



THE PSYCHOPHYSIOLOGICAL REPOSE TO COMPETITION IN SPORT DANCERS

Sasima Pakulanon ^{*1} and Somruthai Poomsalood²

¹School of health science (Sport and health science program), Mae Fah Luang University, Chiangrai, Thailand

²Department of physical therapy, School of allied health science, University of Phayao, Phayao, Thailand

*email: bumbim_spsc@hotmail.com

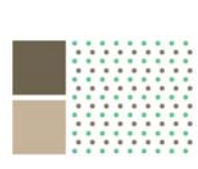
Abstract

The aim of this study was to investigate physiological and psychological states that responded to competition in sport dancers. *Methodology:* Subjects consisted of 18 sport dancers who participated in 38th Thailand National dance sport championships. On the training day (7 weeks and 1 week before completion) and the competition day, the subjects were asked to complete the Thai version of CSAI-2R questionnaire to assess state anxiety. Then their saliva was collected for cortisol and alpha-amylase analysis. Data was statistically analyzed at the 0.05 level of significance. *Results:* Paired t-test analysis showed the statistically significant increment of psychological anxiety and decrement of self-confidence at the point time of 1-week before the competition comparing to 7-week before competition. Interestingly, on the competition day, the cognitive anxiety was statistically significant turned down to the optimal level comparing to 1-week and 7-week before the competition. As well as the other, psychological variables trended to be a positive way. The statistically significant differences of physiological variables were not found at all points of time. The investigation showed that the point time of 1-week before the competition was stimulated the highest level of physiological stress and psychological anxiety among the sport dancers. In gender separation during competition, male dancers seemed to respond to competitive stress and anxiety more than female dancers.

Keywords: Psychophysiology, Salivary cortisol, Salivary alpha-amylase, State anxiety, Sport dancers

Introduction

Dancesport is the word used to define any and all forms of dance commonly referred to ballroom dancing. It has been accepted as a highly popular competitive sport that commonly competing in SEA Games, Asian Games, and Asian Indoor Games. Competitive ballroom dance offers divisions for amateur, professional, and mixed or combined-level couples and from junior through senior age groups. Ballroom dancers are athletes who unite physical activity with artistry and place a premium on the expression of feeling and creation of mood. Dance athletes under the competitive environment would be stressful to perform in the final competition from successive rounds that lasts less than 2 minutes each (Tremayne et al., 2008). As Rohlder et al., (2007) reported the increase of stress indicator in amateur ballroom



dancers during the competition. They found higher level of cortisol in competition day comparing to practice (control) day. It has been concluded that the stress induced by ballroom dance competitive environment was not physical stress. These psychological stress factors were judges, competitors, audience members, physical environment, and partner's behavior. The psychological stress could produce physiological effects. Two primary systems are hypothalamus-pituitary-adrenocortical (HPA) axis and sympatho-adreno-medullary (SAM) system (Takai et al., 2004). The activation of HPA causes an increase in cortisol secretion in adrenal cortex. Salivary cortisol concentrations are highly correlated to serum unbound cortisol concentration (Rohlder et al., 2007). Thus, salivary cortisol reliably reflects the HPA activity, and is a more practical collection than blood collection in stress research (Takai et al., 2004). The activation of SAM causes an increase in alpha amylase secretion. The salivary alpha-amylase was associated with norepinephrine changes induced by exercise and psychosocial stress (Rohlder et al., 2004).

Using multidimensional conceptualization of competitive state anxiety, most sport psychology researchers divided anxiety into somatic and cognitive components. The most common assessment instrument used to measure state anxiety in sport is the second version of the Revised Competitive State Anxiety Inventory (CSAI-2R; Cox et al., 2003). In addition to somatic and cognitive anxiety, the CSAI-2R also measures self-confidence (Cox et al., 2003).

