Effects of a Mindfulness-Based Intervention on the Physical and Psychological Well-Being in Teenagers

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Abstract
As an evidence-based practice for stress reduction, with positive outcomes on mental and physical health, mindfulness proved its effectiveness on behaviors, cognitive abilities, emotional well-being in various populations. One of the many conceptualizations of mindfulness, Baer's five facets mindfulness model, includes five key components of the mindfulness practice: observing, describing, acting with awareness, non-judgement, and non-reactivity to inner experience. These were included in the "In This Moment" program, by Strosahl and Robinson (2015), an effective intervention for distress management. Our research tested the effectiveness of the program on a sample of 431 teenagers from various high-schools in Romania.
164 high school students (93 females, mean age 16.46) had weekly meetings with the trainer, who presented them the exercises, which they subsequently practiced on their own, for one week. The implemented program entailed 9 weeks of practice. Our control group consisted of 217 high school students (112 females, mean age 16.01)
The participants completed measures of psychological flexibility, level of mindfulness, satisfaction with life, depression, anxiety, and stress screening, test anxiety, shyness, and degree of somatic complaints before and after implementation of the program. A three month follow up assessment was also performed.

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We found that mindfulness practice has a positive effect on psychological flexibility, slightly contributing to the decrease of the test anxiety, and to the improvement of somatic well-being, with some of the positive changes maintained also at follow-up. The results will be presented in the light of evidence by other authors and several possible implications will be further discussed on the effects of mindfulness-based practice on physical activity and performance in sports.

Keywords: *mindfulness; psychological flexibility; somatic well-being; stress management; performance in sports.*

1. Introduction

Strosahl and Robinson (2015), the authors of the "In This Moment" program believe that if we do not control stress, neurochemical reactions related to physiological arousal will result in the brain and in internal organs, that can harm physical and mental health. Comprehensive mindfulness strategies activate those parts of the nervous system that counteract and control the effects of stress. Applying these strategies and practicing them regularly will help to strengthen the neural networks in the brain, thus allowing the person to act as flexible and adapted to daily stressful situations as possible. As a result of the exercises, benefits are particularly found in the areas of positive mental health, healthy relationships and increased cognitive efficiency, even though it was previously believed that change could only be achieved through years of practice. Adolescents are seen as a distinct group due to their developmental stage and special problems, and special attention is given to them. (Mohapatra, Panigrahi & Rath, 2012) Several studies have shown that chronic stress interacts with developing brain structures and can cause significant changes that favor the development of psychiatric disorders. During his experiments and research, Kandel (2005) discovered neuroplasticity: structural changes in the brain occur/can occur during practice. (Sheth, McGlade & Yurgelun-Todd, 2017) Papa and Epstein (2018) draw attention to the fact that emotion regulation disorders are currently the biggest and most serious problem. Most emotional process specialists agree that emotions are multidimensionally interconnected response channels, including physiological, expressive, cognitive, and motivational changes. As

protective factors for the promotion and development of social and emotional flexibility, we mention stability and favorable relationships with adults, it is extremely important for the young person to feel that he belongs to a community, which trusts him and positively evaluates his performance. (Chadwick, 2014) Baumeister and Leary, then Newton, highlight the stressors, that occur in connection with motives and goals, which mostly appears in the field of social relations: the need for social interaction, evaluation, appreciation by others, and performance concerns. (Sarafino & Smith, 2011)

In connection with influencing depression, anxiety, and psychological flexibility, Acceptance and Commitment (ACT) programs, with growing evidence regarding transdiagnostic effects are considered contextual behavioral change methods that focus on facilitating psychological processes (Lundgren, Reinebo & Fröjmark, 2021). Psychological flexibility, the central theoretical construct of ACT, has six items. Four of these were also identified as elements of total awareness (present moment, acceptance, defusion, and the self as context). The other two components (values and committed action) can be classified as behavior change processes. (Ciarrochi et al., see Baer, 2018). In a meta-analysis conducted in investigating the effectiveness of acceptance and commitment therapy was demonstrated, that increased psychological flexibility was associated with decreased levels of depression and anxiety (French, Golijani-Moghaddam & Schröder, 2017). In the same time, mindfulness practices predicts long-term reduction in neuroticism in subjects with recurrent depression by labeling the feelings, which is a very effective emotional control procedure and prevents the development of depressive symptoms (Jeffcoat & Hays, 2012; Spinhoven et al., 2017); significantly positive correlation of mindfulness with self-awareness and both with psychological well-being (Harrington, Loffredo & Perz, 2014), less stress and anxiety (Jeffcoat & Hays, 2012; Bullis et al., 2014), level of life satisfaction (Taylor et al., 2014), positive effect of mindfulness training on self-esteem (Pepping, O'Donovan & Davis, 2013). Aldao and Plate (2018) draw attention to the flexibility of emotion regulation, which results a more effective adaptation for the individuals to constantly changing circumstances.

