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Original Investigation

Coping with stress among physically active and inactive students at different educational stages during the pandemic

Katarzyna Kotarska[a,†], Maria A. Nowak[a,†], Celina Timoszyk-Tomczak[b]
Department of Physical Culture and Health, University of Szczecin, Poland[a]
Faculty of Social Sciences, Institute of Psychology, University of Szczecin, Poland[b]
[†]These authors contributed equally as first author

Purpose: The aim of this study was to explore the preferred methods of stress coping among both physically active and inactive students.
Methods: A total of 497 students from various educational stages, including primary schools (PS), level 1 vocational schools (VS1), secondary vocational schools (VS2) and comprehensive secondary schools (CSS), ages ranged from 14 to 17 years participated in the study. Data was collected through a standardized questionnaire (How do you cope?) (HDC) and an original survey questionnaire. Nonparametric statistics were applied in the analyses of the results.
***Results*:** Intergroup comparisons in the dispositional strategy coping with stress show that people exercising ≤15 minutes and (15;30] minutes focused on emotions (DFE) and seek social support (DSSS) more often compared to those exercising ≥60 minutes in one day (DFE: $P< .01$, $P< .05$; DSSS: $P< .01$, $P< .05$, respectively).
Situational stress management (SSM) was more often used by students who exercised for (30;60] minutes a day compared to physically passive (PP) ones ($P< .05$). PP students, compared to those exercising ≤15 minutes a day, more often focused on emotions (SFE) ($P< .05$) and situational search for social support (SSSS) ($P< .05$).
In the situational coping strategy, we observed positive moderate correlations (statistically significant for $P< .05$) for PS students with SFE ($R= .36$) and for VS1 students with SSM ($R= .37$). VS2 and CSS students displayed adapted SSM in response to the situation ($R= .26$; $R= .35$, respectively), SFE ($R= .34$; $R= .32$, respectively), and SSSS ($R= .27$; $R= .26$, respectively).
Conclusions: To reduce stress, it appears essential to educate children and adolescents on coping strategies and to promote and enhance their capacity to incorporate regular physical activity into their daily routines.

Keywords: teenagers, physical activity, dispositional and situational coping strategies, pandemic.

Introduction

The COVID-19 pandemic is a global challenge to the health of people around the world. During this period, an increase in symptoms of anxiety, depression and stress was found.[1] The experience of these symptoms (anxiety, depression and stress) by children and adolescents, who are susceptible to the influence of long-term stressors, especially during developmentally sensitive periods, may lead to serious mental health threats.[2-3] A bidirectional relationship between three dimensions of peer functioning (friendship quality, peer rejection, and peer victimization) with later social anxiety has been demonstrated in research.[4] Victimization and perpetration of peer violence are strongly correlated and develop in both directions. This means that perpetration leads to subsequent victimization as often as victimization leads to subsequent perpetration.[5]
Ways of coping with stress are considered determinants of current and future adaptation[6] as well as predictors of adolescents' immune system dysfunction in adulthood. [7] Coping with stress during and shortly after the pandemic (at the end of the WHO-declared pandemic) is particularly crucial for students in various types of schools. One of the factors that has a positive impact on the psychophysical health of young people is moderate physical activity.[8-9] Research has revealed that junior high school students who engage in higher levels of physical activity are less likely to fixate on their emotions in challenging situations and are more effective in coping with stress.[10] In light of the research conducted by Institute of Mother and Child in 2018, it was found that within the group of students aged 10-19, only 15.6% met the criteria for engaging in moderate to intense physical activity every day, totaling a minimum of 60 minutes.[11]Students generally lack the habit of regularly participating in physical education classes and are not adequately prepared for lifelong physical activity. The pandemic period exacerbated these pre-existing irregularities.
The detrimental effects of physical inactivity among teenagers have been extensively documented in numerous studies.[12]A decrease in physical activity was observed during the pandemic.[13] The restrictions, directives, and bans implemented to curb the spread of Covid-19 significantly contributed to the decline in physical activity.[14] The inability to socialize with peers and engage in physical activities further exacerbated the reduction in physical activity levels. Home-based exercises recommended by teachers for children and teenagers, often conducted in confined living spaces, as well as written assignments related to physical education, were unlikely to have a positive impact on

students' psychomotor development. The situation of students could have been somewhat ameliorated through a suitable and well-structured educational program utilizing contemporary technological solutions (virtual reality platforms and modern video games that simulate scenarios resembling various physical activities).[15] Unfortunately, the surveyed schools did not possess the necessary technological infrastructure to implement such approaches. Research on the relationship between the forms of activity among youth (in the virtual environment and in the real world) and their mental health during the period of enforced social isolation due to the COVID-19 pandemic[16] revealed that the more time students spent on activities in the virtual environment, the higher their levels of stress, depression, and anxiety. The duration of online activity was also negatively correlated with psychological, emotional, and social well-being. The higher the well-being, the more activities took place without the use of any medium.

