

# The effects of mindfulness pedagogy on students' mindfulness states and motivations in university physical education

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**BACKGROUND:** *Mindfulness has been shown to have positive effects on students' cognitive function, social interaction, and mental health. In the context of physical education, being aware of bodily and mental sensations during skill learning is essential for motivating participation.*

**PURPOSE:** *This study was to investigate the impact of mindfulness pedagogy on motivation in physical education using a quasi-experimental design.*

**METHODS:** *The participants in four university physical education classes were randomly assigned to either an experimental group (n = 69) or a control group (n = 68). Both groups underwent 18 weeks of physical education courses, with mindfulness pedagogy being incorporated into the classes of the experimental group. The data were analyzed using mixed-design two-way ANOVAs to assess differences between groups and over time.*

**FINDINGS:** *The results reveal a significant interaction between groups in terms of mindfulness states (mind and body) and amotivation. These findings suggest that mindfulness pedagogy can improve students' awareness of their current mental and physical state, leading to enhanced motivation to participate in physical education courses.*

**CONCLUSIONS:** *Mindfulness plays a significant role in helping students establish and achieve goals within physical education. These adjustments require students to engage in cognitive focus regarding their commitment to physical activity while simultaneously managing other responsibilities. By cultivating mindfulness pedagogy, individuals can effectively align their actions with their internalized val-*

This work was supported by Dr. Fong-Jia Wang through the Ministry of Education Teaching Practice Research Program, Taiwan (award number: PGE1110003).

The authors have no conflicts of interests to declare.

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*ues, resulting in a reduction in learned helplessness, including feelings of ineffectiveness, lack of purpose, or internal resistance toward an action.*

KEY WORDS: physical activity, mindfulness state, college student, design of experiments.

## Introduction

The concern regarding the potential health problems faced by young adults due to insufficient physical activity has been emphasized (World Health Organization 2020). Physical education plays a crucial role in promoting life-long engagement in physical activities by enhancing students' fitness and developing basic motor skills related to health (Fairclough, Stratton, and Baldwin 2002; García-Hermoso et al. 2020; MacNamara et al. 2011; Vasconcellos et al. 2020). However, many students have negative experiences in physical education classes, which not only leads to amotivation and a weakened physical self-concept (Choi et al. 2023; Manzano and Spray 2021), but also impacting teaching quality and student learning outcomes (Wang et al. 2020). To address this issue, incorporating mindfulness into physical education can be a valuable approach to capture students' attention and awareness, thus supporting the development of their intrinsic motivation during physical activities (Cox et al. 2016a). Mindfulness, defined as the practice of 'moment-to-moment awareness, without judgmental cognitive processes' (Kabat-Zinn 2003), has expanded its application to educational settings (Schonert-Reichl et al. 2015). By cultivating attitudes such as 'non-judgment, patience, beginner's mind, trust, non-striving, acceptance, and letting go' (Kabat-Zinn 2009), mindfulness can be effectively incorporated into physical education. Particularly, when students pay greater attention to their physical and mental states during physical activity, they are more likely to experience pleasure throughout the process (Cox et al. 2016a). This study investigates how mindfulness pedagogy in physical education can enhance intrinsic motivation and support long-term positive behavior change (Cox et al., 2016a 2016; Ullrich-French et al. 2017), focusing on the physical sensations during activity. Highlighting the role of mindfulness in fostering students' motivation, the research aims to improve cognitive and emotional outcomes, contributing to lifelong physical activity.

## Mindfulness and Motivation

This study grounded in the self-determination theory (SDT) to investigate how individuals engage in mindfulness during physical education

lessons to develop heightened awareness of their internal experiences and external circumstances (Ryan and Deci 2017). Mindfulness, by promoting an open and non-defensive state of awareness, empowers individuals to make thoughtful decisions and recognize actions that align with their true selves (Cox et al., 2016a; Gould and Carson, 2008). This process increases the likelihood of integrated self-functioning as individuals consider all relevant factors when making choices (Brown et al. 2007; Tanay & Bernstein, 2013). Notably, mindfulness practices can play a pivotal role in shifting individuals' motivation from less adaptive forms, such as extrinsic motivation driven by external rewards and recognition, to more adaptive forms, characterized by intrinsic motivation (Ludwig, Brown, and Brewer 2020). This intrinsic motivation stems from internal desires for personal satisfaction, growth, and fulfillment (Ryan and Deci 2017). Mindfulness, by fostering a heightened state of awareness and presence, enables individuals to better recognize and align with their internal values and motivations, diminishing the reliance on external validation (Cox et al., 2016a). This transition not only enhances personal autonomy but also cultivates a deeper sense of purpose and satisfaction in activities, ultimately strengthening the argument for incorporating mindfulness into various domains to promote more adaptive motivational orientations.

