$ ,  $p < .05$ . The partial eta squared was .22, which is a large effect size. This supports Hypothesis 1. There was also a statistically significant interaction between the effects of Group and Time on PSM-9 scores,  $F(2, 58) = 8.19$ ,  $p < .05$ . The partial eta squared was .04,

which is a small effect size. This supports Hypothesis 2. Figure 5.2 and 5.3 demonstrate the interaction effects based on the estimated marginal means; these means can be found in Table 5.2 and 5.3.

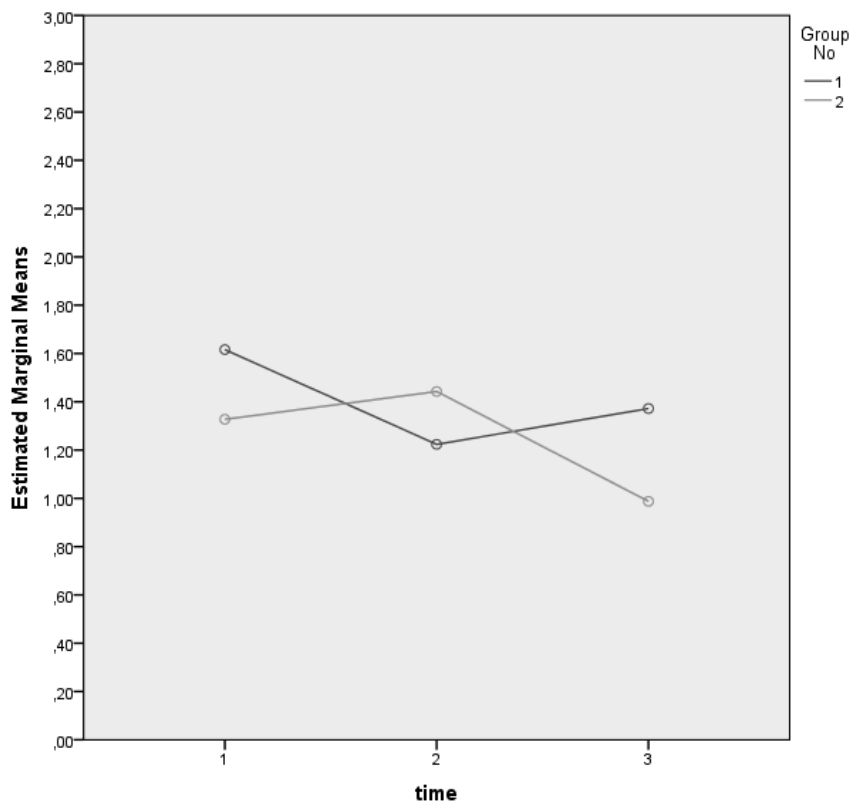


Figure 5.2: Estimated marginal means of DES scores over time and group.

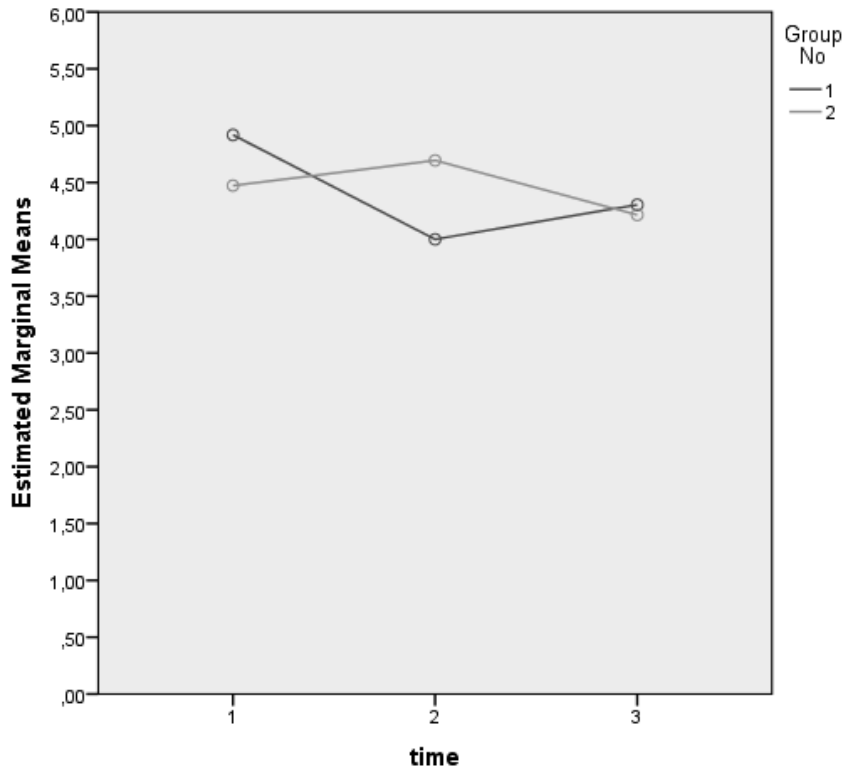


Figure 5.3: Estimated marginal means of PSM-9 scores over time and group.

Furthermore, no main effect of Group could be found, either for the DES scores  $F(1, 29) = 0.93, p > .05$  or for the PSM-9 scores  $F(1, 29) = 0.03, p > .05$ . The estimated marginal means showed that there was no significant difference between the two groups over all measurement times. The mean DES difference between Group 1 and Group 2 was 0.15 ( $SE = 0.16, p > .05$ ). The mean PSM-9 difference between Group 1 and Group 2 was -0.53 ( $SE = 0.29, p > .05$ ).

However, there was an effect of Time on DES scores,  $F(1, 29) = 18.55, p < .05$  and on PSM-9 scores  $F(1, 29) = 7.47, p < .05$ . Post hoc tests showed that there was a significant difference between the estimated marginal means of DES on T1 and T3. This was 0.29 ( $SE = 0.07, p < .05$ ). Also, there was a significant difference between the estimated marginal means of PSM-9 between T1 and T2 and between T1 and T3. These were 0.35 ( $SE = 0.10, p < .05$ ) and 0.44 ( $SE = 0.16, p < .05$ ) respectively.

