Effectiveness of a Dental Students Stress Management Program

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Effectiveness of a Dental Students Stress Management Program
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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-min 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.

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1. 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.\textsuperscript{1} Academic factors and faculty relationships with students are the sources that create the most stress.\textsuperscript{2} 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.\textsuperscript{3} 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. 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, 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, training workshops that include aspects of academic problem solving, deep breathing and Progressive Muscular Relaxation (PMR), and introducing stress-management training over time which is effective in stress reduction and coping.

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. 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.

2. Method

A quasi-experimental pretest-posttest-follow-up-control group design was used to study the effectiveness of the stress management program (see Fig. 1).

<table>
<thead>
<tr>
<th>Time</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Measure stress (Pretest)</td>
<td>DESM Program</td>
<td>Measure stress (Posttest 2)</td>
</tr>
<tr>
<td></td>
<td>Experimental</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 2</td>
<td>Measure stress (Pretest 1)</td>
<td>Measure stress (Posttest 1)</td>
<td>Measure stress (Posttest)</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From Fig. 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.

2.2. 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 preprofessional 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.

2.3. Dental education stress management program (DESM)

The new program was based on the principle of psychoeducation and consists of three 90-min sessions. 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.

2.3.1. First session

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.

2.3.2. Second session

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 min. Secondly, they were asked to apply the seven-step cognitive behavioral approach in their own situations.

2.3.3. Third session
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.

2.4. 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). The DES questionnaire consists of 38 items that are scored on a 6-point scale (0 = not stressful, 5 = 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 1. The DES had a Cronbach’s Alpha of 0.89 at T1, 0.84 at T2, and 0.87 at T3. The PSM-9 questionnaire consists of nine items that are scored on an 8-point scale (1 = not at all, 8 = 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 p = .89). Means, standard deviations of the PSM-9 are presented in Table 1.

2.5. 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.

2.6. 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, 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.

3. Results

Stress levels for all participants are presented in Table 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 > 0.05. 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 > 0.05.

3.1. 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 < 0.05. The partial eta squared was 0.22, 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 < 0.05. The partial eta squared was 0.04, which is a small effect size. This supports Hypothesis 2. Figs. 2 and 3 demonstrate the interaction effects based on the estimated marginal means; these means can be found in Tables 2 and 3.

Furthermore, no main effect of Group could be found, either for the DES scores F(1, 29)=0.93, p > 0.05 or for the PSM-9 scores F(1, 29)=0.03, p > 0.05. 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 > 0.05). The mean PSM-9 difference
between Group 1 and Group 2 was \(-0.53 \ (SE=0.29, p > 0.05)\).

However, there was an effect of Time on DES scores, \(F(1, 29)=18.55, p < 0.05\) and on PSM-9 scores \(F(1, 29)=7.47, p < 0.05\). 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 (\(SE=0.07, p < 0.05\)). 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 (\(SE=0.10, p < 0.05\)) and 0.44 (\(SE=0.16, p < 0.05\)) respectively.

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 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 (\(SD=0.36\)), \(t(30)=5.51, p < 0.05\)) and PSM-9 scores (0.56 (\(SD=0.69\)), \(t(30)=4.52, p < 0.05\)) in the expected direction. These findings provide further support for the hypotheses.

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. All effects are significant at the 0.05 level, except factor 1 Living accommodation (0.18 (\(SD=0.69\)), \(t(30)=1.45, p > 0.05\)) and factor 5 Clinical (0.02 (\(SD=0.44\)), \(t(30)=0.25, p > 0.05\)).

Due to the low scores in Table 1 and the non-significant Cohen's \(d\) in Table 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.

### 4. 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 tests indicate that students had lower stress scores after following the DESM program than during the pretests. These effect sizes were large (see Tables 4 and 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.

4.1. 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.9,16

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’.17 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.17–19

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.

5. 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.

Acknowledgments

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