### **Mindfulness in Physical Education**

Previous research has chiefly focused on primary and secondary school physical education, leaving a need for research in the university context. Incorporating mindfulness into physical education classes has shown various benefits in previous studies. These benefits include improved student behavior, enhanced stress management skills, and increased self-acceptance (Mulhearn, Kulinna, and Lorenz, 2017). Additionally, mindfulness has been found to be effective in reducing emotional and behavioral problems, anxiety, and depression scores among high school physical education classes (Joyce et al., 2010). Similar positive outcomes were observed when mindfulness was integrated into yoga classes for elementary and middle school students, resulting in improvements in social interaction, focus, stress management, confidence, and self-control abilities (Butzer et al., 2015).

University students often experience academic stress, and incorporating mindfulness pedagogy into physical education classes can help them develop effective coping strategies and a positive mindset to manage stress in a healthy manner. Studies have shown that mindfulness yoga classes in physical education settings can significantly reduce negative stress factors and

emotional distress among high school students (Noggle et al., 2012). Therefore, incorporating mindfulness practices into university physical education programs could potentially enhance students' self-acceptance and mitigate adverse stress levels. This is particularly important as students may lack confidence in learning motor skills due to past negative experiences. Mindfulness promotes self-acceptance, enabling individuals to accept mistakes, reduce negative thoughts, and explore new solutions to problems encountered during sports activities (Carson and Langer, 2006; Gould and Carson, 2008). By fostering self-acceptance, mindfulness integration in physical education courses can improve students' learning outcomes and enhance their physical health. In addition to stress management and self-acceptance, it can also enhance movement awareness, learning motivation, and positive emotional experiences. Mindfulness pedagogy increases the vividness of present experiences and strengthen the connection with one's senses, leading to a heightened sense of enjoyment and positive emotions during physical activities (Arch et al., 2016).

### **Current Study**

The study takes place within the context of Taiwan's educational reform, which mandates physical education in higher education. Despite the ongoing development of national education content and teacher training systems in Taiwan, there is a lack of research exploring the integration of mindfulness pedagogy into university-level physical education courses. Previous studies have shown the potential benefits of mindfulness in physical education, including improved student behaviors, attention, and cognitive outcomes (Cox et al., 2016a; Ullrich-French et al., 2017). Therefore, this study fills the research gap by incorporating mindfulness pedagogy into physical education programs and examines the relationship between students' mindfulness states and motivation among university students in Taiwan. This study highlights the critical role of mindfulness pedagogy in the context of physical education and its potential to enhance students' overall well-being.

Building upon successful integration of mindfulness techniques in physical education courses in Europe and America, this study builds on Kabat-Zinn's work and synthesizes mindfulness attitudes that are applicable to the Taiwanese context (Mulhearn, Kulinna, and Lorenz, 2017). The study seeks to investigate the implementation of mindfulness pedagogy within 18-week university physical education courses and provide teachers with guidelines for effectively interacting with students. The study hypothesizes

that participants in the experimental group, who receive mindfulness pedagogy, will demonstrate higher mindfulness states and intrinsic motivation, while exhibiting lower levels of introjected regulation, external regulation, and amotivation compared to those in the control group. By assessing the effectiveness of combining mindfulness pedagogy with physical education courses, this study aims to address practical teaching challenges and improve the learning outcomes.

## **Materials and Methods**

### **Participants**

A total of 150 participants completed the initial baseline survey; however, only the 137 participants who completed all surveys were included in the analyses. Consistent with the study by Cox et al.'s (2018), our sample aligns with the reference criteria for conducting experimental procedures related to mindfulness within the context of physical education curriculum, as mindfulness is considered a personal trait state. The participants in our study were first-year students enrolled in general physical education courses at a university in New Taipei City, Taiwan. Their mean age was  $18.05 \pm 0.22$  years old, with 91 male and 46 female. The participants studied in various departments, including English ( $n = 20$ ), electrical and computer engineering ( $n = 49$ ), physics ( $n = 31$ ), and economics ( $n = 37$ ).

