ORIGINAL ARTICLE

The Effect of a Problem-focused Coping Stress Management Program on Self-efficacy, Psychological Distress, and Salivary Cortisol among First-year Medical Students of Udayana University

Susy Purnawati, MD, PhD, MKK,[1] Putu Gede Adiatmika, MD, PhD, MErg[1]
and Cokorda Bagus Jaya Lesmana, MD, PhD, MARS[2]

[1]*Physiology Department Medical Faculty, Udayana University, Indonesia*
[2]*Udayana University and the Suryani Institute of Mental Health, Indonesia*

ABSTRACT

Objective. Current evidence has shown academic stress to be associated with student maladaptive behavior. This study aimed to investigate the effect of a problem-focused coping stress management program on first-year medical students' self-efficacy, psychological distress and find its effect on salivary cortisol.

Method. Forty students who scored high on academic stress and external locus of control were randomly selected as the intervention (n = 26) and control group (n = 14). An intervention in the form of a problem-focused coping stress management program was organized. The intervention was a 1½-hour training class conducted once a week for four weeks.

Results. There was a significant difference in self-efficacy between the intervention and control groups (p-value = 0.029). The self-efficacy score was significantly higher after the intervention (19.31 ± 2.396 vs 21.27 ± 2.677, p = 0.005). Likewise, a significant difference in the psychological distress between the two groups was found after the intervention (control group = 40.14 ± 3.860; intervention group = 37.12 ± 4.537, p < 0.05). We also found a significant decrease in salivary cortisol after the intervention among this group (0.68262 µg/dl ± 0.367 to 0.43304 µg/dl ± 0.231, p < 0.05), but there was no significant difference in cortisol between intervention and control group after the intervention (0.49479 µg/dl ± 0.264 and 0.43304 µg/dl ± 0.231, p = 0.448).

Conclusion. The problem-focused coping stress management program improved self-efficacy and decreased the psychological distress and salivary cortisol of first-year medical students in this research.

Key Words: cortisol, psychological distress, self-efficacy, coping skill

INTRODUCTION

Worldwide, the incidence of academic stress, depression, and student suicides is increasing.[1-4] The World Health Organization (WHO) defines academic stress as a body reaction that arises when an individual is faced with task demands that are not following his knowledge, skills, or abilities that challenge his ability to cope. Academic stress reactions can be physiological, emotional, cognitive, and behavioral.[5] The incidence of academic stress, as well as other mental health problems in society, is an iceberg phenomenon, which means the detected cases are only a small fraction of the large number of cases that occur in the community, such as drinking, smoking, depression, anxiety,

Paper presented in the 2nd International Conference of Indonesian Occupational Medicine Specialist Association 2019 at Indonesia.

Corresponding author: Susy Purnawati, MD, PhD, MKK
Physiology Department Medical Faculty
Udayana University
Jl. PB. Sudirman Denpasar, Bali, Indonesia.
Email: s_purnawati@yahoo.com

nervousness, fatigue, and decreased immunity to infection and decreased cognitive functioning.[6-8]

The academic workload of medical students is heavy. This is following the profession's demands and responsibilities, including dealing with the risk of patient death and medical misconduct. Stressors on medical students, especially in the first semester, are similar, where the additional task like heading a campus seminar committee, financial problems, attending campus activities (more than two activities on the same day), being away from parents, extensive lecture material that must be learned for exams, and involvement in committees and other student activities. In addition, individual factors can interact with academic burden factors, increasing the risk of academic stress. According to Al-Ayadhi, academic stress can arise due to a large number of academic tasks, short amount of time to complete a task, complex task structures, hectic student activity schedules, poor physical conditions, inadequate learning environment, non-interpersonal relationships, and the lack of social support from friends and family.[9] Research in several countries showed that low academic achievement and conflict with colleagues were the most common academic stress sources.[10-14] Other stressors included family income, heavy quantitative and qualitative homework, additional activities on campus, and additional workload at home.[15,16]

