MEDICAL UNIVERSITY
"Prof. Dr. Paraskev Stoyanov" – Varna

FACULTY OF PUBLIC HEALTH
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Assessment of the Psychoemotional Tension Levels in Managers and Options for Stress Control through an Active Physical Programme

THESIS SUMMARY
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Research Supervisor:

Prof. Teodora Dimitrova Dimitrova, MD, PhD

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The doctoral thesis defence will take place on **06/06/2025 at 11 AM** in the Doctoral School Hall of the Medical University – Varna, 55 Marin Drinov Str.

The thesis defence documentation is available in the Scientific Department of MU-Varna and is published on the University's website.

Contents

Abbreviations and legend of statistical indicators used in the data analysis

APP	Active Physical Programme
AW	After the Weekend
BPT	Bourdon's Proofreading Test
BW	Before the Weekend
CNS	Central Nervous System
ECG	Electrocardiogram
PDS	Psychological Diagnostic System
PhA	Physical Activity
PQ	Psychological Questionnaire
PR	Productivity Ratio
RT	Response Time
SR	Success Ratio
USD	Ultrasound Diagnostics

Introduction

Psychoemotional tension (also psychoemotional stress, psychological stress, and stress) appears in scientific literature with numerous definitions, some of which are contradictory. It is correct to define stress as "a cognitive perception of the lack of control and/or unpredictability, which is expressed through psychological or behavioural response." It is essential to point out that the reverse statement is not always true – a psychological response in itself is not always indicative of a state of stress. The associated concept of "stressor" should also only be used for stimuli where predictability and control are in question. These concepts are often interpreted with some level of bias when describing normal physiological responses necessary for maintaining human behaviour.

From the inception of epidemiological research, it has been recognised that some social groups have better prospects for health and longevity than others, especially racial and ethnic minorities. Archaeological studies of graves from ancient times have even proven that individuals buried in wealthier graves usually enjoyed longer lives. The class, race, and ethnicity of individuals have long been included in systems for assessing morbidity and illness. However, the root cause of this dependency is multifactorial and difficult to study. Some authors point to differences in exposure to serious stressors in everyday life, including persistent difficulties, demands, conflicts, and anxieties. Many of these are specifically associated with the work process – economic difficulties, workplace exploitation, upcoming retirement/redundancy, nursing care for a close one, or discrimination.

Managerial personnel represent a small but particularly significant social group. Throughout most of human history, people have relied on themselves: farmers, craftsmen, merchants, and owners of land resources, services, and employment. Today, in the developed world, the organisation of social processes is different, and people rely mainly on managers. Practically all necessary goods and services are provided by organisations led by managers, and this trend has been present for the past century and a half. Almost all "working" adults spend half of their conscious hours under the influence of managerial personnel. 150 years ago, this was true for less than 10% of the total population. Few studies examine the stressors at different work levels. In modern times, the main determinants of stress responses in the workplace are role ambiguity, which mainly affects managerial personnel, and conflicts, which mainly affect workers. Physical activity is among one of the long-established methods for stress reduction in modern times, as it is known to reduce physiological stress and self-reported perceived stress. Studies prove that people who are aerobically "healthy/fit" report less stress than control groups.

Aim

The thesis aims to establish the correlation between levels of psychoemotional tension and physical activity (represented through an active physical program) among managerial personnel.

Tasks

1. To evaluate the presence and type of APP among managerial personnel.

2. To examine the levels of psychoemotional tension in the group of interest.
3. To examine the indicators of time and precision of responses through PDS-5 PB Psychological Diagnostic System.
4. To examine the indicators of Productivity Ratio and Success Ratio through BPT.
5. To compare the results of quantitative occupational-medical studies in the two groups according to the level of physical activity.
6. To formulate recommendations for workplace health promotion and for increasing the expertise of occupational health professionals in managing psychoemotional stress among management personnel.

Materials and Methods

Research Subject

Subject of research is the managerial personnel (leaders, managers) in Bulgaria in the context of knowledge about stress in this social group and the possibilities for preventing its consequences.

Inclusion Criteria

- Active employment record at the time of the study for a period of ≥ 5 years in the specific position.
- The work position includes managerial/supervisory functions over ≥ 5 people.

Therefore, the terms managerial personnel/leaders/managers within the study are identified with the described social group.

Exclusion Criteria

- Presence of acute and chronic pathological cardiovascular conditions (diagnosed during examination and ECG).
- Presence of acute and chronic pathological conditions of the thyroid gland (diagnosed during examination, USD, and laboratory tests).
- Presence of other acute or chronic somatic pathologies that may affect stress levels or be caused by them.

Criteria for the Study Group

Presence of an active physical programme (APP). For the purposes of research, an active physical programme is characterised by activity that meets the following criteria:

1. It is performed voluntarily and without restrictions;
2. It is performed during free time;
3. It includes elements of active movement and/or physical exertion;
4. It carries an element of subjective positive emotion for the practitioner.

Criteria for Control Group

Absence of APP

Methods

For the purposes of research, the following methods were used:

- Documentary – analysis of scientific literature;
- Sociological – survey;
- Quantitative occupational-physiological – ECG, response time, proofreading test;
- Quantitative laboratory – thyroid hormones;
- Imaging – thyroid ultrasound imaging;
- Statistical – processing of data from planned and targeted studies within the project;
- Graphical – presentation of results in the form of tables and figures.

The methods and their combination are developed by the research team. The methodology was applied in a real environment during the period 2021–2023 at Mladost Medical Centre, Varna. Subsequently, statistical processing of the results was conducted. Participation in the study was voluntary and anonymous. Individuals with job characteristics that meet the criteria for inclusion in the study were invited. The studies were carried out in a real environment in the form of voluntary participation or voluntary additional examination as part of periodic medical examinations. All information from the research was recorded, processed, and stored in compliance with the requirements for the protection of participants' personal data.

1. **Documentary Methods**

The literature review was conducted through analysis of available scientific literature in Bulgarian, English, French, German, and Russian in indexed international databases: Google Scholar, Medscape, Scopus, PubMed, and Web of Science. The search for scientific sources resulted in n=1263 articles, of which n=172 were considered relevant. In addition to scientific sources, the study is based on the experience of the multidisciplinary research team, which includes occupational medicine specialists, clinicians, and psychologists.

2. Quantitative and occupational-physiological methods, including other physiological studies

ECG

The leading cause of mortality in the developed world at the time of the study and the most widely studied group of diseases associated with stress is that of cardiovascular diseases (CV). As such, it should be considered with particular attention in studies associated with work stress. The presence of a cardiovascular condition is simultaneously indicative of a potential result from decompensation of chronic stress and/or an independent cause for its occurrence. Excluding individuals with proven CV diseases or those diagnosed during the study would help reduce statistically significant deviations. In this context, individuals with abnormal findings during a 12-lead ECG are excluded from the study group.

USD of the thyroid gland; Thyroid function tests based on hormonal profile

Similar to the cardiovascular system, the thyroid gland is one of the main organs affected by stress conditions. Thyroid dysfunctions themselves can induce stress conditions, even without significant additional specific signs. In order to avoid the interference of such conditions on the stress profile of the subjects, individuals with abnormal values of TSH, T3, T4, as well as the presence of pathological levels of Anti-TPO or findings of Ti-RADS > 3 from USD, were excluded from the study.

Dot cancellation test – Bourdon Proofreading Test

Tests for persistence of attention are widely used in worldwide practice as a method for indirect assessment of work stress. Dot cancellation test (also called Bourdon or Bourdon-Wiersma tests) is one of the oldest and most established methods in the practice for its assessment. A standardized BPT, composed by the research team, was used. The subject marks a specific letter (in this case 'r') in the test within 2 minutes. We examine two indicators – SR and PR. As results from the BPT test, the two indicators are calculated as follows:

- Success Ratio (SR) – also called the coefficient accuracy, is determined by the following formula: number of correct answers – number of incorrect answers/number of correct answers + number of missed answers, presented as a percentage;
- Productivity Ratio (PR) – The value results from multiplication of SR with the total number of symbols reviewed in two minutes, presented as an absolute value;

- Psychological Diagnostic System 5PB.

As a method for assessing persistence of attention and response speed, psychological diagnostic systems are widely used in suitability tests for particular job roles. In this case, the study is conducted on a standard calibration 5PB system by © GETA Centrum s.r.o. The test is designed to determine the response time to a simple visual stimulus. The stimulus is a red dot that appears on a screen at different time intervals and in random positions within the visible field. The test subject responds to its appearance by pressing a button. In one test series, the system generates a total of 30 symbols at random places on the screen over different time intervals. The result is derived from the response time and the number of incorrect responses. Incorrect/wrong responses are when the test subject reacts without the stimulus being displayed. The numerical value for response time is automatically provided by the equipment as an index of deviation from set values. A higher value indicates a higher delay relative to the scale. Tests for determining response speed, based on pressing a button to mark a visual stimulus in different formats are established as a methodology for adequate assessment in neuroscience.

3. Sociological Methods

The core of the analysis involves participants' self-assessment. It is based on the established Four-Dimensional Symptom Questionnaire (4DSQ). The test is applied for rapid assessment by medical and other trained personnel for symptoms of stress-related conditions of distress, anxiety, depression, and somatisation. The questionnaire is an easy and brief test, demonstrating excellent reliability and validity in mental health conditions. The participant answers a total of 50 questions, assessing the

severity of symptoms on the scales of distress, depression, anxiety, and somatisation during a 7-day period preceding the test. The analysis of the obtained answers allows us to determine the nature of psychosomatic manifestations predominant in the patient's clinical profile. When processing the questionnaire, the number of points is summed by individual scales – distress scale, depression scale, anxiety scale, and psychosomatic symptoms scale (somatisation). The Stress scale contains 16 points (total score from 0 to 32); Depression scale – 6 points (total sum of points from 0 to 12); Anxiety scale – 12 points (total score from 0 to 24); Somatisation scale – 16 points (total score from 0 to 32).

4. Statistical Analysis of Results

Descriptive statistics were implemented: graphical images, one-dimensional and two-dimensional tables, and summarizing numerical characteristics (minimum value, maximum value, mean, standard deviation).

Statistical conclusions were derived by:

- Nonparametric methods: χ^2 test for independence. The Chi-square test is a basic statistical method used to investigate correlations between categorical variables and test hypotheses in various fields. Examples of categorical variables include gender, age, marital status, etc.). The independence test examines whether the distribution of one variable changes depending on the levels of the second variable. Under the null hypothesis (H_0): There is no correlation between the two variables being compared. The observed differences are random. Confirmation

of the alternative hypothesis (H_1) means that the differences are not random but statistically significant.

- Parametric methods: Statistical testing for differences between two independent samples based on t-distribution; statistical testing for differences between means from two interdependent samples based on t-distribution. G*Power software (version X.X) was used to calculate the required sample size and evaluate the statistical power of the analysis. We performed *a priori* power analyses (to determine the required sample size), *post hoc* (to assess power with already collected data), and sensitivity analyses (to determine the minimum detectable effect size). In the present study, an a priori analysis was applied to calculate the minimum required number of participants to ensure sufficient statistical power of 0.80 at a significance level of $\alpha = 0.05$. The selected analysis parameters include a medium effect size (Cohen's $d = 0.5$), based on previous research in the field. The results of the analysis showed that we have the minimum required number of participants to achieve adequate power – 145 individuals.

Study Design

The research commenced following the approval of a resolution by the Research Ethics Committee (REC), protocol 100/25.02.2021, as a monocentric prospective study. The study is conducted in 3 stages, which are combined into 1 cycle. One cycle should be completed by a study participant within 3 months. Each participant accepts the conditions with an informed consent form and consent for processing personal data. Information about the upcoming study was provided to the interested

parties in a structured document detailing the specifications and sequence of project stages. For the managers of the respective enterprises, an information brochure was also prepared with a brief description of the issue, the aim and tasks of research.

