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Features of type personality behaviour among young and healthy students of medicine are related to the declared level of stress but not to the level of stress measured objectively

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Abstract: Features of Type A are common among physicians and may be related to the experience of stress. We aimed to assess the prevalence of features of Type A and the level of declared vs. objectively measured stress among young, healthy men and women studying medicine. 130 healthy female (age: 23±2; BMI: 20.9±2.4 kg/m^2) and 71 male (age: 22±2 years; BMI: 24.3±3.3 kg/m^2) medicine students completed the Polish versions of: the Framingham Type A Scale, The Perceived Stress Scale (PSS-10) and the Sense of Stress Questionnaire (SSQ, with 3 subscales assessing: emotional tension, external stress and internal stress). Moreover, we measured the level of cortisol (the 'stress' hormone) in saliva. Results in both questionnaires assessing perceived stress did not correlate with the level of cortisol (both $p>0.05$). In both genders, features of Type A were positively related to the perceived stress (PSS-10: accordingly, r=0.6 and r=0.5; SSQ: r=0.6 and r=0.6; all $p<0,001$), but not with the level of cortisol ($p>0.05$). Development of the pattern of behavior called Type A personality-behaviour might be related to the conviction of experiencing stress rather than to its actual level measured objectively. Such observation could be valuable for physicians who experience extremely high level of stress during their work**.**
Keywords: perceived stress, salivary cortisol, Framingham Type A Scale, emotional tension, external stress, internal stress.

INTRODUCTION

Type A personality is an action-emotion set of features involving behavioral predispositions (e.g., aggressiveness, competitiveness, and impatience) as well as specific behaviors (e.g., alertness, accelerated pace of activities, rapid and emphatic vocal stylistics) and characteristic emotional responses (e.g., irritation, hostility and an increased potential for anger) [1,32].

It is known that Type A personality characteristics are common in the medical professions because medical doctors frequently make important decisions under the time pressure [2-4]. This profession is generally considered as demanding and moreover, it is suggested that their personal characteristics may contribute to an overall burden experienced by them [5].

It remains unknown whether features of Type A personality are also present among medicine students and whether it may be related to the experience of stress, which is particularly high within this group [6]. There is evidence that medical students suffer from extreme psychological burden [7] and very often experience also depression and anxiety [8].

It is known the people with Type A personality experience psychological stress due to the emotional tension [9-12]. However, stress has various definitions and, there are various methods for its assessment. For instance, questionnaires can assess the perceived stress defined as a situation when "an individual feels that environmental demands tax or exceed his or her adaptive capacity" [13]. On the other hand, each stressful situation activates the hypothalamic-pituitary-

adrenal axis leading to the secretion of biologically active molecules (hormones and/or catecholamines), which can be easily measured as an objective biomarker reflecting the level of stress. In the present study we decided to use saliva samples, for the noninvasive assessment of cortisol, which is known as a specific biomarker of stress [14-18].

We aimed to assess the prevalence of the features of Type A personality and the level of stress among young, healthy men and women studying medicine. Moreover we would like to check if features of Type A personality are related to the level of stress, measured using both declarative as well as more objective, biological measures.

We hypothesise that the higher the level of stress the stronger the manifestation of features characteristic for Type A personality, regardless of the applied (declarative vs. objective) measure of stress.

Methods

Study group

The study was conducted from February to September 2012 at the Faculty of Medicine and Faculty of Dentistry at Wroclaw Medical University. The inclusion criteria comprised as follows: the age between 18 and 35 years, (b) medical students, and (c) has no history of any acute or chronic illness. The exclusion criteria were: smoking cigarettes, experiencing exceptionally traumatic event within previous months (according to 'The Social Readjustment Rating Scale', [19] and incompletely filled in the questionnaires.

The participation in the study was proposed to 334 subjects, however 246 (74 %) of them decided to take part in the study.

The study protocol was approved by the Local Ethics Committee and all participants gave their written informed consent. The study was conducted in accordance with the Helsinki Declaration.

Study protocol

Students were recruited at the university. The fulfillment of the inclusion criteria (including the consent) was verified during a short interview.

The study included three stages. First stage was based on the saliva donation, performed by each student who agreed to participate in the study, according to the precise instruction from the investigator. Second part was based on filling-in the psychological questionnaires (a scale evaluating Type A personality and 2 scales assessing the level of stress) with a short survey regarding anthropometric and demographic data (body weight, height, year of birth, and year of studies), performed by each student while returning saliva samples to the investigator. The final (third) stage was based on measuring the level of cortisol from all collected saliva samples.