Academic stress is related to low self-efficacy and can become a source of psychological distress in students. It also affects the stress response increasing cortisol. The body will respond to stress within the limbic system, particularly the amygdala and hippocampal regions, which signal the posterior medial portion of the hypothalamus. A chain reaction follows this, activating the hypothalamic-pituitary-adrenal axis (HPA-axis) and sympathetic-adrenal-medullary axis (SAM-axis).[17] The sympathetic adrenal-medullary system regulates the secretion of the catecholamines of adrenaline and noradrenaline and the hypothalamic-pituitary-adrenocortical for cortisol secretion controlling system. One of the essential functions of cortisol is to protect the organism as a self-defense system.[18,19] Various stressors can activate the entire system to cause cortisol release quickly. In a previous study, morning salivary cortisol is an adequate parameter for study-related stress.[20,21] Stress stimulation is one of the most potent stimuli; this stimulation can always break the direct inhibiting feedback of cortisol, which will lead to the occurrence of periodic exacerbations of cortisol secretion at various times during the day or the elongation of cortisol secretion in a chronic stress state.[22] The awakening cortisol response (ACR) shows a high degree of intra-individual stability when measured for several days or weeks. Therefore it can presumably be used to measure the level of psychological strain in daily life. Increased ACR is associated with perceived stress.[23]

Self-efficacy is defined as a self-evaluation of one's competence to successfully execute a course of action necessary to reach the desired outcome.[22] Academic self-efficacy refers to students' confidence in their ability to carry out academic tasks such as preparing for exams and writing term papers. A meta-analysis of studies on self-efficacy in educational environments concluded that the most specific academic self-efficacy indices had the strongest effect on academic outcomes. Self-efficacy affects participants in increasing students' motivation and persistence to master challenging academic tasks by fostering the efficient use of acquired knowledge and skills.[22] A previous study found a positive association between academic self-efficacy and the number of hours students spent studying.[23] Thus, low self-efficacy increases the risk of academic stress among students.

Self-efficacy and stress are closely related concepts. In Lazarus's cognitive model of stress, personal beliefs such as self-efficacy are crucial in evaluating demands from the environment. Each external demand is assessed as a threat or a challenge, and persons with high self-efficacy beliefs are more likely to evaluate the demands as a challenge.[22]

A problem-focused coping stress management program has proven to be effective in improving self-efficacy in some professions. This study applied a problem-focused coping stress management program that included personal and time-management skills training. The program focused on reducing the burden of academic tasks, changing one's perceptions of the stressors, and improving the coping mechanisms.[24]

Successful completion of academic tasks and cognitive restructuring processes will improve physiological responses and self-efficacy. High self-efficacy reduces psychological distress because the individual will see the demands of the task as a chance to achieve the goal. In line with other studies, a similar stress management program also benefits by reducing cortisol levels. They found that training programs on stress management techniques and relaxation programs can significantly reduce high cortisol levels.[25,26] In this study, we expect an increase in the students' coping ability, a decrease in external stressors, and a decrease in the cortisol level as a result of the stress management intervention.

A study in Japan found the effectiveness of a stress-management problem-focused coping program in reducing psychological distress in participants from several different professions.[27] Accordingly, we expect the problem-focused coping stress management program to improve self-efficacy, decrease psychological distress, and decrease salivary cortisol among students.

METHODS

Study participants and procedure

This study was a randomized control trial. The sample size was calculated using the *G*Power 3* formula.[28] The accepted type I error was $\alpha = 0.05$ ($Z\alpha = 1.96$), and the type II error received was $ß = 0.05$ ($Zß = 0.84$). To get the effect size of 1.3, the required minimum number of participants for each group was 14 students. The study population was 84 first-

year students at the Medical School of Udayana University. Forty students were selected based on the inclusion criteria: having an external locus of control and high academic stress score. Exclusion criteria: students who were already having stress disorder or under treatment from a psychiatrist. The students were randomly allocated using the lottery method to the intervention group or the control group.