Table 5.2: Estimated marginal means from ANOVA on DES sco

Group	Time	<i>M</i>	Std. Error
1	1	1.61	0.14
	2	1.22	0.12
	3	1.37	0.12
2	1	1.33	0.14
	2	1.44	0.12
	3	0.99	0.12
Combined	1	1.47	0.10
	2	1.33	0.09
	3	1.18	0.08

Table 5.3: Estimated marginal means from ANOVA on PSM-9 scores

Group	Time	<i>M</i>	Std. Error
1	1	4.92	0.25
	2	4.00	0.23
	3	4.30	0.25
2	1	4.47	0.24
	2	4.69	0.22
	3	4.22	0.24
Combined	1	4.70	0.17
	2	4.35	0.16
	3	4.26	0.17

These results show that the stress management program had the desired effect of decreasing the stress levels of its participants. These effects lasted for at least two weeks, based on the times of measurement.

As part of the complete analyses, further post-hoc t-tests were performed. The means, standard deviations and effect sizes of the DESM program for the total group of participants can be found in Table 5.4. For these analyses, both pretests of Group 2 are averaged and both posttests of Group 1 are averaged. The results show a significant difference in DES scores ( $0.36$  ( $SD = 0.36$ ),  $t(30) = 5.51$ ,  $p < .05$ ) and PSM-9 scores ( $0.56$  ( $SD = 0.69$ ),  $t(30) = 4.52$ ,  $p < .05$ ) in the expected direction. These findings provide further support for the hypotheses.

Table 5.4: Means ( $M$ ), standard deviations ( $Sd$ ) and effect sizes of the DESM program

	$M$	$Sd$	$Cohen's\ d$
DES Pretest	1.50	0.53	
DES Posttest	1.14	0.44	0.99
PSM-9 Pretest	4.75	0.88	
PSM-9 Posttest	4.18	0.85	0.81

Finally, the analyses were concluded with measuring the effect of each separate factor of the DES. Again, the combined data of Group 1 and Group 2 was used to compose a pretest and a posttest and then each factor was compared separately. The means, standard deviations and effect sizes of the each separate DES factor for the total group of participants can be found in Table 5.5. All effects are significant at the .05 level, except factor 1 Living accommodation (0.18 ( $SD = 0.69$ ),  $t(30) = 1.45$ ,  $p > .05$ ) and factor 5 Clinical (0.02 ( $SD = 0.44$ ),  $t(30) = 0.25$ ,  $p > .05$ ).

Table 5.5: Means ( $M$ ), standard deviations ( $Sd$ ) and effect sizes of the five DES factors

	$M$	$Sd$	$Cohen's\ d$
Living accommodation Pretest	1.16	0.96	
Living accommodation Posttest	0.98	1.01	0.26
Personal factors Pretest	2.01	0.97	
Personal factors Posttest	0.98	1.00	1.93
Educational environment Pretest	1.55	0.92	
Educational environment Posttest	1.05	0.81	0.99
Academic work Pretest	2.44	0.72	
Academic work Posttest	1.91	0.68	0.91
Clinical factors Pretest	0.10	0.41	
Clinical factors Posttest	0.08	0.22	0.05

Due to the low scores in Table 5.1 and the non-significant Cohen's  $d$  in Table 5.5, we found it necessary to repeat the repeated measures ANOVAs for the DES, whilst excluding factor 5 (Clinical Factors) from the analyses. The results obtained from these analyses are exactly the same as reported above. Excluding the fifth factor did not change the effects found for the DESM program. The limited effect of this factor can be ascribed to the fact that the students in year 2 and year 3 do not yet operate on patients. This explanation matches the low stress scores reported by all participants on factor 5.

## Discussion

Education for dental students has been shown to have different sources of stress. The aim of this study was to investigate the effectiveness of a new stress management program for this group of students. This stress management program consisted of three ninety-minute sessions. The first session contained psycho-educational information about stress and its negative consequences. In the second session the students were taught a cognitive behavioral technique to reduce their stress in stressful situations. To our knowledge, this is the first stress management program for dental students including such a cognitive behavioral technique. The third session was devoted to time management.

To test the effectiveness of the program, a quasi-experimental study with a pretest-posttest-follow-up-control group design has been used. The students in the control group followed the program after two pretests. Two instruments were used to assess the stress levels of the students: the DES and the PSM-9. The DES gives information about the students' stress scores on five factors: (1) Living Accommodation, (2) Personal, (3) Educational Environment, (4) Academic Work and (5) Clinical Factors. It also gives information about their total stress score. The PSM-9 gives information about a general level of psychological stress. So, all together there were seven dependent variables in this study.

We found support for the effectiveness of the DESM program. Both the ANOVA performed with DES as a dependent variable and the ANOVA performed on the PSM-9 showed significant interaction effects of group and time. These results supported the hypotheses and showed that the DESM program was successful in decreasing stress levels, regardless of cohort (second or third year students).

Furthermore, the results of the post-hoc t-tests indicate that students had lower stress scores after following the DESM program than during the pretests. These effect sizes were large (see Tables 5.4 and 5.5).

Looking at the different specific dependent variables of the DES, an interesting question is for which of them we found the largest and the lowest reduction in stress scores after following the stress management program. Both in the experimental group and in the control group we found the highest effect sizes for the Academic Work, the Educational Environment and the Personal factor. For the Living Accommodation factor the results are not clear. This might be related to the unavailability of dorm or students' housing in the University campus, and most of students are living with their families.

The very low scores on the Clinical factor at pretest in both groups are remarkable. Our explanation for this is that second and third year students are not yet in the phase of doing clinical work with patients. So, this kind of work is not yet causing stress, although it might do in the next years of the curriculum.

Overall these findings show that the DESM program was successful in lowering the reported stress levels of dental students. This effect was regardless of year of study, but could not be supported for all factors of the DES.