The study was conducted during 7 months. As a result 70 students were examined during the period of the exams at their University. In order to control the potential differences in the level of stress among students experiencing this additional stress and their colleagues, we compared the values reflecting the level of stress obtained from those 70 students with the values obtained from the remaining participants.

Data collection

Saliva donation

All students received a set for saliva collection, including five 1 mL plastic, sterile tubes, and the following written instruction:

- Eating, drinking and brushing teeth is forbidden for 12 hours prior to the donation;
- The donation has to be performed within 1 day, precisely between 7.00 and 9.00 AM with intervals of approximately 15 minutes;
- The complete donation requires 5 saliva samples (±1 mL each), put directly into plastic tube;
- Saliva samples have to be stored at 4°C (in a standard fridge) for no longer than 5 days;
- Afterwards the samples have to be returned to the investigator, who will to store them at -80°C for further analyses.

Questionnaires

Type A personality was assessed using Framingham Type A Scale (Haynes, et al., 1978) in the Polish version adapted by Juczyński [11]. The scale consists of 10 items. In the first five items,participants assess their personal identification with each statement by selecting 1 of 4 possible answers ('*definitely yes*', '*probably yes'*, '*probably not'*, or '*definitely not'*; scored as: 1; 0,67; 0,33; 0 points, respectively); the possible answers of the last five items were '*yes*' (for 1 point) or '*no*' (for 0 point). The average score was calculated and then divided by 10. As a result an overall score ranged from 0 to 1. Unlike the original version, the Polish version of the scale distinguishes 2 subscales assessing 2 features which characterize Type A personality: haste (items: 2,3,5,6,10) and competition (items 1,4,7,8 and 9) [11].

The Perceived Stress Scale (PSS-10) was developed by Cohen and his colleagues [20], and the Polish version was validated by Juczyński [11].This scale assesses the perception of stress over the last month, for example, whether (and how much) some situations are perceived as stressful and whether (and how much) the participants find it their life unpredictable, uncontrollable, and overloaded. This refers precisely to 1 month preceding the study. The scale consists of 10 items regarding how often the

respondents feel in a certain way (using a 5-point Likert scale, which 0 represents '*never*' and 4 represents '*very often'*). Cronbach's alpha for the polish version of PSS-10 ranged between 0,72 and 0,90 [21].

The Sense of Stress Questionnaire (SSQ), is a polish questionnaire developed by Plopa and Makarowski (2010), which assesses the perceived stress. In addition this SSQ involves in a 3 subtypes of stress: (a) emotional tension, (b) external stress, and (c) intrapsychic stress. The scale consists of 27 items concerning feelings, fears, thoughts and behaviors related to stress in everyday life. Responses are expressed using a 5-point Likert scale, where 5, 4, 3, 2 and 1 represent "*true*", "*somewhat true*", "*do not know*", "*somewhat false*" and "*false*", respectively. Three subscales (each includes 7 items) are used in order to assess three subtypes of stress: (a) emotional tension (related to emotions such as anxiety or excessive nervousness occurring due to both external and internal factors); (b) external stress (caused by external factors, like for instance an unfair evaluation by others) and (c)intrapsychic stress (a stress resulting from purely internal reasons, occurring without any reasonable external source, like excessive worrying). The perceived stress is calculated for each subscale (7-35 points). Sum of the scores in 3 subscales was interpreted as the general level of perceived stress. The three remaining items serve as the lie scale [22]. The Cronbach's alpha of the Polish version of the scale ranged between 0.70 – 0.81[23].

We decided to use 2 questionnaires assessing perceived stress in order to perform a comprehensive assessment of the level of declared stress. PSS-10 is a widely used and validated international tool, measuring stress within a specific period of time (as it refers to precisely one month preceding the study). However, PSS-10 does not distinguish any subtypes of stress. SSQ scale refers to the general sense of stress in everyday life and distinguishes three sub-types of stress.

Laboratory measurements

The investigator delivered all frozen saliva samples to the laboratory, where the samples were defrosted. Concentrations of hormones were measured using the Enzyme-Linked Immunosorbent Assay (ELISA) method with reagents from Labor Diagnostik a Nord GmbH & Co. KG [24, 25].