The relationship between the risk of depression (which can be caused, among other factors, by stress) and physical activity in teenagers is not entirely clear.[17] On one hand, the risk of depression was significantly lower among teenagers who reported more frequent and longer durations of physical exercise compared to those who exercised less often and for shorter periods. On the other hand, the risk of depression was significantly higher among teenagers who engaged in vigorous exercise compared to those who engaged in low-intensity exercise.

Adolescence is a complex developmental period that signifies the transition from childhood to adulthood. The primary objective during this stage is to initiate an independent life, encompassing both personal and social aspects. Challenges faced by adolescents include adjusting to significant physical and sexual changes, establishing their unique identity, cultivating new interpersonal relationships, and navigating the expression of sexual feelings. [18] This period is divided into three phases: early adolescence covering the years 11-13 focused on changes in the body, middle adolescence (14-17 years) associated with building identity and late adolescence (18-21 years) associated with autonomy.[19]This period encompasses educational stages resulting from the education system of a specific country. The Polish education system includes 4 educational stages: nursery, kindergarten, primary and secondary school. The post-primary school stage can be pursued in a comprehensive secondary school, level 1 and 2 vocational schools, a technical secondary school, secondary vocational schools, a special vocational preparatory school, and a post-secondary school. The transition from primary to secondary school is often associated with heightened attention to bodily changes, while the later grades of secondary school coincide with a period of identity formation. Attending different types of upper-secondary schools may lead to distinct paths of identity development.[20] Thus, patterns of changes related to making commitments and increasing exploratory forms of adaptation are observed mainly in high school students, while difficulties in identity development and regressive changes are more prevalent among vocational school students.[21]

The aim of the study was to find out the preferred ways of coping with stress among physically active and passive students of primary, vocational and secondary schools.

The following hypotheses were adopted:

Physical activity is related to the choice of stress coping strategies.

Students at different stages of education prefer different stress coping strategies.

Methods

Participants

We conducted a study involving 497 students, consisting of 226 females and 271 males, whose ages ranged from 14 to 17 years (mean age of 15.2±1.1 years), the residents of Zachodniopomorskie Voivodeship. The youngest participants, aged 14 and 15, were representative of the primary school education stage, while subsequent age groups belonged to the first, second, and third grades of post-primary education. The group of students from secondary schools were at the same stage of education but differed in the type of school they attended. Among them, 142 students attended primary schools (PS), 44 were enrolled in level 1 vocational schools (VS1), 218 attended secondary vocational schools (VS2), and 93 students were enrolled in comprehensive secondary schools (CSS). Most of these students resided in urban areas (67.8%). Additionally, nearly 85% of the respondents rated their financial situation as either very good, or good.

Data Collection

We employed a diagnostic survey method, which included the use of a standardized questionnaire known as "How do you cope?" (HDC)[6], as well as an author-created survey questionnaire. HDC is designed to assess both dispositional stress coping strategies (standard difficult situations) and situational stress coping strategies (to self-described difficult situations that individuals have experienced in the past year). The evaluation of dispositional coping considers the frequency of employing specific types of behavior, while the situational assessment, as described by the participants in the study, indicates the degree of intensity of a given behavior. The HDC enables the assessment of three coping strategies in both dispositional and situational contexts: active coping, emotional focus, and seeking social support. In our study, the Cronbach's α for the HDC dispositional scale was 0.79, and for the situational HDC scale, it was 0.72. The author-created survey questionnaire included personal information and details about the physical activity of the teenagers. The respondents answered the question: How often do you exercise? They were provided with the following answer options: every day, 2 times a day, 3-4 times a week, 2 times a week, 1 time a week, only on holidays, I don't exercise. For the selected answer, they provided the time of physical activity in minutes (each time approx. ... min). Physical activity, determined by the number of minutes of each exercise on individual days of the week, was summed up and then divided by 7. This calculation resulted in the daily physical activity, and its duration was expressed in minutes per day (min/day).