2. Methods

2.1. Study Procedure

2.1.1. Participants

Our sample of 431 participants consisted of clinically healthy teenagers who were selected from various schools in Transylvania, Romania. The participants were 15- and 20-years old students, their average age was 17.11 years (SD = 1.22), 46.8% were boys and 53.2% girls.

44.1% of the total sample made up the study group (N=190), the other 241 participants took part in the study as a control group and were put on a waiting list. The test and control group filled out the questionnaires in printed form, under the supervision of the form-master and the trainer.

2.1.2. Intervention

In the research we measured the influence of the mindfulness based "In This Moment" stress management program, introduced by Strosahl and Robinson (2015), on psychological flexibility, life satisfaction, the five basic components of mindfulness, as well as the level of depression, stress, anxiety and the presenting somatic symptoms.

During the training sessions, the study group received the description of the relevant step, as well as the related exercises, both in print and online version. We created a group on a social media site, where we could send the descriptions online and discuss any questions they might have. At the same time, their feedback about the exercises was sent on an internet interface. The "In This Moment" training program based on total awareness has five steps, during which we develop different skills (observation, description, detachment, compassion and full awareness) with the help of exercises, in order to apply them in different areas of our lives: in relationships, at work, at school, in any area of our daily life. (Strosahl and Robinson, 2015) The steps of stress management training based on total awareness are presented in table. 1

Table 1. The structure of "In This Moment" stress management training

The steps of "In this Moment" stress-management training program	**Exercises**
First step: Observing	7 exercises
Second step: Describing	5 exercises
Third step: Defusion	8 exercises
Fourth step: Self-compassion	9 exercises
Fifth step: Act mindfully	8 exercises
First application: Get to know your everyday helpers and your worries, your annoyances	5 exercises
Second application: The calm and efficient worker	6 exercises
Third Application: Fully Conscious and Balanced daily routines	6 exercises
Fourth Application: Developing Fully Conscious Relationships	7 Exercises

In the research, we compared the study and control groups based on the pre- and post-test results of the questionnaires, as well as the results of the follow-up test of the study group, illustrated in Figure 1

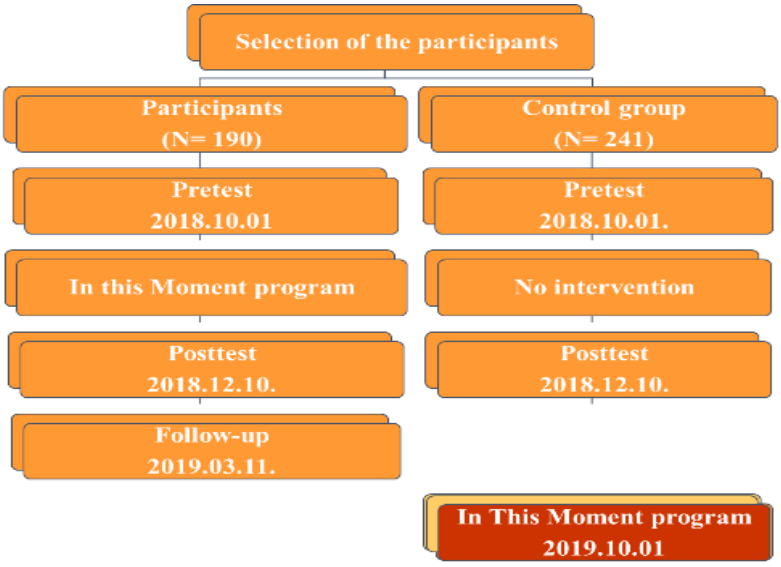

Figure 1. Study design

2.1.3. Measures

The study and the control group completed a pre- and post-test. In the case of the study group, a 3-month follow-up was carried out using the same

test packages. We put a test package at their disposal, which consisted of the following questionnaires:

2.1.3.1. *Acceptance and Action Questionnaire-II (AAQ-II),* which measured the psychological flexibility and experiential avoidance along 7 statements. The subjects evaluated the statements on a seven-point Likert scale according to the extent to which the given statement applies to them personally. (Bond et al., 2011). Based on the results of Karekla and Panayiotou (2011), it can be concluded, that experiential avoidance and coping proved to be predictive for determining psychological distress and well-being.