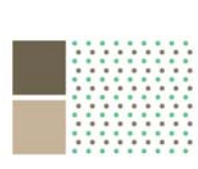
It is reasonable to assume that the competitive situation, such as dancesport competition, could produce competitive stress and anxiety which induce both physiological and psychological effects. This research was aimed to investigate physiological and psychological states that response to competition in sport dancers.

Methodology

Subjects consisted of 18 competitive ballroom dancers (9 males, 9 females) who participated in 38th Thailand National dancesport championships (Trung Games). All the subjects were apparently healthy at the time of the study. Ethical permission was approved by the committee on Human Right Related to Human Experimentation, Chulalongkorn University (IRB no. 175/52). Written informed consents were given by the subjects at the beginning of the study.

Salivary collection

Subjects were abstained from food, alcohol, caffeine products, juice, some medicine (prednisone, dexamethasone, steroids, adrenergic agonist and antagonist) (Hellhammer et al., 2009, Nater et al., 2009, Rohlder et al., 2009) for at least 3 hours prior to the collection of saliva on the practice day and for at least 1 hour on the competition day. The subjects were also asked not to have a vigorous activity bout within 24 hours prior to sample collection. On the practice day (7-week and 1-week before the competition), two milliliters of un-stimulated saliva was collected into the container at 10 am. On the competition day, un-stimulated saliva was collected into saliva container at 10 am before the competition. The salivary samples were stored immediately at -26° C when it was possible. However, in field studies, with no access to a freezer, salivary samples were covered with ice pack (~-4° C) before frozen storage.



Saliva assessment

Salivary cortisol was assessed by the laboratory of King Chulalongkorn Memorial Hospital, Thailand. Cortisol was assessed by enzyme-linked immuno assays (ELISA) using Cobas e 411 analyzer (Roche Diagnostics, USA). Salivary alpha-amylase was assessed at the bioequivalence study center of King Chulalongkorn Memorial Hospital, Thailand. Alpha-amylase was assessed by a quantitative enzyme kinetic method using Cobras Integra 400 analyzer (Roche Diagnostic, USA).

State Anxiety

The revised competitive state anxiety-2 (CSAI-2R: Cox et al., 2003) is a 17-item scale that measures cognitive state anxiety (5 items), somatic state anxiety (7 items) and self-confidence (5 items) in a competitive setting. The respondents rated their feelings before competition on a scale anchored by 1 = not at all and 4 = very much so. The Thai version of CSAI-2R was translated and evaluated by ศักดิ์รินทร์ ธรรมวงศ์. (2548) at Cronbach's alpha coefficients of 0.75. Subjects were asked to complete CSAI-2R on practice day (7 weeks and 1 week before competition) and before competition.

Data analysis

Descriptive statistics were used for baseline data calculation. Means with standard deviation were used for quantitative data. Differences of data within group were determined by paired t-test. Differences of data between groups (male dancers vs. female dancers) were determined by unpaired t-test. An alpha level of 0.05 was used to determine statistical significance. All statistical analyses were performed using Statistic Package for the Social Sciences (SPSS for Windows version 11.5, Chicago, IL, USA).

Results

Demographic characteristics of all subjects were summarized in table 1. The ages of the subjects ranged from 13 to 21 years old with mean age of 15.30 ± 1.94 years.

The study showed the statistically significant higher-level of somatic anxiety, cognitive anxiety, and lower-level of self-confidence at the point time of 1-week before competition compared to 7-week before competition (*p value*: .000, .000, .003 respectively). In the same way, the level of salivary cortisol and salivary alpha-amylase trended to be higher (with no statistically significant difference). Interestingly, on the competition day, the cognitive anxiety was statistically significant decrement comparing to the point time of 1-week and 7-week before competition (*p value*: .016, .023 respectively). The somatic anxiety and salivary alpha-amylase also trended to decrease and self-confidence trended to increase. In contrast, salivary cortisol trended to increase. This would indicate that the sport dancers were stimulated into the highest level of physiological stress and psychological anxiety at the point time of 1-week before the competition.