The research is divided into 3 stages

Stage I – Determines eligibility for participation

This stage aims to establish exclusion criteria and confirm the presence or absence of APP. The following tests and analyses were performed:

1. Objective status: aims to rule out decompensated systemic pathologies.
2. ECG: aims to rule out cardiovascular system pathology.
3. Thyroid ultrasound imaging: aims to rule out thyroid gland pathology.
4. Thyroid hormones and antibodies: TSH, T3 and/or T4; Antibodies: Anti-TPO. The test aims to rule out thyroid pathology.
5. Interview to establish APP and designate the individual to the control or study group.

In the absence of exclusion criteria, the next stage begins. If exclusion criteria appear during the study, participation is terminated regardless of the completed stage.

Stage II – Tests at maximum stress levels

This stage must be conducted at the end of the work week (Friday). The prerequisite for implementing this stage is the maximum workload on the body at the end of the work week.

The following procedures were performed:

1. Psychological survey: assessment of psychological status and subjective evaluation of neuropsychological load.
2. Dot Cancellation Test: quantitative determination of dynamics in attention and concentration levels.
3. Psychological diagnostic system 5PB by © GETA Centrum s.r.o: The test aims to determine levels of psychoemotional tension by measuring response time.
4. Objective status: ruling out decompensated systemic pathologies.

In the absence of exclusion criteria, the next stage begins.

Stage III – Study at minimum stress levels

This stage must be conducted within the three-month cycle framework and specifically on the first day of the work week (Monday). The following were performed:

1. Dot cancellation test – Bourdon Proofreading Test;
2. Psychological diagnostic system 5PB by © GETA Centrum s.r.o;
3. Objective status.

Provided that there are no restrictions on the individual's testing during Stage III, the cycle is finalised and participation in the study is considered complete due to the completion of all tests.

Results

Demographic Structure

The research was conducted in Varna at the Mladost Medical Centre during the period of 2021–2023. The study group consisted of individuals in leadership positions in Varna and the Varna region. The companies they are employed by cover a variety of industries – manufacturing, communications, finance, information technology, and trade. At the start of the study, 152 individuals were registered: 121 women and 31 men. In the first stage of the study, two individuals with newly established rhythm disorders and four individuals with abnormal changes in thyroid hormone indicators were excluded. Individuals aged 30 to 60 years were included.

The study group works under similar labour conditions with low physical activity and high psychoemotional workload. Due to the nature of their work, they typically have longer working hours and tend to carry over task resolutions and problem-solving into their rest time. Workplace environmental factors – microclimate, industrial radiation, industrial lighting, mechanical fluctuations, chemical and biological factors for all individuals in the group are within normal ranges. The managerial role is often associated with high levels of stress related to project management, tasks, and budget frameworks, as well as the constant requirements to balance corporation interests and the well-being of their teams. The work process for this group of personnel often takes place under time constraints, psychoemotional strain arising from the necessity to face

challenging choices, and high responsibility possible tangible and intangible damage. Based on these criteria, we have assessed the studied individuals as working under high stress levels. The main risk in the surveyed group is managing personal stress and the risk of burnout.

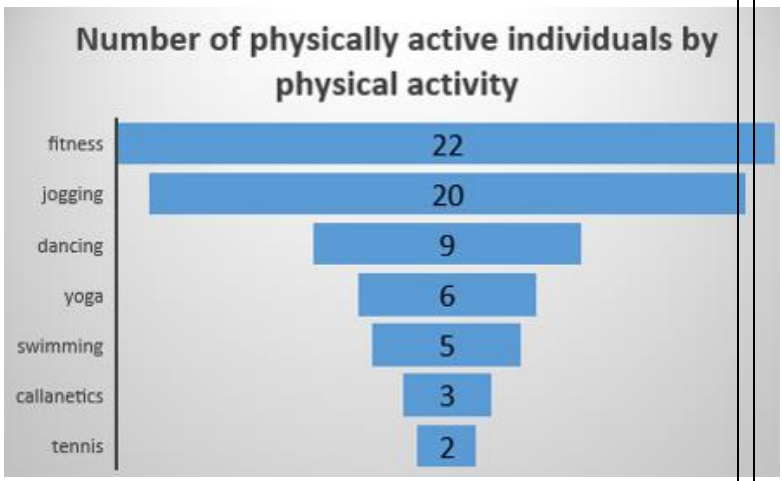
Distribution of participants according to their physical activity

Most of the study participants do not engage in any physical activity programme. The percentage distribution depending on APP is as follows: 83 or 55.3% of participants are physically inactive, while 67 or 44.7% are physically active.

Distribution of the number of participants by activities (Fig. 1)

For active individuals, the sport that is most frequently practiced is fitness, followed by jogging. One-third of physically active individuals engage in jogging. The least common sport among physically active individuals is tennis.

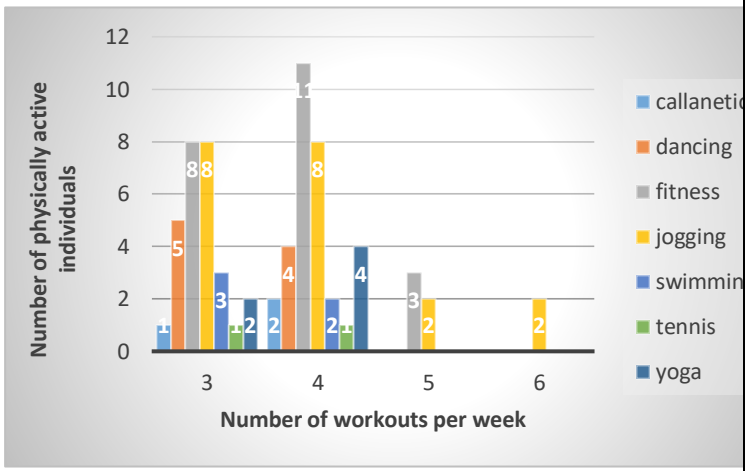
Fig. 1. Distribution of the number of participants by activities



Distribution by type of activity and average weekly frequency of practice

Those who engaged in physical activity the most often exercised 4 times per week (32 individuals or 47.76%), followed by those who practiced 3 times per week (26 individuals or 38.80%), (Fig. 2).

Fig. 2. Distribution by type of activity and average weekly frequency of training activity



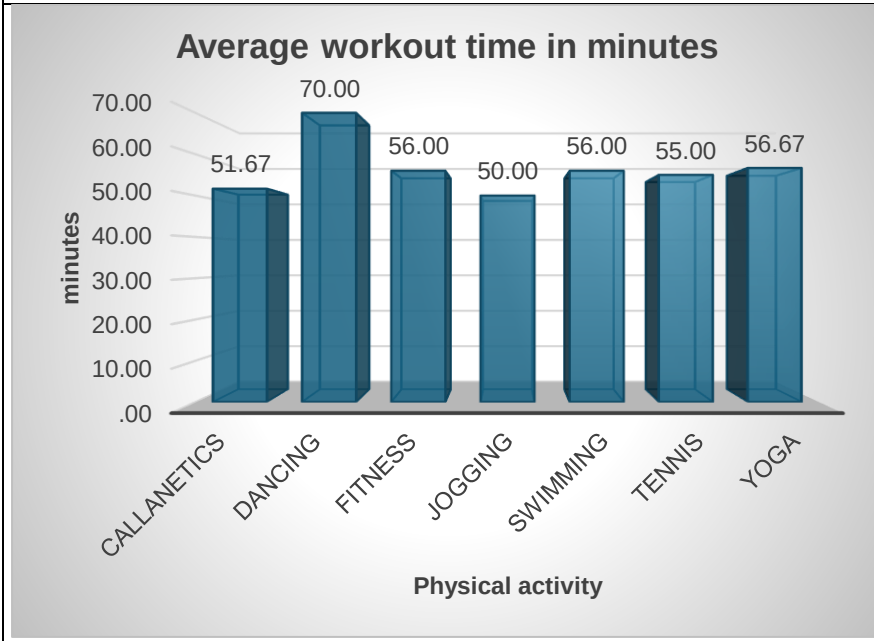
Distribution of participants according to the average number of workouts per week

On average, physically active individuals exercise between 3 or 4 times per week.

Distribution of participants by duration of workout

The longest duration of a workout was for dancing, averaging 70 minutes, and the least was for jogging, 50 minutes (Fig. 3).

Fig. 3. Average time per workout



Descriptive analysis of the physiological parameters assessed in the study and control groups

Indicator estimates of the whole study sample (mean, minimum value, maximum value and standard deviation) of the studied parameters – SR, PR, and RT before and after the weekend are presented in Table 1.

Variable	N	Min	Max	Mean value	Standard deviation
SR before the weekend	145	31	100	89.59	11.53
SR after the weekend	98	61	100	93.39	7.707

PR before the weekend	145	620	1900	1237.52	268.011
PR after the weekend	98	450	1650	1125.03	246.637
RT before the weekend	145	0.26	1.13	0.3952	0.09974
RT after the weekend	98	0.25	0.65	0.3591	0.06508
Valid number of observations	98				

Table 1. Descriptive characteristics of all results in all individuals

Descriptive study results from the full analysis, by gender and group, are presented in Tables 2 – 5

When examining the entire group of management personnel, there is a noticeable trend of improvement in results after the two-day break in both the success ratio and response time. However, for the productivity ratio, the results on Monday worsen compared to Friday.

Parameter evaluations for physically inactive individuals (mean, minimum value, maximum value, and standard deviation) of the studied indicators – Success Ratio, Productivity Ratio, and Response Time before and after the weekend are presented in Table 2.

Variable	**N**	**Min**	**Max**	**Mean value**	**Standard deviation**
SR before the weekend	81	31	100	90.99	11.897
SR after the weekend	52	61	100	93.92	7.372

PR before the weekend	81	620	1900	1235.35	277.392
PR after the weekend	52	450	1650	1094.25	260.205
RT before the weekend	81	0.26	0.68	0.3984	0.08336
RT after the weekend	52	0.29	0.65	0.3769	0.07133
Valid number of observations	52				

Table 2. Descriptive characteristics of all results for the physically inactive individuals

Parameter estimates of the physically active individuals (mean, minimum value, maximum value and standard deviation) of the studied indices, i.e., Success Ratio, Productivity Ratio, Pre- and Post-Weekend Response Time, are shown in Table 3.

Variable	**N**	**Min**	**Max**	**Mean value**	**Standard deviation**
SR before the weekend	64	46	100	87.81	10.882
SR after the weekend	46	64	100	92.78	8.107
PR before the weekend	64	667	1880	1240.28	257.797
PR after the weekend	46	708	1640	1159.83	228.156
RT before the weekend	64	0.27	1.13	0.3911	0.11783
RT after the weekend	46	0.25	0.48	0.3389	0.05078
Valid number of observations	46				

Table 3. Descriptive characteristics of all results for the physically active individuals

In the subgroups according to the presence or absence of physical activity, the Monday results after the two-day break improved only for the success ratio and response time. In terms of productivity in the correlation test, both groups recorded weaker results on Monday compared to Friday.

Variable	N	Min	Max	Mean value	Standard deviation
SR before the weekend	118	31	100	89.84	11.849
SR after the weekend	72	61	100	93.50	7.476
PR before the weekend	118	620	1900	1185.48	276.279
PR after the weekend	72	450	1650	1089.27	259. 668
RT before the weekend	118	0.26	1.13	0.4020	0.10252
RT after the weekend	72	0.25	0.65	0.3668	0.06850
Valid number of observations	72				

Table 4. All results – female individuals

Variable	N	Min	Max	Mean value	Standard deviation
SR before the weekend	27	67	100	89.84	11.849
SR after the weekend	26	64	100	93.50	7.476
PR before the weekend	27	821	1650	1249.43	276.279
PR after the weekend	26	712	1355	1137.94	259. 668

RT before the weekend	27	0.27	0.65	0.3652	0.8154
RT after the weekend	26	0.25	0.48	0.3377	0.04958
Valid number of observations	26				

Table 5. All results – male individuals

For both sexes, the results before and after the weekend improve for accuracy and response time. However, fatigue deepens when examining the productivity ratio.

