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Stress in the physical education students in the examination situation

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Abstract

Introduction: Formal education is accompanied by the knowledge execution and progress in the education in each stage of teaching. Such activities are difficult situations, tightly closed with feeling of stress in the students. In view of the “transactional stress theory”, stress situation such as examination may be a kind of challenge indicating an appraisal of the own abilities to control situation and to gain something. Stress feeling during examination may depend on its cognitive appraisal and earlier experiences connected with such a situation.

Objectives: This study aimed at acquainting the knowledge of the stress feeling in the students during examination. Stress situation was the final examination of DEP (developmental and educational psychology) and psychological tests executed during this situation. It was assumed that the group of students filling these tests during DEP examination will work in time deficit and it may affect tests accuracy and intensify stress.

Material and Methods: The study took place in April-June 2017. It included 28 students of the master course in the Physical Education Faculty at Physical Education Academy in Gdańsk. The examined group included 14 female and 14 male students, aged between 22 years and 27 years. In this study three perception tests were used: Multiple Add-Substrate Test (MAS), Speed, Divisibility, Accuracy (SDA) test, and Visual Speed and Accuracy Test (VSA) designed by Grimsley *et al.* To assess the feeling of stress during examination, Stress Feeling Questionnaire (SFQ) of Plop and Makarowski was used. SFQ enables to calculate total result informing about the generalized stress level, and three results referring to the following dimensions: Emotional Tension (ET), External Stress (ES), and Intrapyschic stress (IS). FSQ test contains also Lie Scale (LS).

Results: Results of MAS test showed the differences concerning the number of the arithmetical calculations made both in neutral and examination situations. During examination, an increased number made calculations was accompanied by an increase in the number of errors. Statistical analysis of the SDA test results showed significant difference in the number of the correct calculations made in neutral situation and during the examination. Analysis of the stent results of SFQ test obtained in both neutral situation and during examination revealed visible differences in its subscales. Answers to the SFQ test during examination increased emotional tension (ET), increased external stress (ES), and intrapsychic stress (IS) in the examined students. Significant differences were noted in the value of stents of the general SFQ test result, i.e. generalized stress feeling in the examined students in both neutral situation and during the examination.

Conclusions: Students during the examination usually made lower number of the arithmetical calculations and perception tasks and made more errors. Difference in the number of errors in perception tests made by students in stress situation (examination) is statistically significant, which may indicate increased stress intensity. Statistically significant differences in the stress feeling exist in the physical education students between neutral and stress (examination) situations.

Keywords: Perception tests, stress feeling, coping with stress strategies, situation cognitive appraisal, examination

Introduction

Since the down of times, a formal education is accompanied by the execution of the knowledge and assessment of the progress in the study. There are difficult situations tightly connected with stress. It is assumed that the skill of coping with stress situations decides about an effectiveness of the functioning at every stage of an education. Therefore, the attempts of the skills, experience, and own competitions, and success in the education as well as coping with stress description are take (e.g. Płotka *et al.*, 2003; Sękowski, 2004; Sikora, 2010; Talik, n

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Szewczyk, 2010; Talik, 2011) [27, 28, 29, 37, 36].

Stress understanding in the psychological sense is related to the “psychosomatic” studies carried out by Grinker and Spiegel with reference to the symptoms of neurosis (anxiety, decrease in the emotional control, mood swings) being reactions to the war stress related to the permanent threat to life and health (cit. Terelak, 2005) [38]. These studies emphasized the relationship between difficult situations with various emotional and somatic symptoms. That time, an evidence of the translatability of the physiological and psychological stress indices was sought out as well as their interdependence and interaction. Later, it was seen that the physiological indices alone are not able to explain mechanisms responsible for psychological stress development (Lazarus, 1966; Cox, 1995) [13, 2]. The studies concentrating on the meaning of activity and excitation prior to anticipation or the direct contact with the natural situation being a stress source proved to be successful. It was shown that active behavior of the subject reduces psychological stress (measured by the anxiety indices) and intensifies physiological excitation (measured by the hormones release) [cit. Plopa and Makarowski, 2010] [26]. Survey of the available literature concerning this subject made Terelak (2008) [39], Plopa and Makarowski (2010) [26], and Heszen (2013) [6].

