

ORIGINAL RESEARCH**The relationship between spiritual wellbeing and depression, stress, anxiety with cortisol level among nursing students**

Bahman Akbari ¹, Maryam Gharehzad Azari², Seyedeh Maryam Mousavi*³ 

1. Department of Psychology, Rasht Branch, Islamic Azad University, Rasht, Iran
2. Rasht Health Center, Guilan University of Medical Sciences, Rasht, Iran
3. PhD Candidate of Health Psychology, Department of Psychology, Rasht Branch, Islamic Azad University, Rasht, Iran

*Corresponding Author: Seyedeh Maryam Mousavi,
Department of Psychology, Rasht Branch, Islamic Azad University, Rasht, Iran
Email: mmousavi.msc@gmail.com

Date Received: April, 2017 Date Accepted: July, 2017 Online Publication: December 28, 2017

Abstract

Introduction: Stress is a public health problem in today's world. Spiritual health is one of the health dimensions that can affect the other ones. This study is about the connection between spiritual health and stress and cortisol level among nursing students.

Materials and Methods: This study was a descriptive analytic search that was done in Azad University, Rasht on 2013. Total of 100 students were participated in this study. Our tools for collecting data were included: demographic information such as, age, sex, occupation and marital status situation. Also, questionnaire about depression, anxiety and stress measurement (Dass_21) were utilized. Additionally, standard questionnaire about spiritual health (SWB) were used. The cortisol plasma was measured with Eliza method.

Results: According to this study, increasing the spiritual health will decrease depression, anxiety and stress among students. We also can conclude that by increasing the depression and anxiety, the cortisol level will increase. There is no connection between cortisol level and stress and spiritual health among these students, but there is a connection between believing in God (as a solution of problems and enjoying the life) and cortisol level.

Keywords: Spiritual health; Stress, Anxiety; Depression; Cortisol.

Introduction

Recognizing spiritual is an essential key for individuals' mental and physical health. World Health Organization (WHO), considers the spiritual factors as a guarantee for individuals' health, and besides the physical dimensions, it seriously looks at spiritual and social health. Also, WHO has added the spiritual dimension to the overall definition of health. As physical, mental and social dimensions are connected with each other, and have influence on each other, the spiritual health of individuals' can have influence on the other dimensions too (1,2).

Spirituality is a dimension of human being that shows the human being's solidarity and connection to the universe. Spirituality includes dimensions such as sincerity, self-sacrifice, austerity, catharsis and charity. Spirituality means belief, behavior and activity that connect individuals with super natural forces and God. This definition may result in the similarities between spirituality and religion (3,4).

Spiritual health has two dimensions: existence and religious. Religious health refers to the satisfaction taken from connection with a higher power (almighty). While, existence health refers to the understanding the meaning and end of life. Spiritual health is correlated with physical, mental and social health (5,6).

In this era, stress, anxiety and depression are inevitable. Stress is one of the most contributing factors leading to physical and mental difficulties. Stress can have direct influence on individuals' biological processes and can lead to the development of many disorders such as, anxiety, depression and behavioral problems (8,9).

Religious belief and spirituality can counteract with stressors and mental disorders (7). There is a positive correlation between spirituality and individuals' mental health (6,10,11). Spiritual health not only promotes positive feelings such as, hope, love, serenity and forgiveness, but also reduces negative feelings such as, hatred and jealousy. Positive feelings can decrease the stress hormone, cortisol. Low level of cortisol is associated with the decrease in

anxiety and depression. Also, it can lead to the lower level of blood pressure and heartbeat. Thus, decrease in the level of cortisol can have a positive effect on individuals' overall mental and physical health (4,11,15).

Spiritual health and spirituality definition in Iran, comparing to other societies, are very important. Also, it is imperative to clarify the link between spiritual health and mental health. Thus, the aim this study is to examine the connection between spiritual health, stress and cortisol level among nursing students.

Procedure

This is a sectional descriptive-analytical study. Total of 100 nursing students attending Azad University in Rasht on 2013 were randomly selected to participate in this study. The following students were excluded:

Students with infectious, metabolic, anxiety and harmonic disorders, students with kidney failure, autoimmune Sickmen, and steroid consumers as well as others who were recognized as affecters with cortisol levels.