2.1.3.2. *Satisfaction with life scale (SWLS)* contains five statements and the persons had to rate their level of agreement on a seven-point Likert scale. (Diener et.al., 1985)

2.1.3.3. *Depression, Anxiety and Stress Scale-21 (DASS-21)* is a quantitative measure of distress, which measures the level of depression, anxiety and stress. Based on the results, people can be classified into five categories for all three subscales: normal, mild, moderate, severe and extremely severe levels of depression, anxiety and stress. The questionnaire contains 21 items, during which the persons have to evaluate the statements regarding the last week (0= did not happen to me at all; 3= happened to a great extent or most of the time) (Henry & Crawford, 2005)

2.1.3.4. *The Five Facet Mindfulness Questionnaire (FFMQ)* was developed by Baer et al. (2006) and contains 39 items related to five conceptualized elements of total awareness, during which we evaluate: observation, description, conscious action, and lack of judgments and reactivity to internal experiences.

2.1.3.5. By completing the *Ghent Multidimensional Somatic Complaints Scale (GMSCS),* subjects must rate 18 symptoms in the past four weeks in terms of frequency and intensity on a scale from 0 to 7 (Frequency rating: 0=never, 7=constantly; Rating of strength: 0=not at all, 7=unbearable) Contains five subscales: Pain in the head, shoulders, Stomach, Cold-hot sensation, Feelings in the heart, and Fatigue perception (Beirens & Fontaine, 2009)

2.1.3.6. *Cheek and Buss Shyness Scale* contains 14 items, during which the students determine how typical the respective statement is of their emotions or behavior on a 5-point Likert scale. (Cheek & Melchior, 1990)

2.1.3.7. The *Spielberg Test Anxiety Scale* contains 20 statements that children use to describe themselves and they must rate the statements according to frequency. (1=almost never, 2=sometimes, 3=often, 4=always) (Vargha & Szabó, 2011)

2.2. Results

The data were analyzed using SPSS 22.0, parametric tests were chosen to compare the differences in scores (Student's t test) and Pearson's r correlations were computed for the association of variables.

2.2.1. Correlations

A lower level of psychological flexibility and satisfaction with life strongly correlate with a precarious psychological health, assessed in our investigation (depression, anxiety, stress, somatization, shyness), whereas the level of mindfulness is negatively associated with psychopathology and positively associated with both flexibility and satisfaction with life, as presented in table 2.

Table 2. Correlations at pretest

	1	2	3	4	5	6	7	8	9
1. AAQII									
2. SWLS	.478**								
3. Depression	.734**	.461**							
4. Anxiety	.531**	.308**	.637**						
5. Stress	.642**	.375**	.695**	.643**					
6. DASS21	.731**	.438**	.895**	.862**	.878**			.	
7. Mindfulness	-.586**	-.360**	-.581**	-.391**	-.486**	-.556**			
8. Somatization	.568**	.340**	.641**	.655**	.664**	.742**	-.409**		
9. STAI	.644**	.335**	.536**	.504**	.541**	.600**	-.486**	.548**	
10. Shyness	.470**	.296**	.437**	.290**	.376**	.426**	-.495**	.357**	.459**

**. Correlation is significant at the 0.01 level (2-tailed).

2.2.2. Comparisons

2.2.2.1. Comparison of differences in measures between experimental and control samples

The mean of differences in scores between pre and post-test proved to be significantly different for depression, mindfulness and somatic symptoms after the implementation of the intervention program. Thus, the average level of depression and the subscales of Fatigue, Cold-Hot Feeling and Somatization decreased after the intervention for participants in the experimental sample. Also, the average level of mindfulness increased compared to the levels of these characteristics in the control sample, which results we summarized in table 3. Though not statistically significant, all the differences in scores proved to be modified by the intervention in the post-test assessment phase in the case of the experimental sample, compared to the control sample.

Table 3. Differences in measures between participants and control sample

		Mean	**Std.dev.**	**t**	**p**	*
DASS21 Depression subscale	Experimental group	-.5745	3.72680	-2.134	.034	*
	Control group	.3100	3.79948			
FFMQ	Experimental group	1.8444	11.28654	2.763	.006	**
	Control group	-1.5619	10.79622			
FFMQ Describing subscale	Experimental group	1.1986	4.36417	2.711	.007	**
	Control group	-.1741	4.77227			
GMSCS Fatigue subscale	Experimental group	-1.0347	5.60396	-2.062	.040	*
	Control group	.0974	4.49693			
GMSCS Hot-cold subscale	Experimental group	-1.4583	3.99103	-2.865	.004	**
	Control group	-.3077	3.38701			

* p<.05, ** p<.01.