In gender separation, the statistically significant increment of psychological (somatic and cognitive) anxiety and decrement of self-confidence were found in both males and females at the point time of 1-week before competition compared to 7-week before competition (self-confidence in male was excepted) (*p value*: .001, .330 for male; .000, .032, .003 for females, respectively) On the other hand, the physiological stress did not show any statistically

significant differences among males and females. On competition day, there were no statistically significant differences in psychological anxiety and self-confidence among males and females which trended to be a positive way when comparing to the point time of 1-week before the competition. In addition, the statistically significant decrement of salivary alpha-amylase was only observed in female dances (*p value*: .041). Nevertheless, females' salivary cortisol trended to increase. This would conclude that male dancers seemed to respond to competitive stress and anxiety more than female dancers.

Table 1 Demographic data of subjects

Demographic data of subjects	
Number of couples	10
Gender (Male:Female)	10:10
Age (year)	15.30±1.9
	4
Type of ballroom dance (Standard:Latin American)	8:12
Dance level (class A:B:C:D)	2:2:14:2

Data was shown as mean ± SD

Table 2 The physiological response to competition in sport dancers

	7-week before competition	1-week before competition	Competition day
Salivary Cortisol			
<i>All dancers (n=14)</i>	7.77±4.64	8.42±5.63	11.67±5.87
<i>Male dancers (n=7)</i>	9.07±4.94	6.21±4.42	11.10±5.13
<i>Female dancers (n=7)</i>	6.47±4.29	10.62±6.15	12.23±6.90
Salivary Alpha-Amylase			
<i>All dancers (n=13)</i>	93.63±61.06	147.63±87.94	111.42±89.89
<i>Male dancers (n=7)</i>	83.65±76.86	118.72±86.24	118.38±113.02
<i>Female dancers (n=6)</i>	105.26±39.48	181.36±84.27	103.29±62.60

*Data was shown as mean ± SD

*Four subjects dropped out of the study. Only fourteen dancers were in the study for cortisol collecting. Thirteen dancers were in the study for alpha amylase collecting because the saliva of a female dancer was not enough for analysis.

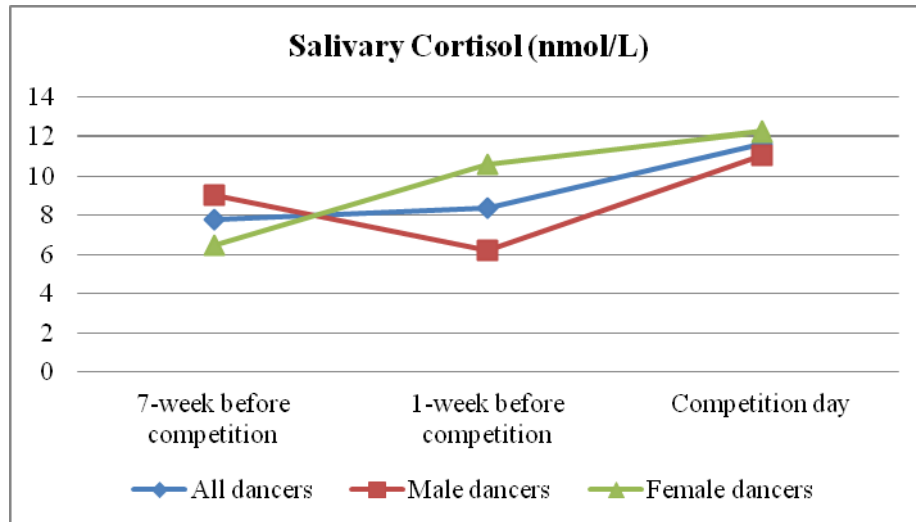


Figure 1 Salivary Cortisol level of all dancers, male dancers, and female dancers at the point of time (7-week before competition, 1-week before competition, and competition day)

