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Original Article

The Effects of Mindfulness Training in the Physical Education on Intention to Physical Activity, Mental Health and Academic Performance among High-School Students

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Abstract

Introduction: Existing studies indicate that mindfulness can effectively enhance emotional education, mindfulness, awareness skills, self-efficacy, self-regulation, and reduce stress levels in students.
Objective: This research was designed to further investigate this issue by examining the impact of a mindfulness intervention program in the physical education (PE) on high school students' intention to physical activity (PA), mental health, and academic performance.
Methods: The current study employed a semi-experimental approach with an applied purpose, utilizing a pre-test and post-test design in conjunction with a control group. The participants were 45 high-school students aged 15 to 18 years old. They were randomly assigned into experimental (n=24) and control (n=21) groups. Intention to PA and mental health were measured using standard questionnaires. Academic performance was measured using GPA. The experimental group underwent a mindfulness training program for 12 weeks (one sessions per week, totaling 12 sessions) in the interval between the first and second semester. Dependent and independent t-tests using SPSS version 26 were employed to perform the intra- and inter-group comparisons.
Results: Students of both groups were at mild level of depression, anxiety and stress before exposing into the training protocol. Moreover, the findings indicate a significant increment in the intention to PA, mental health (including depression, anxiety and stress) and academic performance among the mindfulness training' subjects during the post-intervention period (P<0.001).
Conclusion: Given the goal of increasing student participation in PA, the use of mindfulness techniques in PE classes can be seen as a valuable supplement.

Keywords: Mindfulness, Physical Education, Mental Health, Exercise, Adolescent

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1. Introduction

Mindfulness is the practice of being fully present and aware of the current moment without judgment (1). Originally developed as a clinical technique to address conditions like depression and anxiety, mindfulness allows individuals to cultivate a new relationship with their internal thoughts and external circumstances (2). By focusing on moment-to-moment awareness and responding to emotions consciously rather than reactively, mindfulness can help regulate emotional responses by engaging the higher cognitive functions of the brain (3). Studies have indicated that individuals with higher levels of mindfulness tend to experience fewer negative automatic thoughts and feel more empowered to break free from them (2,4,5). Research has also shown that people seek to enhance their performance in various tasks by incorporating techniques that target psycho-social factors (3,4). Given the strong connection between mindfulness and awareness, reflecting on our current state of awareness can shed light on the complexity of defining consciousness (6-8). Consciousness is the understanding of one's own existence in relation to the environment, encompassing the awareness of our mental processes and the sense of self. Consciousness is often defined as the personal experience of our own existence in relation to the world around us during social interactions (6,7). According to this definition, consciousness plays three key social roles: 1) recognizing one's actions, leading to a sense of accountability towards oneself and others; 2) acknowledging one's choices, enabling us to rationalize decisions and motivations; and 3) recognizing one's emotions, contributing to a shared understanding of reality. Through awareness, uncertainty is minimized, allowing for access to comprehensive information (9,10). The level of consciousness is contingent upon an individual's capacity to synthesize various sources of information and perceive them holistically (9).

Over the past few decades, there has been a rise in

the utilization of mindfulness-based interventions aimed at enhancing mental and physical well-being by teaching mindfulness techniques. Mindfulness, a unique form of awareness developed by Kabat-Zinn, entails children and adolescents attentively observing the present moment with compassion and interest, and subsequently making conscious decisions on how to respond thoughtfully rather than impulsively (6,8-10). Several studies, primarily focusing on adults, indicate a correlation between mindfulness and mental well-being (11-16). Despite the variability, symptoms of neurosis tend to decrease (17-20). While the majority of mindfulness interventions and studies have centered on adults, there has been a noticeable increase in utilizing these techniques with children in recent years. Findings from some of these studies suggest that mindfulness-based interventions can reduce attention deficit hyperactivity disorder (ADHD) symptoms, diminish aggressive and confrontational behaviors in children, and alleviate symptoms of depression and anxiety, ultimately enhancing mental health in children (21-26).