### *Limitations of this study*

Although this study gives some first support for the effectiveness of the stress management program, it has some serious limitations that have to be mentioned. Based on these limitations we do recommendations for future research.

The first limitation is that the number of students involved in this study was rather small. This was caused mainly by practical reasons. The site where we have developed the stress management program, a College of Dentistry in Riyadh, Saudi Arabia, was offering the dental curriculum only to a limited number of students, namely around 20 students per year. Studies including higher numbers of students and at other Dentistry Colleges are recommended to find more support for the effectiveness of the program, and for the generalizability of the first findings.

The second limitation is that this study only included second and third year students of dentistry. So, we cannot draw conclusions about the usefulness and effectiveness of the stress management program in other years of the dentistry curriculum. However, there are some other studies that demonstrate the effectiveness of a stress management program on dental students, especially in the clinical phase.<sup>9, 16</sup>

The third limitation is that this study included only male students. The reason for that is that within the Saudi Arabian culture educational programs for males and females takes place in different Colleges, at different sites. So, we can neither draw any conclusions about the effectiveness of the stress management program in female students, nor about eventual differences between male and female students. Future research including female students who follow this program is therefore recommended.

The fourth limitation of this study is that only self-report measures have been used. We have not been able to use behavioral or physiological measures of stress in this study. A disadvantage of only using self-report measures is that students might be inclined to please the teacher who executed the program by indicating that their stress has decreased after the program. This phenomenon is also known as the ‘hello-goodbye effect’.<sup>17</sup> So, for future research we recommend the inclusion of behavioral and physiological measures of stress. For example, other than self-report measures can be (before and after the stress management program) an assessment of the time devoted to relaxation activities as behavioral measure, and a determination of the salivary cortisol level as physiological measure.<sup>17-19</sup>

The fifth limitation is that the program has only been executed by one tutor, who was also the main researcher. Therefore, it was not possible to determine whether other teachers might reach comparable results. A larger study,

in which the stress management program is executed by larger numbers of teachers, is necessary to shed more light on the question whether different teachers realize comparable effects.

A sixth and final limitation is that the follow-up period was rather short: two months. Also, we only measured these follow-up data for Group 1. For practical reasons these data could not be gathered in Group 2. To investigate the long term effects of the program we recommend measurements of stress a half year and one year after finishing the stress management program.

## **Conclusion**

This first study into the effectiveness of a new stress management program, consisting of three ninety-minute sessions, showed positive results. However, the study has several serious methodological limitations. Therefore, more research is needed before final and more generalizable conclusions can be drawn.

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## Chapter 6

### Summary and General Conclusions (English & Arabic)

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## **Objectives of the thesis**

The main aim of this thesis was to tackle different aspects of stress in dental education. The first objective was to define the concept of stress and to present a theoretical stress model, briefly discussing the negative effects of stress, and to present the main aims of the studies we have performed concerning stress among dental students (Chapter 1). The second objective was to systematically review the literature regarding stress among dental students in order to identify the main sources in dental education, and other aspects of stress among dental students, including symptoms, signs, impact and management (Chapter 2). The third objective was to study the effect of the year of study on the stress level of dental students in a 5-year Bachelor of Dental Surgery (BDS) curriculum and to identify the main sources of stress in our sample, which was from a religious culture studying in a traditional curriculum (Chapter 3). The fourth objective was to systematically review the literature to identify stress management programs in dental education and to determine their effectiveness (Chapter 4). The fifth objective was to develop and evaluate a new stress management program for dental students, incorporating elements that have been proved to be useful previously including; psychoeducational principles, stress reduction exercises, and time management skills (Chapter 5). Below we summarize the main findings of the four studies presented in chapter 2 to 5.

## **Stress Amongst Dental Students: A Systematic Review (Chapter 2)**

The main objective of this study was to systematically review the literature regarding stress among dental students and to identify its main sources during dental education. This study, to the best of our knowledge, is the first systematic review of the literature about stress amongst undergraduate dental students. In this review we made a distinction between different aspects of stress, namely demographic variables, stressors, signs and symptoms, indicators, measuring instruments, and finally the management of stress.

Previous studies about stress amongst dental students showed significant stressors mostly related to examinations, clinical requirements, patients, financial problems, lack of time for relaxation, and faculty feedback or criticism. Moreover, fear of parents after failure,<sup>(1)</sup> getting material for study, clinical requirements<sup>(2)</sup> and overcrowded accommodation<sup>(3)</sup> were a major source of stress for dental students in several countries.

Many studies reported that female dental students showed more stress than male, and sometimes the literature shows that there is a difference between preclinical and clinical years. Stress in the preclinical years affects female more than male, but stress during the clinical years affects male more than female students.<sup>(4)</sup> Some sources of stress were found more often in female than male, such as lack of confidence in clinical decision making, and doubt to be a successful dentist.<sup>(5)</sup>

First choice for admission has been reported as an important demographic variable and it has been shown that there is more stress amongst those students who were admitted in dentistry against their first choice.<sup>(1, 2, 6, 7)</sup> In addition, stress differs according to the year of study, where it was reported that more stress exists in senior years generally.<sup>(1-4, 6-26)</sup> Dominant stressors of junior students in preclinical years differ from those of senior dental students in the clinical years, and the stress level is increasing over time.<sup>(16)</sup>

Reviewing the results and putting them into perspective, the following conclusions were drawn. First, stress amongst dental students and stressors seem not to have changed much, overall. For example, we found comparable results of studies in the 1990s of the last century and the first decade of the present century. Second, specific stressors seem to differ in different parts of the world. Stressors related to fear of parents were found more significant in India, stressors related to the financial situation of the students were more significant in western countries than in eastern countries, and stressors related to resources and dental material supply were more significant in poor countries in Africa.<sup>(1, 2, 11, 27)</sup> Thirdly, stress amongst dental students can be discovered early by looking closely at signs and symptoms of stress including student performance. Instruments of stress are useful for early detection so that stress issues can be immediately addressed.<sup>(10, 28, 29)</sup>

### **Effect of the year of study on the stress level among male undergraduate dental students (Chapter 3)**

The third objective of the thesis was to study the effect of the year of study on the stress level of dental students in a five-year Bachelor of Dental Surgery (BDS) curriculum and to identify the main sources of stress in our sample, which was from a religious culture studying in a traditional curriculum. Third-year students generally reported the highest stress levels, while first-year students reported the lowest stress levels. An explanation for this finding was that third-year students are in the transfer phase from the preclinical to clinical years, during which they start to see patients and have to meet clinical requirements. Examinations and clinical requirements were reported to be the highest stressors for dental students.