### **Procedure**

Ethical approval was obtained from the lead author's university prior to data collection. This study utilized a quasi-experimental design. Four first-year physical education courses were randomly assigned to either the experimental group ( $n = 69$ ; male  $n = 51$ , female  $n = 18$ , mean age =  $18.07 \pm 0.26$ ) or the control group ( $n = 68$ , male  $n = 40$ , female  $n = 28$ , mean age =  $18.03 \pm 0.17$ ). In the first week of the course, the lead author explained the purpose and procedures of the study, obtained informed consent from the participants, and administered the baseline questionnaire. During September 2022 to January 2023, the experimental group engaged in 18 weeks of mindfulness-based physical education in indoor facilities, including martial arts room, table tennis court, volleyball court, and badminton court, as shown in Figure 1. The lead author, who is qualified in mindfulness guidance and sports psychology counseling, provided instruction to the experimental group. It is noteworthy that the lead author also serves as a physical education lecturer for this group. In contrast, the control group underwent 18 weeks of regular physical education. Both groups completed a post-intervention questionnaire and a learning experience survey in the 18th week. As a manipulation check, brief qualitative data were collected by gathering feedback on the students' learning experiences. Students who completed both the baseline and post-intervention received a gratitude gift valued at 25-50 New Taiwan Dollars in the form of sports drinks or stationery.

The lecturer incorporated five mindfulness techniques into the 18-week physical education classes to guide students in cultivating present-moment awareness. This study included both elective and required physical education courses offered at universities in Taiwan,

Technique	Description	Verbal Cues	When to Use	Purpose
1. Skill visualization	Students take a few breaths, check in with their body, and visualize themselves performing a skill.	Where do you feel your breath? Can you picture yourself doing the skill correctly?	Before trying a new skill.	Set the intention for class. Decrease over-hype. Calm nerves for anxious students.
2. Activity reflection	Students sit or lie down and notice how their body feels after exercising.	How does your body feel now? How did you do today? How does your mind feel now?	After an activity, or at the very end of class.	Reflection time. Learn physical body awareness. Recognize emotions connected to events.
3. Breath awareness	Students sit or lie comfortably and begin noticing their breath.	Notice where you feel the breath (nose, belly, chest). Are you breathing fast or slowly?	Anytime. This practice can be used at any point of the day or during an activity.	Notice the breath-body connection. This is important for monitoring exercise intensity, as well as anxiety and anger arising.
4. Body scan	Students lay down. Go through each part of the body and notice how it actually feels. They can even contract the muscles in that area for a brief moment before relaxing fully.	When you breathe in, feel if there is tension in this part of the body; when you breathe out, see if you can relax and let the floor hold you.	Anytime you want students to remember to focus on the physical body. This is a great way for them to notice how exercise benefits their muscles.	Body awareness. Students need to notice the difference between tense muscles and relaxed muscles. Earlier recognition of the source of their tension/anger
5. Sun salutation	See Figure 2.	Keep the movements slow and even, just like the breaths.	At the beginning of class. Anytime you need a movement break.	Linking breath to movement

Fig. 1. - Mindfulness experience teaching materials for physical education classes. "Harvesting Harmony: Mindfulness in Physical Education", Mulbearn, S. C., P. H. Kulinna, and K. A. Lorenz., 2017, *Journal of Physical Education, Recreation & Dance* 88 (6): pp.48.

covering a range of physical activities such as physical fitness, table tennis, volleyball, and swimming. Individualized prompts were provided to each student, and specific tasks were designed for each class to address student concerns or questions. During each class, students were gradually guided through mindfulness practice ranging from one to fifteen minutes, seamlessly integrating mindfulness into the curriculum phase (see Table I). At the end of each class, students engaged in three to four rounds of Sun Salutation, a mindfulness yoga practice (see Figure 2). Starting from the ninth week, once students had become familiar with simple mindfulness techniques, they were given two minutes before class to choose their preferred meditation and quietly focus on themselves without guidance. After demonstrating skill movements, the teacher encouraged students to concentrate on specific body parts during their daily skill practice and make necessary adjustments based on the specific movement (refer to Figure 1). An example of integrating stretching exercises into the routine involved engaging in sequential body movements, accompanied by abdominal breathing while verbally reciting the corresponding movement instructions.