Participants were 18 to 23 years old. The intervention group (n = 26) included 18 females and 8 males, while the control group (n = 14) included 12 females and 2 males.

Intervention

The intervention was a problem-focused coping stress management, in the form of training class. The training was done four times (one session each week), and each session was one and a half hours in duration. Participants learned about how academic stress affects the body and mind. They were trained in time management techniques, assertiveness skills, and internal locus of control to improve cognitive performance. They were also given tasks to perform as homework and had to write in a mood diary book. There were two trainers as resource persons experienced in providing training (an occupational physician who completed "stress management program" training at the Mental Health Department of Tokyo University, and an industrial psychologist trainer/expert at the Medical Faculty of Udayana University). The participants agreed on the day and time for the training. To assess the effects of the intervention, participants answered the questionnaire before an activity and two days after the end of the training. We did a waiting list intervention for the control group after the study was completed according to the ethical issue.

Self-report measures

Self-efficacy was measured using the Student Self-Efficacy Questionnaire.[29] The questionnaire contained five items that were responded to on a scale of 1–5 (*strongly disagree* to *strongly agree*). The five items included (1) "I'm certain I can master the skills taught in this class"; (2) "I'm certain I can figure out how to do the most difficult classwork"; (3) "I can do all the work in class if I do not give up"; (4) "Even if the work is hard, I can learn it"; and (5) "I can do the hardest work in this class if I try." The lowest score is 5, and the highest is 25.

Academic stress was measured using a modified version of the Brief Job Stress Questionnaire (BJSQ) in the Indonesian language. The questionnaire had 29 items that were responded to on a 4-point Likert scale, where 1 = very rarely and 4 = almost all the time. Some items were reverse-scored such that higher scores represented higher levels of academic stress.

Salivary cortisol levels

To prepare for the salivary cortisol examination, the participants were told the following requirements: (1) No drinking of alcohol twelve hours before salivary sampling; (2) No eating sixty minutes before salivary sampling; (3) No drinking milk or dairy products twenty minutes before salivary sampling; (4) No eating of sweet or sour or coffee/caffeine foods as these can lower the pH of the saliva and invite bacterial growth; (5) Rinse mouth with water (to remove food scraps) before salivary sampling, and drink water (to increase hydration); (6) Wait for ten minutes after rinsing before the salivary sampling (to avoid dilution of salivary samples); (7) No smoking during the intervention period; (8) No heavy physical activities in the evening; (9) Enough sleep at night; and (10) Record any form of physical activity, alcohol consumption, amount of caffeine-related drinks, and medicines, and history of oral diseases.

The research participants collected their saliva between 5 and 6 a.m., which was collected by a lab officer and stored in a freezer from 8 to 8:30 a.m. The saliva collection was done by tilting the head forward, allowing the saliva to stagnate at the bottom of the oral cavity. Then, the saliva was passively dropped into a polypropylene bottle. Sampling was done the day before the intervention and two days after the intervention at the same time in the morning. Research participants collected their saliva in the morning when waking up and putting it in a container. Then, within 1–2 hours, the saliva samples were submitted to the laboratory personal at the Medical Faculty building to be transported to a freezer container in the laboratory where the specimen was examined. A High Sensitivity Salivary Cortisol Enzyme Immunoassay Salimetric was used to measure the salivary cortisol.[30] The standard calibration range was 0.012–3 µg/dL, and the detection limit was 0.007 µg/dL. The saliva analysis was done at the Prodia Laboratory in Denpasar, which has national and international certifications.

Statistical procedures

Data were statistically analyzed for normality using the Kolmogorov Smirnov test. To test the hypotheses, the independent t-test was used to analyze the difference in scores on the measures between the two groups (before and after intervention). The paired sample t-test was used to analyze the difference in scores before and after the intervention in each group.