Our data tools were included three divisions. First, demographic information including age, sex, occupation and marital status were collected. Then,, anxiety deliberation questionnaire (Dass-21) and standard spiritual health questionnaire (SWB) were utilized. Stress questionnaire includes 21 questions on a 3-point Likert score (0=never, 1=little, 2=average, 3= a lot). In this questionnaire, 7 questions were given for the measurement of anxiety, stress and depression.. As this questionnaire was a short form of original version with 42 questions, the final score of small standard were multiplied by 2 and the maximum score for each one was 42. Score were categorized from normal to very severe (16). Validity and reliability of this questionnaire were accepted (17). Cronbach's alphas were as follows: anxiety (0.79), depression (0.79), and stress (0.72). Spiritual health questionnaire includes 20 phrases with two subscales measuring religious and existence. Each subscale has 10 phrases scoring from 10 to 60. The total

spiritual scores were achieved by adding these two subscales scoring from 20 to 120. The higher score indicates that the level of spiritual health is higher (18). Stability and validity of this questionnaire was confirmed previously (19). The validity of this questionnaire was confirmed with the cronbach's alpha of 0.87.

In this study, the cortisol concentration was measured by Eliza method. Vein blood samples were collected in the morning time from 10 to 12 a.m. that is the closest time to serum cortisol concentration.

This study was confirmed by the ethics committee of the university, and consent form were signed by participants. The questionnaires were anonymous and coded with phone numbers. Participants were informed about the time of blood sampling and the test tubes were identified through participants' phone number.

For data analysis, SPSS 21 software was utilized. Quantitative data were displayed by average and standard deviation and qualitative data were displayed in the form of numbers and percentage. For average comparison between two groups the independent t-test was used and chi square test 2 was used for comparison of ratios. Pearson correlation coefficient was used for correlation between questionnaires scores and cortisol level.

Results

Ninety-three percent of students were female and 7 percent were male and 74

percent of them were married and the rest were single. Eleven percent were occupied. The average and age standard deviation among the students were 21.28 ± 2.30 . The spiritual health score average was 97.78 ± 13.42 ranging from 63 to 118. The average of spiritual health questionnaire religious dimension was 48.58 ± 7.06 ranging from 32 to 60. 49 percent of students were at the average spiritual health level and the rest were at the high level. The difference of spiritual health score average and the religious and existential dimension between the males and females was not statistically significant. ($p=0.05$). The difference of spiritual health average score and religious dimension between the married and the singles was not statistically significant ($p=0.232$). But, the existential dimensional score among married participants were higher than single participants ($p=0.044$). The difference of depression average score ($p=0.686$) and stress ($p=0.116$) between the men and women were not significant, but anxiety score among women were significantly higher than men ($p=0.0001$). There was not a significant difference between the female and male students regarding anxiety score ($p=0.519$), depression ($p=0.665$) and stress ($p=0.832$). The average and standard deviation of blood cortisol level in the students was 14.08 ± 5.08 ranging from 4.5 to 27. There was no difference between the cortisol level average among men and women and the married and the single ($p=0.941$) (table 1).

Table 1. The comparison of stress, anxiety, depression, spiritual health average score and Cortisol level among the married and the single students.

Variance	Women	Men	p-value	Married	Single	p-value
Spiritual health	97.91±13.59	96.0±11.72	0.718	100.50±13.45	96.82±13.37	0.232
Religious dimension	50.81±7.11	51.43±8.28	0.826	50.92±7.76	50.82±6.99	0.952
Existential dimension	47.11±7.77	44.57±8.62	0.410	49.58±6.36	46.0±8.10	0.044
Depression	9.27±8.10	8.00±6.11	0.686	8.31±9.03	9.49±7.59	0.519
Anxiety	9.38±7.73	3.71±1.38	0.0001	9.54±7.03	8.78±7.83	0.665
Stress	15.70±7.80	10.86±7.65	0.116	15.08±8.12	15.46±7.80	0.832
Cortisol	14.07±5.10	14.16±5.23	0.965	14.01±4.80	14.10±5.21	0.941

The average of depression score was 9.18 7.96 (range 34-0). The depression intensity

among 10 percent of the students was severe and very severe. The anxiety average

score was 8.98 ± 7.60 (range 36-0). The anxiety intensity among 19 percent of the students was severe and very severe. Stress standard deviation and the average were

15.36 ± 7.85 (range 34-0). 13 percent of students were at the severe and very severe level (table-2).

Table 2. Abundance of depression intensity, anxiety and stress among students.