Statistical analysis

Continuous variables were assessed for normality by the Kolmogorov-Smirnov test. Variables are presented as means with standard deviations of a mean. Differences between results of all applied questionnaires and cortisol measures obtained by men and women as well as between results obtained by students examined during the examination period and those examined during the remaining time were tested using Student's *t*-test. Proportions of students from various years were demonstrated as percentages; gender differences in those proportions were tested using χ^2. Relationships between the analyzed variables were assessed using Pearson's correlation coefficients. A *p*-value of under 0.05 was considered to be statistically significant.

RESULTS

None of the examined students experienced any stressful event (by using 'The Social Readjustment Rating Scale', reference). 45 students had to be excluded due to lack of answers in the questionnaires. As a result, 201 medical students (130 women) were included in this study.

The mean level of stress (assessed using questionnaires and the saliva samples) did not differ between students examined during the exams and the remaining students (p values for the comparisons were: 0.82 for the cortisol, 0.73; 0.17; 0.41 and 0.89 for SSQ and its subscales and 0.40 for PPS-10). Similarly, there were no differences in the scores in Framingham Type A Scale (p=0.80)

Results are presented in Table 1. Examined women did not differ in age as compared to men (p>0.05). Moreover, there were no differences related to the representation of students from a particular year of studies in women compared to men (all p<0.005). Men had higher BMI as compared to women (p=0.004).

The scores in Framingham Type A Scale did not differ between genders (p>0.05).There were also no differences in perceived stress (assesses using both PSS-10 and SSQ) between the genders (p>0.4) (see Table 1).Exams did not affect the level of stress (p>0.1).

Women's results in Framingham Type A Scale correlated positively with perceived stress (both p<0.001), but not with the level of cortisol (p>0.05) (Table 2). Similarly, men's scores in Framingham Type A Scale were positively related to perceived stress (both p<0,001), but not with salivary cortisol (p>0.05). Both Subscales of Framingham Type A Scale correlated positively with each subscale of SSQ among both analyzed gender groups (all p<0.05, see table 2).

The results of the PSS-10 and SSQ correlated strongly with each other (r=0.73 in women; r=0.62 in men; both p<0.05) (figure 1).

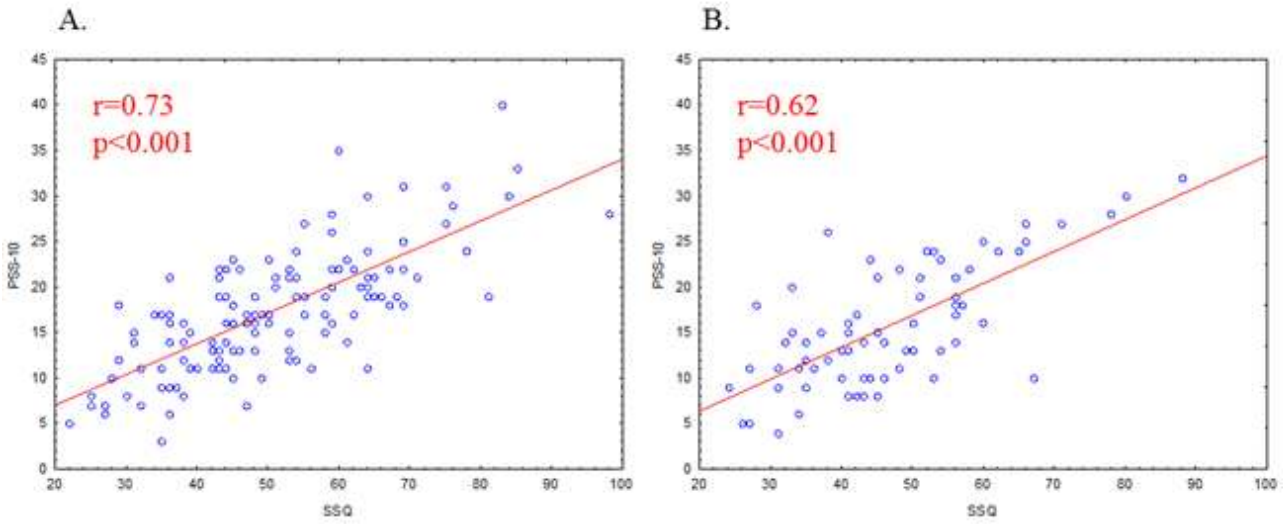
Surprisingly, the level of the perceived stress did not correlate with hormonal parameters reflecting stress (p>0.05) (figure 2).