Research ethics board (REB) approval

Ethical clearance for this study was obtained from the Udayana University Research Ethics Committee (Approval No: 1494/UN14.2/Litbang/2015).

RESULTS

Based on statistical analysis by paired sample t-test, we found that self-efficacy scores significantly increased after the intervention (p = 0.005), with a pretest mean of 19.31 (SD = 2.396) and posttest mean of 21.27 (SD = 2.677). This showed that there was a 10% increase in self-efficacy.

There was no significant increase in the self-efficacy scores in the control group. In line with self-efficacy, psychological distress decreased by 15.9%, and salivary cortisol levels reduced by 36.6% in the intervention group. The results are shown in Table 1.

The results of statistical analysis by independent samples t-test comparing the two groups are provided in Table 2. Self-efficacy, psychological distress, and salivary cortisol levels before the intervention between the two groups were all comparable, as shown by the following p values: 0.825 for self-efficacy, 0.065 for psychological distress, and 0.064 for salivary cortisol.

After the intervention, there was a significant difference in self-efficacy scores between the two groups ($p < 0.05$). The control group mean was 19.29 (SD = 1.541), whereas the intervention group mean was 21.27 (SD = 2.677). There was also a significant difference in psychological distress scores at posttest. However, there was no significant difference in salivary cortisol levels between the two groups after the intervention.

DISCUSSION

This study investigated the effects of a problem-focused coping stress management program on medical student's self-efficacy, psychological distress, and salivary cortisol levels. After the program, we found a significant increase in self-efficacy and a significant decrease in psychological distress and salivary cortisol level in the intervention group. In contrast, there were no significant differences in pre and post-test scores in the control group. Additionally, there were significant differences in self-efficacy and psychological distress between the control and intervention groups at posttest. However, salivary cortisol did not differ significantly between groups. The results of this study were in line with the three hypotheses.

The problem-focused coping stress management program is one of the most effective methods for coping with academic stress and job stress.[27] The goal of this method was to overcome the causes of academic stress and to deal with other related factors. Time management skills and cognitive

Table 1. The result of statistical analysis by paired sample t-test of salivary cortisol, psychological distress, and self-efficacy in intervention and control group

	Variable	n	Mean	Std. Deviation	95% Confidence Interval		p
					Lower	Upper	
Control group	Psychological distress (pre)	14	40.00	4.132	-1.536	1.251	0.828
	Psychological distress (post)	14	40.14	3.860			
	Salivary cortisol (pre)	14	0.488	0.271	-0.155	0.140	0.917
	Salivary cortisol (post)	14	0.495	0.264			
	Self-efficacy (pre)	14	19.1429	2.14322	-1.518	1.232	0.826
	Self-efficacy (post)	14	19.2857	1.54066			
Intervention group	Psychological distress (pre)	26	44.12	5.975	4.639	9.361	0.001
	Psychological distress (post)	26	37.12	4.537			
	Salivary cortisol (pre)	26	0.683	0.367	0.153	0.346	0.001
	Salivary cortisol (post)	26	0.433	0.231			
	Self-efficacy (pre)	26	19.3077	2.39615	-3.256	-0.666	0.005
	Self-efficacy (post)	26	21.2692	2.67668			

Table 2. Results of the comparability test and analysis of intervention effects between the intervention and control groups

Variable		n	Mean	Std. Deviation	95% Confidence Interval		p
					Lower	Upper	
Psychological distress (pre)	Control Intervention	14 26	40.00 44.12	4.132 5.975	-7.383	0.848	0.065
Psychological distress (post)	Control Intervention	14 26	40.14 37.12	3.860 4.537	0.248	5.807	0.034
Salivary cortisol (pre)	Control Intervention	14 26	0.488 0.683	0.271 0.367	-0.402	0.012	0.064
Salivary cortisol (post)	Control Intervention	14 26	0.495 0.433	0.264 0.231	0.235	-0.111	0.469
Self-efficacy (pre)	Control Intervention	14 26	19.14 19.31	2.143 2.396	-1.679	1.349	0.825
Self-efficacy (post)	Control Intervention	14 26	19.29 21.27	1.541 2.677	-3.324	0.533	0.005