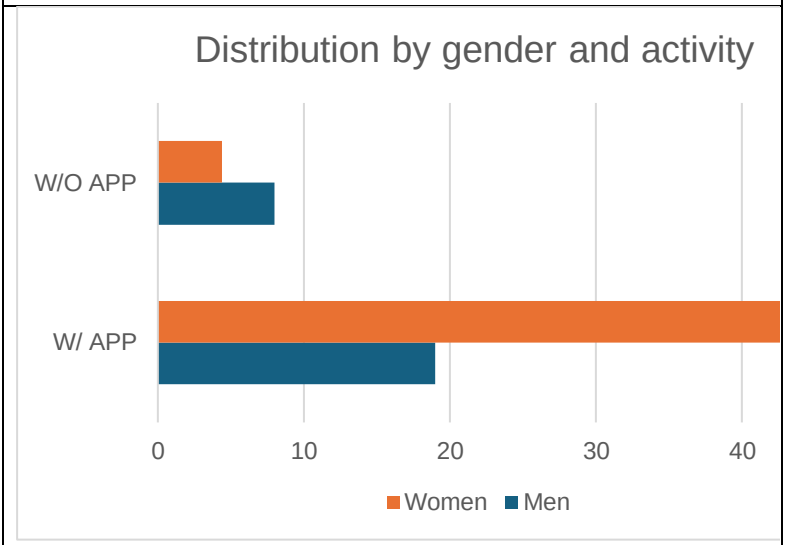
Two-dimensional distribution tables

The tables present the distribution of study participants simultaneously by gender and their participation in physical activity. It can be seen that out of all study participants, 73 women and 8 men have no physical activity, while 45 women and 19 men have an active physical programme (APP), (Fig. 4).

Percentage distribution:

- Among inactive study participants, 90.1% are women and 9.9% are men;
- Among physically active participants, 70.3% are women and 29.7% are men (Table 6).

Fig. 4. Distribution by gender and activity

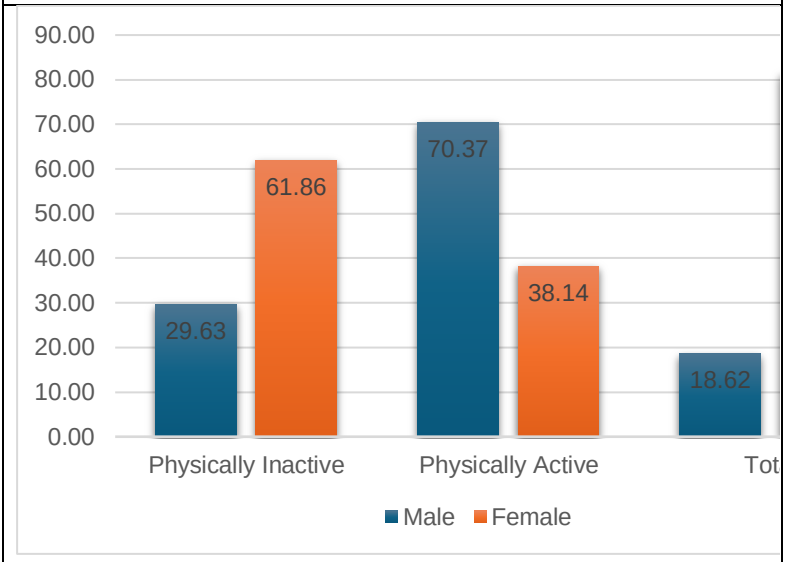


	Groups		
	No APP	With APP	Total
Females – number	73	45	118
Females – % from the group	90.1%	70.3%	81.4%
Males – number	8	19	27
Males % from the group	9.9%	29.7%	18.6%
Total – number	81	64	145
Total %	100%	100%	100%

Table 6. Percentage distribution by gender

Testing the statistical hypothesis of the dependence of physical activity on the gender of the participants (Fig. 5).

Fig. 5. Physical activity



The statistical analysis establishes that gender is a significant factor in the physical activity of the studied individuals. Despite the proportionally smaller ratio of men in the study group, their greater physical activity is notable (χ^2 9.260 at $p < 0.002$).

Statistical significance test of the differences between physically active and physically inactive individuals

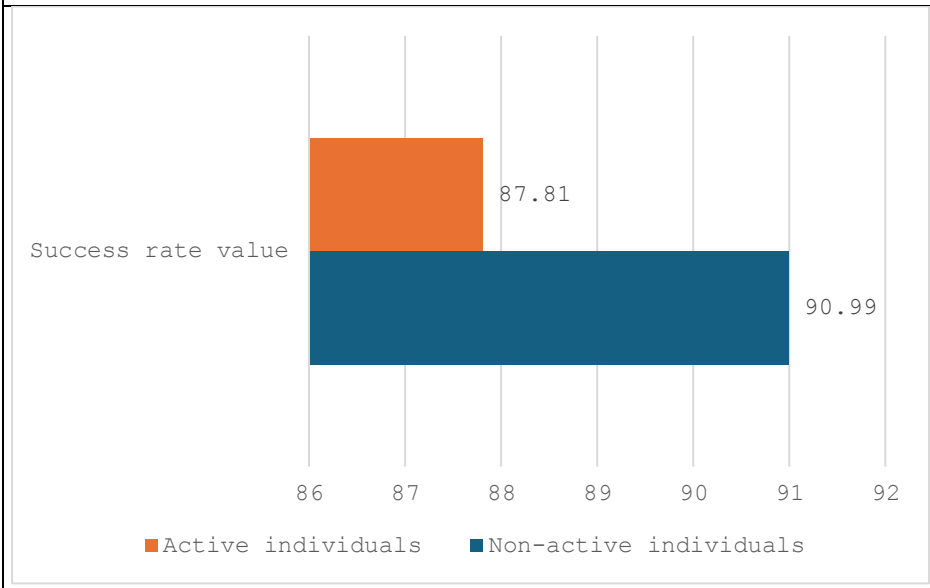
The test examines the difference in selected indicators **between physically active and physically inactive individuals.**

Statistical hypothesis testing for the difference between means of two independent samples (**Independent t-test**) is used.

Success Ratio before the weekend (BW)

Results: The Success Ratio before the weekend was established in 145 study participants. Of these, 81 are without physical activity, and 64 have physical activity. Results from the statistical data processing are presented in Fig. 6.

Fig. 6. Success Ratio before the weekend

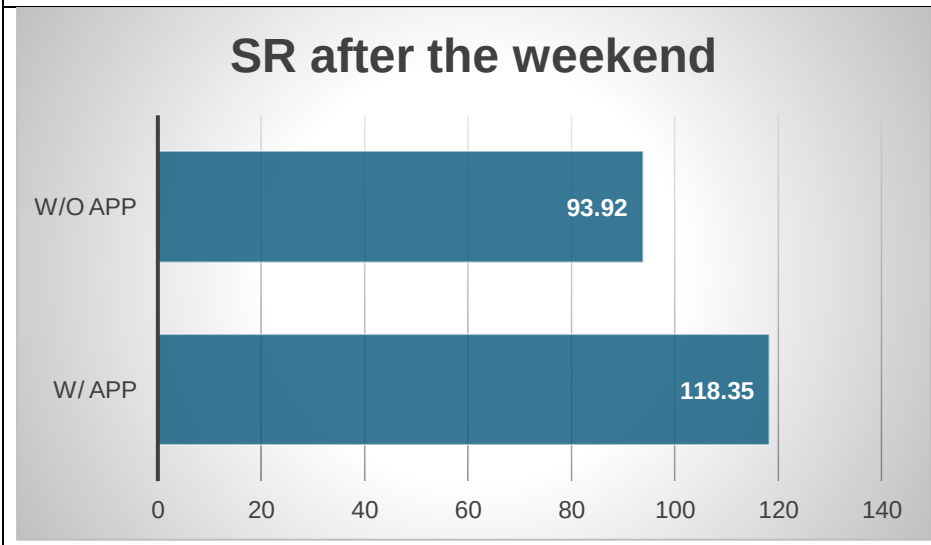


There was no difference in the SR score before the weekend in the two groups of subjects. The difference between physically active persons and physically inactive persons is statistically insignificant, even there is a tendency for a higher indicator in the group without APP. Effect size (Effect size) d = 0.28 was determined, small effect size.

Success Ratio after the weekend (AW)

The post-weekend success ratio was found in 98 participants, 52 without physical activity and 46 with physical activity, respectively (Fig. 7).

Fig. 7. SR after the weekend



Productivity Ratio before the weekend (BW)

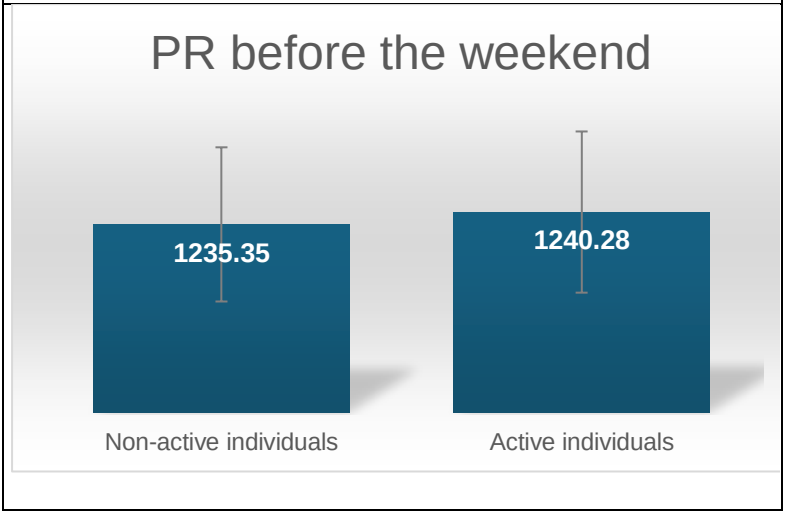
The pre-weekend productivity ratio was established in 145 study participants. Of these, 81 were without physical activity and 64 were with physical activity, respectively (Table 7).

	N	Mean	Standard deviation	Standard error
No APP	81	1235.35	277.392	30.821
With APP	64	1240.28	257.797	32.225

Table 7. Before the weekend productivity ratio (PR) in the whole group

We aim to find a variation in the pre- and post-weekend productivity ratios for non-active and active individuals, respectively. With p-value (0.913) > α, there is no reason to dismiss the argument that productivity is better in physically active individuals before the weekend compared to inactive individuals at a significance level of α= 0.05. The conclusion is that the difference between physically active individuals and physically inactive individuals in this particular indicator is statistically insignificant (Fig. 8).

Fig. 8. Before the weekend productivity ratio averages for physically active and inactive individuals



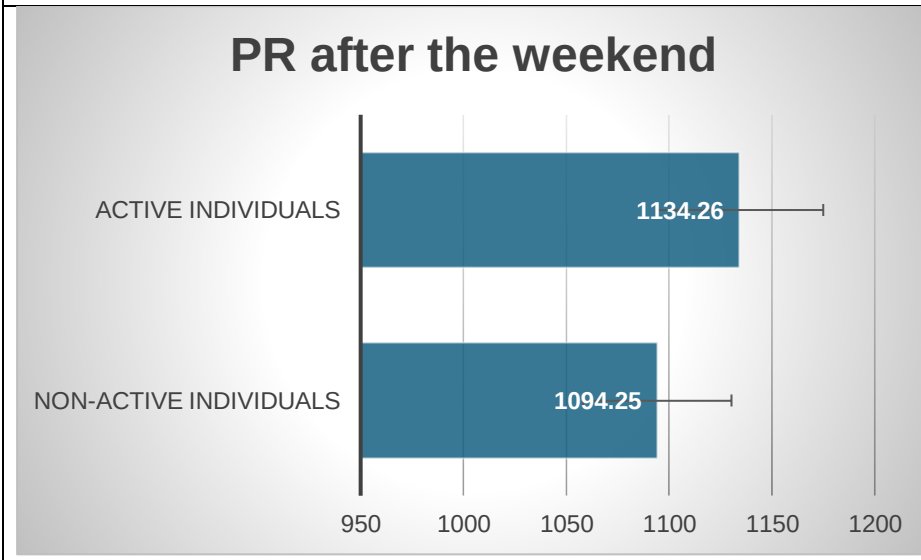
Productivity Ratio after the weekend (AW)

The post-weekend productivity ratio was found in 98 participants, 52 without physical activity and 46 with physical activity, respectively (Table 8, Fig. 9).

