Improvement in Academic Performance of Undergraduate Dentistry Students after Learning Stress Coping Skills

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ABSTRACT

Objectives: To assess the effectiveness of learning stress coping skills in improving academic performance and reducing anxiety levels amongst undergraduate students of dentistry. **Methods:** 43 students received a pre-validated module on stress coping skills. The module consisted of 13 units, a total duration of 24 hours consisting of topics related to stress, coping skills and relaxation techniques. 41 students were in the control group without any special training. **Results:** In training group majority of students reported normal (58.1%) or minimal to moderate anxiety (27.9%) in contrast the control group students 39% students reported most extreme anxiety as measured by Zung anxiety self-assessment tool, and Coping as measured by "Ways of coping scale by Folkman and Lazarus". Significantly more number of students in the training group reported lower levels of exam related stress, better coping ability, higher satisfaction about performance in exam compared to control group. Blinded faculty assessment of student performance, students stress levels and students coping ability showed that trained students had significantly higher ratings compared to control group. Students who underwent stress control program showed better academic performance in written assessment examination as well as practical assessment. **Conclusions:** Training program helped the students in having less stress, better coping skills and superior academic performance.

Key words: Dental student, Education, Performance, Psychological stress, Stress coping skills, Zung anxiety self-assessment

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INTRODUCTION: The dental education in highly stessful[1,2 3]. A comparative study found that stress levels increase significantly throughout the years of course for dental students whereas the stress levels progressively decreased in medical students.[3,4] Dental students also reported higher pathological values of burnout, depression and depersonalization compared to medical students[5]. The high stress of dental students may lead to maladaptive coping behaviours[6], depression and anxiety and substance abuse thus adversely affecting personal life of the students.[5-7]

Stress could lead to adverse effects on health like difficulty concentrating, intense fatigue, back pain, and feeling down/depressed and thus adversely affect academic performance[4].It can thus be implied that dental students' anxiety can interfere with their performance during dental procedures as well as operator's anxiety could in turn adversely affect patient anxiety. Higher emotional intelligence in a dental student can significantly reduce stress and improve patient satisfaction[8]. Some dental students do require enhanced support to enhance learning and it has been recommended that dental students be provided with a stress management program during their dental training[9,10]. Though some recent reviews of literature[11] and individual studies involving dental students[12] have suggested isolated positive effects of stress management programs on surgical skills[12] or on examination success[13] there is need for comprehensive study that measures effects of such introduction of such a program as a part of curriculum on knowledge, skills and coping strategies of dental students. Thus, aim of our study was to assess the effectiveness of learning stress coping skills in improving theoretical and practical academic performance, reducing anxiety levels and supporting positive coping behaviours amongst undergraduate students of dentistry in our dental institution.

MATERIAL AND METHODS:

Study population and groups: All the second year undergraduate students of dentistry were invited to participate in the

study. Written informed consent was obtained from all the students willing to participate. Institution ethics committee approved the protocol. The participating students (n=84) were randomly (????) divided into two groups: Group 1 (n=43) : Training group received 24 hours pre-validated stress coping skills module included 13 units and Group 2(n=41) : Control group without any special training. The principal investigator is a recognized trainer in stress control training programs. He conducted the 'learning stress coping skills' program for students. Method of instruction included interactive lectures with PowerPoint presentations and group activities. Curriculum and contents of stress coping skills module included 13 units was pre-validated and is as shown in annexure (Annexure I)

Assessments and evaluations: First internal exams attended by students prior to the study participation served as baseline assessment. The second internal assessments and preliminary examination conducted after the stress coping training program served as post training assessments for comparison of groups. The exams were for all the subjects taught during the second year including general pathology, microbiology, and pharmacology. The assessments were in written assessment format as well as practical skills assessment. Written assessment included multiple choice questions, short answer questions and long answer questions. Practical skills assessments included spotting, table viva, procedures. During the examinations the students were also asked to assess exam related stress and self-assess their own performance in the exam. The stress levels of student and overall performance was also measured as perceived by blinded faculty. Faculty ratings were calculated by taking average ratings taken independently by four faculties. All the participants also responded to assessment of anxiety using **"Zung anxiety self-assessment tool" and details regarding the common coping styles using "Ways of coping scale by Folkman and Lazarus".** The students also answered questions related to their sleep and diet and also rated their coping ability. Finally, the students in the training group also evaluated various aspects of 'stress coping training program".