Intensity levels	Depression	Anxiety	Stress
	Number	Number	Number
Normal	59	54	47
Slight	17	9	23
Average (mean)	14	18	17
Severe	5	5	12
Very severe	5	14	1

There was a reverse correlation between the spiritual health total score, existential dimension and religious dimension with anxiety scales. There was not a meaningful correlation between the spiritual health and its dimensions with cortisol level. Among the twenty questions given to the participants there was a reverse meaningful correlation between the cortisol level and the following phrases: "I believe that God is thinking of me" ($r=0.211$, $p=0.035$), "I do not much enjoy in my life." ($r=-0.202$,

$p=0.044$) in other items there was no meaningful correlation (table 3).

There was a meaningful direct correlation between cortisol level and depression score ($r=0.255$, $p=0.044$), but there was no meaningful correlation between stress score and cortisol level ($r=0.066$, $p=0.515$).

Table3. Review the correlation between the spiritual health and its dimensions with depression, anxiety, stress and cortisol level.

Variance	Depression	Anxiety	Stress	Cortisol
Spiritual health	-0.673**	-0.305**	-0.385**	-0.138
Existential dimension	-0.651**	-0.285**	-0.411**	-0.061
Religious dimension	-0.550**	-0.262	-0.273**	-0.180

** : p-value=0.01

Discussion

According to our study by increasing the spiritual score and its dimensions, the depression, anxiety and stress scores will decrease. It has also been concluded that there is no meaningful connection between stress and cortisol level. There is a significant reverse correlation between cortisol level and the belief that God will help in problems solution and in enjoying the life.

In different studies that have been conducted in Iran, the reverse correlation between the spiritual health and anxiety, depression and stress were confirmed. In Bolhery and colleagues study, they have found that by increasing the score of trust in God among the students, the stress scores will decrease (20). In another study conducted by Dashtaky, they have found that spiritual training among female students can decrease the stress (21). Also, Qobary study showed that there is a positive connection between spirituality and mental health (22). Moreover, Moeini et al. showed that a spiritual program could decrease the anxiety level (23). Mousaraezie et al. proposed that there is a reverse connection between the spiritual health score and its dimension with stress, anxiety, and depression (especially in breast cancer patients) (24).

Tuck et al., showed that there is a negative connection between understood stress and the spiritual health among the students of universities (26). In Kirk's research it is reported that there is a positive connection between spiritual health and agreement skills with stress (27). In another study that Mahon and Biggs have done, it is showed that the existential spiritual health is the best provident for decreasing the anxiety. There is a reverse connection between the spirituality and low tolerance (28). In another study it was shown that there is a significant positive connection between mental safety level and spiritual health among the Dialytic patients (29). Kopacz research showed that there is significantly worse or lower safety level among those thinking of suicide (compared to who don't think of suicide) (30). Amjad and Bokharey

studied the patients with anxiety and showed that there is significantly negative connection between the anxiety and the spiritual safety (31). In studies about the benefits of spiritual interference of anxiety, the researchers showed that spiritual safety had significantly connection with mental safety. There is significantly negative correlation between the spiritual safety and the anxiety (32).

According to our results, by increasing or decreasing spiritual safety scores and its dimensions, there won't be any changes in blood cortisol level. But, there is a reverse correlation between Cortisol level and trust in God for helping the humankind and enjoying the life. It means that the more belief in God, the less of Cortisol level, or if people enjoy life more, their cortisol level is lower.

In different studies about the connection between spiritual health and cortisol level, sometimes it was confirmed that spiritual health and a positive influence on cortisol level, and sometimes we couldn't find significant link between them.

As religious and spiritual activities in different cultures and religious are not the same, the studies done in other countries are not comparable to Islamic society of Iran. Thus, we should pay attention to different questionnaires in different studies that can lead to different results and comparisons.