Table 1. Demographic parameters, results of psychological questionnaires and the level of cortisol reflecting physiological parameter related to stress.

	WOMEN (N=130)	**MEN (N=71)**
Age (years)	23 ± 2	22 ± 2
BMI (kg/m^2)	20.9 ± 2.4	24.3 ± 3.3*
Year of studies (I/II/III/IV/V/VI) (%)	15/18/18/25/18/7	20/18/21/18/18/4
The Framingham Type A Scale (n) Subscale - haste (n) Subscale - competition (n)	0.59 ± 0.18 0.61 ± 0.22 0.57 ± 0.21	0.56 ± 0.18 0.56 ± 0.23 0.55 ± 0.20
The Sense of Stress Questionnaire (n)	50.6 ± 14.6	46.6 ± 13.3
Subscale – emotional tension (n) Subscale – external stress (n) Subscale – intrapsychic stress (n)	18.7 ± 6.2 16.3 ± 5.3 15.5 ± 5.3	17.8 ± 5.9 15.0 ± 5.0 13.8 ± 4.7
The Perceived Stress Scale (n)	17.3 ± 6.7	15.7 ± 6.6
Cortisol (ng/mL)	6.9 (5.6-8.3)	6.1 (5.0-7.2)
*p<0,05; BMI – Body Mass Index;		

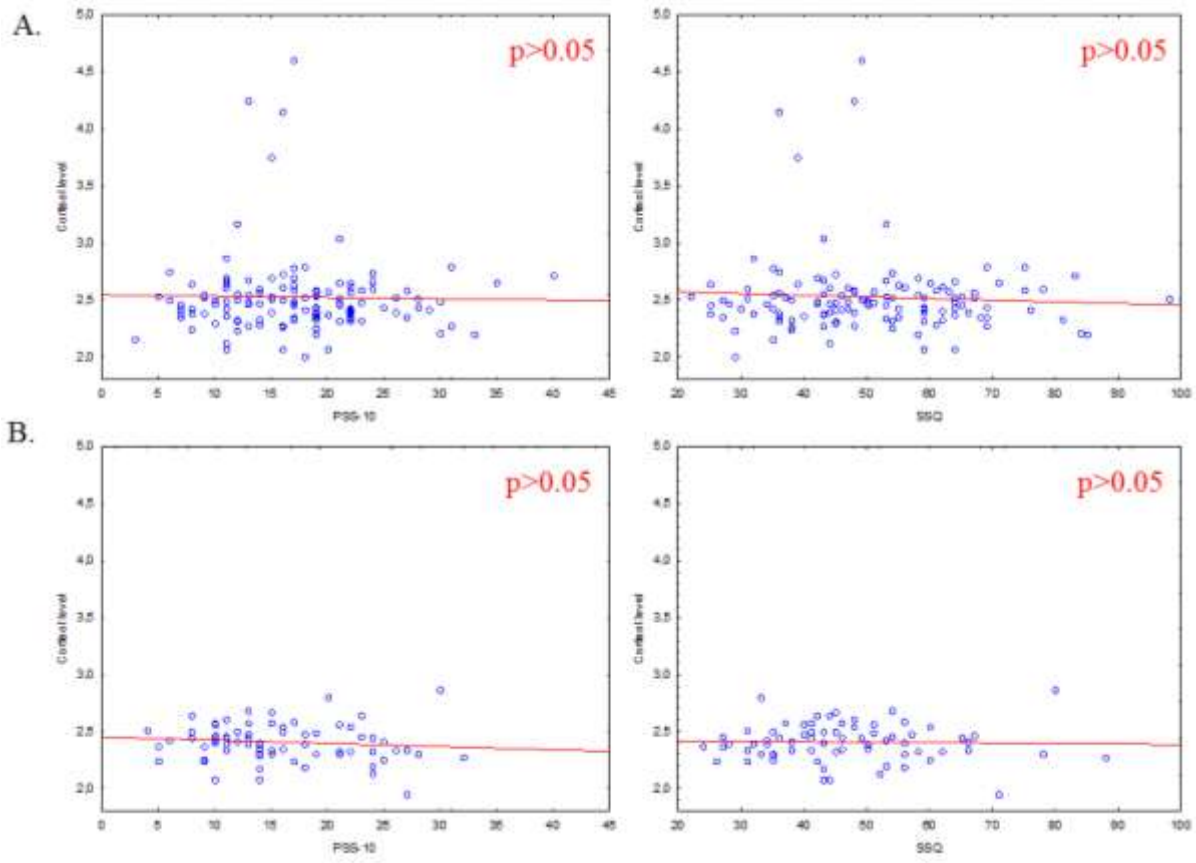
Table 2: Results in Framingham Type A Scale