Statistical analysis : Analysis was conducted using the statistical computation software SPSS Version 17. All the continuous variables were first checked for normalcy using Shapiro-Wilk test. P-value of <0.05 was assumed to be significant deviation from normal distribution. In such

cases the analysis was followed by application of non-parametric tests. Comparison of training and control group's continuous variables following normal distribution was done by Independent samples –t-test. Comparisons for comparison of ordinal variables were done using Mann-Whitney test. Probability value of <0.05 was considered as statistically significant.

Observation and Results: General characteristics of study participants: A total of 84 participants took part in the study. Mean age of study participants was 18.7 with a standard deviation of 0.5. There were 60 females (72.3%) and 23 males (27.7%) participating in the study. 49 participants (59%) stayed at hostel provided in campus whereas 26 participants (31.3%) were from the same city and stayed with their family and a minority of participants (9.6%) stayed outside campus at a rented place. Majority of participants spoke Marathi – the regional language- as their mother tongue (n= 56, 68.3%) whereas rest of the students had other languages as mother tongue. Majority of participants were having English language as their medium of study (n=69, 85.2%) whereas 12 others (14.8%) studied with regional language as medium of instruction. The qualifying examination (12^{th} standard) performance for the study participants was 78% with a standard deviation of 0.1%. Only 34 of the study participants (41%) had dentistry as their first preference while selecting their career. Though majority of participants chose dentistry on their own (n=67, 80.7%) parents strongly influenced the choice for the other students (n=16, 19.3%). Common stressors and relaxing factors are presented in Table 1. Evaluation of the program by the students in the training group is presented in table 2.

Table 1: Top five stressors and relaxing factors identified by students (information obtained at baseline, n= 84)

Common stressors	**Not stressful**	**Slightly stressful**	**Moderately stressful**	**Highly stressful**
Amount of assigned class work	8 (9.5%)	31 (36.9 %)	42 (50.0%)	2 (2.4%)
Examinations and grades	8 (9.5%)	25 (29.8%)	34 (40.5%)	17 (20.2%)
Competition for postgraduate seats	9 (10.7%)	13 (15.5%)	23 (27.4 %)	29 (34.5%)
Fear of failure in exam	15 (17.9%)	23 (27.4%)	24 (28.6%)	17 (20.2%)
Insecurity concerning professional future	17 (20.2%)	25 (29.8%)	24 (28.6%)	13 (15.5%)
Overall stress: How much of stress did you feel this week?	12 (14.3%)	24 (28.6%)	28 (33.3%)	20 (23.8%)

Relaxing factors	Very much relaxing	Considerably relaxing	Somewhat relaxing	Little relaxing
Listening to music in clinical departments	64 (76.2%)	14 (16.7%)	3 (3.6%)	3 (3.6%)
Personal hobbies like music, sports	58 (69.0%)	16 (19.0%)	7 (8.3%)	3 (3.6%)
Interaction with your friends	54 (64.3%)	24 (28.6%)	3 (3.6%)	3 (3.6%)
Vacations and holidays	48 (57.1%)	20 (23.8%)	4 (4.8%)	12 (14.3%)
Beautiful campus of college	52 (61.9%)	18 (21.4%)	11 (13.1%)	3 (3.6%)

Table 2: Evaluation of the stress-coping skills program by the students in the training group (n = 37)*

Aspects of evaluation	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
The training met your expectations	16 (43.2%)	17 (45.9%)	4 (10.8%)	0 (0%)	0(0%)
You will be able to apply the knowledge learned	10 (27 %)	27 (73%)	0 (0%)	0(0%)	0(0%)
The training objectives for each topic were identified and followed	11 (29.7%)	22 (59.5%)	3 (8.1%)	1 (2.7%)	0(0%)
The content was organized and easy to follow	14 (37.8%)	22 (59.5%)	1 (2.7%)	0(0%)	0(0%)
The presentation of trainer was effective	18 (48.6%)	18 (48.6%)	1 (2.7%)	0(0%)	0(0%)
The trainer was knowledgeable	30 (81.1%)	7 (18.9%)	0(0%)	0(0%)	0(0%)
The quality of instruction was good	14 (37.8%)	22 (59.5%)	1 (2.7%)	0(0%)	0(0%)
The trainer met the training objectives	10 (27 %)	27 (73%)	0 (0%)	0(0%)	0(0%)
Class participation and interaction were encouraged	14 (37.8%)	20 (54.1%)	3 (8.1%)	0(0%)	0(0%)
Adequate time was provided for questions and discussion	12 (32.4%)	23 (62.2%)	2 (5.4%)	0(0%)	0(0%)
The stress management program may help you in life	24 (64.9%)	13 (35.1%)	0(0%)	0(0%)	0(0%)
The rating of the training overall	24 (64.9%)	13 (35.1%)	0(0%)	0(0%)	0(0%)

*Out of 43 participants of the training group only 37 participated in providing feedback.