The only research that used a questionnaire like ours and used spiritual health deliberation belongs to Mihaljevic. He used this questionnaire for soldiers who were in hospital suffering from post-traumatic stress disorder (PTSD). The results of this research showed that there is no significant correlation between measured cortisol in the morning and spiritual health. Only the level of cortisol at night had an inverse correlation with spiritual health (33). Since we measured the level of cortisol in the morning, our results were inconsistent with Mihaljevic's study. In another study that was about the connection of cortisol and the activities of religious women who had fibroma, it was shown that the average of cortisol level is not related to religious

activities (34). Another study done by Yeager, they have examined the index of healthy life and religious activities among elderlies. He concluded that there is no connection between the Cortisol level and religious belief and activities (35). But, another study conducted by Tartaro et al. studied the influence of religion and spirituality on cortisol level of students due to stress. He showed that the wetted cortisol in response to stress is significantly less than comparing to other students (36). In our study we measured the normal cortisol serum, but in Tartaro's study he measured the wet cortisol in response of instantaneous stress. According to our study, there is a significant direct correlation between anxiety, stress score and cortisol level. It means that if the depression or anxiety scores increase, the cortisol level will also increase. But, there is no significant correlation between the cortisol level and stress score, that is increasing or decreasing of stress score has no influence on cortisol. The connection between cortisol level with anxiety, depression and stress is confirmed in different studies. Bakheet studied the cortisol level in normal people and patients who suffered from severe anxiety and showed that the cortisol serum level is significantly higher in the patients (40). In a research about dependence of anxiety and cortisol, it was shown that the people with higher anxiety have higher cortisol level (41). In another research for examining the influence of stress on cortisol of SPI patients, it was proved that there is no meaningful correlation between cortisol level and stress (42). A research was done to study the stress level and cortisol of Greek and Swedish youth. The Greek had more stress, anxiety and depression than the Swedish, but the Greek youth's cortisol level was significantly less than the

Swedish. The researchers concluded that long time face to stress can lead to decreasing of cortisol level (43). In our study there was no significant connection between serum cortisol level and stress score while cortisol is named stress hormone and its wet increasing in stress situation is confirmed (44). One hypothesis for explaining our finding can be due to stress condition like tuition for university, anxiety for future, and stress for exam. In other studies, it was also shown that long time stress and harmful conditions can interfere with the function of hypothalamus, hypophysis and adrenal (45).

Our study had some limitations. We were limited to measure cortisol only in the morning. For future implications, measuring the cortisol level early in the morning will be recommended. We will also suggest interventional studies for examining the influence of spiritual health on cortisol level. Another issue that limited our findings was multiplicity of women in our research.

According to our study, increasing spiritual health will lead to decreasing of stress, anxiety and depression among students. We also concluded that by increasing anxiety and depression, the cortisol level would increase. In our study there was no connection between cortisol level with stress and spiritual health. However, there is a significant relationship between trust in God, as a supporter, and enjoying the life with serum cortisol level.

Conflict of interests

Authors declare no conflict of interest.

Acknowledgment

We sincerely thank Azad University, Rasht Branch for the financial support. We also thank the students who took part in this project.

References

1. Dalmida SG. Spirituality, mental health, physical health, and health-related quality of life among women with HIV/AIDS: integrating spirituality into mental health care. *Issues in mental health nursing*. 2006 Jan 1;27(2):185-98.
2. Chirico F. Spiritual well-being in the 21st century: It's time to review the current WHO's health definition. *Journal of Health and Social Sciences*. 2016;1(1):11-6.
3. Eames P, Cayley S. Spiritual wellbeing for older New Zealanders. *Perspectives in public health*. 2010 Mar;130(2):62-3.
4. Fisher J. The four domains model: Connecting spirituality, health and well-being. *Religions*. 2011 Jan 11;2(1):17-28.
5. Dhar N, Chaturvedi SK, Nandan D. Spiritual health scale 2011: Defining and measuring 4th dimension of health. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine*. 2011 Oct;36(4):275.
6. Stuckelberger A. Spirituality, Religion and Health United Nations Geneva Panel report: "Spirituality, Religion and Social Health" 58th World Health Assembly in Geneva. [Last accessed on 2005]. Available from: <http://www.rcrescendo.org/11.Spiritualitpastorale/GINEBRA/SPIRITUALITY.pdf>.
7. Taheri-Kharameh Z, Abdi M, Omid Koopaei R, Alizadeh M, Vahidabi V, Mirhoseini H. The relationship between religious-spiritual well-being and stress, anxiety, and depression in university students. *Health, Spirituality and Medical Ethics*. 2016 Mar 15;3(1):30-5.
8. Cohen S, Janicki-Deverts D, Miller GE. Psychological stress and disease. *Jama*. 2007 Oct 10;298(14):1685-7.
9. Scott SB, Graham-Engeland JE, Engeland CG, Smyth JM, Almeida DM, Katz MJ, Lipton RB, Mogle JA, Munoz E, Ram N, Sliwinski MJ. The effects of stress on cognitive aging, physiology and emotion (ESCAPE) project. *BMC psychiatry*. 2015 Dec;15(1):146.
10. Hill PC, Pargament KI. Advances in the conceptualization and measurement of religion and spirituality: Implications for physical and mental health research.
11. Rippentrop AE, Altmaier EM, Chen JJ, Found EM, Keffala VJ. The relationship between religion/spirituality and physical health, mental health, and pain in a chronic pain population. *Pain*. 2005 Aug 1;116(3):311-21.
12. Baljani E, Kazemi M, Amanpour E, Tizfahm T. A survey on relationship between religion, spiritual wellbeing, hope and quality of life in patients with cancer. *Evidence Based Care*. 2011;1(1):51-62.
13. Davis DE, Worthington Jr EL, Hook JN, Hill PC. Research on religion/spirituality and forgiveness: A meta-analytic review. *Psychology of Religion and Spirituality*. 2013 Nov;5(4):233.
14. Paloutzian RF, Park CL, editors. *Handbook of the psychology of religion and spirituality*. Guilford Publications; 2014 Dec 19.
15. Koenig HG, Al Zaben F, Khalifa DA. Religion, spirituality and mental health in the West and the Middle East. *Asian journal of psychiatry*. 2012 Jun 1;5(2):180-2.
16. Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS).
17. Alipoor R, Ebrahimi A, Omid R, Hedayati A, Ranjbar H, Hosseinpour S. [Depression, anxiety, stress and related demographic variables in nurses of Fasa University of Medical Sciences in