### **Dental Students Stress Management: A Systematic Review (Chapter 4)**

The fourth objective was to systematically review the literature to identify stress management programs in dental education and to determine their effectiveness. Different types of programs about stress management for dental students have been reported, and they differ in their duration, content, and effect. These programs are either single or multiple sessions and contain relaxation techniques or information about stress. The shortest stress management program consisted of one 60-minute session, while the longest consisted of six 60-minute to 90-minute sessions. The stress management programs either help to reduce the number of stressors or enhance the stress coping skills including relaxation techniques as deep breathing and yoga. Stress management programs offering stress prevention tried to reduce the stressors through stress awareness lectures. Most of these programs were liked

by the students and helped them to manage their stress. However, most studies had serious methodological limitations.

### **Effectiveness of the Dental Education Stress Management program (Chapter 5)**

Based on the findings of the literature review, the fifth objective was to develop and evaluate a new stress management program for dental students, incorporating elements that have been proved to be useful previously. We named the new program the Dental Education Stress Management program (DESM program). This stress management program consisted of three 90-minute sessions. To our knowledge it is the first stress management program for dental students to include a cognitive behavioral technique.

Overall findings showed that the DESM program was successful in lowering the reported stress levels of dental students. However, although we used a quasi-experimental design, our study also had a number of methodological limitations. Therefore, results should be generalized with caution.

## **Discussion**

High levels of stress have been shown to have negative effects on dental students. Furthermore, stress can cause symptoms that can cause even more stress. Dealing with this stress is an important concern for dental students, educators, and practitioners. Identification of the most common sources of stress and the stress symptoms is a first step towards dealing with this problem. Then, the focus should be managing the stress sources and treating the stress symptoms, in order to break the stress cycle.

Obviously, we did not want to suggest that the stress during the dental study should be reduced to zero. The study of dentistry and the profession of the dentist are exciting and some 'normal' stress remains necessary for optimal performance when both studying dentistry and treating patients. However, too high stress levels may have detrimental effects, first on study achievements and ultimately for the treatment effects on real patients.

The most common sources of stress are the exams and the clinical requirements. Also, stress levels increase as the study progresses, an important reason for this is the exposure to dental patients. The overview of these factors and their importance in each year of study in the research of this dissertation can be a great benefit to educators and can help in improving the design of dental education.

The most important finding in this dissertation is that there is a great mismatch between the number of studies investigating sources of stress, and those investigating possibilities for reducing stress, such as stress management programs. It was shown that only seven stress management programs were effective in reducing the level of stress among the students. However, these programs did not follow any standard in their duration or content.

In order to provide a complete stress management program for dental students, the Dental Education Stress Management (DESM) was developed and its effectiveness tested. This new program includes stress awareness, stress reduction through physical and cognitive behavioral approach, plus time management skills. It was shown to be effective regardless of year of study. Incorporating such a program into dental education could be very beneficial, especially for those students where stress causes negative outcomes.

Overall, the research in this dissertation has shown what the causes are for stress, how it develops over time, what its effect is on students and practitioners, and what can be done to reduce it. The importance of stress has been adequately discussed in the literature; all this knowledge combined could now be used to start to lower the stress level of dental students.

### **Limitations and suggestions for future research**

The review studies in this dissertation covered most of aspects of stress among dental students and made it easier for scholars to have a base to proceed with their research in the same subject and for educators to use for their program design. Furthermore a new effective stress management program was designed that included a cognitive behavioral approach for the first time. However, the results of the studies in this dissertation have a few limitations that should be understood.

All field studies have been performed in the Middle East; cultural factors may have played a role in the results. Also, the field studies were conducted on male dental students only, due to these cultural factors. Future research should include both male and female dental students.

The newly proposed stress management program DESM has been supported by the research, but the sample was rather small. Although significant results were found, it would be good to repeat the study on a larger, cultural diverse sample.

In the systematic reviews, we have suggested research that could develop more effective stress management programs, and establish standards and criteria for effective stress management programs, applied to dental students. Also, there is a need to develop an updated validated tool to measure stress among dental students including new dental technology and techniques. The field of dental education is ever developing and although the DES has been often used, it would be good to see if there are newly emerging factors that could be incorporated. Furthermore, the significant effect of the year of study on the stress level of male dental students showed the need for a future longitudinal study to investigate the students stress prior to admission to dental school and relate it to the students' personality and year of study during all years of curriculum.

It is also recommended to investigate the influence of new educational approaches such as two-way learning and a student-centered curriculum on the level of stress, as compared to more traditional lecture-based educational

programs. As previously mentioned, the newly developed stress management program also deserves more research and validation, in a variety of different settings.

Finally, multiple or alternative methods, apart from the DES, can be used to measure stress among dental students. Many studies in different parts of the world have been using the Dental Environment Stress (DES) questionnaire that was subjective and non-validated yet.