Effect on academic performance: Baseline comparison (first internal exam) showed no significant differences between the training and control groups for all the three subjects. The training program students performed significantly better than control group during II internal exam in general pathology and pharmacology subjects. The difference was not significant for microbiology subject for II internal exam between the two groups. However, the training program students performed significantly better than control group during preliminary examination in all the three subjects. Overall i**mplication is that the s**tudents who underwent Stress control program showed better academic performance in written assessment

examination when compared to the control group. The results suggest a beneficial effect of the stress management programs on performance of students in theory examination. **(Table 3)**

Effect on performance in practical examination: Baseline comparison (first internal exam) and preliminary examination marks showed no significant differences between the training and control groups for all the three subjects. The training program students performed significantly better than control group during II internal exam in all the three subjects. The results suggest a beneficial effect of the stress management program on performance of students for a **short period of time**. The beneficial effect seems to wear off by ____months as seen in preliminary exam marks. **(Table 3)**

Table 3: Comparison of academic performance of the students in both groups in the subject of general pathology written assessment examination (Independent samples –t-test)

Assessment test subject and test name			Training program group(n = 43) Mean ± Standard deviation	Control group (n=41)	Mean Difference of training minus control (95% confidence limits)	Significance
Written assessment	General pathology	First internal	25.4 ± 7.0	25.1 ± 5.7	0.3 (-2.5, 3.1)	0.81, NS
		Second internal	30.1 ± 4.4	27.0 ± 4.9	3.1 (1, 5.1)	0.003, S
		Preliminary	30.3 ± 6.5	26.1 ± 5.5	4.2 (1.6, 6,8)	0.002, S
	Microbiology	First internal	31.4 ± 5.6	31.2 ± 5.5	0.2 (-2.2,2.6)	0.89, NS
		Second internal	32.2 ± 5.2	30.1 ± 5.4	2.1 (-0.2, 4.4)	0.06, NS
		Preliminary	34.6 ± 4.9	31.0 ± 5.7	3.6 (1.3, 5.9)	0.003, S
	Pharmacology	First internal	24.3 ± 9.7	21.1 ± 8.1	3.3 (-0.6, 7.1)	0.09, NS
		Second internal	26.7 ± 8.5	22.2 ± 7.7	4.5 (1, 8.1)	0.01, S
		Preliminary	47.0 ± 11.0	37.9 ± 10.1	9.1 (4.5, 13.7)	<0.001, S
Practical assessment	General pathology	First internal	32.0 ± 7.3	31.7 ± 6.1	0.4 (-2.6, 3.3)	0.81, NS
		Second internal	36.3 ± 4.8	33.5 ± 7.2	2.9 (0.2, 5.5)	0.03, S
		Preliminary	36.5 ± 4.2	35.1 ± 5.8	1.4 (-0.8, 3.6)	0.21,NS
	Microbiology	First internal	30.3 ± 6.5	29.6 ± 4.8	0.6 (-1.9, 3.1)	0.62, NS
		Second internal	31.7 ± 4.5	29.9 ± 5.0	1.8 (-0.3, 3.8)	0.09,S
		Preliminary	33.7 ± 3.4	32.3 ± 4.5	1.4 (-0.3, 3.1)	0.11, NS
	Pharmacology	First internal	43.5 ± 6.6	40.6 ± 8.0	2.9 (-0.3, 6.1)	0.08, NS
		Second internal	46.6 ± 8.2	42.1 ± 10.5	4.5 (0.4, 8.5)	0.03,S
		Preliminary	64.3 ± 9.2	63.1 ± 11.5	1.2 (-3.3, 5.8)	0.59,NS

S –Significant, NS – Not significant

Stress and coping during the examinations based on anxiety questionnaires: In training group majority of students reported normal (58.1%) or minimal to moderate anxiety

(27.9%). Only 11.6% students reported marked to severe anxiety whereas one

student (2.3 %) reported extreme anxiety when assessed by by Zung anxiety self-assessment tool. **In contrast, in control group** 39% students reported most extreme anxiety. Only 14.6% students in control group showed normal stress levels. The stress levels in training group were significantly lesser than control group when statistical test was applied. It is implied that undergoing training program for stress reduction could significantly reduce exam related stress in students. **(Table 4)**

Table 4: Comparison of training and control groups based on "Zung anxiety self-assessment tool"