restructuring of locus of control create more powerful coping strategies and anticipating complicated tasks or stressful situations. It may also have a calming effect on the student because of a change in the limbic system. There is a decrease in dopamine release, affecting the HPA-axis and SAM-axis, resulting in reduced cortisol. When a task is appraised as a challenge, one is more likely to select an effective coping strategy to persist at managing the task. Self-efficacy thus affects the perception of external demands and mediates the relationship between external stressors and psychological stress. Therefore, this method can directly reduce academic stress. It can also alter the physical and emotional response by decreasing the academic stress response.

Several studies have also consistently found an association between academic stress and self-efficacy based on cognitive theory. Cognitive activation theory provides the links among work stress, cognitive activation, and psychophysiological arousal. A decrease in arousal or the stress response resulting from the problem-focused stress management program will increase cognitive functioning reflected by increased self-efficacy. The cognitive theory posits a strong negative relationship between self-efficacy and perceived stress.[23,31]

In this study, the morning salivary cortisol levels of the students who participated in the problem-focused stress management program decreased significantly from 0.683 μg/dL to 0.433 μg/dL. Compared with cortisol levels based on a similar age group, previous studies reported morning salivary cortisol levels in the range of 0.021–0.888 μg/dL. Adolescents 12–18 years old had cortisol levels in the range of 0.021–0.888 μg/dL, and in adult males aged 21–30 years old, the levels were 0.112–0.743 μg/dL, whereas, in women, the range was 0.272–1.334 μg/dL.[32,33] Cortisol secretion has been found to increase in unfamiliar situations that evoke feelings of uncertainty, anxiety, or negative experiences.[23] The effect of the intervention in this study in reducing concerns about the ability to handle tasks and increasing the belief that one can have control over the situation (i.e., internal locus of control) would therefore have the opposite effect on cortisol secretion; that is, it would reduce the activation of the HPA and SAM axes and decrease cortisol. A previous study found that individuals with high psychological well-being had significantly lower salivary cortisol than individuals with low psychological well-being.[34,35] A person in a good psychological condition had significantly lower salivary cortisol than individuals who have a terrible psychological condition. In addition, according to Lundberg, morning salivary cortisol is more affected by changes in daily job strain.[36]

One study found that higher cortisol levels were reported in men and women when feeling pressured for time. A feeling of time pressure showed a significantly higher ACR (mean/SD) of 18.37/14.75 mmol/L versus 8.41/9.28 mmol/L in not feeling time pressure. Also, salivary cortisol levels throughout the day tended to be significantly elevated in subjects with feeling time pressure.[37]

Psychological distress decreased significantly in the students who participated in the problem-focused coping academic stress management program in this study. Many factors can influence the effectiveness of a program on changes in individual physiological and psychological responses.[27]

A larger number of samples is needed for further research. In addition, the involvement of genetic factors in amygdala activation will undoubtedly have a different response to the effects of the intervention on each individual.[37]

A significant potential limitation of our study was the small number of participants in the control group compared to the intervention group. Additionally, further research is needed on students at other institutions to evaluate the effects of the intervention on different types of students experiencing academic stress in Bali or Indonesia. Lastly, the problem-focused coping stress management program needs to be evaluated for its long-term effects to see if what has been gained through the intervention is maintained throughout the student's academic program.

CONCLUSION

First-year medical students who participated in a problem-focused coping stress management program showed a significant increase in self-efficacy and decreased psychological distress compared to the control group. Additionally, there was a substantial decrease in their salivary cortisol levels. Thus, the study supports the effectiveness of a group intervention to reduce academic stress in medical students.