Physical education (PE) is an essential part of the general education system, playing a crucial role in promoting and maintaining the health and well-being of students through practical movement (27-29). By focusing on the five dimensions of physical, emotional, intellectual, social, and spiritual development, the PE curriculum aims to help students achieve positive outcomes (30-32). Emphasizing the acquisition and maintenance of health and well-being, along with basic sports skills, not only enriches students' leisure time but also serves as a platform for nurturing talented athletes and attracting elite students to competitive sports (27,29,33,34). Numerous studies have explored the influence of different interventions in PE on students' motivation and their intention to engage in physical activity (PA) (35). The majority of these studies have been grounded in theoretical frameworks like achievement goal theory and self-determination theory, shedding light on the significance of motivation in fostering PA. Additionally, other line of studies has delved into the effects of physical and psychological interventions in PE (such as yoga, cognitive-behavioral techniques, social support, resilience training, etc.) on students' physical and psychological well-being, demonstrating that these interventions enhance physical aspects (e.g., physical fitness, participation in PA, etc.) and mental aspects (e.g., depression, anxiety, happiness, academic performance, etc.) of school students (36-38). Nevertheless, the implementation of mindfulness in PE has not been widely explored. Existing studies indicate that mindfulness can effectively enhance emotional education, mindfulness, awareness skills, self-efficacy, self-regulation, and reduce stress levels in students (39).

Due to the fact that PE course as a fundamental component of the school curriculum encompasses instruction on growth, body strengthening, and maintenance of physical fitness, it can enhance cognitive abilities and movement skills through a variety of exercises, training sessions, and PA, including martial arts and aerobics. Thus, participation in PE can be considered as a necessity for school-children to gain health-related outcomes. In addition, due to the fact that finding the ways for improving the quality of PE is a necessity, this research was designed to further investigate this issue by implementing a mindfulness intervention alongside the regular PE curriculum. Overall, the aim of the study was to examine the impact of a mindfulness intervention program in PE on high school students' intention to PA, mental health, and academic performance.

2. Methods

2.1. Participants

The current study employed a semi-experimental approach with an applied purpose, utilizing a pre-test and post-test design in conjunction with a control group. The study focused on male high-school students aged 15 to 18. Four schools were randomly selected to choose participants, and 50 male students were chosen using a convenience sampling method. The sample size was determined to be sufficient through the use of G*Power software, which indicated a significance level of 0.05 and a power test of 0.95. The research samples were then divided into two groups, the experimental and control groups, each consisting of 25 students. It is worth noting that the number of participants in the groups decreased during the research process due to lack of motivation, not filling the questionnaires completely, and irregular participation in training sessions. As a result, the number of final samples whose data was analyzed decreased to 45 students, with 24 participants in the experimental group and 21 participants in the control group. Prior to commencing the research practical stages, the purpose and method of the research were explained to the participants and their parents. Discussions were held regarding PA and mental health in children, emphasizing the importance of PE in improving it, and written consent was obtained from the parents of the students. Subsequently, the students underwent a health examination by a specialist doctor and received a certificate of health. During the initial evaluation, the requirements for participating in the study were: 1) being students in high-school, 2) not having any physical or mental disorders, 3) not taking any special medicine, and 4) absence of short-term physical and mental damage. If any of these conditions are not met, the individual is excluded from the research study.

2.2. Measures

2.2.1. Intention to Physical Activity

The assessment of the intention to engage in PA was conducted through two questions, which were evaluated using a Likert scale ranging from strongly disagree (1) to strongly agree (7). The original version of this questionnaire demonstrated a high level of reliability, indicated by a Cronbach's alpha coefficient of 0.87 (40). The validity of the Persian adaptation of this instrument was established by nine experts, yielding a CVI of 0.92 and a CVR of 0.90. In this study, the reliability of the questionnaire was found to be robust, with a Cronbach's alpha coefficient of 0.92.