Measurement scale	Statistical parameter	Training program group (n = 43)	Control group (n=41)	Overall total
Zung's raw scores	Mean ± Standard deviation	35.8±9.8	52.0± 19.0	
	Median (25th and 75th percentiles)	35 (29,39)	45 (37,75)	
	p-value and significance*	p <0.001, Significant		
Anxiety index scores	Mean ± Standard deviation	44.9± 12.2	65.5± 23.7	
	Median (25th and 75th percentiles)	44 (36,49)	56 (46,94)	
	p-value and significance*	p <0.001, Significant		
Number and percentage of participants with corresponding clinical interpretation of "Zung anxiety self-assessment tool"	Within normal range anxiety	25 (58.1 %)	6 (14.6%)	31 (36.9%)
	Minimal to moderate anxiety	12 (27.9 %)	18 (43.9%)	30 (35.7%)
	Marked to severe anxiety	5 (11.6%)	1 (2.4%)	6 (7.1%)
	Most extreme anxiety	1 (2.3 %)	16 (39.0%)	17 (20.2 %)
	Total	43 (100 %)	41 (100%)	84 (100%)
	p-value and significance (Mann-Whitney test)	P<0.001, Significant		

*Mann-Whitney U test

Self reported stress, coping skills and self-perceived performance during exam: Significantly more number of students in the training group reported lower levels of exam related stress compared to control group when measured on Likert scale. Significantly more number of students in the training group reported better coping ability to exam related stress and significantly better self- rated satisfaction about performance in exam.**(Table 5)**

Comparison of stress, coping and performance between training and control groups based on Faculty ratings: Blinded faculty assessment ratings showed that stress levels were significantly higher in control group whereas coping ability of student was rated higher for the students in the training group. Faculty assessment of student performance in test had significantly higher ratings for the students in training group compared to control. **(Table 5)**

Coping styles employed by students: Training groups students were having mean scores for all coping types compared to control group except escape avoidance coping and distancing coping. The control group had higher levels of escape avoidance coping. There was no significant difference between the groups for distancing coping. **(Table 6)**

Table 5: Comparison of exam related stress, coping and satisfaction about performance in exam between test and control groups

		Number and percentage of students			
		Training group	Control	Total / Combined	p-value
Self-rated exam stress	Not at all stressful	4 (9.3 %)	0 (0%)	27 (32.1%)	p< 0.0001, Significant
	A little bit stressful	16 (32.7 %)	7 (17.1%)	33 (39.3%)	
	Moderately stressful	20 (46.5%)	18 (49.3%)	9 (10.7%)	
	Very stressful	3 (7%)	15 (36.6%)	15 (17.9%)	
	Extremely stressful	0 (0%)	1 (2.4%)	1 (1.2%)	
	Total	**43 (100 %)**	**41 (100%)**	**84 (100%)**	
Self-rated coping ability	Not coping at all	1 (2.3 %)	0 (0%)	1 (1.2%)	p< 0.0001,Significant
	Coping a little	8 (18.6 %)	25 (61%)	33 (39.3%)	
	Coping satisfactorily	20 (46.5%)	13 (31.7%)	33 (39.3%)	
	Coping well	11 (26.5%)	3 (7.3%)	14 (16.7%)	
	Coping Extremely well	3 (7%)	0 (0%)	3 (3.6%)	
	Total	**43 (100 %)**	**41 (100%)**	**84 (100%)**	
Self-rated satisfaction about performance	Not satisfied at all	2 (4.7 %)	12 (29.3%)	14 (16.7%)	p< 0.0001,Significant
	A little bit satisfied	16 (37.2 %)	19 (46.3%)	35 (41.7%)	
	Moderately satisfied	15 (34.9%)	10 (24.4%)	25 (29.8%)	
	Very satisfied	10 (23.3%)	0 (0%)	10 (11.9%)	
	Extremely satisfied	0 (0%)	0 (0%)	0 (0%)	
	Total				
Faculty rated exam stress	Mean $\pm$ Standard deviation	2.5 $\pm$ 0.4	3.1 $\pm$ 0.9		p <0.001, Significant
	Median (25^{th} and 75^{th} percentiles)	2.5 (2, 2.75)	2.75 (2.25, 4.25)		
Faculty rated coping	Mean $\pm$ Standard	3.2 $\pm$ 0.7	2.4 $\pm$ 0.6		p <0.001,

ability	deviation				Significa nt
	Median (25th and 75th percentiles)	3 (2.75, 3.75)	2.5 (1.87,3)		
Faculty rated satisfaction about performance	Mean ± Standard deviation	3.3 ± 0.6	2.2 ± 0.86		p <0.001, Significa nt
	Median (25th and 75th percentiles)	3.25 (2.75,3.75)	2.5 (1.25,3)		