	N	Mean	Standard deviation	Standard error
No APP	52	1094.25	260.205	36.084
With APP	46	1159.83	228.156	33.640

Table 8. After the weekend productivity ratio by groups with and without APP

Fig. 9. Mean values for productivity ratio after the weeked for physically active and inactive individuals

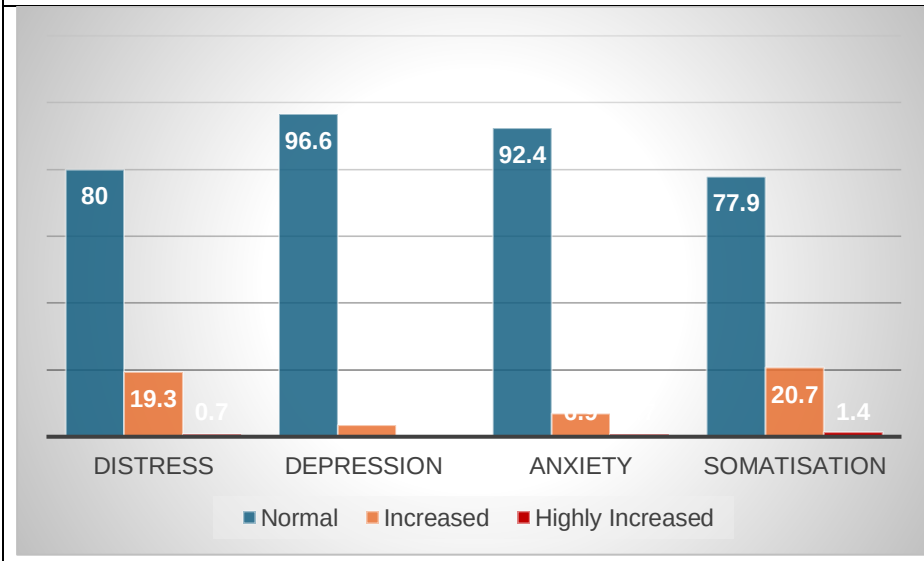


The hypothesis in this case seeks differences between the PR indicator before and after the weekend in the two groups with and without APP. The values are minimally higher in the group with APP. With p-value 0.190 > α, there is no reason to reject the hypothesis that the PR indicator after the weekend is higher in the group with APP at a

significance level of a = 0.05. Therefore, the differences in the distribution of physically active and physically inactive individuals when examined by the Productivity Ratio indicator are not statistically significant. The effect size is d = 0.27, a **small size.**

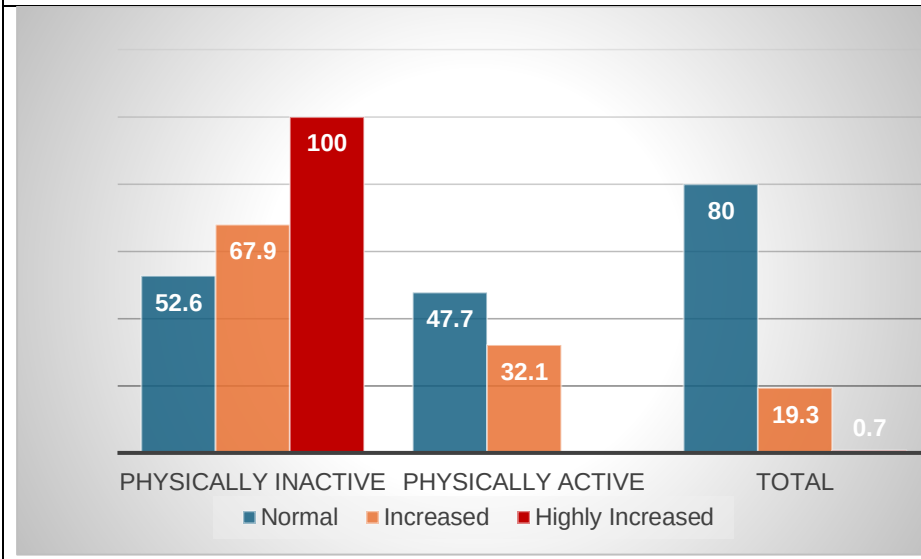
The Four-Dimensional Symptom Questionnaire (4DSQ) is used for diagnosing distress, depression, anxiety, and somatisation in autonomous and borderline psychosomatic disorders. The results are presented graphically in Fig. 10. In the studied group, almost no symptoms of depression are found in the responses to the corresponding scales. However, there are isolated cases with manifestations in the scales for distress and anxiety, as well as two individuals with increased scores for somatisation.

Fig. 10. General distribution



An analysis of the distress group by physical activity and gender found a trend for physically inactive participants to have a higher percentage in moderate distress. The only participant indicating high distress was also physically inactive (Fig. 11, Table 9).

Fig. 11. Distress in physically active and inactive individuals



Distribution of physically active and inactive groups by distress

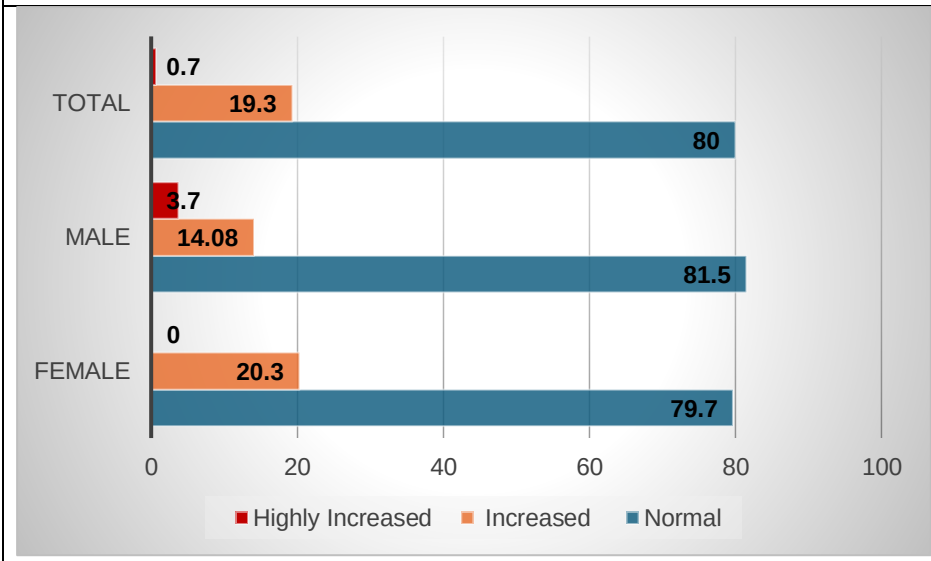
		Physical activity		Total
		No	Yes	
Normal values	Number	58	54	112
	% of the group	51.8%	48.2%	100%

Moderatio distress	Number % of the group	19 67.9%	9 32.1%	28 100%
High distress	Number % of the group	1 100%	0 0%	1 100%
Total	Number % of the group	78 55.3%	63 44.7%	141 100%

Table 9. Distribution of the distress group by physical activity

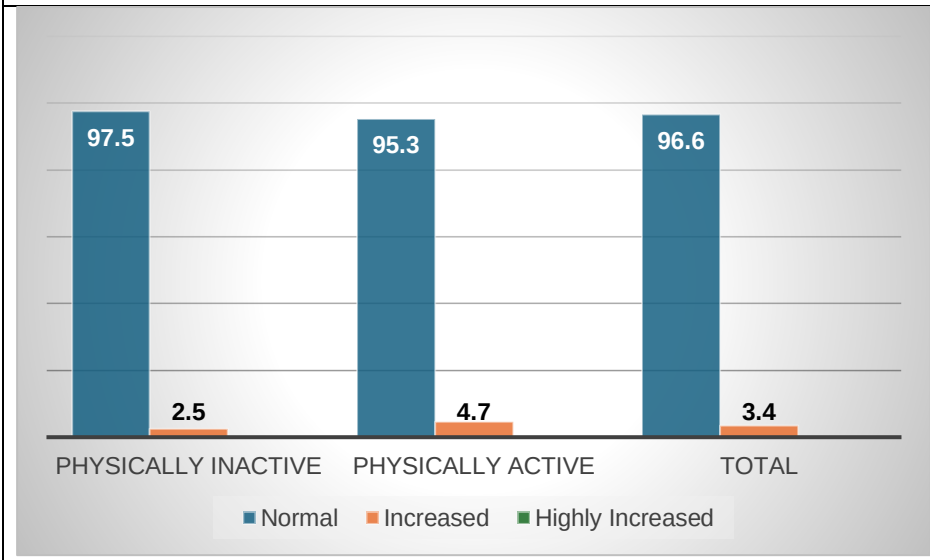
The trend, which is not statistically confirmed, shows that women with increased distress predominate, but the only high distress participant is male (Fig. 12).

Fig. 12. Gender distribution by distress level



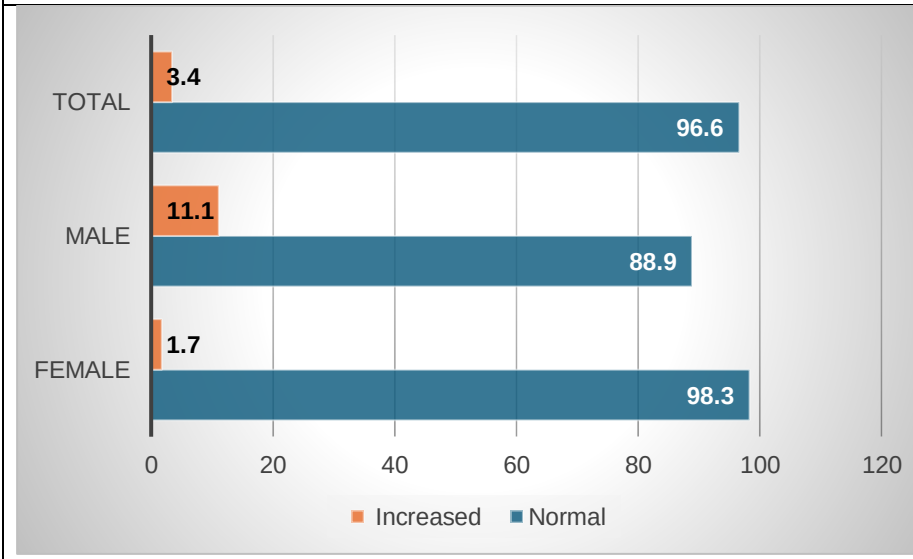
Individuals with high depression scores were not identified. It is noteworthy that the predominant group in physically active and physically inactive participants had normal values in this dimension of the scale (Fig. 13).

Fig. 13. Distribution of the physically active and inactive individuals by level of depression



In the gender distribution, we find a statistically significantly larger group of men in moderate depression – 11.1% compared to only 1.7% of women (Chi-square 5.851, $p < 0.05$), (Fig. 14).

Fig. 14. Gender distribution by level of depression severity



We do not find a significant impact of the physical activity and gender on the distribution of participating executives by anxiety levels (Figs. 15, 16).