Statistical Analysis

Nonparametric statistics were applied in the analyses of the results (distribution that differs from normal). The Kruskal-Wallis test (H) was used to compare several independent samples. In the case of determining statistical significance of differences for the comparison of two independent samples, the Mann-Whitney (U) test was employed. The trait frequency and the independence chi-square test were used. The effect size was calculated for each test: E^2_R for the Kruskal-Wallis H test, Glass rank biserial correlation (*Rg*) for the Mann-Whitney U test, *Cramér's V* for the χ^2 test. Spearman's rank order correlation (*R*) was used to assess the intensity of preferred situational strategy behavior (HDC) by students from different schools. The value of $P < .05$ was assumed to be statistically significant. Statistical

calculations were made with Statistica 13.1 for Windows (StatSoft Sp. z o.o., Crakow, Poland), Microsoft Office Excel 2007 (Microsoft Sp. z o.o., Warsaw, Poland) and JASP 0.8.1.2 (https://jasp-stats.org)(accessed December 2022).

Results

Students' physical activity

Among the surveyed students, 29.6% engaged in physical activity for at least 60 minutes on all seven days of the week. The students who spent the most time on physical activity (≥60 minutes) in a single day were those attending comprehensive secondary schools (CSS) and level 1 vocational schools (VS1) (46.2% and 38.6%, respectively). Primary school students (PS) more frequently reported engaging in physical activity [15;30] (33.1%) and (30; 60) (30.3%). Students from secondary vocational schools (VS2) engaged in physical activity (15;30] (24.3%), (30;60) (26.6%) and ≥60 minutes per day (25.7%). Among VS2 students, the largest group was those who engaged in physical activity for ≤15 minutes or reported being physically passive (PP) and not engaging in any physical activity (23.4%) (Figure 1).

Explanations:

PS - primary school students; VS1 - level 1 vocational schools; VS2 – secondary vocational schools; CSS - comprehensive secondary schools; PP - physically passive

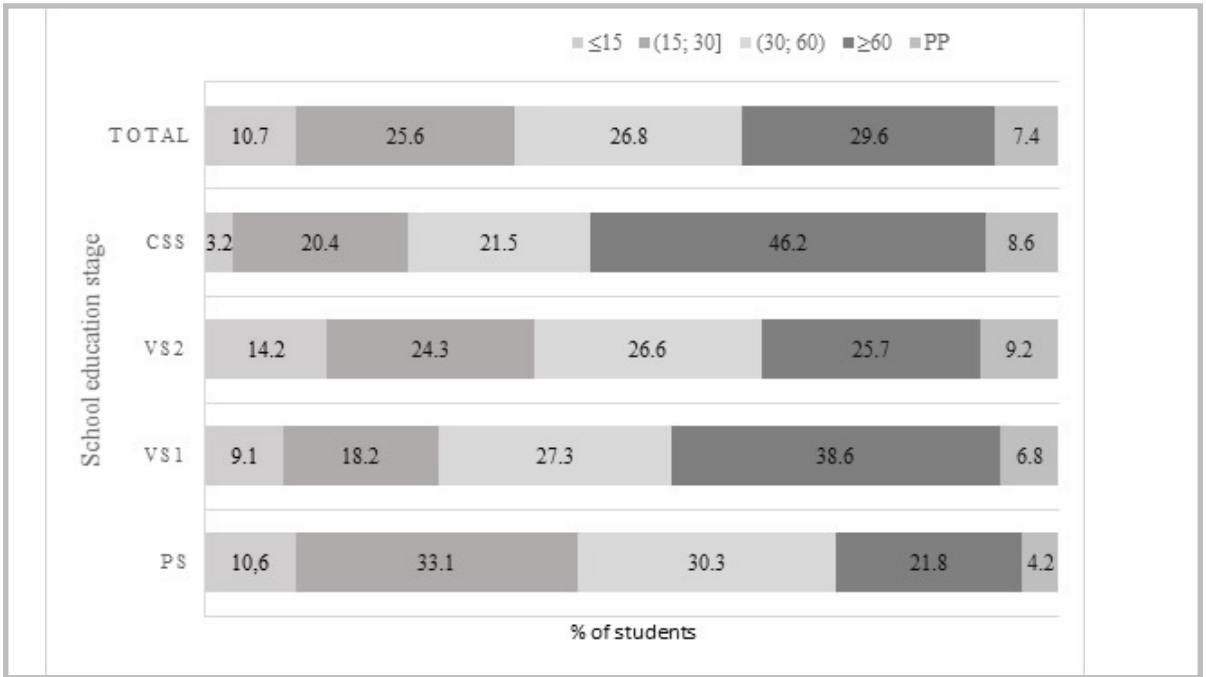

Figure 1. Characteristics of students' physical activity time (in min/day) at various stages of education (independence *χ2* test, and *Cramér's V*)