## MEASURES MINDFULNESS STATE

This study employed two subscales from the State Mindfulness Scale for Physical Activity, namely the state of mind and state of body (Cox et al. 2016b). The state of mind subscale consisted of six items and assessed individuals' curiosity regarding their thoughts and emotions arising during physical activity experiences. Examples of state-mind items included 'I became aware of the various emotions arising within me'. The state of body subscale, also comprising six-item, evaluate individuals' awareness of bodily sensations during physical activity and their ability to maintain an open and accepting attitude toward those sensations. Examples of state of body items included 'I became attentive to the sensations in my body.'

TABLE I

Week	Course topics and mindfulness activities
1	Course topics: Physical fitness. Mindfulness activities: Mindful breathing 1 minute, mindful stretching 15 minutes, mindful breathing 1 minute, sun salutation.
2	Course topics: Physical fitness. Mindfulness activities: Mindful breathing 1 minute, mindful stretching 15 minutes, mindful breathing 1 minute, sun salutation.
3	Course topics: Physical fitness. Mindfulness activities: Mindful breathing 1 minute, mindful stretching 15 minutes, body scan 30 minutes.
4	Course topics: Physical fitness. Mindfulness activities: Mindful breathing 1 minute, mindful stretching 15 minutes, body scan 20 minutes.
5	Course topics: Table tennis. Mindfulness activities: Mindful breathing 3 minutes, mindful walking 5 minutes, mindful breathing 3 minutes, sun salutation.
6	Course topics: Table tennis. Mindfulness activities: Mindful breathing 3 minutes, mindful stretching 10 minutes, mindful breathing 3 minutes, sun salutation.
7	Course topics: Table tennis. Mindfulness activities: Mindful breathing 3 minutes, mindful walking 5 minutes, mindful breathing 3 minutes, sun salutation.
8	Course topics: Table tennis. Mindfulness activities: Mindful breathing 3 minutes, mindful stretching 10 minutes, mindful breathing 3 minutes, sun salutation.
9	Midterm exam week
10	Course topics: Volleyball. Mindfulness activities: Mindful breathing 1 minute, mindful stretching 15 minutes, body scan 10 minutes, sun salutation.
11	Course topics: Volleyball. Mindfulness activities: Mindful breathing 1 minute, mindful stretching 15 minutes, mindful breathing 1 minute, sun salutation.
12	Course topics: Volleyball. Mindfulness activities: Mindful breathing 1 minute, mindful stretching 15 minutes, body scan 10 minutes, sun salutation.
13	Course topics: Volleyball. Mindfulness activities: Mindful breathing 1 minute, mindful stretching 15 minutes, mindful breathing 1 minute, sun salutation.
14	Course topics: Swimming. Mindfulness activities: Mindful breathing 3 minutes, mindful stretching 10 minutes.
15	Course topics: Swimming. Mindfulness activities: Mindful breathing 3 minutes, mindful stretching 10 minutes.
16	Course topics: Swimming. Mindfulness activities: Mindful breathing 3 minutes, mindful stretching 10 minutes.
17	Course topics: Swimming. Mindfulness activities: Mindful breathing 3 minutes, mindful stretching 10 minutes.
18	Final exam week

Source: authors' own creation

All items were rated on a five-point Likert scale from one (strongly disagree) to five (strongly agree). This scale has demonstrated good reliability, with Cronbach's  $\alpha$  coefficient ranging from 0.87 to 0.93 (Cox et al. 2016a).