- 2014]. Pajouhan Scientific Journal. 2015;13(4):51-59.
18. Mosavi S M, Pourmarzi D, Dehganzadeh S, Ruzbehan B, Pourhamed G. Relationship between spiritual well-being and cortisol level in nursing students . pajoohande. 2015; 20 (1) :12-17
 19. Kalyani MN, Pourjam E, Jamshidi N, Karimi S, Kalyani VN. Survey of stress, anxiety, depression and self-concept of students of Fasa University of medical sciences, 2010. J Fasa Univ Med Sci. 2013;3(3):235-40.
 20. Bolhari j, Ehsanmanesh M, KarimiKaisami E. Relationship between the stressors, stress symptoms, and reliance on God (Tavakkol) in Medical students. IJPCP 2000; 6(1): 20-25
 21. Bahrami DH, Alizadeh H, Ghobari BB, KARAMI AA. The effectiveness of group spirituality training on decreasing of depression in students, COUNSELING RESEARCH AND DEVELOPMENT, 2006;5(19): 49 - 72.
 22. GhobaryBonab B, Hakimirad, , Habibic. Relation between mental health and spirituality in Tehran University student. Procedia - Social and Behavioral Sciences, 2010; 5: 887–891.
 23. Moeini M, Taleghani F, Mehrabi T, Musarezaie. Effect of a spiritual care program on levels of anxiety in patients with leukemia. Iranian Journal of Nursing and Midwifery Research, 2014; 19(1):88-93.
 24. Musarezaie A, NajjEsfahani H, MomeniGhaleghasemi T, Karimian J, Ebrahimi A. The Relationship between Spiritual Wellbeing and Stress, Anxiety, and Depression in Patients with Breast Cancer, Journal of Isfahan Medical School, 2012; 30(195):922-931.
 25. Yeganeh T, Shaikhmahmoodi H. Role of Religious Orientation in Predicting Marital Adjustment and Psychological Well-Being . Sociology Mind 2013. Vol.3, No.2, 131-136.
 26. TuckI, Alleyne R, ThinganjanaW. Spirituality and Stress Management in Healthy Adults. journal of *Holistic Nursing*. 2006; 24(4): 245-253.
 27. KirkM D. Investigating relationships between spiritual well-being, stress coping skills, and quality of life among African Americans, Native Americans and Latinos. ProQuest Dissertations and Theses, 2011.
 28. Mckenna M. Spirituality and health: assessing the relationship between spiritual and religious well-being, depression and quality of life in clinical and non- clinical populations. York St John University, 2012.
 29. Martinez BB, Custodio RP. Relationship between mental health and spiritual wellbeing among hemodialysis patients: a correlation study. Sao Paulo medical journal. 2014;132(1):23-30.
 30. Kopacz M S. The spiritual health of veterans with a history of suicide ideation. Health Psychology & Behavioural Medicine, 2014; 2(1): 349–358.
 31. Amjad F, Bokharey I Z. The Impact of Spiritual Wellbeing and Coping Strategies on Patients with Generalized Anxiety Disorder. Journal of Muslim Mental Health, 2014; 8(1).
 32. Wachholtz A B, Pargament K I. Is Spirituality a Critical Ingredient of Meditation? Comparing the Effects of Spiritual Meditation, Secular Meditation, and Relaxation on Spiritual, Psychological, Cardiac, and Pain Outcomes. Journal of Behavioral Medicine, 2005;28(4):369-384.
 33. Mihaljevic S, Vuksan-Cusa B, Marcinko D, Koic E, Kuevic Z, Jakovljevic M. Spiritual Well-Being, Cortisol, and Suicidality in Croatian War Veterans Suffering