As far as the subject literature is concerned, the authors generally agree that the cornerstone of the significant influence on the defined theoretical opinion on the interdependence of the human physiological and psychological factors and an idea of the psychological stress concept was laid by Lazarus works (1966, 2002) [13]. Plopa and Makarowski (2010) [26] carried out a searching analysis of Lazarus’ fascination of his stress concept.

Stress is, therefore, a result of the person’s cognitive appraisal of the real or anticipated harm/loss, threat or challenge (primary appraisal), and evaluation of the own ability to cope with the existing situation. Stress-producing factors are not objective features of the said subject, or specific situation, but a way of their perception and interpretation by the object (Lazarus, 1986; Terelak, 2005; Tomczak, 2009) [11, 38, 40].

In view of the “transactional stress theory”, situation of the examination may be some kind of challenge in the object appraisal, which indicates an evaluation of the own abilities to cope, and to achieve something. This challenge is accompanied by the specific emotions. Their picture is quite complex because they include both basic and complex emotions: negative such as anxiety, fear, panic, anger, shame, upset, and positive, e.g. hope, expectations, enthusiasm, joy, content, and satisfaction (Łosiak, 2007; Łosiak 2007a; Jarymowicz and Imbir, 2010) [18, 19, 9].

Protocol of study

Objectives

This study aims at recognizing feeling of stress in students during the examination. Stressor was a final examination of the developmental and educational psychology (DEP) and psychological tests during the exam. It was assumed that the group of students solving psychological tests during DEP will have time deficit, which may affect correctness of the test and increase in the feeling of stress. These objectives were realized by an attempt to find answer to the following questions:

1. What is students’ ability to execution of simple mathematical calculations and perceptual problems in both the natural and stressful (examination) situations?
2. What is feeling of stress in students in both the natural

and stressful (examination) situations and are the differences statistically significant?

Participants

The study was performed in April-June 2017. It included 28 students of the master studies at the Physical Education Faculty in Gdańsk. This group consisted of 14 female and 14 male students aged between 22 years and 27 years (mean=23.410; SD=1.290). Participants were the group volunteers selected from the group of 107 students participated in developmental and educational psychology course. The students were informed about the aim of this study and the methods used, and possible consequences resulting from their participation in the study. Before each experiment, the students signed consent, declaring them voluntary participation and understanding that it may have a negative effect on the final note of the examination.

Methods

Three perceptual tests were used to check effectiveness of the students’ cognitive skills and Stress Feeling Questionnaire (SFQ) The first test is multiple add-substrate tests (MAS – experimental version). It assesses so-called skills of the mathematical calculations, wider abilities of the quantitative reasoning, understanding of the quantitative relations, and structuring mathematical problems. As both adding and subtracting are very similar, the student have to pay attention to the sign indicating the type of calculation, i.e. what should be done – adding or subtracting in every calculation. Questionnaire includes 99 questions. Each correct calculation is given 1 point. The number of errors is also noted. The test should be completed in 3 minutes.