Acknowledgment

We would like to thank the Medical Faculty of Udayana University, who funded this research. We would also like to thank colleagues and students, especially Manik, Utami, and Cahya, who provided their assistance in conducting this research study.

Statement of Authorship

All authors participated in the data collection and analysis and approved the final version submitted.

Author Disclosure

All authors declared no conflicts of interest.

Funding Source

This paper was funded by the Medical Faculty of Udayana University.

REFERENCES

1. Hesketh T, Zhen Y, Lu L, Dong ZX, Jun YX, Xing ZW. Stress and psychosomatic symptoms in Chinese school: Cross-sectional survey. Arch Dis Child. 2010 Feb;95(2):136-40. DOI: 10.1136/adc.2009.171660.
2. Huan VS, See YL, Ang RP, Har CW. The impact of adolescent concerns on their academic stress. Educ Rev. 2008; 60(2):169–78.
3. Hong M, Cho HN, Kim AR, Hong JH, Yong-Sil K. Suicidal deaths in elementary school students in Korea. Child Adolesc Psychiatry Ment Health. 2017; 11(53):1-5. DOI 10.1186/s13034-017-0190-3
4. Owen-Yeates A. Stress in year 11 students. Pastor Care Educ. 2005; 23: 42–51.
5. World Health Organization. Constitution of the World Health Organization. In: Basic documents, forty-fifth edition, supplement. [Internet]. 2006 [cited 2015 Dec]. Available from: https://www.who.int/governance/eb/who_constitution_en.pdf.
6. Tsai FJ, Huang WL, Chan CC. Occupational stress and burnout. J Occup Health. 2009; 51(5):443–450. doi: 10.1539/joh.l8179
7. Hall JE, Guyton AC. Resistance of the body to infection. In: Hall JE, Guyton AC eds. Guyton and Hall textbook of medical physiology. 13th ed. Philadelphia: Saunders Elsevier. 2015. pp. 423-30
8. Seeman TE, Singer BH, Ryff CD, Albert MS, Rowe JW. Increase in urinary cortisol excretion and memory declines: MacArthur studies of successful aging. J Clin Endocrinol Metab. 1997; 82(8):2458–65.
9. Al-Ayadhi LY. Neurohormonal changes in medical students during academic stress. Ann Saudi Med. 2005; 25(1): 36–40.
10. Bjorkman SM. Relationships among academic stress, social support, and internalizing and externalizing behavior in adolescence. Northern Illinois University, 2007. pp. 98-107.
11. Li J -h., Feng X -l., Mei S -l., Yao DL. Investigation of study pressure effects on mental health of junior high school students in Changchun. Medicine Soc. 2007; 20(2):56–7.
12. Lin J, Chen Q. Academic pressure and impact on students' development in China. McGill J Educ. 1995; 30(2):149–68.
13. Moshe Z. Sources of academic stress: the case of first year Jewish and Arab college students in Israel. Education 1992; 24(1):25–40.
14. Xie LN. Study on learning stress, social support and their relationship among senior high school students: An investigation of two senior high schools in Hennan Province. (Master Thesis). Huadong Normal University, 2007. pp 5-10
15. Pedersen W. Parental relations, mental health, and delinquency in adolescents. Adolescence 1994; 29(116):975-90.
16. Yang S, Shin CS. Parental attitudes towards education: what matters for children's well-being? Child Youth Serv Rev 2008; 30(11):1328–35.
17. Appels A, Kop WJ. Fatigue & stress. In: Appels A, Kop WJ eds. Encyclopedia of Stress. 2nd Ed. USA: Elsevier Inc; 2007. pp. 11–14.
18. Lundberg J, Kristenson M. Is subjective status influenced by psychosocial factors? Soc Indic Res. 2008; 89(3): 375–90.
19. Purves D, Augustine GJ, Fitzpatrick D. Psychophysiology. The body's response to emotional states. In: Purves D, Augustine GJ, Fitzpatrick D, eds. Neuroscience. 3rd ed. Sunderland: Sinauer Associates Inc., 2004. pp. 687-710.