## **Conclusion**

Several conclusions can be drawn from the research presented in this dissertation. We will sum them up briefly and conclude with a thought for the future. Dental students are facing many stressors in dental education, causing many negative outcomes. The most common are the exams and the clinical requirements. The year of study has been shown to affect the stress level among dental students, where in our own empirical study the third year students had the highest stress scores and the first year students the lowest. This result is not in line with previous studies showing that the stress levels of students in the clinical phase are higher than in the pre-clinical phase. The relatively early exposure to patient care in our sample in the third year may be an explanation for the difference between the outcome of our study and the previous studies. In fact, we suggest exposing the dental students to patient care as early as possible in their curriculum. That can help to balance the stress across the different years of the curriculum, and maybe reduce the stress levels in the later years of the curriculum. That is important because too stressed dentists may be detrimental for the treatment of their patients.

Our literature overview has shown that there are only a limited number of studies discussing stress management for dental students. In general, dental students appreciated these programs, but they did not yet follow a golden standard. Therefore, we decided to develop a new stress management program named the Dental Education Stress Management (DESM) program. The first study into its effectiveness showed positive results. We found a reduction of stress levels in the students on two measures of stress. Based on this result, we recommend that the DESM program is included in other dental curricula. That might also offer the opportunity to investigate whether comparable reductions in stress can be found in other samples.

Stress in dental environment is significant and needs prevention and intervention programs, which should be included in dental curricula. These stress management programs will affect the dental students achievement positively and make them more effective dentists in their future career.

## أهداف الأطروحة

لقد كان الهدف الرئيسي من هذه الرسالة معالجة جوانب مختلفة من التوتر في تعليم طب الأسنان. كان الهدف الأول هو تعريف مفهوم التوتر وتقديم نموذج لنظريته، ومناقشة الآثار الجانبية السلبية للتوتر، وتقديم الأهداف الرئيسية للدراسات التي قمنا بتنفيذها بشأن التوتر بين طلاب طب الأسنان، وإلى تزويد القارئ بالخطوط العريضة لهذه الأطروحة (الفصل ١). أما الهدف الثاني فقد كان مراجعة الأبحاث المنشورة بشأن التوتر بين طلاب الأسنان لتحديد المصادر الرئيسية في تعليم طب الأسنان، وغيرها من جوانب التوتر بين طلاب طب الأسنان بما في ذلك الأعراض والعلامات والآثار والعلاج (الفصل ٢). بينما الهدف الثالث هو دراسة تأثير السنة الدراسية على مستوى التوتر لطلاب طب الأسنان خلال ٥ سنوات من بكالوريوس طب و جراحة الفم والأسنان وتحديد المصادر الرئيسية للتوتر في العينة التي لدينا، والتي كانت من مجتمع مُتدّين وتدرس طبقاً لمنهج دراسي تقليدي (الفصل ٣). في حين أن الهدف الرابع يتضمن مراجعة الأبحاث المنشورة لتحديد برامج علاج التوتر في تعليم طب الأسنان وتحديد فعاليتها (الفصل ٤). وكان الهدف الخامس من هذه الأطروحة تصميم وتقييم برنامج جديد لطلاب طب الأسنان لعلاج التوتر، ويتضمن البرنامج الجديد الأساليب التي ثبتت فعاليتها بما في ذلك؛ العلاج التربوي النفسي، وتمارين تخفيض ومكافحة التوتر، ومهارات إدارة الوقت (الفصل ٥). أدناه تلخيص النتائج الرئيسية للدراسات الأربع المعروضة في الفصول ٢ إلى ٥.

### التوتر بين طلاب طب الأسنان: مراجعة منهجية للأبحاث المنشورة (الفصل ٢)

كان الهدف الرئيس من هذه الدراسة المراجعة المنهجية للأبحاث المنشورة بشأن التوتر بين طلاب طب الأسنان وتحديد المصادر الرئيسية للتوتر في تعليم طب الأسنان. هذه الدراسة إلى حد علمنا هي المراجعة المنهجية الأولى من نوعها حول التوتر بين طلاب طب الأسنان في المرحلة الجامعية. في هذا المراجعة المنهجية حددنا الجوانب المختلفة من التوتر، وهي المتغيرات الديموغرافية، ومصادر التوتر، والعلامات والأعراض، والمؤشرات، وأدوات القياس، وأخيراً علاج التوتر.

أظهرت دراسات سابقة حول التوتر بين طلاب طب الأسنان ضغوطات كبيرة تتعلق في معظمها بالامتحانات والمتطلبات السريرية والمرضى والمشاكل المالية وعدم وجود وقت للاسترخاء وردود فعل أو نقد أعضاء هيئة التدريس. وعلاوة على ذلك الخوف من الوالدين عند الفشل،<sup>(١)</sup> الحصول على المواد للدراسة والمتطلبات السريرية،<sup>(٢)</sup> والإقامة في مساكن مكتظة،<sup>(٣)</sup> كانت مصادر رئيسة للتوتر لطلاب طب الأسنان في عدد قليل من البلدان. وأفادت العديد من الدراسات أن طالبات طب الأسنان الإناث أظهرن توتراً أكثر من الطلاب الذكور، و أظهرت بعض الدراسات فرقاً في توتر طلاب طب الأسنان بين السنوات المعملية والسريرية. التوتر في السنوات

المعملية قبل السريرية يؤثر على الإناث أكثر من الذكور، بينما يتأثر الذكور أكثر من الإناث خلال السنوات السريرية.<sup>(4)</sup> تم العثور على بعض مصادر التوتر في الإناث أكثر من الذكور، مثل عدم الثقة في اتخاذ القرارات السريرية، والشك في أن تكون طبيبة أسنان ناجحة.<sup>(5)</sup>

تم عرض الخيار الأول للقبول كمتغير ديموغرافي هام ولقد ثبت أن هناك المزيد من التوتر بين الطلاب الذين تم قبولهم في طب الأسنان ضد رغبتهم الأولى.<sup>(1، 2، 6، 7)</sup> بالإضافة إلى ذلك فقد يختلف مستوى التوتر وفقاً إلى السنة الدراسية، حيث عرض في دراسات سابقة أن المزيد من التوتر يتواجد في سنوات الدراسة العليا بشكل عام.<sup>(4، 1)</sup> 26 6 تختلف الضغوطات المهيمنة على الطلاب المبتدئين في السنوات قبل السريرية عن تلك التي يعاني منها طلاب طب الأسنان المتقدمين في السنوات السريرية، حيث أن مستوى التوتر يتزايد مع مرور الوقت.<sup>(16)</sup>