Coping with stress and time of exercise students'

There was a notable variation in the strategies used by the surveyed students to cope with stress in dispositional contexts DFE (H (4,495)=11.01; E^2R= .022; $P < .05$) and DSSS (H (4,495)=11.72; E^2R= .023; $P < .05$).

Intergroup comparisons (the U test) in the dispositional strategy show that people exercising ≤15 minutes and (15;30] minutes focused on emotions (DFE) more often compared to those exercising ≥60 minutes in one day ($P < .01$, Rg =.27; $P < .01$, Rg = .17, respectively). People exercising ≥60 minutes a day were less likely to seek social support (DSSS) compared to those exercising ≤15 and (15; 30] minutes ($P < .01$, Rg = .29; $P < .05$, Rg = .14, respectively). There were no differences in the use of active coping with stress (FCS) between exercising and non-exercising people.

In the situational strategy, people exercising (30;60) minutes a day were more guided by active stress coping (SSM) ($P < .05$, Rg =.22) than those who were physically passive. Focus on emotions (SFE) and seeking social support (SSSS) in solving situational problems were mainly used by physically passive people compared to those who exercised ≤15 min a day ($P < .05$, Rg = .26; $P < .05$, Rg =.29, respectively). (Table 1).

Difficult situations described by students.

In regard to the situational ways of coping described by young people, over 800 difficult situations were revealed (one to three or more such situations). The most commonly reported problems were related to maintaining relationships with peers (59.4% of students); issues related to poor health (41.6%), insufficient contacts with teachers (38.2%), and learning difficulties (about 10% of), family disagreements (over 8%). Around 8% of students indicated other problems (non-compliance with the law, experiences of cyberbullying, harassment, ridicule by peers due to factors like body weight and appearance, drug use, excessive alcohol consumption, violence towards friends, and suicidal thoughts). For 4% of students, family illnesses and the death of loved ones were significant stressors. Love problems caused stress for 3.6% of students. Some respondents chose not to disclose the nature of their problems, deeming them too difficult to discuss.

Correlations of situational coping strategies

In terms of the situational coping strategy, positive moderate correlations were observed among PS students in relation to focusing on emotions (SFE) (R = .36; $P < .001$). VS1 students showed a preference for active coping with stress (SSM) (R = .37; $P < .05$). Among VS2 and CSS students, positive moderate correlations were found in their choice of active coping with stress (SSM) (R = .26, $P < .001$; R = .35, $P < .001$, respectively), as well as in their tendencies to focus on emotions (SFE) (R = .34, $P < .001$; R = .32, $P < .001$, respectively) and seeking social support (SSSS) (Table 2).

Table 1. Ways of coping with stress (HDC) by young people with different exercise time (min/day) and physically passive (PP) (the U test, *Rg*)

Ways for dealing with stress		Physical activity min/day	*P*-value for U test		Glass rank biserial correlation (Rg)		Rank mean
			≥60	PP	≥60	PP	
Dispositional ways of coping with stress	Dispositional focus on emotions	≤15	<.01		.27		287.3
		(15;30]	<.05		.17		264.8
		≥60					221.5
	Dispositional search for social support	≤15	<.01		.29		295.0
		(15;30]	<.05		.14		256.6
		≥60					222.4
Situational ways of coping with stress	Situational stress management	(30;60)		<.05		.22	264.4
		PP					208.4
	Situational focus on emotions	≤15		<.05		.26	277.4
		PP					213.0
	Situational search for social support	≤15		<.05		.29	280.7
		PP					205.7

Explanations:
PS - primary school students; VS1 - level 1 vocational schools; VS2 – secondary vocational schools; CSS - comprehensive secondary schools; PP - physically passive; SSM – situational stress management; SFE – situational focus on emotions; SSSS – situational search for social support.