Remaining two tests aims to evaluating attention responsible for the perception selectivity. Execution of these two tests consists of the crossing out assigned numbers or symbols out of similar ones during 3 minutes. The obtained results provide the following indices: perception speed (PS) – informing how the person is able to survey perceptual material, perception unreliability (D – divisibility) informs about the skill of the perceptual material differentiation, attention unreliability (A – accuracy) informs about the skill of identification of the significant stimuli. The first of the used perception tests was popular test assessing speed, divisibility, and accuracy (SDA) in the experimental version elaborated, based on the Bourdon Letter Cancellation Test (encircling letters “s” and “u”), and Toulouse-Pieron Test. The student executing SDA test had to cancel numbers 2 and 7, hidden in 10 rows of different numbers from 1 to 9. Total number of the correct cancellations was 197. Number of the wrong cancellations were also noted. Examined students had 3 minutes for completing the test (designed Borkowska by, 2002). The second perception test was Visual Speed and Accuracy Test (VSA) designed by Grimsley *et al.* In this case, the examined student had to compare several numbers in 5 columns and encircle letters S (same) and D (different). The test contains 150 such pairs. Correct answer receives 1 point. Time for test filling is 3 minute. Total number of cancellation, errors, and the proportion of the correct answers to the erroneous ones were calculated.

After completing perception test, the students answered the questions in the Stress Feeling Questionnaire (SFQ) designed by Plopa, Makarowski (2010) [26]. This test is destined to measure stressors structure. It enables to calculate both general result informing about generalized stress level as well as three results referring to the following measurements:

emotional tension (ET), external stress (ES) and intrapsychic stress (IS). SFQ contains also scale of the lie (LS). Questionnaire contains 27 statements; the examined student defines to which degree the said statement applies to him/her in a 5-step scale. Its ends describe answers "True" and "False". Coefficients of the internal conformity for three scales (measurements) found in the studies in adults were 0.70 to 0.81. Reliability of the lie scale proved to be lower (0.57). SFQ contains standard ten norms for persons aged between 16 years to 70 years, including age, sex, and education level of the examined individuals. Calculation of the obtained results and their interpretation were described by the authors Plopa, Makarowski (2010)^[26].

The advantage of the tests used in this study is their Polish standardization; reliability and accuracy for the Polish population are known – centile and stents norms for adult women and men of various age compartments, college and university students, and conscript soldiers (Szafranec, 1980; Ciechanowicz, 2006; Plopa, Makarowski, 2010)^[1, 26].

The study included two stages. In the first stage, the examined students filled psychological tests assessing function of their cognitive processes and self-assessment of the stress feeling in the "neutral" situation during DEP lessons. The second stage took place 5 weeks later during written DEP examination. In this stage of the study, the participants answered 20 open questions of the questionnaire specifically designed for the examination in 45 minutes. After 20 minutes, the examination was interrupted and psychological tests were carried out; when they were completed, the examination was continued for 10 minutes. Psychological tests lasted for about 15 minutes. Therefore, the students of the experimental group had about 15 minutes less to pass the examination of DEP and it could affect its result. The obtained results were analyzed statistically, calculating: arithmetical mean, standard deviation, of the distributions differences significance – Student t test for independent groups. The following markings were used: MAS – multiple add-substrate test; R – result; E – error; SDA – speed, divisibility, accuracy; N – number of the executed tasks, Z – number of the correctly executed tasks, N-

Z – difference; SFQ – stress feeling questionnaire: ET – emotional tension, ES – external stress, IE – interpsychic stress, LS – lie scale; GRS – standard ten for the total result; AM1 – arithmetic mean for group 1 in neutral situation; AM2 – arithmetical mean for group 2 during the examination; SDG1 – standard deviation for group 1; SDG2 – standard deviation for group 2; t – statistic value of Student t test; df – degrees of freedom; p – level of difference significance at $p < 0.05$.

Results

Results of SDA test revealed the differences in the number of the executed mathematical calculation in the neutral and examine situations. Observed differences were visible (AM1=39.679; SDG1=10.481 and AM2=44.179, SDG2=8.978) but statistically insignificant. An increased number of the mathematical calculations during the examination was usually accompanied by an increase in errors (AM1=1.571, SDG1=2.284 and AM2=2.964, SDG2=2.769). Comparison of the number of errors distribution in neutral situation and during examination showed statistically significant differences ($t = -2.053$; $p = 0.045$).