2.2.2. Mental Health

The Depression, Anxiety, Stress Scale-21 (DASS-21) was employed to evaluate mental health (41). This self-assessment instrument is structured into three distinct subscales, each aimed at quantifying the negative emotional states associated with depression, anxiety,

and stress. Each subscale comprises seven items that pertain to the week prior to assessment and are rated using a four-point Likert scale, ranging from 'not at all' (0) to 'most of the time' (3). Elevated scores indicate increased symptom severity. In the context of this study, the DASS-21 demonstrated a Cronbach's alpha of 0.90, and its validity was corroborated by nine experts, yielding a CVI of 0.88 and a CVR of 0.90.

2.2.3. Academic Performance

In order to check and measure the academic performance of the students, the academic average of the first and second round was used. In this research, the grade point average of the first round was recorded as a pre-test of academic performance. Then, all the students of the experimental group were exposed to mindfulness practice in the interval between the first and second semester. In the end, the average grades or average grades of the second round were considered as the post-test of academic performance.

2.3. Procedure

The research commenced with the necessary coordination with the Education, followed by obtaining permission to proceed. The pre-test encompassed intention to PA and mental health questionnaires was performed one week before implementing the training protocol. Then, the experimental group underwent a mindfulness training program for 12 weeks (one sessions per week, totaling 12 sessions) in the interval between the first and second semester. The mindfulness program was introduced over the course of 12 consecutive PE sessions, with one session per week. During these sessions, the individual leading the study conducted a 10-minute guided meditation as part of the relaxation phase. This meditation practice centered on the awareness of breath and bodily sensations, alongside the non-judgmental observation of thoughts. Participants were encouraged to visualize natural environments to enhance feelings of presence and serenity. The instructors leading the sessions had prior experience as facilitators and were knowledgeable in mindfulness techniques. One week following the training protocol, a post-test assessment was carried out in identical conditions to the pretest to evaluate the impact of the intervention. The control group, who did not participate in mindfulness training, continued with their usual PE activities during this time frame.

2.4. Statistical Analysis

The research employed mean and standard deviation to characterize the variables under investigation. The Kolmogorov-Smirnov test was utilized to evaluate the normality of the data distribution, confirming that all variables followed a normal distribution (P>0.05). Intra- and inter-group comparisons were conducted using dependent and independent t-tests via SPSS version 26. A significance threshold of 0.05 was established, and the data analysis was carried out using SPSS version 26.

3. Results

3.1. Intention to Physical Activity

Table 1 displays the intention to PA scores before and after the intervention for both the experiment and control groups. The findings indicate a significant increment in the intention to PA scores among the mindfulness training' subjects during the post-intervention period (P<0.05).

Table 1. Pre- and Post-Intervention Intention to Physical Activity Scores in the Experimental and Control Groups.

Variable	Phase	Group		Inter-Group Comparisons
		Mindfulness M±SD	Control M±SD	
Intention	Pre-test	3.05±0.53	3.11±0.48	t=0.1.024 P=0.634
	Post-test	3.86±0.65	3.07±0.42	t=6.584 P<0.001
	Intra-Group Comparisons	t=5.847 P<0.001	t=0.057 P=0.957	

3.2. Mental Health

Table 2 displays the mental health components' scores before and after the intervention for both the experiment and control groups. First of all, it should be stated that students of both groups were at mild level of depression (Mean=12.13±1.68 and 12.18±2.13, respectively for the experiment and control groups), anxiety (Mean=8.54±1.79 and 8.60±1.88, respectively for the experiment and control groups), and stress (Mean=16.58±2.86 and 16.69±2.97, respectively for the experiment and control groups) in the pretest (before exposing into the training protocol). In addition, the findings indicate a significant reduction in depression, anxiety, and stress scores among the mindfulness training's subjects during the post-intervention period (P<0.001).

Table 2. Pre- and Post-Intervention Mental Health Components' Scores in the Experimental and Control Groups.