Fig. 15. Distribution of physically active and inactive groups by anxiety level (%)

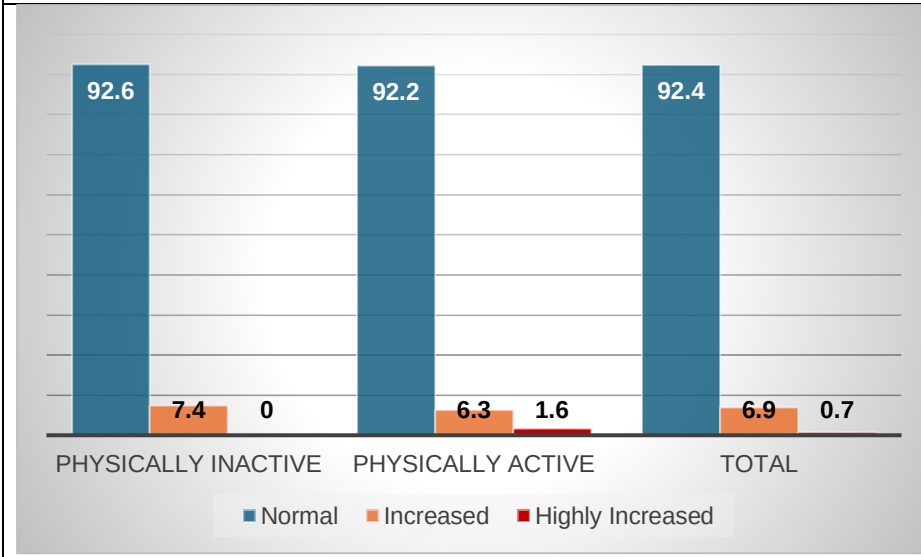
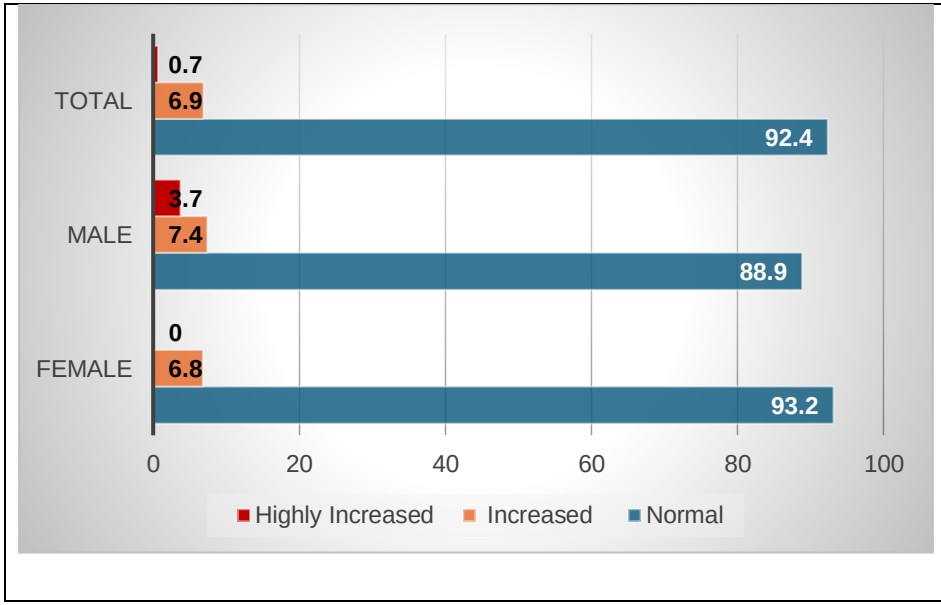


Fig. 16. Gender distribution by level of anxiety



The findings in the somatisation group reflect similar outcomes: more pronounced somatisation in the physically inactive study participants and in women (Figs. 17, 18, Table 10).

Fig. 17. Somatisation disorder in physically active and inactive individuals

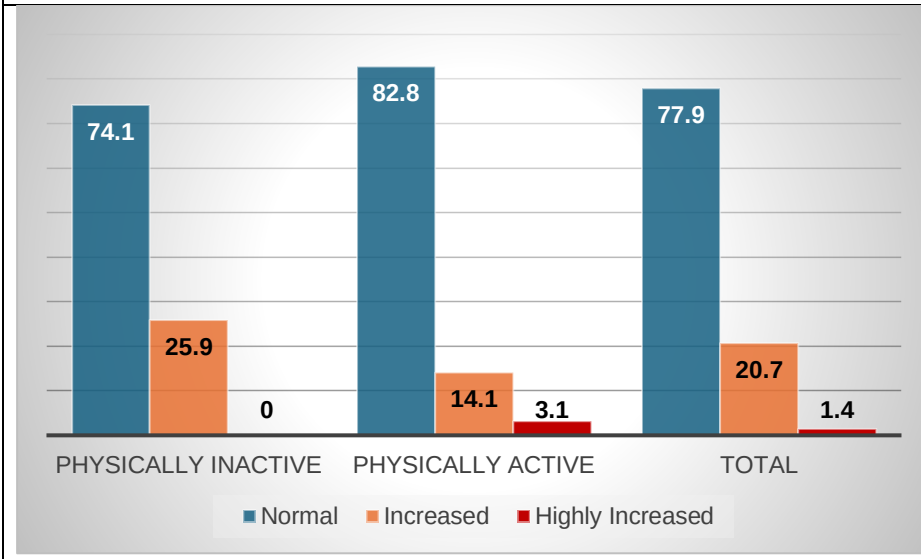
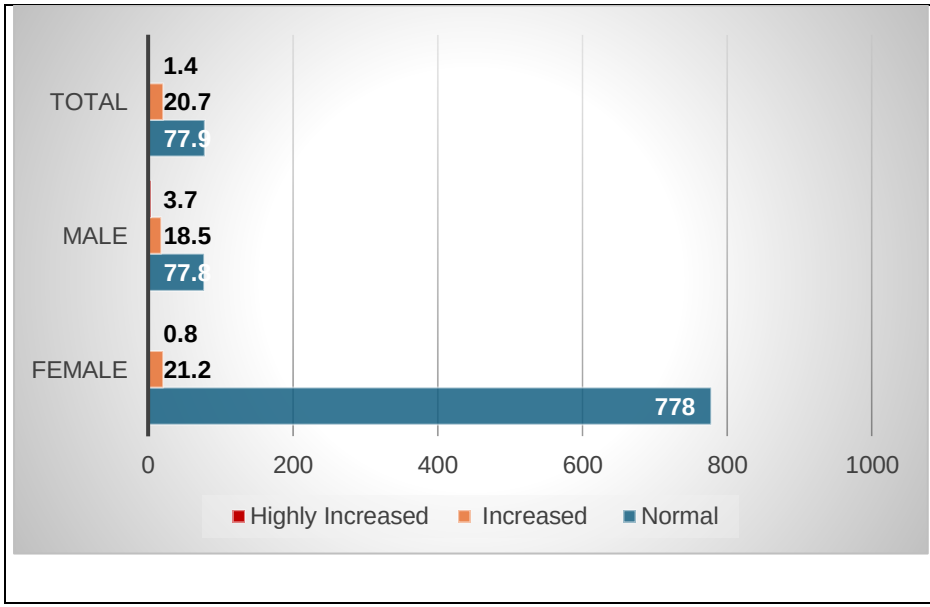


Fig. 18. Distribution in the somatisation group by physical activity and gender



		Physical activity		Total
		No	Yes	
Normal values	Number	56	52	108
	% of the group	51.9%	48.1%	100%
Moderatio somatisation	Number	21	9	30
	% of the group	70.0%	30.0%	100%
High degree of somatisation	Number	0	2	2
	% of the group	0 %	100%	100%
Total	Number	77	63	140
	% of the group	55.0%	45.0%	100%

Table 10. Distribution of the somatisation group according to physical activity

Response Time before the weekend (BW)

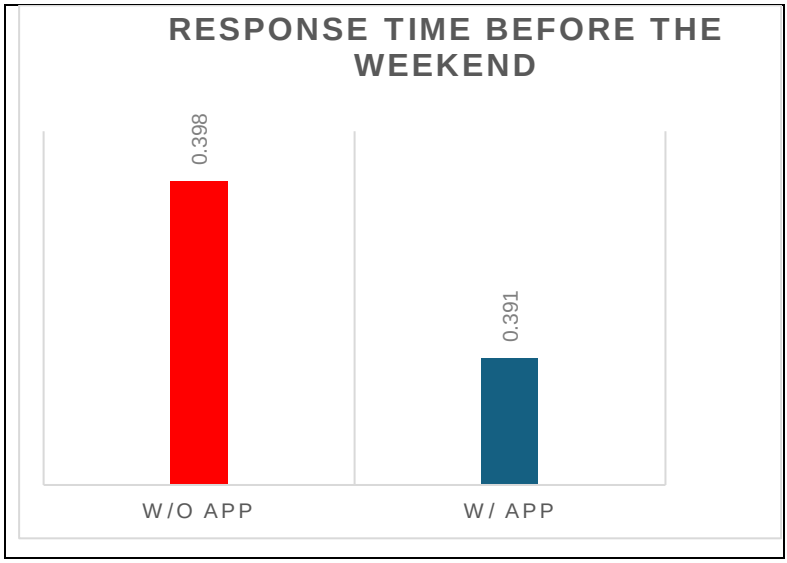
Pre-weekend response time was established in 145 study participants. Of these, 81 were without physical activity and 64 were with physical activity, respectively, $p > 0.05$ (Table 11, Fig. 19).

	N	**Mean**	**Standard deviation**	**Standard error**
No APP	81	0.3984	0.08336	0.00926
With APP	64	0.3911	0.11783	0.01473

Table 11. Response time in both groups before the weekend

The working hypothesis is that the response time is less in active individuals compared to non-active individuals. With p-value (0.663) > α, there is no basis to claim such a difference at a significance level of $\alpha = 0.05$. This means that the difference between physically active and physically inactive individuals in the results of the completed test is statistically insignificant. Effect size is $d = 0.07$, **very small.**

Fig. 19. Average RT values before the weekend



Response Time after the weekend (AW)

The response time after the weekend was established in 98 study participants. Of these, 52 were without physical activity and 46 were with physical activity, respectively. The results are presented in tabular form (Table 12, Fig. 20).

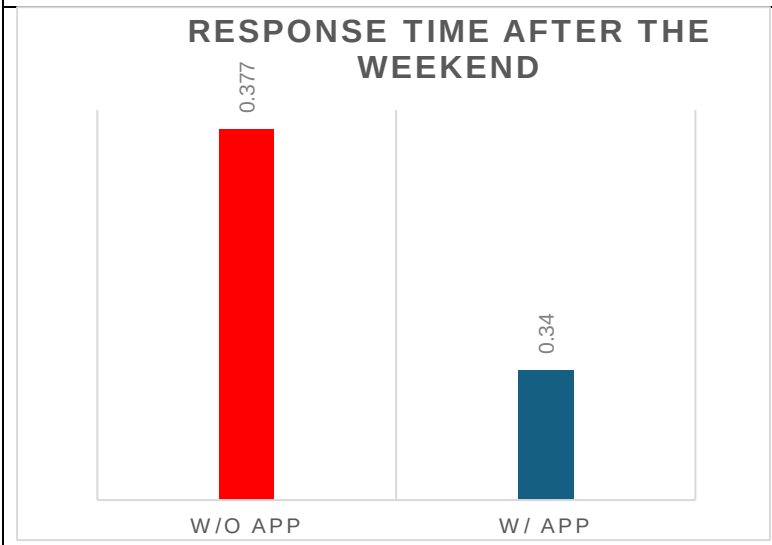
	N	**Mean**	**Standard deviation**
No APP	52	0.3769	0.07133
With APP	46	0.3389	0.05078

Table 12. Response time in both groups after the weekend

The working hypothesis for this particular indicator is that the response time after the weekend in the APP group is less compared to inactive

individuals. A p-value (0.003) < α demonstratios less response time in active individuals compared to inactive individuals at a significance level of α = 0.05. This implies that the difference between physically active individuals and physically inactive individuals is statistically significant. The data obtained from the samples leads to the conclusion that the response time indicator after the weekend is lower for physically active individuals compared to that for physically inactive individuals. Effect size is d = 0.61, **mean effect size**.