Table 2. Spearman's rank order correlation (R) between the type of school and adolescents' situational ways of coping with stress

School type and choosing a situational strategy (HDC)	N important	Spearman's *R*	*P*
PS and SSM		.14	> .05
PS and SFE	140	.36	< .001
PS and SSSS		.07	> .05
VS1 and SSM		.37	< .05
VS1 and SFE	44	.09	> .05
VS1 and SSSS		.08	> .05
VS2 and SSM		.26	< .001
VS2 and SFE	218	.34	< .001
VS2 and SSSS		.27	< .001
CSS and SSM		.35	< .001
CSS and SFE	93	.32	< .001
CSS and SSSS		.26	< .05

Explanations: PS - primary school students; VS1 - level 1 vocational schools; VS2 – secondary vocational schools; CSS - comprehensive secondary schools; PP - physically passive; SSM – situational stress management; SFE – situational focus on emotions; SSSS – situational search for social support.

Discussion

The hypothesis suggesting a relationship between the choice of coping with stress and the level of physical activity in the surveyed youth was confirmed. Dispositional strategies such as focusing on emotions and seeking social support were more common among students who engaged in ≤15 and (15;30] minutes of physical activity per day compared to those who exercised ≥60 minutes or more per day. Situational strategies, including focusing on emotions and seeking social support, were preferred by physically inactive adolescents, even compared to those who engaged ≤15 minutes of daily exercise. This research underscores the protective role of physical and social activities in the mental health of young people.[16,22] Spending more time engaged in physical activity was associated with reduced stress levels in teenagers. Regardless of the activity's intensity, physical exercise can help adolescents effectively cope with stress and improve their mental health.[23] Furthermore, individuals who

engaged in regular physical activity almost every day during the pandemic (4-5 days, 6 days and daily), regardless of their pre-pandemic exercise habits, reported better overall well-being.[24] A study involving Korean adolescents[25] found that students who engaged in physical activity more than five times a week were less likely to experience stress compared to their less active peers. Additionally, athletes tended to rate their ability to cope with challenging situations more highly.[26]

In the period before the pandemic, the stress felt by teenagers most often concerned school, learning, parents, friends and love relationships.[27] During the pandemic, an increase in anxiety symptoms was most strongly associated with challenges in relationships with teachers, a higher number of daily responsibilities, and problems in relationships with loved ones, friends, and colleagues.[28] Our research partially aligns with these findings, but the mentioned issues occur in a different order: disrupted relationships with peers due to pandemic restrictions, health problems, and insufficient contacts with teachers. The reduction in real-life interactions among young people has diminished their opportunities for social support from peers.[16,29-30] However, in none of the previously cited studies did young people report health problems of such intensity. This condition is likely a consequence of the pandemic, as well as limited opportunities for physical activity.[28]

We confirmed the hypothesis that students at various educational stages favor different stress coping strategies. These results substantiated positive moderate correlations. Among the situational coping methods, primary school students displayed a preference for focusing on emotions (SFE). Previous research has indicated that junior high school students (ages 13-15) tend to favor active coping strategies for dealing with stress (in the context of school problems or challenging peer relationships).[31] Employing an emotion-focused strategy can be most beneficial in situations where individuals perceive limited possibilities for change.[32] The observed effect in our research could be linked to the limited capacity to select a coping strategy, as well as the constrained ability to alter a stressful situation. However, students in level 1 vocational schools (VS1), vocational secondary schools (VS2), and comprehensive secondary schools (CSS) tended to utilize active coping strategies for managing stress. Focusing on emotions and seeking social support were distinctive among VS2 and CSS students in similar proportions. Studies suggest that teenagers adapt their coping strategies in response to situational demands, and they tend to become more flexible in this regard as they grow older.[27]

Numerous studies emphasize the positive impact of physical activity on stress reduction.[22,33] Engaging in activities that resemble their pre-pandemic lifestyle may help individuals feel more capable of coping with challenging situations and contribute to an improved sense of well-being. It has been observed that young people who maintain their daily routines and habits may experience reduced stress.[34] Cultivating such daily habits can enable young people to strike a balance between the real and virtual worlds.[16]

In our study, only 29.6% of the surveyed children and adolescents managed to meet the WHO-recommended guideline of engaging in 60 minutes or more of moderate to vigorous physical activity per day (WHO, 2020). When comparing these findings to WHO[35], globally 81% of adolescents (aged 11–17 years) do not meet the WHO global recommendations on physical activity for health. In line with the outcomes of our research, which encompassed adolescents aged 14-17, 70.4% did not comply with these recommendations. There is a connection between psychological stress and physical activity, but the exact nature of this relationship is not yet fully understood.[33,36] Psychological stress can have varying effects on physical activity - it can either reduce or increase it. These complex interactions necessitate further research and may provide insight into the relatively weak relationships observed in many studies.