		PSS10	**SSQ**	**SSQ-emotional tension**	**SSQ-external stress**	**SSQ-intrapsychic stress**	**Cortisol level**
Women	**Type-A**	0.61 p<0.001	0.59 p<0.001	0.46 p<0.001	0.58 p<0.001	0.50 p=0.001	-0.11 p=0.225
	Type-A: Haste	0.53 p<0.001	0.46 p<0.001	0.40 p<0.001	0.47 p<0.001	0.33 p<0.001	-0.035 p=0.693
	Type-A: Competition	0.48 p<0.001	0.52 p<0.001	0.38 p<0.001	0.50 p<0.001	0.51 p<0.001	-0.15 p=0.096
Men	**Type-A**	0.53 p<0.001	0.57 p<0.001	0.56 p<0.001	0.49 p<0.001	0.41 p<0.001	-0.11 p=0.343
	Type-A: Haste	0.44 p<0.001	0.48 p<0.001	0.52 p<0.001	0.39 p<0.001	0.29 p=0.012	-0.01 p=0.910
	Type-A: Competition	0.43 p<0.001	0.45 p<0.001	0.37 p<0.001	0.46 p<0.001	0.37 p=0.001	-0.18 p=0.126
Data are presented as Pearson's correlation coefficients; PSS-10 – Perceived Stress Scale; SSQ – Sense of Stress Questionnaire.							



PSS-10 – Perceived Stress Scale; SSQ – Sense of Stress Questionnaire

Fig-1: The relationships between two declarative measures of stress among women (A.) and men (B.).



PSS-10 – Perceived Stress Scale; SSQ – Sense of Stress Questionnaire

Fig-2: The relationships between two declarative measures of stress and the level of cortisol in saliva among women (A.) and men (B.).

DISCUSSION

Type A personality (Type A) and the perception of stress are known as the potential risk factors for the development of cardiovascular disease [1, 9, 26-28].

In the present study we aimed to demonstrate that among medical students, there is a relation between their personality (in term of features of Type A) and the way how they experience stress. We have shown that the higher intensity of Type A characteristics, the higher level of perceived stress**.** However, analogous associations were not confirmed regarding hormonal parameters related to stress. It may result from the fact that perceived stress was not associated with hormonal parameters related to stress.

It is worth considering whether features of Type A determined the selection of medical studies or whether students developed characteristic features of Type A during their studies. Both explanations are possible, because: studying medicine requires being competitive; on the other hand, there is evidence suggesting that Type A may have genetic background [29].

Our data proved that women and men with higher intensity of Type A features had higher perceived stress level, which is consisted with the previous findings [10-12]. Additionally, although Type A appeared to be associated with each distinguished subtype of perceived stress, it is independent of hormonal parameters related to stress.

Interestingly, there was no relationship between the perceived stress and hormonal parameter reflecting the level of stress. This observation is consistent with the results demonstrated by Eck and co-authors [30], in which only anxiety and depression (but not perceived stress) were associated with increased level of cortisol. Eck and colleagues considered that negative affectivity is associated with increased cortisol secretion during normal daily activities [30]. However, there are also data known, that the relation between perceived stress and hormonal parameters related to stress were noted: the higher level of perceived stress (assessed by PSS-10) was associated with the lower level of salivary cortisol among employees [31]. In conclusion, perceived stress does not need to mean increased parameters related to stress, which can be the result depending on many factors such as: coping styles or duration and type of stressors. It can be assumed that

it results from the fact that examined subjects, for example, students experience only temporal stress (e.g., directly before their exams) which is relatively insignificant as compared to stressors which are characteristic for adults (related to their job and financial problems, children and health). The items in the applied questionnaires are related to more serious stressors than those experienced by students [20, 11].

Study limitations

We are aware that our study has a limitation, which need to be acknowledged. We allow the possibility that the selection bias could have occurred due to the procedure of saliva donation, which might be perceived as difficult (as it required getting up at 7.00 am, remaining fasting through 2 hours and other preparations started at day before).

Declaration of Interest

The authors declare no conflicts of interest.

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