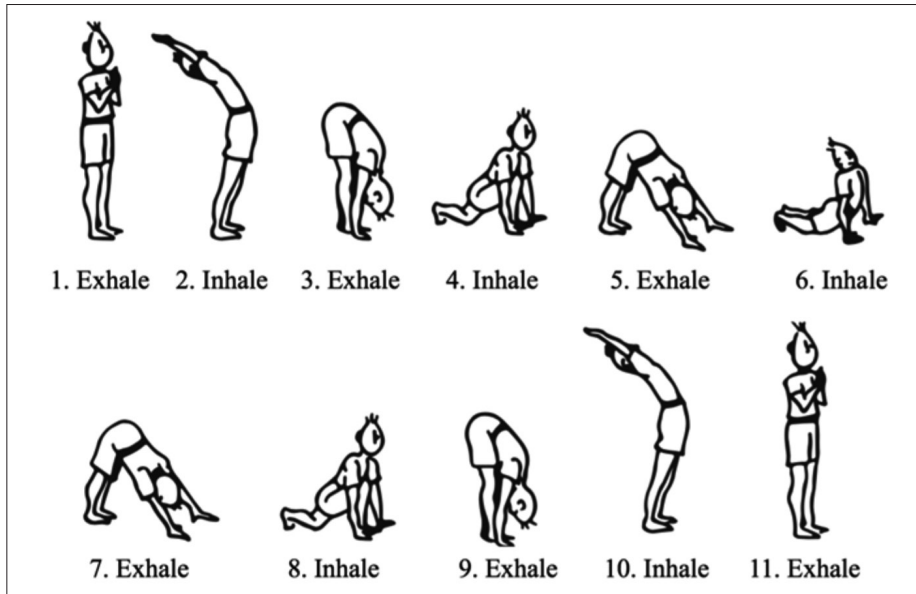


Fig. 2. - Sun Salutation with breathing cues.

*"Harvesting Harmony: Mindfulness in Physical Education"*, Mulhearn, S. C., P.H. Kulinna, and K. A. Lorenz., 2017, *Journal of Physical Education, Recreation & Dance* 88 (6): pp.49.

## MOTIVATION

the 16-item Situational Motivation Scale measured intrinsic motivation, introjected regulation, external regulation, and amotivation when engaging in physical activity (Gary et al. 2000). The scale employs a Likert scale ranging from one (not at all true) to seven (very true). Example statements included: (a) *Because I think that this activity is interesting* (intrinsic motivation); (b) *Because I think that this activity is good for me* (introjected regulation); (c) *Because I don't have any choice* (external regulation); and (d) *I do this activity, but I am not sure it is a good thing to pursue it* (amotivation). This scale has demonstrated reliability and validity in physical activity settings among college-aged students (Guay et al. 2000), with an adequate internal consistency ( $\alpha = 0.77-0.95$ ).

## DATA ANALYSIS

the data collected in this study were analyzed using the IBM SPSS statistical software package (version 23) for Windows (IBM SPSS). Preliminary data analysis included computing Mahalanobis distance analysis (Hair et al. 2010) and descriptive data. Additionally, Box's M test and Levene's test were employed to assess the homogeneity of covariance and variance, respectively, between baseline and post-intervention measures. This study employed a quasi-experimental design to examine the effect of mindfulness pedagogy on its students' mindfulness states and motivation in physical education. To analyze the data, the  $2 \times 2$  mixed-design two-way ANOVAs were conducted to explore the interaction effect of two independent vari-



ables: teaching groups (experimental group and control group) and testing time (baseline and post-intervention), on the dependent variable of mindfulness states and physical education motivations. Post hoc comparisons were conducted using the *Scheffe* test. The significance level was set at 95% for all analyses.

## Results

A total of 150 student participants completed the questionnaire at baseline, but after excluding invalid questionnaires, the number reduced to 137 at the post-intervention. Descriptive statistics for the baseline scores of mindfulness states and motivation for each group at each phase are presented in Table II. Homogeneity of covariance and variance of attributes across the groups were confirmed through Box's M test and Levene's test. The results of this study revealed significant findings. There was a significant increase in mindfulness states (both

TABLE II  
Descriptive Statistics for Mindfulness States and Motivations.

		Experimental (n=69)		Control (n=68)		Total	
		Mean	SD	Mean	SD	Mean	SD
Mindfulness states	Baseline	2.57	.72	2.77	.79	2.67	.76
	Post-intervention	2.66	.71	2.49	.75	2.58	.73
State of mind	Baseline	2.63	.81	2.78	.80	2.71	.80
	Post-intervention	2.73	.74	2.49	.75	2.61	.75
State of body	Baseline	2.50	.71	2.76	.84	2.63	.78
	Post-intervention	2.59	.83	2.50	.82	2.55	.83
Intrinsic motivation	Baseline	5.16	1.03	4.99	1.15	5.07	1.09
	Post-intervention	4.87	1.12	4.92	1.14	4.90	1.12
Introjected regulation	Baseline	4.31	1.36	4.23	1.32	4.27	1.34
	Post-intervention	4.09	1.31	3.89	1.38	3.99	1.34
External regulation	Baseline	4.80	0.96	4.54	1.21	4.67	1.10
	Post-intervention	4.58	1.07	4.57	1.23	4.58	1.15
Amotivation	Baseline	3.50	1.44	3.44	1.34	3.47	1.38
	Post-intervention	3.18	1.30	3.67	1.59	3.43	1.47