Fig. 20. Average RT values after the weekend



Based on the aggregate score of the entire sample, a summary can be derived for each specific indicator (Table 13).

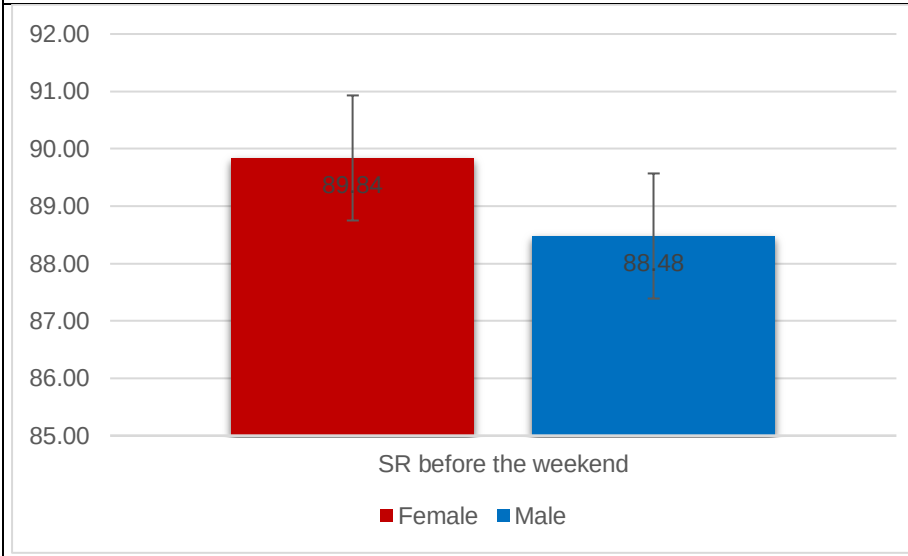
Statistical hypotheses and effect size in independent samples		Groups: active and inactive individuals
SR before the weekend	statistical significance	insignificant difference
	effect size	small
SR after the weekend	statistical significance	insignificant difference
	effect size	very small
PR before the weekend	statistical significance	insignificant difference
	effect size	very small
PR after the weekend	statistical significance	insignificant difference
	effect size	small
4DSQ	statistical significance	insignificant difference
	effect size	small
RT before the weekend	statistical significance	insignificant difference
	effect size	very small
RT after the weekend	statistical significance	significant difference
	effect size	medium

Table 13. Summary of physical activity indicators

Testing for statistical significance of the difference between male and female study participants

The difference in selected indicators between **female and male study participants is investigated. Success Ratio before the weekend (BW) for both genders** was established for 145 study participants. Of these, 118 were female and 27 were male, respectively. Results are presented in Fig. 21.

Fig. 21. SR before the weekend



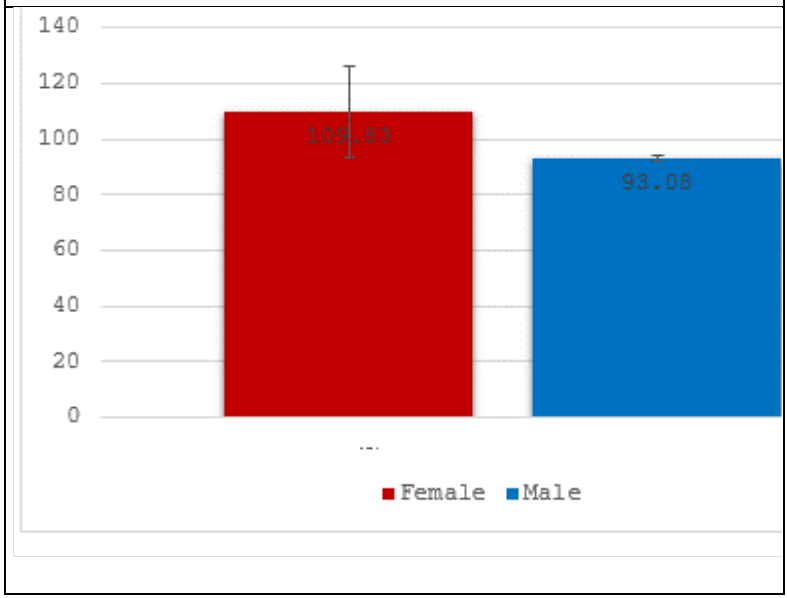
The analysis of the results aimed to identify a difference in SR before the weekend between male and female subjects. At p-value (0.583) > α, it is found that there is no significant difference in the said Ratio at significance level α = 0.05. This means that the difference between male

and female participants is statistically insignificant. Effect size is d = 0.12, a very small effect size.

Success Ratio after the weekend (AW)

Results in the total group were reported for 98 participants (Fig. 22).

Fig. 22. SR after the weekend



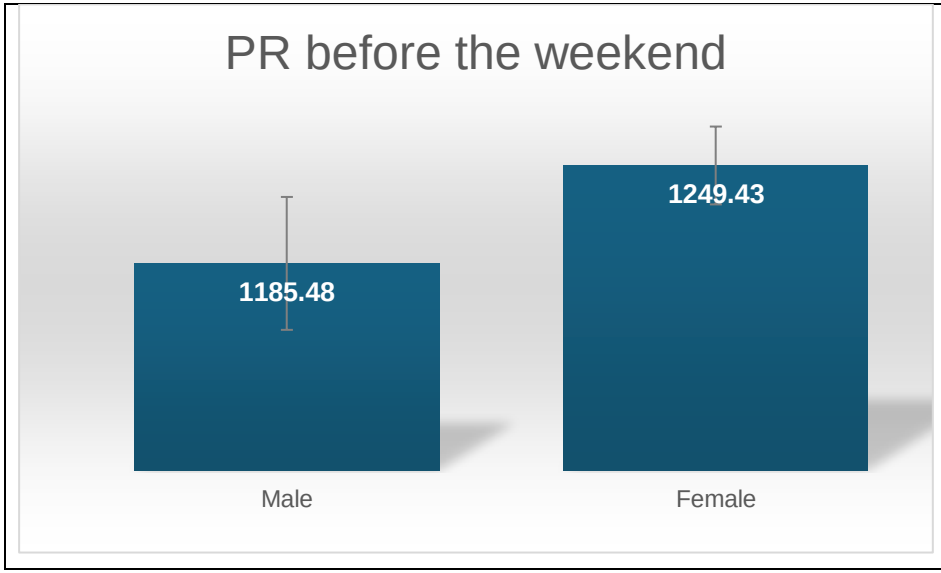
Studying the SR indicator we sought to identify differences in the values of the indicator in male and female persons. At p-value (0.812) > α, there was no statistical difference of the success ratio between the two groups significance level α = 0.05. This means that the difference between male and female participants is statistically insignificant. Effect size is d = 0.05, a **very small effect size**.

Productivity Ratio before the weekend (BW) was found in 145 study participants. Of these, 118 were female and 27 were male, respectively (Fig. 23, Table 14).

	N	**Mean**	**Standard deviation**	**Standard error**
Female	118	1249.43	276.279	25.434
Male	27	1185.48	225.578	43.413

Table 14. Female/male productivity ratio before the weekend

Фиг. 23. Коефициент на продуктивност преди уикенда



Hypotheses: At p-value (0.265) > α, there is no reason to reject H_0 in favour of H_1 at a significance level of α = 0.05. This implies that the difference between male and female individuals in the general cohort is statistically insignificant. Effect size is d = 0.24, small size.

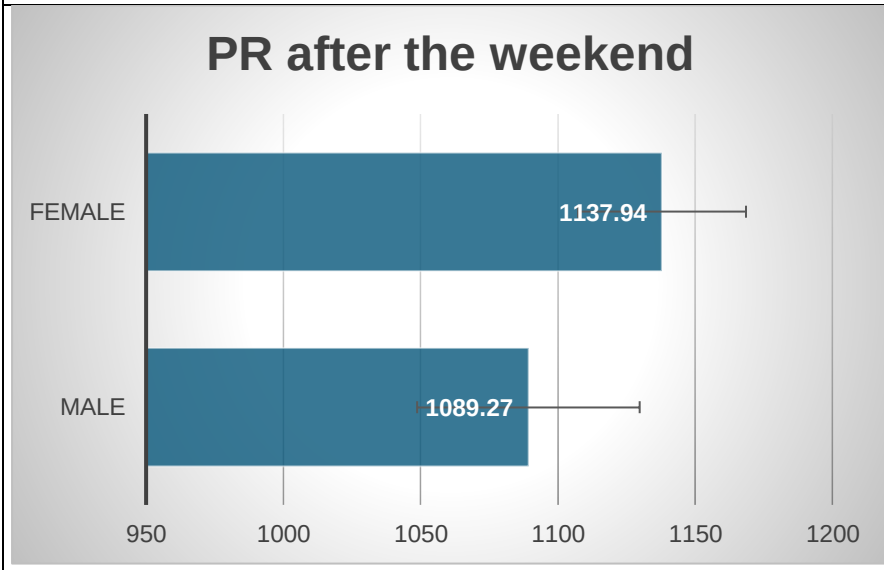
Productivity Ratio after the weekend (AW)

The results for the post-weekend productivity ratio were pooled across 98 participants, of which 72 were female and 26 were male (Table 15, Fig. 24).

	N	Mean	Standard deviation	Standard error
Female	72	1137.94	259.668	30.602
Male	26	1089.27	206.674	40.532

Table 15. Female/male productivity ratio (PR) after the weekend (AW)

Fig. 24. Productivity ratio (PR) female/male after the weekend (AW)



The working hypothesis looks for differences between PR after the weekend in male and female individuals. At p-value (0.391) > α, there is no basis to claim that there are differences in the Ratios for the two sexes at a significance level of α = 0.05. This means that the difference between male and female individuals on this indicator is statistically insignificant. Effect size is d = 0.20, a very small effect size.

Rresponse Time BW in both genders

The results are summerised for a total of 145 participants, of whom 118 were female and 27 were male (Table 16).

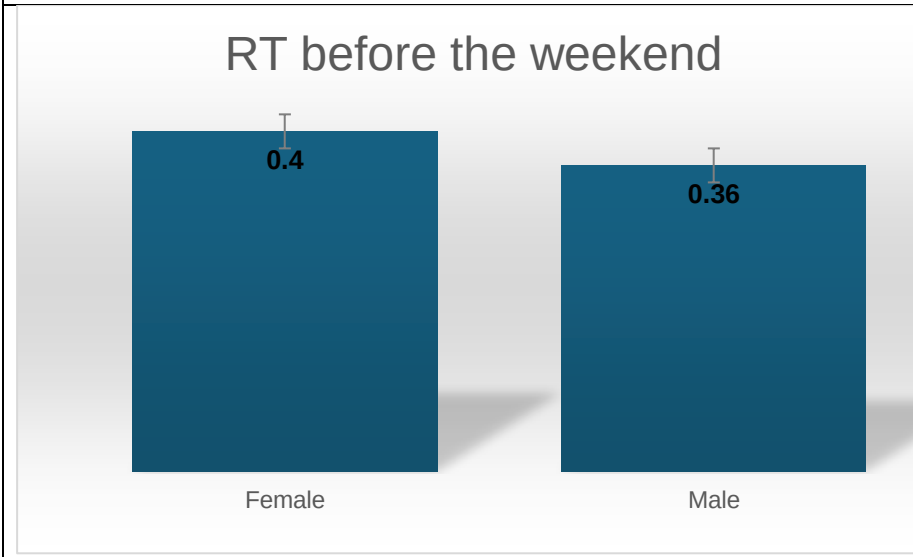
	N	Mean	Standard deviation	Standard error

Female	118	0.4020	0.10252	0.00944
Male	27	0.3652	0.08154	0.01569

Table 16. RT before the weekend female/male

The result shows that at p-value 0.083 > α, there is no reason to claim that there is a difference in the indicator between males and females at a significance level of α = 0.05. Although the values in response time for the male participants is less, this indicator before the weekend shows no statistically significant difference in both sexes. The effect size (Effect size) was d = 0.37, a small effect size (Fig. 25).