2.2.2.2. Comparison of pre- and post-test in the experimental sample

Some of the characteristics significantly improved after the intervention in the experimental sample. A significantly higher level of psychological flexibility was reported by the participants after the intervention and a slight improvement of their level of mindfulness, presented in table 4. Examining the pre- and post-measurement of the study group, we conclude that the significant difference can be attributed to the intervention.

Table 4. Pre- and post-test measurements of the participants

			Mean	**Std.dev.**	**t**	**p**	*
AAQII	Experimental group	pretest	21.028	8.5142	3.099	.002	**
		posttest	19.168	8.1802			
FFMQ describing subscale	Experimental group	pretest	24.7589	6.61373	-3.261	.001	**
		posttest	25.9574	6.43081			

* p<.05, ** p<.01.

2.2.2.3. Comparisons of post-test and the follow-up in the experimental sample

97 students from the experimental group participated in the follow-up study. We used Student's T-test, which allows us to conclude on the changes that took place within the group between the two measurements: in our case, between the post-test and the three-month follow-up. If a significant difference was found between the averages of the post- and follow-up test in the study group, then this is most likely due to the persistence of the changes that appear because of the intervention.

Looking at the results, we can say that the positive change in almost all variables was maintained, and in many cases reached the level of significance during the follow-up: psychological flexibility increased significantly, vulnerability to depression, anxiety and stress decreased, the overall level of awareness increased, and the level of test anxiety also decreased. A study conducted by Bullis et al. (2014) explores the effect of mindfulness as a trait on emotional regulation, and they conclude, that

factors related to the full awareness trait are associated with less distress and anxiety.

The comparison and significant change of the post and follow-up test scores of the Acceptance and Action Questionnaire, DASS21 integrally and the Stress subscale, FFMQ Non-judgement subscale, GMSCS Fatigue and Hot-cold subscales and Spielberg Test Anxiety Scale is illustrated in table 5.

Table 5. Results of follow-up study

		Mean	**Std.dev.**	**t**	**p**	*
AAQII	Post-test	19.729	8.5045	3.666	.000	**
	Follow-up	17.865	7.1534			
DASS21	Posttest	20.785	12.5055	2.316	.023	*
	Follow-up	18.914	10.9352			
DASS21 Stress subscale	Post-test	7.9175	4.26876	2.956	.004	**
	Follow-up	6.9794	3.71085			
FFMQ Nonjudgement subscale	Post-test	26.3333	7.19600	2.124	.036	*
	Follow-up	27.3646	7.02345			
GMSCS Fatigue subscale	Post-test	7.9381	6.20117	2.499	.014	*
	Follow-up	6.8247	5.71002			
GMSCS Hot-cold subscale	Post-test	6.1649	4.54991	2.527	.013	*
	Follow-up	5.1959	3.92545			
Spielberg Test Anxiety	Post-test	45.194	11.6731	2.164	.033	*
	Follow-up	43.112	11.7569			

* p<.05, ** p<.01.

3. Discussions

The results of the study show that a mindfulness-based stress management intervention, namely the "In This Moment" program positively affects vulnerability to depression, stress, test anxiety, psychological flexibility, conscious action, and the frequency and strength of the experienced somatic symptoms. Our first hypothesis, according to which a significant difference can be shown between the experimental and control group in relation to the pre- and post-results of the questionnaires and scales: DASS-21 Depression subscale, the FFMQ scale, and especially the

Description subscale, as well as the two subscales of the GMSCS seems to be confirmed.

The measurement results treated as dependent variables has changed in a positive direction: vulnerability to depression, anxiety, and somatization decreased and the consolidation of the basic components of total awareness, seems to be confirmed. The three-month follow-up study demonstrated the durability of the changes: the positive influence of the stress management program continued to show an increasing trend in psychological flexibility, and mindfulness and a decreasing trend in depression, anxiety, stress, somatic symptoms, exam anxiety, and even in terms of some subscales of stress and somatization. Our assumption was not confirmed in the case of satisfaction with life and the shyness scale.

4. Conclusions and future research

The present study shows that mindfulness stress-management programs have significant positive effects on psychological flexibility, stress, anxiety and somatic symptoms. The encouraging results with mindfulness and ACT based training programs focusing on stress-management and nomophobia reduction (Barabási-Madár, Costea-Bărluţiu & Vargha 2019) suggest that it is worth considering expanding similar research programs also in the sport area with objective performance measurements.

The results of research in the area of the enhancement of performance and the prevention of performance anxiety for athletes and the presented data provide some initial promise for mindfulness and ACT based programs as potential strategies for the athlete's well-being and performance.

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