Table 6: Comparison of faculty ratings of coping styles in training and control groups

Type of coping	Training program group (n = 43)	Control group (n=41)	Significance
	Mean ± Standard deviation		
Confrontive coping	2.3 ± 0.41	2.1 ± 0.33	0.01,Significant
Distancing coping	2.3 ± 0.57	2.1 ± 0.5	0.17, Not significant
Self-controlling coping	2.5 ± 0.47	2.1 ± 0.7	p - 0.001, Significant
Seeking social support	2.5 ± 0.47	2.1 ± 0.7	p - 0.001, Significant
Accepting responsibility	2.5 ± 0.47	2.1 ± 0.7	p - 0.001, Significant
Escape-avoidance	2.1 ± 0.5	2.6 ± 0.7	p <0.001, Significant
Painful-problem solving	2.7 ± 0.6	2.2 ± 0.8	p <0.001, Significant
Positive re-appraisal	2.9 ± 0.6	2.3 ± 0.9	p - 0.001, Significant

DISCUSSION: Studies have revealed that being a student is stressful and it is more stressful for students of dentistry compared to medical. Stresses may be the schoolwork related items such as amount and difficulty of class work, obtaining of grades, fear of failing a course and fear of being unable to catch up if left behind. Some potential stressors may be related to atmosphere of school like belittlement, bullying, criticism, inconsistency in feedback…etc. The personal life stressors of students like financial problems, family issues and insecurities about professional future could also prove to be of detrimental effect to the students' academic life.

It is well known that people can be trained to positively cope with stress and anxiety. When stress has prevailed as unwanted side effect of the learning process, it is desirable that the curriculum itself incorporates modules to annihilate the effects of stress on academic progress of students. The positive effects of such training programs have been reported in literature earlier and many medical and dental schools have tried to incorporate a stress control program[14 - 24].

Kelly JA in 1982[14] conducted stress management training amongst medical students and found the training

group to be superior in stress management. We share the authors concerns that although there are ample studies reporting high stress amongst medical students very few studies are reported that model a training program to deal with this stress effectively. In a more recent study Rosenzweig S[15] and colleagues in reported reduction in psychological stress following mindfulness based training program for medical students. In another training program, Whitehouse WG et.al.[16] reported a reduction in stress after a stress management training using self- hypnosis techniques. These programs though based on different strategies of dealing with stress could be offered as a part of the course itself or can be electively chosen or offered to the students in academic or personal distress. Lee J and Graham AV[17] reported in 2001 the effectiveness of a "wellness elective" for students in medical school. Rosenzweig S et al conducted a study on effectiveness of mindfulness-based stress reduction to improve coping skills. It was found that mood disturbance was higher in control group compared to intervention group that received mindfulness based stress reduction program**[15]**. Similar beneficial effects have been found after students were trained in a self- hypnosis stress management program[16] , mindfulness based programs[17], programs based on bio-feedback-aided relaxation techniques. Iglesias SL [18] studied the effects of different types of stress management programs and used objective measures like salivary cortisol levels an one of the outcome measures and found that the stress management program participants did show decreased levels of cortisol in saliva.

As suggested by authors such programs need to be designed to train the students for a life-long habit of dealing with stressful medical practice. Similar suggestions have been made by Kjeldstadli K et.al[23] that conducted a six year longitudinal, nationwide comparative study in Norway and concluded that medical schools should encourage students to improve social and personal lives as health-promoting coping strategies. Similar views have been reported by Dunn et.al.[25.]

Most of these aforementioned programs reported beneficial effects in reducing stress but very few programs

report its impact on academic performance. One study examined students who meditated or used diaphragmatic breathing (Five minutes of Deep Breathing meditation) showed significant increases in students' academic learning and achievement. One limitation of our study was that there was no 'randomization' done to allot the students to the different groups. (Explanation of how the allotment done might not have affected the study results.) The duration of our study was for 6 months. Though the effectiveness has been seen for the shorter duration it is to be expected that there may be some long term decay in the knowledge and skills learnt in the training period. It remains to be seen the length of duration up to which positive effect of the training program will remain and at what stage do we need to repeat the program to reinforce the positive effects training all though the course of the dentistry program.

CONCLUSION: The students in training group had significantly lesser stress levels during exam, better coping skills and better academic performance and practical skills when self-assessed and assessed by blinded faculty. In view of the positive impacts observed in this study author highly recommend introduction of modules of stress coping skills for all students.

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