Fig. 25. RT before the weekend



Rresponse Time AW

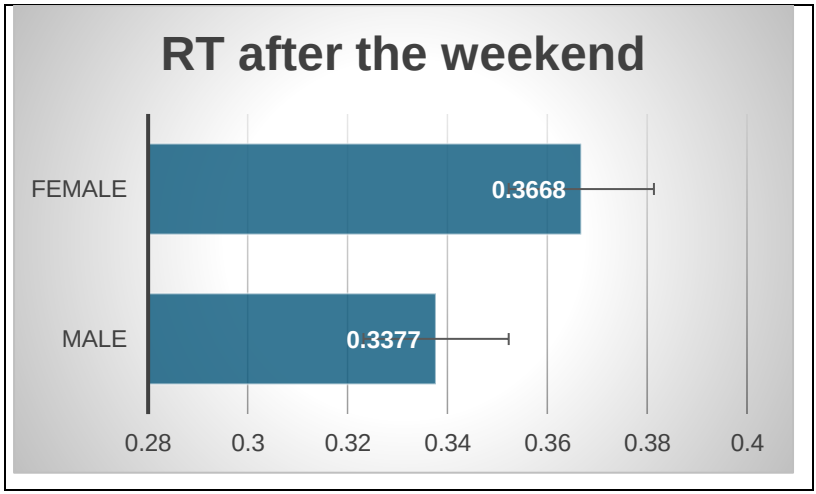
The results in the post-weekend response time indicator were reported for a total of 98 individuals, of whom 72 were female and 26 were male (Table 17).

	N	**Mean**	**Standard deviation**	**Standard error**
Female	72	0.3668	0.06850	0.00807
Male	26	0.3377	0.04958	0.00972

Table17. RT after the weekend female/male

The working hypothesis assumes a difference in the indicator between the two genders. With p-value (0.05) = α, the hypothesis that there is a difference in the values of the indicator is confirmed at a significance level of a = 0.05. In our study, it is established that the difference between male and female participants is statistically significant. Based on the obtained results from the samples, we can conclude that this indicator is lower for men compared to women. This means that male participants have a faster response time than the female study participants AW. The effect size is d = 0.45, a small size (Fig. 26).

Fig. 26. RT after the weekend



Summary data on the impact of gender are presented in Table 18.

Statistical hypotheses and effect size in independent samples		Groups: male and female
Success ratio BW	statistical significance	insignificant difference
	effect size	small
Success ratio AW	statistical significance	insignificant difference
	effect size	very small
Productivity ratio BW	statistical significance	insignificant difference
	effect size	very small
Productivity ratio AW	statistical significance	insignificant difference
	effect size	small

4DSQ test	statistical significance	insignificant difference
	effect size	small
Response time BW	statistical significance	insignificant difference
	effect size	very small
Response time AW	statistical significance	significant difference
	effect size	small (but tending in value towards medium)

Table 18. Summary table on the impact of gender

Testing the statistical significance of the differences between Friday and Monday

Success Ratio before the weekend (BW) and after the weekend (AW)

The research hypothesis is that this indicator has a higher value after the weekend. The results are summarised based on the 98 participants filled out the survey before and after the weekend (Table 19).

	Mean	**N**	**Standard deviation**	**Standard error**
SR before the weekend	88.54	98	12.663	1.279
SR after the weekend	105.39	98	119.5	12.07

Table 19. Mean values of SR before and after the weekend

The results show the mean value of the SR indicator before and after the weekend. With p-value (0.000) < α, a significant difference in the indicator is established at a significance level of α = 0.05. The results show that the mean value of the indicator before the weekend is lower than the mean value of the indicator after the weekend (AW). The two-day rest affects the target group with improved accuracy when completing the test. The effect size is d = 0.36, a small size. The results are expected and are confirmed by other literature sources comparing the levels of psychoemotional tension before and after the regulated two-day rest.

The weekend plays an essential role in recovery from work fatigue and psychoemotional tension for those working under stressful conditions. It has been established that effective weekend rest is associated with indicators such as higher engagement and enhanced work efficiency during the following week. Participants who have recovered effectively show higher levels of energy and concentration in their work.

Productivity Ratio BW and AW

The indicators are reflected in a total of 98 participants before and after the weekend. The research hypothesis is that this indicator has a higher value before the weekend (Table 21).

	Mean	**N**	**Standard deviation**	**Standard error**
PR before the weekend	1211.39	98	271.338	27.409
PR after the weekend	1113.03	98	267.08	26.979

Table 21. Mean PR values before and after the weekend

In the specific results, the expected higher value after the weekend is not confirmed. With p-value (0.000) < α, the values of the indicator are lower after the weekend than before the weekend at a significance level of a = 0.05. The effect size is d = 0.36, **small size** (Table 22).

Response Time before (BW) and after the weekend (AW)

The study sample consists of 98 participants. Our assumption is that this indicator has a higher value before the weekend, i.e., on average, participants react more slowly before the weekend than after a two-day regulated rest. The mean response time before and after the weekend is reflected in Table 23.

	Mean	**N**	**Standard deviation**	**Standard error**
RT before the weekend	0.3853	98	0.07647	0.00772
RT after the weekend	0.3591	98	0.06508	0.00657

Table 23. Mean response time BW and AW

For this indicator, the expected values before the weekend are higher than those after the weekend. A p-value 0.000 < α reveals smaller response time values after the weekend at a significance level of α = 0.05. The mean value of the response time indicator BW is greater than the mean value of the indicator AW. Effect size is d = 0.58, **mean effect size** (Table 24).

Summary data of the differences in the indicators at the end of the workweek compared to the beginning of the workweek are presented in Table 25.

Statistical hypotheses and effect size in interdependent samples		BW и AW
Success ratio BW and AW	statistical significance	significant difference
	effect size	small
Productivity ratio BW and AW	statistical significance	significant difference
	effect size	small
Response time BW and AW	statistical significance	significant difference
	effect size	medium

Table 25. Summary table between BW and AW indicators

BW and AW response times by separate groups: physically active persons, physically inactive persons, female and male individuals

The research hypothesis is that this indicator has a higher value before the weekend.

Physically inactive study participants

Results were compared for 52 participants without APP, who carried out the response time test before and after the weekend (Table 26).

	Mean	**N**	**Standard deviation**	**Standard error**
RT before the weekend	0.3981	52	0.08275	0.01148
RT after the weekend	0.3762	52	0.07133	0.00989

Table 26. RT in physically inactive individuals BW and AW

The data show that the response time of the study group before the weekend was higher than that after the weekend. The signs of fatigue disappeared and the response time was statistically significant, i.e. faster response after the weekend. At p-value (0.000) < α, higher BW values are found at significance level α = 0.05. The effect size (Effect size) was d = 0.44, small size (Table 27).

Physically active study participants

Results were compared for 52 participants with APP, who carried out the pre- and post-weekend response time tests (Table 28).

	Mean	**N**	**Standard deviation**	**Standard error**
RT before the weekend	0.3709	46	0.06666	0.00983
RT after the weekend	0.3389	46	0.05078	0.00749

Table 28. RT in physically inactive individuals – comparison between BW and AW

The statistical processing of data at p-value (0.000) < α, shows that the BW response time is greater than the AW response time at a significance level of α = 0.05. Participants had faster responses after the weekend. Effect size is d = 0.77, mean effect size (Table 29). The signs of fatigue at the end of the week decreased after the two-day weekend break.

Female study participants

Seventy-two females participated in a study of RT performance before and after the weekend. A comparison of the results is presented in Table 30.

	Mean	**N**	**Standard deviation**	**Standard error**
RT before the weekend	0.3965	72	0.07912	0.00932
RT after the weekend	0.3668	72	0.06850	0.00807

Table 30. RT in female individuals BW and AW

At p-value (0.000) < α , H_0 is rejected in favour of H_1 at significance level α = 0.05. This means that the mean value of the BW indicator is greater than the mean value of the AW indicator. The post-weekend response time was shorter in females. They were able to recover the signs of fatigue after the weekend. Effect size is d = 0.64, mean size.

Male study participants

Results are summerised for 26 male participants comparing RT before and after the weekend (Table 31).

	Mean	N	Standard deviation	Standard error
RT before the weekend	0.3542	26	0.05954	0.01168
RT after the weekend	0.3668	26	0.04958	0.00972
Table 31. RT in male individuals BW and AW				

From the results, it is found that there is a statistically significant difference of response time scores before and after the weekend for the male study participants. At p-value (0.002) < α, the RT scores are greater before the weekend at a significance level of α = 0.05. Study individuals had a faster response after the weekend. The Effect size was d = 0.42, a **small** effect size (Table 33).

Signs of fatigue, as reported by the response time metric, disappeared after the weekend in both activity groups (active and inactive) and in both sexes.

Discussion

The surveyed group of management personnel is sufficient for **statistically significant** results from the conducted study. The individuals come from different professional fields, with varying experience and number of employees in their teams. Examining certain indicators at the end and at the beginning of the work week facilitates the evaluation of recovery from work-related stress.

The gender of the management personnel proves to be a significant factor concerning the APP – the relative share of men with APP is greater than that of women. The predominance of females in the target group can be interpreted as:

A trend toward the feminisation of management positions

The jubilee study "Women in the Workplace 2024" examines the role of women in the American corporate environment over the last decade, including both progress in gender equality and the persistent challenges in achieving it. Among the key findings are the increase in the number of women in management positions from 17% in 2015 to 29% in 2024, in the context of limited advancement in positions within middle management – from 37% to 39% in the same period. An unfavourable "first step" trend is identified: while men and women have similar successes and career development, once in leadership positions, their initial appointment to positions do not fully correspond. In reality, for every 100 men hired for a leadership position, 81 women are hired. The discrepancy is also confirmed when examining the distribution across different sectors (again in the USA), where women consistently account for about 1/3 of managerial positions compared to men.

The comparison with the current situation in Bulgaria shows that data is significantly more favourable for women – participation in the workforce is practically identical to the European Union average (about 50%), but leadership positions are occupied significantly more often by women in Bulgaria (40.4%) compared to the average for EU countries (35%) according to ILOSTAT data. Although statistical data on the ratio of female executives in Bulgaria are relatively scarce and show significantly

higher participation of women in leadership positions, this trend is unlikely to account for the difference in gender ratio in the study. Limitations that should be noted in this case are: no records of the exact nature of the participants' work (although practically all are in the service sector, where women are more likely to be managers), and the lack of records detailing the ranks of managerial staff.

A pattern emerges where women are more likely to engage with health issues, assess neuropsychological stress, and seek out solutions to manage stress-related issues.

Due to multiple factors, women are significantly more influenced by social and cultural conventions and are more likely to communicate with others about both their physical and mental state. Women are more proactive and engaged in health-preserving activities compared to men. This pattern is evident in their internet usage as well, especially regarding issues related to individual health, with women demonstrating a significantly greater tendency to search for such information online (48.7%) compared to men (39.5%).

It is essential to point out that this difference in behaviour is not necessarily explained solely by the inherent positive characteristics of gender. The driving force behind this type of behaviour may also be more significant anxiety, as well as lower self-assessment of appearance and greater tendency to compare against the flawless representations of beauty found in social media. The significantly larger participation of women in studies is a phenomenon that is widely known. Women are more inclined toward making altruistic decisions and, at the same time, are more likely to consult with their loved ones before making relevant decisions.

The stress level in the study group was assessed using the Four-Dimensional Symptoms Questionnaire (4DSQ). A stress study among 2 127 individuals with 4DSQ found that distress was the most pronounced measured symptom in the group, followed by somatisation, anxiety, and depression. This result is also confirmed in our study. Even when breaking down the individual components of the test, no significant differences were observed in terms of gender and age. Another study confirms that the general population in the Netherlands demonstrates moderate levels of distress and somatisation, but few show anxiety and depression. The data from this paper shows that distress and somatisation are significantly more prevalent compared to anxiety and depression.