أدى إستعراض النتائج ووضعها في منظورها الصحيح إلى استخلاص الاستنتاجات التالية: أولاً: التوتر بين طلاب طب الأسنان والضغوطات لا يبدو أنها تعتمد على فترة الدراسة بشكل عام. وجدنا على سبيل المثال نتائج مماثلة من الدراسات في التسعينيات الميلادية من القرن الماضي والعقد الأول من القرن الحالي. ثانياً: يبدو أن بعض مصادر التوتر تختلف في أجزاء مختلفة من العالم. مصادر التوتر المتعلقة بالخوف من الوالدين تتواجد بكثرة في الهند، بينما كانت مصادر التوتر المتعلقة بالوضع المالي للطلاب أكثر في الدول الغربية الرأسمالية مما كانت عليه في الدول الشرقية، وأتضح أن مصادر التوتر المتعلقة بالموارد وتوريد المواد لطب الأسنان أكثر في الدول الفقيرة في أفريقيا.<sup>(1، 2، 11، 27)</sup> ثالثاً: التوتر بين طلاب الأسنان يمكن اكتشافه في وقت مبكر من خلال النظر عن كثب في علامات وأعراض التوتر بما في ذلك أداء الطالب. أدوات قياس التوتر مفيدة للكشف المبكر بحيث يمكن معالجته على الفور.<sup>(10، 28، 29)</sup>

للدراستات المستقبلية، نوصي بدراسة تأثير المناهج وطرق التدريس الحديثة على مستوى التوتر لدى طلاب طب الأسنان مثل التعليم النشط والمناهج الدراسية التي تركز على الطالب وعلى حل المشكلات وعلى البراهين، بالمقارنة مع المناهج التقليدية التي تركز على حضور المحاضرات النظرية والعملية.

من الواضح، أننا لا نريد إزالة التوتر تماماً أو إنقاص التوتر إلى مستوى الصفر أثناء دراسة طب الأسنان. دراسة طب الأسنان ومهنة طب الأسنان هي مثيرة ويبقى بعض التوتر طبيعى وضروري لتحقيق الأداء الأمثل عند كل من دراسة طب الأسنان وعلاج المرضى. لكن قد يكون التوتر العالي جداً له آثار ضارة، في أول الأمر على مستوى الأداء والتحصيل الدراسي، وفي نهاية المطاف على جودة علاج المرضى.

### تأثير السنة الدراسية على مستوى التوتر بين طلاب طب الأسنان الذكور (الفصل ٣)

وكان الهدف الثالث هو دراسة تأثير السنة الدراسية على مستوى التوتر لطلاب طب الأسنان خلال خمس سنوات من بكالوريوس طب و جراحة الفم والأسنان وتحديد المصادر الرئيسية للتوتر في العينة التي لدينا، والتي كانت من مجتمع مُتدّين وتدرس طبقاً لمنهج دراسي تقليدي. وتبين أن طلاب السنة الثالثة عموماً يتعرضون لأعلى مستويات التوتر، في حين أن طلاب السنة الأولى يتعرضون لأدنى مستويات التوتر. كان تفسير هذه النتيجة أن طلاب السنة الثالثة هم في مرحلة إنتقالية من السنوات العملية الى السنوات السريرية، والتي يبدأ الطلاب في علاج المرضى للمرة الأولى ويكون لديهم هاجس تلبية المتطلبات السريرية. وتبين في هذه الدراسة أن الإمتحانات والمتطلبات السريرية هما أكثر مصدران للتوتر عند طلاب طب الأسنان.

### علاج التوتر لدى طلبة طب الأسنان :مراجعة منهجية (الفصل ٤)

وكان الهدف الرابع هو مراجعة منهجية للدراسات المنشورة لتحديد برامج علاج التوتر في تعليم طب الأسنان وتحديد فعاليتها. تم نشر أنواع مختلفة من البرامج حول علاج التوتر لطلاب طب الأسنان، وأنها تختلف في المدة، والمحتوى، والنتيجة. وهذه البرامج هي جلسات إما مفردة أو متعددة، وتحتوي على طرق الاسترخاء أو معلومات عن التوتر. أقصر برنامج لعلاج التوتر مدته ساعة واحدة في جلسة واحدة، في حين أن أطول برنامج يتألف من ست جلسات ومدة كل منها ستين إلى تسعين دقيقة. برامج علاج التوتر إما أنها تقلل عدد مصادر التوتر أو أنها تعزز مهارات التعامل مع التوتر بطرق الإسترخاء مثل التنفس العميق واليوغا. تقلل برامج علاج التوتر الوقائية من مصادر التوتر من خلال محاضرات التوعية بالتوتر. معظم هذه البرامج أحبها الطلاب وساعدتهم على علاج التوتر لديهم. والجدير بالذكر أن معظم الدراسات المنشورة في هذا المجال لديها عيوب في طريقة البحث.

### فعالية برنامج علاج التوتر في تعليم طب الأسنان (الفصل ٥)

استناداً إلى نتائج البحث المنهجي، كان الهدف الخامس هو تصميم وتقييم برنامج جديد لعلاج التوتر لدى طلاب طب الأسنان، بحيث يتضمن طرق علاجية ثبتت فعاليتها من دراسات سابقة. نحن أطلقنا علي البرنامج الجديد أسم برنامج علاج التوتر في تعليم طب الأسنان . البرنامج يتألف من ثلاث جلسات كلّ منها تسعين دقيقة، وهو على حد علمنا أول برنامج لعلاج التوتر لدى طلاب طب الأسنان يحتوي على طريقة العلاج السلوكي المعرفي. وأظهرت النتائج العامة أن البرنامج الجديد كان ناجحاً في خفض مستويات التوتر لدى طلاب طب الأسنان. لكن على الرغم من أننا استخدمنا تصميم شبه تجريبي، إلا أن دراستنا أيضاً فيها عدداً من النواقص في منهجية البحث. لذلك فإنه لا يزال من غير الواضح ما إذا كانت النتائج قابلة للتعميم.