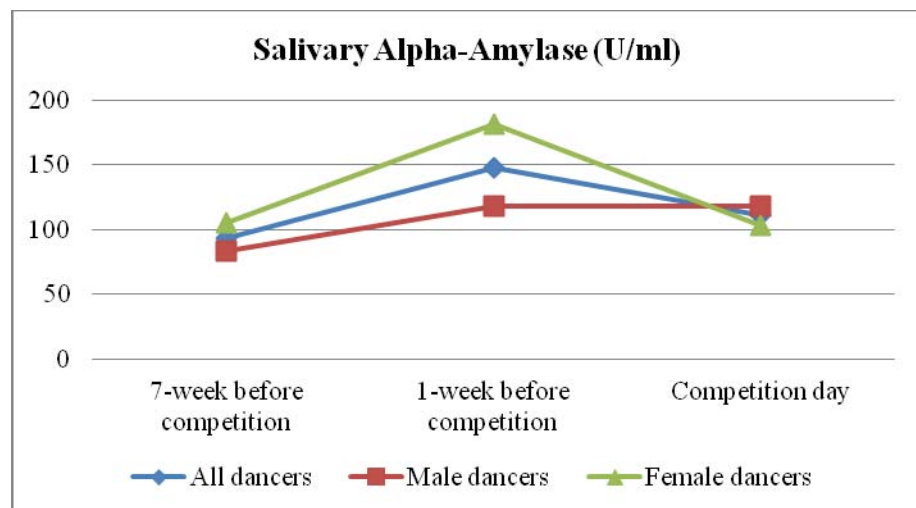


Figure 2 Salivary Alpha-Amylase level of all dancers, male dancers, and female dancers at the point of time (7-week before competition, 1-week before competition, and competition day)

Table 3 The psychological response to competition in sport dancers

	7-week before competition	1-week before competition	Competition day
Somatic Anxiety			
<i>All dancers (n=18)</i>	17.77±4.10	22.61±3.86	19.92±6.22
<i>Male dancers (n=9)</i>	18.09±3.77	23.01±3.80	19.20±4.52
<i>Female dancers (n=9)</i>	17.46±4.61	22.22±4.11	20.63±7.79
Cognitive Anxiety			
<i>All dancers (n=18)</i>	19.00±4.13	26.88±6.18	22.66±5.65
<i>Male dancers (n=9)</i>	12.00±4.40	26.44±4.44	22.44±4.87
<i>Female dancers (n=9)</i>	20.22±3.66	27.33±7.81	22.88±6.64
Self-confident			
<i>All dancers (n=18)</i>	28.88±4.01	23.55±5.29	27.66±7.42
<i>Male dancers (n=9)</i>	29.11±5.57	25.33±6.16	29.55±6.91
<i>Female dancers (n=9)</i>	28.66±6.91	21.77±3.80	25.77±7.83

Data was shown as mean ± SD

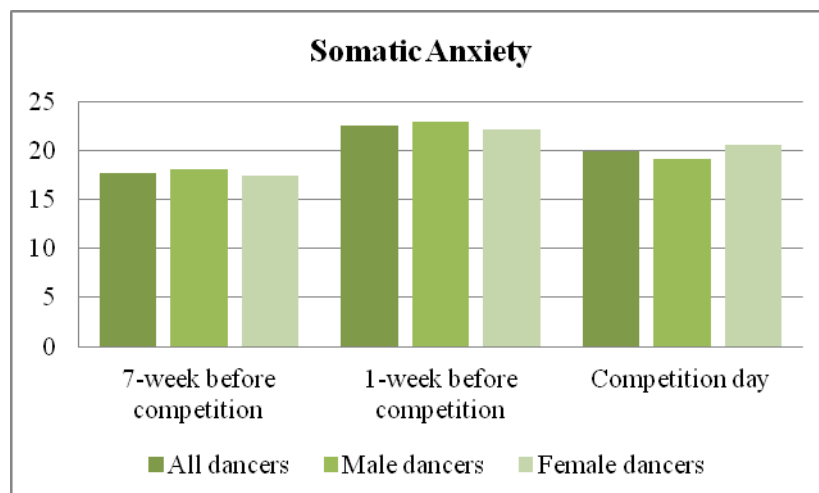


Figure 3 Somatic anxiety level of all dancers, male dancers, and female dancers at the point of time (7-week before competition, 1-week before competition, and competition day)