Practical applications

The problems indicated by young people (in this age group also related to limitations in meeting development needs) prompt reflection on methods of supporting teenagers in coping with stress, especially after the end of the pandemic was announced. The choice of active strategies for coping with stress by students participating in physical education classes, in physical recreation, and practicing sports prove the importance of physical exercises in overcoming situational difficulties. To reduce stress in children and adolescents, it is important to educate them on effective stress coping methods and to establish conditions for regular physical activity integrated into their daily lives. It is also important to make physical education teachers, instructors and sports trainers, as well as parents, aware of effective methods of dealing with stress in connection with the physical activity of young people. The presence of a school psychologist is also necessary in this educational process. A comprehensive study of the problem - coping with stress among physically active and inactive students - requires continuation of research among young people, considering gender, place of living, sports infrastructure, and health condition.

Conclusions

The results show that students training less than 30 minutes, compared to those training 60 minutes or more day, focused mainly on emotions and seeking social support, as a dispositional strategy of coping with stress. In solving situational problems, focusing on emotions and seeking social support, characterized students as physically passive. Students training 30 to 60 minutes daily were more likely to actively cope with stress compared to those physically passive ones.

Secondary vocational school and comprehensive secondary school students used diversified ways of coping, appropriate to the situation: active coping with stress (SSM), tendencies to focus on emotions (SFE), seeking social support (SSSS). Primary school students focused on emotions and level 1 vocational school students actively coped with stress.

The complex interactions between physical activity teenagers and ways of coping with stress require further interdisciplinary research. In our research, we employed a test examining stress coping strategies, which allows us to differentiate between dispositional and situational strategies. Dispositional strategies for coping with stress are the basis for developing relatively stable traits, whereas situational strategies are related to the current state of stress. In this regard, the study provides a new perspective.

The research conducted has its limitations, which do not encompass factors such as: the effects of school education including grades, which could be a more objective indicator of the effects of coping with stress or adaptation to changed school conditions. The groups compared were not randomly selected and had different sizes, thereby restricting the potential for generalizations. Temperamental predispositions, which could partially explain the relationship between the level of activity and the selection of strategies for coping with stress, were not examined.

In future research, it would be valuable to broaden the perspective by incorporating factors related to the intrapersonal context (e.g., temperament) and the interpersonal context (e.g., established patterns related to coping with stress), while enhancing it with objective indicators of coping with difficult situations.

Ethical Committee approval

University of Szczecin, Szczecin (KB 27/2021).

ORCID

Katarzyna Kotarska e-mail katarzyna.kotarska@usz.edu.pl ORCID ID 0000-0001-5679-3466
Maria Alicja Nowak e-mail maria.nowak@usz.edu.pl ORCID ID 0000-0003-4682-7356
Celina Timoszyk-Tomczak e-mail celina.timoszyk-tomczak@usz.edu.pl ORCID ID 0000-0002-8314-0476

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Topic

Sport Science.

Conflicts of interest

The authors confirm there is no conflict of interest.

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Declaration if used ChatGPT

We didn't used ChatGPT.

Author-s contribution

Conceptualization, M.A.N. and K.K.; methodology, M.A.N. and C.T-T.; software, C.T-T.; validation, K.K. and M.A.N.; formal analysis, M.A.N; investigation, K.K.; resources, K.K. and C.T-T.; data curation, M.A.N. and K.K.; writing—original draft preparation, M.A.N. and K.K.; writing—review and editing, K.K. and C.T-T.; visualization, M.A.N.; supervision, M.A.N. and K.K.; project administration, K.K. All authors have read and agreed to the published version of the manuscript.

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Corresponding information:
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Correspondence to: *Prof. Katarzyna Kotarska PhD
University: Department of Physical Culture and Health, University of Szczecin
E-mail: katarzyna.kotarska@usz.edu.pl