In our study of executives, we observed that most participants have moderate levels of distress and somatisation, but few exhibit symptoms of anxiety and depression. High distress among management personnel is expected, as this group is often exposed to extreme levels of professional stress. Somatisation can be viewed as a manifestation of chronic stress and strain. The results of two of the questions require further exploration, as 145 out of 146 participants responded positively.

> **Question 17** – During the past week, have you noticed any signs of feeling low or experiencing depression?

A study by a French research team presents results supporting our findings. The main conclusions indicate that healthcare managers are exposed to high levels of stress and emotional burden, leading to subjective feelings of depression and feeling down. Our data can be supported by the cited paper and explained as arising from:

- Strong corporate pressure and conflicting responsibilities;
- Lack of support and high expectations for managers;
- Accumulated emotional and cognitive fatigue, leading to feelings of helplessness and demotivation.

Regarding the subjective assessment of symptoms of depression and feeling down, according to DSM-5, a single response to a questionnaire about feelings of depression cannot be used for diagnosing any condition from the Depressive Disorders class. However, this question is indicative of the overall subjective individual assessment of stress and one's tolerance threshold. One of the research limitations is that no screening for known anxiety and depressive disorders was conducted among the participants. Cultural, ethnic, and other factors, as well as the nature of participants' jobs, may influence the results, and it is appropriate for them to be explored in future research studies.

Question 20 – During the past week, have you experienced disturbed sleep? A positive response to this question was recorded for 145 out of 146 participants.

In addition to the already described purely physiological causes of sleep quality disturbances during stress, there are many interconnected factors that have not yet been studied. Sleep pathology is one of the most common and simultaneously most difficult to treat consequences of stress and distress. Still, we should consider that the response to this question may be subjective, and work stress is not the only cause of deviations. Some authors investigate sleep and its disorders as a consequence of professional psychoemotional tension. The main conclusions describe workplace tension and fear of job loss as factors intensifying the problem.

Sleep disturbances are also viewed as a two-way challenge – poor sleep quality leads to decreased productivity, increased anxiety, and somatisation, which in turn increase stress levels. The paper mentions that management positions are associated with a greater risk of insomnia due to long working hours, social pressure and corporate culture, mental strain, and insufficient balance between professional and personal life.

Stress in management personnel affects attention and the ability to focus on work tasks. The Bourdon test (Bourdon-Wiersma test) is a reliable tool for assessing attention, concentration, and cognitive endurance, which is confirmed by other authors as well. In our study, the test in both its criteria – SR and PR – was conducted before and after the weekend in the study group and in the control group. The results indicate that there is no difference in values between the two groups, nor is there a statistically significant difference in both groups before and after the weekend. Physical activity by itself does not guarantee improvement in concentration and attention.

In the analysis of our study results, productivity and success ratios before and after the weekend are discussed. When measuring the success ratio before the weekend between the two examined groups, we found that the difference between physically active individuals and physically inactive ones in the general population is statistically insignificant. A trend of lower values in the success ratio after the weekend was established, while no such trend was found in the productivity ratio examined before and after the weekend. When measuring the success ratio after the weekend between the two examined groups, we found that the difference between physically active and inactive individuals is also statistically insignificant.

While tests assessing the stability and distribution of attention are frequently employed in psychological evaluations, it is still uncertain how effectively they convey a complete and objective picture of an individual's psychological condition. Tests that aim to quantitatively measure aspects of consciousness (especially in individuals accustomed to intensive mental work) provide, at best, a framework for guidance. Their results may even be misleading, showing surprisingly low values in otherwise productive individuals. The reason for this is often cited as the "filtering mechanism," in which consciousness differentiates between essential and non-essential stimuli (which these tests often represent).

Although our team expected SR and PR values after the weekend to be higher, this hypothesis was not confirmed, and such a trend is reported by other sources as well. A research team examined the "Monday Effect" phenomenon – the tendency for increased frequency of cognitive errors and work incidents on Monday morning. The study analyses possible causes for this effect, focusing on three main ones:

- Cognitive deficit at the beginning of the work week;
- The influence of weekend sleep on cognitive effectiveness;
- Social stress in the workplace.

The results confirm that cognitive errors on Mondays are significantly higher compared to other workdays. Employees who experience higher social stress, such as management personnel, are more prone to cognitive errors. Stress may be a constant factor that is not significantly influenced by a short weekend break. Other authors examine the phenomenon of "overwork culture" and its influence on cognitive functions on Monday. "The Monday Effect Revisited" analyses the so-called "Monday effect," which suggests an increase in cognitive errors and work incidents at the

beginning of the work week. The phenomenon of "overwork", according to the authors, describes the period of adaptation and gradual restoration of work rhythm after a break such as a weekend or vacation. This period may be associated with temporary changes in cognitive functions, including attention and concentration.

Response time to a specific stimulus is an immediate representation of cognitive function and stress levels. This is confirmed by a research team examining the issue in a study group aged 20–60 years. Response to a visual stimulus is a reliable indicator for assessing overall psychophysiological condition and cognitive functions. The established faster responses after rest are explained by the recovery of cognitive resources and reduction of work fatigue. Cognitive load affects both the accuracy and speed of responses. Rest can reduce cognitive tension, improving response speed. Quick decision-making is a fundamental aspect of an executive's job, often under conditions of time and information constraints. Examining response time before and after rest (weekend) provides information about the effectiveness of the work-break. In our study, we established that the difference in response time between physically active and physically inactive individuals at the end of the work week is statistically insignificant. Regarding response time after a two-day rest (weekend), the difference between physically active and inactive individuals in the studied sample is statistically significant. These results are confirmed by authors who investigate how rest affects cognitive functions and fatigue. Statistical results show improvement in response time and reduction of fatigue after rest, which reinforces the idea that taking breaks enhances productivity.

The results obtained from the samples suggest that the response time indicator is lower in physically active individuals compared to physically inactive ones. A study by a research team from the University of Quebec evaluated response time in athletes. Although their study focuses mainly on the sports community, the concept of response time to visual stimuli can be applicable in the context of management personnel and stress. High levels of stress cause delays in cognitive processing and response to stimuli, which is of great significance for managers. This group of employees often needs to make decisions with limited time resources. In the cited Canadian study, response time is determined as a reliable indicator of cognitive effectiveness. Quick response to visual stimuli is a sign of good cognitive functioning. The study also measures factors such as fatigue, mental load, and consumption of caffeine/alcohol, which can influence response time. Similar to athletes, managers need to manage their workload and stress levels to maintain optimal cognitive performance. Another result from the Quebec research is the possibility of improving response time through regular workouts. These conclusions are confirmed in our study as well.

The fact that response time after the weekend is shorter in the executives group with an active sports programme is explained and confirmed by other authors – the positive influence of physical activity on stress levels and improvement of cognitive functions.

A multicentre study involving 76 occupational health physicians in France identified factors of occupational stress and evaluated the impact of physical activity on its consequences. The study demonstrates the protective effect of regular physical routine, in any form, during leisure time. The authors also establish the phenomenon that engaging in physical

activity for more than 3 hours weekly does not lead to additional benefits compared to practicing just 1 hour weekly. No statistically significant dose-dependent effect was found between the amount of physical activity and stress level reduction. The results showcase the psychological aspect of the effect – physical activity helps individuals distance themselves from job-related problems, allocate time for themselves and pleasure, and maintain social contacts outside the work environment. The weekend plays an essential role in recovering from work fatigue and psychoemotional tension for those working under stressful conditions. It has been established that effective weekend rest is associated with indicators such as higher engagement and improved work efficiency during the following week. Participants who recovered effectively show higher levels of energy and concentration in their jobs.

Conclusions and Recommendations

Conclusions

1. The methodology for stress assessment is adequate for the purposes of this study and similar ones, as the measured values correspond to general averages for the population.
2. The indicators associated with high stress levels do not differ significantly between the two genders and the two groups.
3. A significant difference in response time after rest is registered in all studied groups by gender and physical activity.
4. APP has limited overall influence on the stress levels in "management personnel" but significant influence on certain indicators (response time after rest).

5. Response time after rest, besides being an important indicator of overall stress levels, can also be considered a significant individual factor in assessing the individual's productivity, particularly in "management personnel."

Recommendations

1. APP is an important factor for response time after rest and a beneficial factor for general stress levels. It is recommended for all groups but is essential for "management personnel" who need quick response times.
2. The described methodology is both comprehensive and easily applicable (cost-efficient and with respect to equipment). The results, in the context of adequate interpretation, can be used for an objective general evaluation of stress.
3. The research results endorse the implementation of informational campaigns about the importance of APP for all "management personnel". They should be used to promote APP (and relevant activities such as sports, core physical activity modules, fitness, wellness, etc.).
4. The conducted research and its results can provide a framework for examining the levels of psychoemotional tension in management personnel by employers and occupational health physicians.
5. Based on these results, employers and occupational health specialists can develop strategies and programmes to influence stress and promote an active lifestyle.

Thesis contributions

1. For the first time in Bulgaria, a definition of the term "management personnel" is provided in regard to workplace stress studies.
2. For the first time in Bulgaria, a definition of "active physical programme" is provided regarding workplace stress studies.
3. For the first time globally, a methodology is developed for indirect, combined (self-assessment, equipment-based, laboratory and dot cancellation test) evaluation of stress levels, which can be used as a groundwork for future research.
4. For the first time, the 5PB device by © GETA Centrum s.r.o is used to evaluate response time as an indirect indicator of stress in "management personnel."
5. The described methodology is used to compare "management personnel" with an "active physical programme" and those without one across multiple criteria and indirect indices for stress levels.
6. For the first time, a study design examining levels of neuropsychological load at the end and the beginning of the work week is applied to research recovery in physically active versus physically inactive personnel.

Thesis-related publications and participation

Publications

- Scripta Scientifica Medica, November 2021. Antihypertensive therapy volume reduction following dietary consultation and the establishment of an adequate nutritional intake, Tatyana Mateva, Ivan Enev, Boyko Matev

- Scripta Scientifica Medica, November 2022. Complementary medicine options in work-related stress in management staff—the capabilities of Gelsemium sempervirens in homeopathic dilutions, Tatyana Mateva, Ivan Enev, Boyko Matev, Teodora Dimitrova

- Journal of IMAB, Supplement 13 SEEC & 33 IMAB, 2023. 5-8. Contemporary aspects of managerial stress – a review, Mateva Tatyana, Dimitrova Teodora

- Scientific collection "The Science of Nutrition. In view of the present and a look to the future", 2023, edited by Prof. Dr. Bozhidar Popov, 2-3. Emotional eating, stress and Homeopathy, Tatyana Mateva, Ivan Enev, Eva Hristova, Rositsa Stancheva

Participation in scientific forums

● 10th Nutrition Conference, 10th Jubilee Nutrition Conference, June 2019, Varna, Poster "Toxoplasmosis - Neurotropism. Hypotheses and Studies", authors - Tatyana Boikova Mateva, Ivan Enev, Boyko Matev

● Jubilee Scientific Conference "Medicine of the Future" at Medical University-Plovdiv, October 2020. Poster "Overview of Nutrition Under Stress Conditions for Management Personnel", authors: Tatyana Mateva, Boyko Matev, Ivan Enev, Darina Hristova, Teodora Dimitrova

● Symposium "Alumni Club and Friends. Digitalization, Telemedicine and Artificial Intelligence", Medical University-Varna, March 2022, presentations "Stress in Management Personnel"

● Symposium "Alumni Club and Friends. Dynamics, Development, Change", Medical University-Varna, 10 years Sliven Branch, March 2023, presentation "Carbohydrate Nutrition and Stress"

● Symposium "Marine Dietetic Days", March 2023, Presentation "Hyperphagia and Obesity", poster "Stress and Carbohydrate Nutrition" with authors T. Mateva, I. Enev