Variables	Phase	Group		Inter-Group Comparisons
		Mindfulness M±SD	Control M±SD	
Depression	Pre-test	12.13±1.68	12.18±2.13	t=0.847 P=0.769
	Post-test	10.56±1.52	12.24±2.36	t=-5.441 P<0.001
	Intra-Group Comparisons	t=-4.569 P<0.001	t=-0.124 P=0.786	
Anxiety	Pre-test	8.54±1.79	8.60±1.88	t=0.032 P=0.910
	Post-test	7.29±1.77	8.57±1.76	t=-8.719 P<0.001
	Intra-Group Comparisons	t=7.142 P<0.001	t=0.041 P=0.961	
Stress	Pre-test	16.58±2.86	16.69±2.97	t=-0.663 P=0.759
	Post-test	13.08±2.71	16.47±2.88	t=-5.441 P<0.001
	Intra-Group Comparisons	t=6.669 P<0.001	t=0.049 P=0.864	

3.3. Academic Performance

Table 3 displays the academic performance's scores before and after the intervention for both the experiment and control groups. The findings indicate a significant enhancement in academic performance's scores among the mindfulness training's subjects during the post-intervention period (P<0.001).

Table 3. Pre- and Post-Intervention Academic Performance's Scores in the Experimental and Control Groups.

Variable	Phase	Group		Inter-Group Comparisons
		Mindfulness	Control	
		M±SD	M±SD	
GPA	Pre-test	16.75±1.25	16.50±1.50	t=-0.009 P=0.921
	Post-test	18.00±1.50	16.25±1.50	t=4.557 P<0.001
	Intra-Group Comparisons	t=-9.586 P<0.001	t=0.021 P=0.986	

4. Discussion

Existing studies indicate that mindfulness can effectively enhance emotional education, mindfulness, awareness skills, self-efficacy, self-regulation, and reduce stress levels in students. This research was designed to further investigate this issue. It involved implementing a mindfulness intervention alongside the regular PE curriculum. Overall, the aim of the study was to examine the impact of a mindfulness intervention program in PE on high school students' intention to PA, mental health, and academic performance.

The findings indicate a significant increment in the intention to PA scores among the mindfulness training' subjects during the post-intervention period. These findings are in line with those of previous studies on children and adults (22,25,26), indicating that participating in mindfulness training within PE may enhance intention to PA in high-school students. To interpret these findings, it can be stated that mindfulness is a strong predictor of internal locus of control, indicating that individuals with higher mindfulness skills tend to have a greater sense of internal control (12,13). The relationship between mindfulness and external locus of control, on the other hand, is not found to be significant. Through the practice of relaxation techniques, individuals are able to cultivate a deeper awareness of the present moment and its impact on their mental well-being. Those with heightened self-awareness are more likely to possess confidence in their abilities, leading to reduced anxiety levels (22,23,25). This increased self-awareness also enables individuals to exhibit greater responsibility, emotional control, and honesty. These factors collectively contribute to a decrease in anxiety and improved self-management. By engaging in an internal dialogue, individuals can foster a positive mindset that empowers them to take on new challenges, ultimately boosting their self-confidence. In essence, mindfulness plays a crucial role in reshaping negative thought patterns and empowering individuals to take charge of their emotions, behaviors, and life circumstances, thereby recognizing the role of their own efforts in both failures and successes (17,18,20). The development of such an attitude leads individuals to depend on their own skills and efforts, enhancing their self-confidence and preventing them from taking a passive stance towards life's challenges. Through this approach, the negative perceptions and illogical beliefs held by students regarding the lack of control, unlucky, and unpredictability of life events can be corrected and changed, subsequently boosting self-confidence and a sense of control (21,22,24). This process is influenced by the environment in which these individuals find themselves. The outcome of adopting such an attitude is the internalization of sense of control and the attribution of success to one's abilities. Essentially, this technique encourages individuals to observe their thought processes, recognize and acknowledge their critical and judgmental thoughts without dwelling on them, and underscores the importance of self-acceptance, which may prompt a reassessment of dysfunctional beliefs. These combined factors create an environment that fosters a greater intention towards autonomous activities among students, thereby increasing their engagement in PE lesson's activities (which primarily involve PA) (25,26).