## المناقشة

يتضح أن مستويات التوتر العالية تؤثر سلباً على طلبة طب الأسنان. والجدير بالذكر أن التوتر يسبب أعراضاً مرضية وهي بدورها تسبب توتراً أكثر. التعامل مع هذا التوتر يعتبر مهماً لطلبة طب الأسنان والمعلمين والممارسين لطب الأسنان. يعتبر التعرف على معظم مصادر التوتر وأعراضه الخطوة الأولى للتعامل معه. والخطوة التالية هي التركيز على تقليل مصادر التوتر و علاج أعراضه، لكسر حلقة التوتر.

من الواضح أننا لا نقترح تقليل التوتر أثناء دراسة طب الأسنان الى الصفر. دراسة طب الأسنان ومهنة طب الأسنان من التجارب المثيرة التي تتطلب بعض التوتر الطبيعي للتحفيز الأداء في دراسة طب الأسنان وعلاج المرضى. والجدير بالذكر أن مستويات التوتر العالية لها آثار ملحوظة على التحصيل الدراسي أولاً و على علاج المرضى ثانياً.

المصادر الرئيسة للتوتر هي الإمتحانات و المتطلبات السريرية. أيضاً مستوى التوتر يزيد مع التقدم في سنوات الدراسة، والسبب الرئيس هو مقابلة الجمهور وعلاج المرضى. اللوحة الموجزة عن عوامل التوتر وأهميتها في كل سنة دراسية في دراسات هذه الأطروحة يمكن أن تكون نافعة جداً للمعلمين ولتطوير تعليم طب الأسنان.

أهم نتيجة في هذه الأطروحة أن هناك إختلاف واضح بين عدد الدراسات التي تناولت مصادر التوتر والدراسات التي تقلل او تعالج التوتر. هناك فقط ٧ دراسات تناولت علاج التوتر وكانت فعالة في تقليل مستوى التوتر عند طلبة طب الأسنان. والجدير بالذكر أن هذه الدراسات التي قدمت برامج لتقليل التوتر لم تتبع معايير ومقاييس مشتركة في المدة والمحتوى.

لغرض تقديم برنامج متكامل لعلاج التوتر لدى طلبة طب الأسنان، تم تصميم برنامج علاج التوتر في تعليم طب الأسنان وتم دراسة فعاليته لأول مرة. هذا البرنامج يحتوي على معلومات تثقيفية عن التوتر، ويحتوي على تمرين تقليل التوتر بخطوات سلوكية معرفية، وكذلك يحتوي على مهارات توفير الوقت. أوضحت دراستنا أن هذا البرنامج لعلاج التوتر فعال بغض النظر عن السنوات الدراسية. تضمين مثل هذا البرنامج لعلاج التوتر في تعليم طب الأسنان يمكن أن يكون مفيداً، وخاصة للطلاب الذين يشكون من آثار التوتر.

الأبحاث في هذه الأطروحة بيّنت أسباب التوتر، وتزايد به بمرور الوقت، وآثاره على الطلبة وأطباء الأسنان، و كيفية علاجه وتقليله. نوقشت أهمية التوتر في الأبحاث العلمية السابقة مما تلخص عنها كمية من المعلومات المفيدة لتقليل أثر التوتر لدى طلبة الأسنان.

## نقاط القصور ومقترحات للأبحاث المستقبلية

دراسات المراجعة المنهجية في هذه الأطروحة غطت معظم جوانب التوتر لدى طلاب الأسنان ووفرت قاعدة معلوماتية عن التوتر للعلماء لمتابعة البحث في نفس الموضوع، وللمعلمين لتطوير مناهجهم. وكذلك البرنامج الجديد الفعال لعلاج التوتر الذي يحتوي على طريقة معرفية سلوكية للمرة الأولى. والجدير بالذكر أن نتائج الدراسات في هذه الطروحة يعترضها بعض القصور.

كل الدراسات الميدانية في هذه الأطروحة تمت في الشرق الأوسط وأتسمت بتأثير العوامل الثقافية. كذلك هذه الدراسات الميدانية أجريت على طلاب طب الأسنان الذكور فقط بسبب العادات الثقافية والدينية. الدراسات المستقبلية لابد وأن تشمل طلاب وطالبات طب الأسنان.

البرنامج الجديد المقترح لعلاج التوتر تم التحقق من فاعليته بالبحث الميداني وتجربته على طلاب طب الأسنان، لكن عينة الدراسة كانت محدودة. ومع أن نتائج الدراسة كانت مشجعة وجيدة إلا أننا نقترح إعادة الدراسة على عينة أكبر ومتنوعة تمثل جميع مستويات طلاب وطالبات الأسنان.

إقترحنا في المراجعة المنهجية أبحاث ممكن أن تصمم برنامج علاجي فعال للتوتر، ووضع معايير ومواصفات البرامج الفعالة لعلاج التوتر لدى طلاب طب الأسنان. أيضاً هناك حاجة لعمل أداة حساسة ودقيقة لقياس التوتر لدى طلاب الأسنان ويشمل التطور التقني و العمليات الحديثة. مجال تعليم طب الأسنان يتطور وحيث أن أداة قياس التوتر القديمة (DES) أستخدمت كثيراً حول العالم فمن الجيد أن ندرس إذا كانت هذه الأداة تحتاج الى تحديث لشمول عوامل أستخدمت في المجال. الجدير بالذكر أن الأثر الواضح لتأثير السنة الدراسية على مستوى التوتر لطلاب طب الأسنان الذكور يُظهر الحاجة لدراسة مستقبلية مسحية طويلة على طول سنوات الدراسة للكشف عن مستوى توتر الطلبة قبل قبولهم في كلية طب الأسنان و مقارنة ذلك بشخصية الطلاب والسنوات الدراسية.