Note. N = 137. Source: Authors' own creation

mind and body) and a significant decrease in amotivation in the experimental group compared to the control group. Qualitative feedback from the post-intervention indicated that the majority of students in the experimental group favored body scanning ( $n = 61, 88\%$ ), followed by breath awareness ( $n = 18, 26\%$ ), meditation ( $n = 11, 16\%$ ), and Sun Salutation ( $n = 5, 7\%$ ) as mindfulness technique. Students reported various benefits from mindfulness-instructed physical education classes, including stress relief ( $n = 43, 62\%$ ), improved concentration ( $n = 35, 51\%$ ), enhanced emotion regulation ( $n = 31, 45\%$ ), increased patience ( $n = 24, 35\%$ ), heightened awareness ( $n = 23, 33\%$ ), enjoyment ( $n = 20, 29\%$ ), and greater motivation to participate ( $n = 9, 13\%$ ).

In terms of interaction effect on mindfulness states, there was no significant difference between the experimental and control groups at the baseline measures ( $p > .05$ ), indicating homogeneity at the beginning of the study. Significant interactions were observed between group and phase measures on mindfulness states [ $F(1, 270) = 6.08, p < .05, \eta_p^2 = .04$ ], state of mind [ $F(1, 270) = 5.36, p < .05, \eta_p^2 = .04$ ], and state of body [ $F(1, 270) = 4.99, p < .05, \eta_p^2 = .04$ ], as shown in Table III.

Further analysis was conducted to examine the simple main effect (see Table IV), focusing on the post-intervention results. A significant simple

TABLE III  
2x2 mixed design ANOVAs of mindfulness states, state of mind, and state of body.

Source (mindfulness states)	SS	DF	MS	F
Among groups (A)	.03	1	.03	.04
Baseline, post-intervention (B)	.59	1	.59	1.51
AxB	2.36	1	2.36	6.08*
Error	148.20	270		
Among error	95.84	135	.71	
Among of residuals	52.36	135	.39	
Total	151.18	273		
Source (state of mind)	SS	DF	MS	F
Among groups (A)	.13	1	.13	.19
Baseline, post-intervention (B)	.67	1	.67	1.37
AxB	2.61	1	2.61	5.36*
Error	162.25	270		
Among error	96.37	135	.71	
Among of residuals	65.88	135	.49	
Total	165.66	273		

(Continue)

Continue TABLE III

Source (state of body)	SS	DF	MS	F
Among groups (A)	.48	1	.48	.56
Baseline, post-intervention (B)	.51	1	.51	1.21
AxB	2.12	1	2.12	4.99*
Error	173.69	270		
Among error	116.41	135	.86	
Among of residuals	57.28	135	.42	
Total	176.80	273		

Note. \*  $p < .05$ . Source: Authors' own creation

main effect (see Figure 3) was found between the two groups in terms of the state of mind [ $F(1, 270) = 4.80, p < .05, \eta_p^2 = .03$ ]. The experimental group demonstrated a higher state of mind (mean =  $2.78 \pm .74$ ) compared to the control group (mean =  $2.49 \pm .75$ ). In contrast, within the control group, a significant simple main effect (see Figure 4) was observed between regarding the state of body [ $F(1, 135) = 5.47, p < .05, \eta_p^2 = .02$ ]. The post-intervention

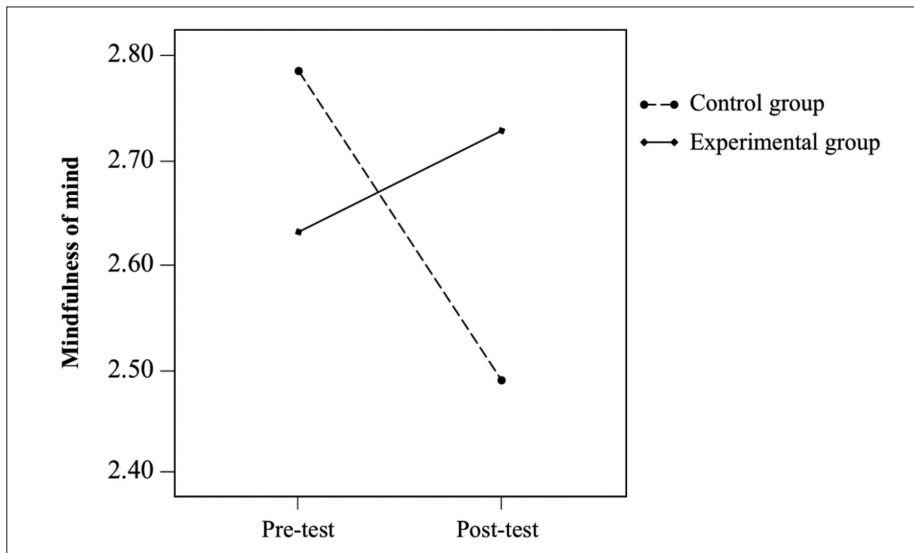


Fig. 3. - Simple main effect of the state of mind between groups.