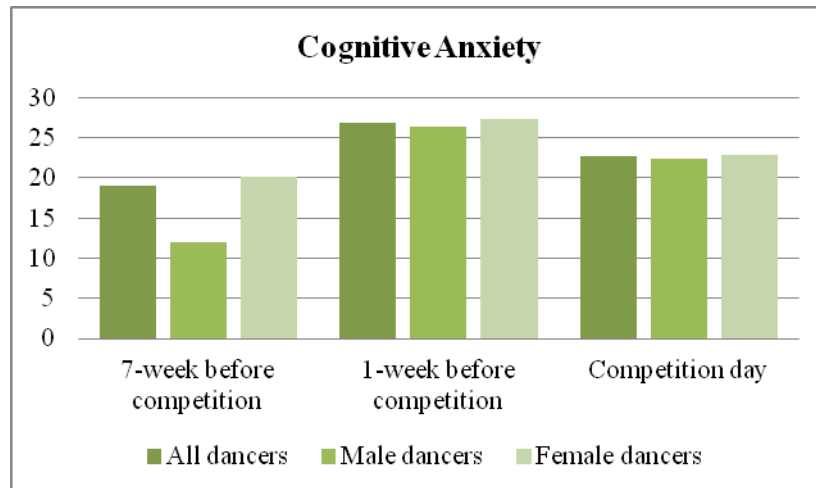


Figure 4 Cognitive anxiety level of all dancers, male dancers, and female dancers at the point of time (7-week before competition, 1-week before competition, and competition day)

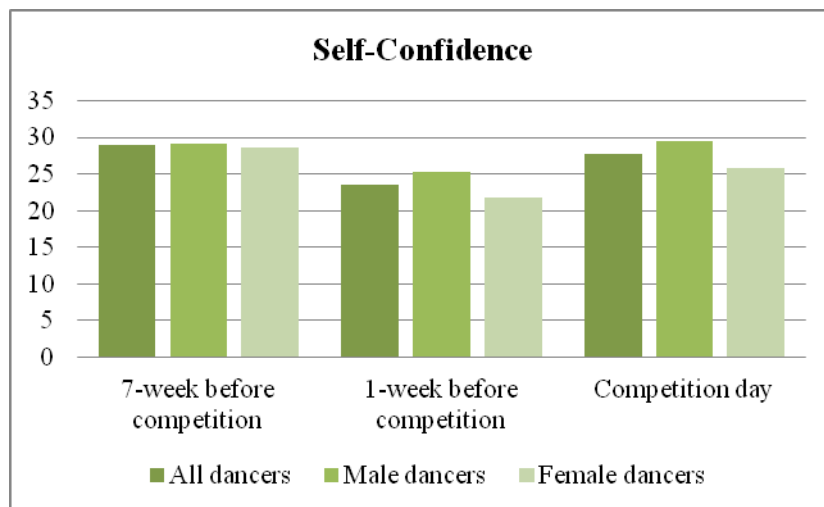



Figure 5 Self-confidence level of all dancers, male dancers, and female dancers at the point of time (7-week before competition, 1-week before competition, and competition day)