- from PTSD. *J Relig Health*, 2010;50(2):464. DOI 10.1007/s10943-010-9383-2.
34. Dedert E A, Studts J L, Weissbecker I, Salmon P G, Banis P L, Sephton S E. Religiosity May help preserve the cortisol rhythm in women with stress-related illness. *INT'L J PSYCHIATRY IN MEDICINE*, 2004; 34(1): 61-77.
 35. Yeager DM, Gleib DA, Au M, Lin HS, Sloan RP, Weinstein M. Religious involvement and health outcomes among older persons in Taiwan. *SocSci Med*, 2006;63(8):2228-41.
 36. Tartaro J, Luecken L J, Gunn H E. Pressure and Cortisol Stress Responses Exploring Heart and Soul: Effects of Religiosity/Spirituality and Gender on Blood. *J Health Psychol*, 2005;10(6): 753–766.
 37. Bormann JE, Aschbacher K, Wetherell J L, Roeschf S, Redwine L. Effects of faith/assurance on cortisol levels are enhanced by a spiritual mantram intervention in adults with HIV: A randomized trial. *J Psychosom Res*, 2009; 66(2): 161–171.
 38. Anyfantakis D, Symvoulakis EK, Panagiotakos DB, Tsetis D, Castanas E, Shea S, Venihaki M, Lionis C. Impact of religiosity/spirituality on biological and preclinical markers related to cardiovascular disease, Results from the SPILI III study. *HORMONES*, 2013; 12(3):386-396.
 39. Ironson G, Solomon GF, Balbin EG, O'Cleirigh C, George A, Kumar M, Larson D, Woods T E. The Ironson Woods Spirituality Religiousness Index is associated with long survival, health behaviors, less distress, and low cortisol in people with HIV/AIDS. *Annals of Behavioral Medicine*, 2002; 24(1): 34–48.
 40. Bakheet MS. Serum Cortisol level in depression patients. Biochemistry Department, Al-Azhar Faculty of Medicine, Assiut, Egypt. *International Journal of Medical and Biomedical Sciences*, 2013; 1(1): 005-008.
 41. Jaremka L M, Glaser R, Loving T J, Malarkey W B, Stowell J R, Kiecolt-Glaser J K. Attachment Anxiety Is Linked to Alterations in Cortisol Production and Cellular Immunity. *Psychol Sci*. 2013;24(3):272-9.
 42. Rydén M, Hedbäck B, Jonasson L. Does Stress Reduction Change the Levels of Cortisol Secretion in Patients With Coronary Artery Disease? *JOURNAL OF CARDIOPULMONARY REHABILITATION AND PREVENTION*, 2009; 5 (29): 314-317.
 43. Faresjö Å O, Theodorsson E, Chatziarzenis M, Sapouna V, Claesson HP, Koppner J, Faresjö T. Higher Perceived Stress but Lower Cortisol Levels Found among Young Greek Adults Living in a Stressful Social Environment in Comparison with Swedish Young Adults. *PLoS ONE*, 2013; 9(8). <http://dx.doi.org/10.1371/journal.pone.0073828>.
 44. McRae AL, Saladin ME, Brady KT, Upadhyaya H, Back SE, Timmerman MA. Stress reactivity: biological and subjective responses to the cold pressor and Trier social stressors. *Human Psychopharmacol: Clin. Exp*, 2006;21(6):377–385.
 45. Hinkelmann K, Muhtz C, Dettenborn L, Agorastos A, Wingenfeld K, et al. Association between childhood trauma and low hair cortisol in depressed patients and health control subjects. *Biol Psychiatry*, 2013; doi:pii: S0006-3223(13):00400-9.