Statistical analysis of the obtained results of the test SDA (speed, divisibility, accuracy) showed statistically significant difference in the number of the properly marked numbers (AM1=195.143, SDG1=6.851 and AM2=170.607, SDG2=24.411; $t = 5.121$; $p = 0.000$). No statistically significant differences in the distribution of made errors by the students in both situations was seen.

Similarly, an analysis of VSA showed significant differences in the number of correctly executed tasks in the neutral situation and during examination. It was found that during examination the students generally executed less tasks and made more errors. The differences proved to be significant (N AM1=74.464, SDG1=8.016; AM2=68.357, SDG2=12.816; $t = 2.138$, $p = 0.037$; E AM1=70.464, SDG1=7.50; AMG2=62.893, SDG2=12.830; $t = 2.695$, $p = 0.009$). The obtained results are shown in Table 1.

Table 1: Analysis of the significance of the perception tests distribution in the neutral situation and during examination.

Variable	AM1	AM2	SDG1	SDG2	t	df	p
MAS, R	39.679	44.179	10.481	8.978	-1.725	54	0.090
MAS, E	1.571	2.964	2.284	2.769	-2.053	54	0.045*
SDA, R	195.143	170.607	6.851	24.411	5.121	54	0.000**
SDA, E	0.571	1.893	1.476	4.954	-1.353	54	0.182
VSA, D	74.464	68.357	8.016	12.816	2.138	54	0.037*
VSA, Z	70.464	62.893	7.510	12.830	2.695	54	0.009**
VSA, D-Z	3.929	4.071	3.516	3.790	-0.146	54	0.884

Test t for independent groups: Group G1 – neutral situation, N=28; Group G2 – examination, N=28, * $p < 0, 05$; ** $p < 0,001$.

Analysis of the standard ten of the results SFQ obtained by the student in the neutral situation and during examination showed visible differences in the test subscales. In every case, students' answers to the questions contained in SFQ increased emotional tension, increased external stress and intrapsychic stress during examination. However, these differences proved to be statistically insignificant. During the examination, an increase in the standard ten results was noted in LS (lie scale).

It may indicate a tendency to make selves better than in the reality in some students. Statistically significant differences were noted in the values of the standard tens of the general SFQ results (AMG1=4.893, SDG1=1.750; AMG2=5.964, SDG2=2.045; $t = -2.106$; $p = 0.040$) obtained in the neutral situation and during the examination. The results of this analysis are shown in Table 2.

Table 2: Comparison of the statistical significance of the standard ten values distributions in students in the neutral situation and during examination.

Variable	AM1	AM2	SDG1	SDG2	t	df	p
SFQ ET	3.750	4.464	1.974	2.117	-1.306	54	0.197
SFQ ES	2.821	3.500	1.765	2.064	-1.322	54	0.192
SFQ IS	3.357	3.750	1.810	1.624	-0.855	54	0.396
SFQ LS	5.571	6.750	2.631	2.444	-1.737	54	0.088
SFQ GRS	4.893	5.964	1.750	2.045	-2.106	54	0.040*

Test t; grouping: Groups (sheet1 in SFQ. Group G1 – neutral situation, N=28; Group G2 – examination, N=28, * p<0, 05.

Analysis of the arithmetical means of the standard ten values obtained by the examined students in particular SFQ scales indicates that they may be treated as average, typical for the majority of the population. Results of standard tens for nervous tension (NT) reveal moderate students' experience of the nervous tension in both the neutral situation and during the examination (AM1=3.750, SDG1=1.974 and AM2=3.500, SDG2=2.064). Similarly, the results referring to: the mean external stress (MES1=2.821, SDG1=1.765 and MES2=3.500, SDG2=2.064) as well as intrapsychic stress (MIS1=3.357, SDG1=1.810 and MIS2=3.750, SDG2=1.624) suggest that the examined students did not experience such a stress due to the lack of relations with external world or resulting from their relations with themselves. Despite the fact that noted differences of the mean standard ten values in these