Discussion and conclusion

The key finding of the present investigation was the observation of statistically significant higher-level of somatic anxiety, cognitive anxiety, and lower-level of self-confidence at the point time of 1-week before competition comparing to 7-week before competition (*p value: .000, .000, .003 respectively*). Moreover, on the competition day, the cognitive anxiety was statistically significant turned down to the optimal level comparing to 1-week and 7-week before competition (*p value: .016, .023 respectively*). This would indicate that sport dancers were stimulated to the highest level of physiological stress and psychological anxiety at the



point time of 1-week before the competition. Surprisingly, it was turned down on the competition day. Many researches showed the raise of stress and anxiety level when the time closed to the competition or the real or the important competition. As Alix-Sy et al. (2008) found the statistically significant increment of salivary cortisol on competition day when compared to non-training day in elite soccer players. Rohleder et al. (2007) and Filaire et al. (2009) found the similar result in sport dancers and tennis players respectively. Moreover, Loupos et al. (2008) showed the statistically significant increment of salivary cortisol and somatic anxiety on competition day when compared to resting day among swimmers.

In addition, the last week of the dancesport training was also a very stressful situation. First of all, most competitive dancers must come to practice at Thailand Dancesport Association in Bangkok which would benefits to their performance and the result of the competition. In this part, it is the first time they know and see each other's performance. Second, lots of competitive dancers appreciate to take the private dancing lesson from judges. Some of them couldn't take it because of the limit time and judges. Thus, the physiological stress and psychological anxiety may be induced at 1-week before the competition.

However, the reason why it turned down to the optimal level is difficult to explain. This may be explained, at least in part, by situational factors and individual aspects. A competitive match might place reduced emotional stress inherent within the competitive environment (Whitehead et al. 1996). In the dancesport competitive situation, most experienced competitive dancers may prepare themselves for the competition very well; some of them do the psychological skill training. The well-know audience and judges would not affect to induce any stress and anxiety; on the other hand, this may promote dancers' confidences.

In gender separation, the statistically significant decrement of salivary alpha-amylase was only observed in female dances (*p value*: .041). This would conclude that male dancers seemed to be responded to competitive stress and anxiety more than female dancers. The reason of the more competitive stress influence observed in male dancers may explain by the individual in gender aspects to dancesport competition. Dancesport demanded that a man controls the situation after all. It is a man's job to lead the dance and ensure he makes his lady look nothing less than fabulous on the dance floor. Male dancers would perform more complex technique and thinking than female dancers. Thus, the same way competitive stress may affect to male dancers more than female dancers. The impact of sex difference that responds to salivary cortisol and alpha-amylase has been studied. Several researches showed that men and women differed in their responses to stressful events (women almost always rated higher stressful than men) (Bradley et al., 2001; Cahill et al., 2003; Canli et al., 2002; Stegeren et al., 2005). Moreover, Stegeren et al., (2008) found a strong salivary cortisol response in men than in woman in reaction to stressors. They also showed that men had higher salivary alpha-amylase than woman during the complete course of the study. The gender aspects would involve the difference of basal level of salivary cortisol on imagery intervention. However, Takai et al., (2007) did not see any gender effect on salivary alpha-amylase level.

In conclusion, sport dancers were stimulated by competitive stress and anxiety at the point time of 1-week before competition. Most of them turned down to the optimal level on the competition day. In gender separation, during competition, male dancers seemed to be responded to competitive stress and anxiety more than female dancers.



Practical Implications

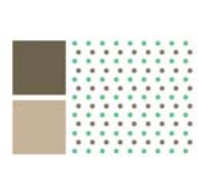
The dancers should be trained after their normal practice to reduce stress and anxiety especially 1 week before competition. Male and female athletes should be separated according to the different response in gender.

Acknowledgments

The success of this research can be attributed to the extensive support and assistance from Associate Professor Wilai Anomasiri, Ph.D. and Pichit Muangnapoe, Ph.D. Moreover, I would like to gratefully acknowledge that this research is successfully completed by Ratchadapiseksompotch Fund., Faculty of Medicine, Chulalongkorn University.