Moreover, the findings of this study indicate a significant reduction in depression, anxiety, and stress scores among the mindfulness training's subjects during the post-intervention period. These results are consistent with previous research results on children and adults (11-16,21-26). To interpret these findings, it can be stated that the human mind processes and analyzes events, leading to stable reactions and emotions. Individuals with lower mental health tend to dwell on negative and uncomfortable thoughts, further impacting their mental well-being (12,17). High mindfulness, on the other hand, enables individuals to focus on neutral stimuli and cultivate deliberate awareness. By enhancing one's awareness of the present moment and redirecting attention to efficient information processing, mental health can be improved. Understanding the profound peace that mindfulness brings allows individuals to realize that peace, love, and joy are inherent within themselves (18,21). By tapping into these inner resources, individuals can transcend suffering and find deeper meaning in life, not just for themselves but for those around them as well. In the current moment, the key technique utilized in this approach is to fully embrace the present moment. Practicing mindfulness involves allowing all thoughts, emotions, and reactions to arise without attaching oneself to them. It is important not to identify oneself with these thoughts and emotions, but rather to observe them without judgment (22,25,26). A mindful individual recognizes that thoughts are separate from the reality of life, and that they do not define one's true essence. By practicing mindfulness, individuals can better manage negative emotions, develop healthier coping mechanisms, and view challenges as opportunities for personal growth rather than threats. Whether positive or negative, thoughts are simply thoughts and not a reflection of reality. While one cannot completely control their

thoughts, they can choose to observe them from a distance (4,8,13). This sense of detachment can lead to a greater sense of self-control. Mindfulness fosters an attitude of acceptance and compassion towards oneself, others, and the world. It involves accepting internal experiences without trying to change or avoid them. Compassion, characterized by unconditional love and acceptance, allows individuals to embrace all aspects of themselves and others, regardless of whether they are pleasant or not. Cultivating compassion is seen as a means of overcoming negative emotions and building meaningful connections with others (1,5,18,21).

The results of this study indicated a significant enhancement in academic performance's scores among the mindfulness training's subjects during the post-intervention period. These findings are in line with those of previous studies (17-20). To interpret these findings, it can be stated that mindfulness enhances awareness and attention, encompassing non-judgment, acceptance, non-reactivity, ability to describe and analyze experiences. It is considered a form of meditation that cultivates self-knowledge and skill (13,14). Mindfulness skills involve coping mechanisms, cognitive change, self-management, relaxation, and acceptance. This means that students can better confront educational challenges such as academic procrastination and anxiety, by positively altering their cognitive patterns, managing themselves, and effectively dealing with the problem. Consequently, students who have developed mindfulness skills are expected to demonstrate improved self-control and subsequently achieve better academic performance (20,21).

This research encountered specific limitations, notably its exclusive focus on male adolescents. Consequently, the findings cannot be applied to obese female adolescents. It is therefore recommended that future studies address these limitations and explore the impact of Mindfulness training in PE on the physical and mental health of obese teenage girls.

4.1. Conclusion

The study demonstrated that integrating mindfulness training into PE lesson in schools can enhance the quality of PE for students. The research findings indicate that this integration can lead to positive outcomes such as improved mental health and academic performance. Additionally, given the goal of increasing student participation in PA, the use of mindfulness techniques in PE classes can be seen as a valuable supplement. Therefore, it is recommended that PE teachers consider implementing mindfulness-based interventions. Furthermore, future research could explore other interventions, such as meditation and cognitive-behavioral techniques, to further enhance the impact of PE lessons.

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Footnotes

Authors' Contribution: This study was carried out solely by the corresponding author.

Conflict of Interests: The researcher confirms that there is no conflict of interests in this study with any participant.

Data Availability: The data that support the findings of this study are openly available upon request from the corresponding author.

Ethical Approval: Approval for this study was obtained from the university. The author confirms that all steps and requirements of this study comply with ethical guidelines. Participants were informed about the characteristics of the study and gave written informed consent.

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