20. Eller NH, Netterstrom B, Hansen AM. Psychosocial factors at home and at work and levels of salivary cortisol. P Biol Psychol 2006; 73(3):280 – 7.
21. Steptoe A, Hill DP, Mark C, Jayne G, Clemens K. Job strain and anger expression predict early morning elevations in salivary cortisol. Psychosom Med 2000; 62(2): 286 – 92.
22. Jaruzalem M, Mittag W. Self-efficacy in stressful life transitions. In: Bandura A, eds. Self-efficacy in changing societies. 1995. Cambridge: Cambridge University Press. pp. 177-201
23. Torres JB, Solberg VS. Role of self-efficacy, stress, social integration, and family support in Latino college student persistence and health. J Vocat Behav. 2001; 59(1):53–63.
24. Smith JC. Stress management, a comprehensive handbook of techniques and strategies. 2002. New York: Springer Publishing Company, Inc. pp. 103-225
25. Jones D, Owens M, Kumar M, Cook R, Weiss SM. The effect of relaxation interventions on cortisol levels in HIV-seropositive women. J Int Assoc Provid AIDS Care. 2014 Jul-Aug; 13(4): 318–323. DOI: 10.1177/2325957413488186
26. Theorell T, Emdad R, Arnetz B, Weingarten AM. Employee effects of an educational program for managers at an insurance company. Psychosom Med 2001; 63(5):724–33.
27. Shimazu A, Umanodan R, Schaufeli WB. Effect of brief worksite stress management program on coping skills, psychological distress and physical complaints: a controlled trial. Int Arch Occup Environ Health 2006, 80(1):60-9.
28. Faul F, Erdfelder E, Lang AG, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Methods 2007; 39(2): 175–191.
29. Midgley C, Maehr ML, Hruda LZ, Anderman E, Anderman L, Freeman KE et al. Manual for the patterns of adaptive learning scales (PALS), Ann Arbor, MI: University of Michigan, 2000. In Anderman EM, Urdan T, Roeser R. The patterns of adaptive learning survey: history, development, and psychometric properties. Indicators of positive development conference proceeding. 2003 March. pp. 1-28.
30. Salimetrics Europe. Salimetrics, cortisol salivary enzyme immunoassay. [Internet]. 2015. [cited 2014 Dec]. Available from: https://salimetrics.com/assay-kit/salivary-cortisol-elisa-kit/
31. Hackett G, Betz NE, Casas JM, Rocha-Singh IA. Gender, ethnicity, and social cognitive factors predicting the academic achievement of students in engineering. J Couns Psychol. 1992; 39(4):527–38.
32. Kiess W, Meidert A, Dressendorfer RA, Schriever K, Kessler U, Kounig A, et al. Salivary cortisol levels throughout childhood and adolescence: Relation with age, pubertal state, and weight. Pediatr Res. 1995; 37(4):502–6.
33. Aardal E, Holm A. Cortisol in saliva–reference ranges in relation to cortisol in serum. Eur J Clin Chem Clin Biochem. 1995; 33(12): 927–32.
34. Lindfors P, Lundberg U. Is low cortisol release an indicator of positive health? Stress Health. 2002; 18(4): 153–60.
35. Rydstedt LW, Cropley M, Devereux JJ, Michalianou G. The relationship between long-term job strain and morning and evening saliva cortisol secretion among white-collar workers. J Occup Health Psycho.l 2008; 13(2):105–13.
36. Alderling M, Theorell T, Torre B, Ingvar L. The demand-control model and circadian saliva cortisol variations in a Swedish population-based sample (the PART study). BMC Public Health. 2006; 6(1):1-8.
37. Heinz A, Braus DF, Michael N, Wrase J, Puls I, Hermann D, et al. Amygdala-prefrontal coupling depends on a genetic variation of the serotonin transporter. Nat Neurosci. 2004; 8(1): 20–1.