References

1. Alix-Sy D., Scanff C.L., Filaire E. (2008) Psychophysiological response in the pre-competition period in elite soccer players. *Journal of sport science and Medicine* 7: 446-454.
2. Bradley M.M., Codispoti M., Sabatinelli D., Lang P.J. (2001) Emotion and motivation II: sex differences in picture processing. *Emotion* 1(3): 300–319.
3. Cahill L., Stegeren A. (2003) Sex-related impairment of memory for emotional events with beta-adrenergic blockade. *Neurobiology of Learning and Memory* 79 (1): 81–88.
4. Canli T., Desmond J.E., Zhao Z., Gabrieli J.D. (2002) Sex differences in the neural basis of emotional memories. *Proceedings of the National Academy of Sciences* 99 (16): 10789–10794.
5. Cox R.H., Martens M.P., Russell W.D. (2003) Measuring anxiety in athletes: The revised competitive state anxiety inventory-2. *Journal of sport and exercise psychology* 25, 519-533.
6. Filaire E., Alix D., Ferrand C., Verger M. (2009) Psychophysiological stress in tennis players during the first single match of a tournament. *Psychoneuroendocrinology* 34: 150-157.
7. Hellhammer D. H., Wiist S., Kudielka B. M. (2009) Salivary Cortisol as a Biomarker in Stress Research. *Psychoneuroendocrinology* 34: 163-171.
8. Loupos D., Fotini M., Barkoukis V., Tsorbatzoudis H., Grouios G., Taitzoglou I. (2008) Psychological and physiological changes of anxiety prior a swimming competition. *The open sports medicine journal* 2: 41-46.
9. Nater U.M., Rohleder N. (2009) Salivary alpha-amylase as a non-invasive biomarker for the sympathetic nervous system: current state of research. *Psychoneuroendocrinology* 34: 486-496.
10. Rohleder N., Nater U.M., Wolf J.M., Ehlert U., Kirschbaum C. (2004) Psychosocial stress-induced activation of salivary alpha-amylase: an indicator of sympathetic activity? *New York Academy of Sciences* 1032: 258-263.
11. Rohleder N., Beulen S. E., Chen E., Wolf J. M., Kirschbaum C. (2007) Stress on the Dance Floor: The Cortisol Stress Response to Social-Evaluative Threat in Competitive Ballroom Dancers. *Personality and Social Psychology Bulletin* 33(1): 69-84.
12. Rohleder N., Nater U.M. (2009) Determinants of Salivary alpha – amylase in Humans and Methodological Considerations. *Psychoneuroendocrinology* 34: 469-485.

- 
13. Rohlder N., Nater U.M. (2009) Salivary alpha-amylase as a non-invasive biomarker for the sympathetic nervous system: Current state of research. *Psychoneuroendocrinology* 34: 486-496.
 14. Stegeren A.H., Wolf O.T., Kindt M. (2008) Salivary alpha-amylase and cortisol response to different stress tasks: impact of sex. *Psychophysiology* 69: 33-40.
 15. Stegeren A.H., Goekoop R., Everaerd W., Scheltens P., Barkhof F., Kuijer J.P., Rombouts S.A. (2005) Noradrenaline mediates amygdala activation in men and women during encoding of emotional material. *Neuroimage* 24 (3): 898–909.
 16. Takai N., Yamaguchi M., Aragaki T., Eto K., Uchihashi K., Nishikawa Y. (2004) Effect of psychological stress on the salivary cortisol and amylase level in healthy young adults. *Archives of oral biology* 49: 963-968.
 17. Takai N., Yamaguchi M., Aragaki T., Eto K., Uchihashi K., Nishikawa Y. (2007) Gender-specific differences in salivary biomarker response to acute psychological stress. *Annals of the new york academy of sciences: Issue oral-based diagnostics*. 1098: 510-515.
 18. Tremayne P., Ballinger D. A. (2008) Performance enhancement for ballroom dancer: Psychological Perspectives. *The Sport Psychologist* 22: 90-108.
 19. Whitehead R., Willson B.J., Kozar B., Vaughn R.E. (1996) Stress and performance: an application of Gray's three-factor arousal theory to basketball free-throw shooting. *Journal of sport science* 14: 393-401.