subscales are visible (ET: D=0.714; ES: D=0.697; IS: D=0.939) but are insignificant. An analysis of an arithmetical means of the stent ten values in lie scale (MLS) obtained by the students in both neutral situation (MLS1=5.571, SDG1=2.631) and during examination (MLS2=6.750, SDG2=2.444) revealed students' average tendency to present themselves in SFQ test. However, the detailed analysis of the results obtained in LS suggests that some of the examined students filled individual entries of SFQ test decreasing their coefficients, giving a picture inconsistent with reality. Such an interpretation of these results is supported by an increase in the stent scores about 7 – 10 (LS1=32.14 and LS2=57.14%). These results suggest that some students had a tendency to hide their faults, whitening up, and neglecting their weak points, i.e. presenting themselves in the better light.

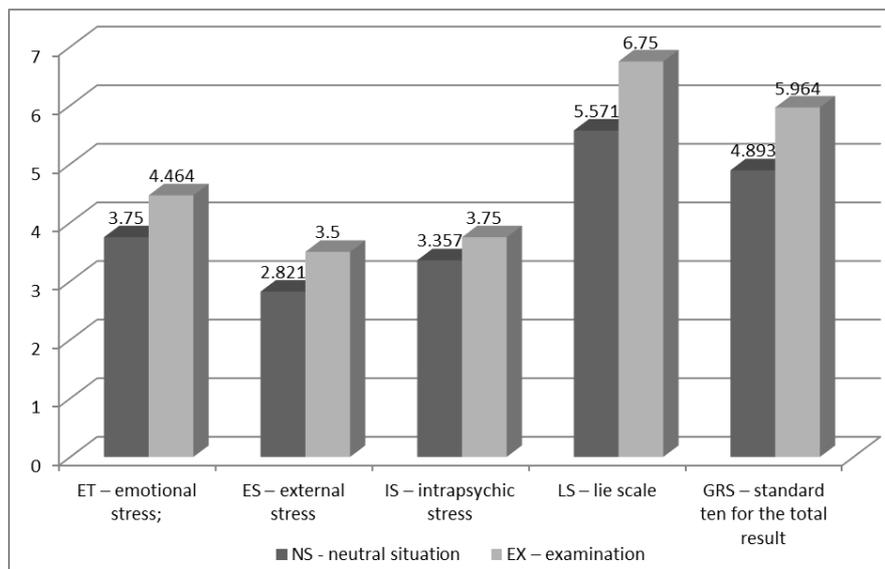


Fig 1: Histogram of the stents scores obtained in SFQ in both neutral and stressful (examination) situations.

Discussion

Stress according Lazarus is defined as: “a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being” (Lazarus and Folkman, 1984) [15]. In Lazarus stress concept. an essential meaning for the person has situational concept and his relation with the environment called transaction. Transaction is not only an influence on the person but also an impingement of the subject on the environment which together with situational context is an entity not being a simple sum of the particular parts. Transaction with the environment is the subject of the cognitive appraisal of the person, it is not a state but a continuous process during a certain time period; process aimed at reaching person's well-being (Heszen-Niejodek, 2000; Terelak, 2005) [6, 38]. It may be appraised as not important, favorable-positive or stressful. Stress transaction may be listed in the primary appraisal as (3

stressor types): harm/loss, threat, and challenge. The first appraisal refers to the damage which already had happened (e.g. close person loss, self-assessment). Threat refers to the same damages, which may appear and are anticipated. If the person in the result of the primary appraisal, e.g. examination situation, recognize it as stress, the next cognitive process is started, i.e. secondary appraisal in which a strategy of coping with stress is evaluated as well as costs and probability of success. In this situation, a basic adaptation process – coping with stress, defined as: “the cognitive and behavioral efforts made to master, tolerate, or reduce external and internal demands and conflicts among them” (Lazarus and Folkman, 1984) [15]. According to this, coping is a series of the purposeful efforts made by the person in the stress situation and is not an automatic adaptive behavior. Coping with stress has two functions: (1) instrumental (of a task), i.e. solving a problem, which is stress source, by a change of the own behavior or a change of threatening environment; (2)