من المقترح دراسة الطرق التعليمية الحديثة مثل التعليم النشط الثنائي حيث لا يقتصر التعليم على الإصغاء وإنما يشجع على المشاركة في النقاش وكذلك دراسة المناهج الحديثة التي يكون الطالب هو محورها الرئيس وأثرها على مستوى التوتر ومقارنتها بالمناهج التقليدية المبنية على التلقين. كما ذكر سابقاً فإن برنامج علاج التوتر الجديد يستحق دراسة وبحث أكثر للتأكد من فاعليته في عينات وكليات مختلفة.

وفي النهاية يمكن أن نستخدم عدة طرق وبدائل غير المقياس الشائع لقياس التوتر (DES). والجدير بالذكر أن عدة دراسات حول العالم استخدمت مقياس التوتر (DES) الذي هو غير موضوعي وليس دقيق.

## الخلاصة

يمكن أن تُستنبط عدة إستنتاجات من الأبحاث في هذه الأطروحة. سوف نلخص هذه النتائج مع مراعاة التطور المستقبلي. طلاب طب الأسنان يواجهون العديد من مصادر التوتر في تعليم طب الأسنان والأكثر شيوعاً هي الامتحانات والمتطلبات السريرية. وقد تبين أن السنة الدراسية تؤثر على مستوى التوتر لدى طلاب طب الأسنان، حيث تبين في دراستنا التجريبية الخاصة أن طلاب السنة الدراسية الثالثة سجلوا أعلى درجات التوتر وطلاب السنة الدراسية الأولى سجلوا أدناها. هذه النتيجة لا تتفق مع الدراسات السابقة حيث تظهر أن مستويات التوتر لدى طلاب المرحلة السريرية أعلى مما كانت عليه في المرحلة ما قبل السريرية. تعرّض الطلاب في وقت مبكر نسبياً لرعاية المرضى في عينتنا في السنة الثالثة قد يكون تفسيراً للفرق بين نتائج دراستنا والدراسات السابقة. نقترح تعريض طلاب الأسنان لرعاية المرضى في أبكر وقت ممكن أثناء المنهج الدراسي. ذلك يمكن أن يساعد على تحقيق التوازن في الضغط عبر السنوات الدراسية المختلفة من المنهج الدراسي، وربما يقلل من مستويات التوتر في السنوات الأخيرة من المنهج الدراسي. هذا أمر مهم لأن أطباء الأسنان المتوترين قد يؤثر توترهم على علاج مرضاهم.

أظهرت المراجعة المنهجية أن هناك عدد محدود من الدراسات التي ناقشت علاج التوتر لدى طلاب طب الأسنان. وعلى العموم طلاب طب الأسنان يقدرّون برامج علاج التوتر واستفادوا منها مع أنها لا تتبع معايير وصفات معروفة. لذلك قررنا تصميم برنامجاً جديداً لعلاج التوتر أسمه برنامج علاج التوتر في تعليم طب الأسنان (DESM). وأظهرت الدراسة الأولى فعالية البرنامج و نتائج إيجابية في تقليل مستوى التوتر. واستناداً إلى هذه النتيجة، نوصي بإضافة البرنامج DESM إلى مناهج طب الأسنان. وهذا سوف يقدم فرصة للتحقق في ما إذا كان تقليل التوتر مماثل في عينات أخرى لعينة دراستنا. نوصي أيضاً بعمل بحث مماثل لدراستنا على طالبات طب الأسنان حيث بيّنت دراسة المراجعة المنهجية أن مستويات التوتر في الطالبات أعلى منها في الطلبة الذكور.

التوتر في أوساط كليات طب الأسنان مثبت وخطير ويحتاج إلى برامج وقائية وعلاجية، والتي يجب أن تضاف لمناهج طب الأسنان. هذه البرامج لمكافحة وعلاج التوتر سوف تؤثر إيجاباً على التحصيل الدراسي للطلبة وسوف تساعد على إنتاج أطباء أسنان أكفاء منتجين في حياتهم العملية.

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# Appendix 1

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Abdullah

## Appendix 2

### Curriculum Vitae

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## **Curriculum Vitae**

Dr. Abdullah Mohammed Alzahem (BDS, FAGD, MME) was born in 1970 and raised in Riyadh, Saudi Arabia. In 1995 he graduated from College of Dentistry, King Saud University and became a holder of a Bachelor's degree of Dental Surgery (BDS). He then completed his postgraduate studies in Temporomandibular Joint and Advanced General dentistry in the USA, in 1998. Subsequently, he was appointed the chief of dental clinics in Yarmook, King Abdulaziz Medical City in Riyadh. In 2004 he was awarded in USA the prestigious Fellowship of Academy of General Dentistry (FAGD), in the same year he was appointed as Consultant in Advanced General Dentistry and Temporomandibular Disorders. In 2009 he successfully completed the two-year master's program in Medical Education (MME) at the College of Medicine in King Saud bin Abdulaziz University for Health Sciences. The following year he was appointed as the program director for Advanced Education in General Dentistry residency program in King Abdulaziz Medical City and King Saud bin Abdulaziz University for Health Sciences. In this function he was tasked with the responsibility for all dental training programs, which he performed in addition to his practice in the clinic as dental consultant. He completed several studies in the field of dentistry related to stress, dental education, and Orofacial pain. He lectured nationally and internationally with innovative instructional methods including Problem-Based Learning, which makes him a health profession educationalist. He is a member of several central committees in the King Saud bin Abdulaziz University for Health Sciences related to health profession education and research, and interested in stress among dental students and its relation with curricula construction. He continued this interest in stress among dental students at Erasmus University Rotterdam, where he started a PhD program in 2010, and the results of his PhD project are reported in the present dissertation. Besides his research activities and dental practice in government sector he enjoyed charity work for non-profit organizations and looking forward to be a member of doctors without borders association (MSF).