regulation of the emotion – decrease of an unpleasant tension and other emotional states, and stimulation of emotions to mobilizing to act. These functions may be conflicted threatening an adaptation (e.g. when the function of self-appeasement makes impossible the efforts necessary for adaptation). There are 4 basic ways of coping with stress (each plays double role): (1) search of an information – includes an overview of the own stress situation to gain a knowledge to make a rational repair decision or re-appraising damage, or threat; (2) direct action – an activity of the person (except cognitive), which aim at coping with stress transaction may refer to changes in the person or the environment; (3) abstain from the action, because it may be more favorable, considering the transaction demands; (4) intrapsychic processes – all cognitive processes which aim at regulating emotions (such as defensive mechanisms such as negation, rationalization, projection) [Lazarus, 1986; Ogińska-Bulik, 2006; Łosiak, 2008] [11, 23, 20].

Stress in the school situation is a natural state and may be experienced by both the pupils and junior college, and university students. The studies carried out in the schools showed that the main sources of stress are problems in the school and threats such as family breakup, and loos of the emotional ties in families (Gacek, Frączak, 2005; Tabak, 2005; Jagieła, 2010) [4, 35, 7], communication and students relation with the teachers (Mróz, 2012; Sztajnberg, Jasiński, 2014, 2015) [22, 33, 34], school successes (Sokołowska, 2000; Siudem, 2005) [31, 30], and examination stress, specially the

way of the knowledge enforcement (answers at the blackboard, fear of the bad grades) (Płotka, Łagiewczyk, Płotka *et al*, 2003) [27]. Stress during the examination may produce the feeling of empty head, memory disturbances, problems with concentration, and decision making (Sikora, 2010; Talik, 2010) [29, 37].

The above listed feelings of both pupils and students last rather for a short time during the examination. Therefore, one should not immediately “loose his head”, worry, activate negative emotions, or panic. In every examination situation one should bear in mind that stress is neither good nor bad (Kuczyńska, Janda-Dębek, 2002) [10]. According Lazarus cognitive stress theory, a degree of stress in examination situation depends on the meaning set by the said person and what are the ways of coping with stress (Lazarus, Folkman, 1984; Folkman, Lazarus, 1986; Terelak, 2008; Ogińska-Bulik, Juczyński, 2010; Sygit-Kowalkowska, 2014; Janicka, 2015) [15, 16, 39, 24, 32, 8]. Assuming that the student will appraise his examination a too difficult and he will not pass it, such as stress is bad. If he will appraise his degree of the knowledge as sufficient to pass an exam, stress may be good. Stress overcoming may add power, mobilize to the further actions, and be a motor of the student's success. Examination produces short-lasting stress, called eustress, which is an optimum of the body stimulation, necessary for the normal and proper functioning contrary to the distress (chronic stress). Consequences of the optimum and too high level of stress are shown in Figure 2.

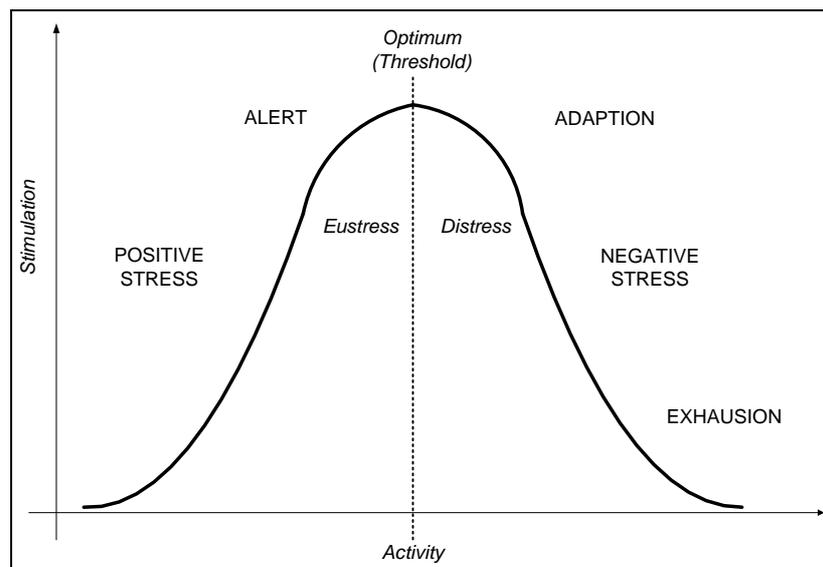


Fig 2: Consequences of the optimum and too intensive stress.

In this study, objective and subjective methods were used to appraise degree of stress examination.

The objective data were provided by MAS test and perception tests (SPD and SDS tests) evaluating cognitive processes effectiveness of the examined students in both neutral and examination situations. Tests SPD and SDS (similarly to the popular TUS test) enable to assess the skill of material selection in order to find elements corresponding in the established criteria. Perception selectivity (get rid of some information considered insignificant), alert (abstain reactions to the stimuli inconsistent with an instructions, waiting for the consistent ones), search (active checking of the perception field to find specific stimulus), and control of the simultaneous activities (plasticity of an attention in the situation requiring a control of a few cognitive processes at

the same time) (Ciechanowicz, Stańczak, 2006) [1]. Solving perception problems require an engagement of the attention elements such as: speed, divisibility, and accuracy. Attention is a group of the abilities or processes which are connected with perception, reception and reaction to both external and internal stimuli. It is responsible for the selection of stimuli reaching the individual, direction of the cognitive processes, and defining the volume of the used cognitive sources used for realization of various tasks. Therefore, an attention is a base of the remaining cognitive functions (Maruszewski, 2003, Lezak, 2004; Pawełczyk and Pawełczyk, 2007) [21, 17, 25]. Use of the perception tests for a method of the objective appraisal of the cognitive processes efficacy in the examination situation proved to be justified. A decrease in the number of accurately completed tasks and increased number

of errors made by the students during examination may suggest that they experienced stress. It affected making the simple mathematical calculations (adding and subtracting), speed and attention divisibility, and accuracy in the examination situation.

Subjective appraisal of feelings during the examination was assessed with the aid of SFQ. According to Plop and Makarowski (2010) [26], total SFQ score measures generalized stress level, understood as a hidden variable appearing by three indices: intrapsychic stress, external stress, and emotional tension. The carried out studies, mean stent scores did not exceed 5 – 6 scores (Table 1, Figure 1). Such a result is moderate and may be considered typical for the population majority. Naturally, a detailed analysis for particular subjects requires to separate them or analyzing in constellation. In this case, distribution of the mean SFQ value (stent score) obtained in neutral and examination situations differed significantly ($p=0.040$). These results may indicate increased feeling of stress during the examination. However, presented results should be interpreted carefully as the students sample was relatively small. Moreover, every second student tended to show himself and his feelings in a different light than that in the reality. The authors think that: “it may resulting from the weak criticism, weak insight into themselves, or other persons intentional misleading (Plopa, Makarowski, 2010) [26]. It is not also excluded the physical education students, who are obligatorily underwent various fitness tests, elaborated specific and unique for themselves ways of reactions and characteristic methods of describing their feelings in the stress situation (examination).

Conclusions

An analysis of the obtained results enabled to conclude:

1. Students in the stress (examination) situation usually completed less arithmetical calculations and perceptual tasks, and made more errors.
2. Difference in the number of errors in perception tests made by students in stress situation (examination) is statistically significant, which may indicate increased stress intensity.
3. Statistically significant differences in the stress feeling exist in the physical education students between neutral and stress (examination) situations.

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