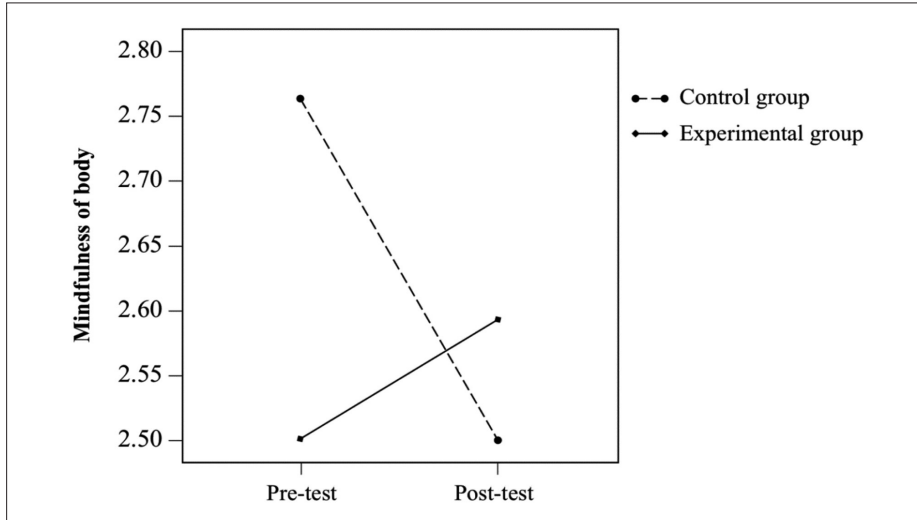


Figure 4. Simple main effect of the state of body between groups.

TABLE IV  
Among Groups and Phases on the State of Mind and State of Body.

Source (state of mind)	SS	DF	MS	F
<i>Among groups (A)</i>				
Baseline (B1)	.34	1	.34	0.57
Post-intervention (B2)	2.88	1	2.88	4.80*
Error	162.00	270	.60	
<i>Baseline, post-intervention (B)</i>				
Experimental (A1)	.78	1	.78	1.58
Control (A2)	1.96	1	1.96	4.00
Error	66.15	135	.49	
Source (state of body)	SS	DF	MS	F
<i>Among groups (A)</i>				
Baseline (B1)	2.32	1	2.32	3.62
Post-intervention (B2)	0.28	1	0.28	0.43
Error	172.80	270	0.64	
<i>Baseline, post-intervention (B)</i>				
Experimental (A1)	.28	1	.28	0.67
Control (A2)	2.30	1	2.30	5.47*
Error	56.70	135	.42	

Note. \*  $p < .05$ . Source: Authors' own creation

state of body in the control group (mean = 2.50 ± .82) was lower than that of the experimental group (mean = 2.76 ± .84).

Regarding the interaction effects on physical education motivation, there was no significant differences between the experimental and control groups in the baseline measures of motivation subscales ( $p > .05$ ), indicating homogeneity between the groups. A significant interaction was observed between group and phase measures in amotivation [ $F(1, 270) = 4.01, p < .05, \eta_p^2 = .03$ ], as shown in Table V. However, no significant interaction was found for intrinsic motivation [ $F(1, 270) = 1.12, p = .29$ ], introjected regulation [ $F(1, 270) = .22, p = .64$ ], and external regulation [ $F(1, 270) = 1.17, p = .28$ ].

Further analysis found that there was a significant main effect between the experimental and control groups in post-intervention amotivation [ $F(1, 270) = 4.06, p < .05, \eta_p^2 = .02$ ], as shown in Table VI. The experimental group

TABLE V  
2x2 Mixed-Design Anovas on Amotivation.

Source	SS	DF	MS	F
Among groups (A)	3.13	1	3.13	1.14
Baseline, post-intervention (B)	.14	1	.14	.10
AxB	5.26	1	5.26	4.01*
Error	546.54	270		
Among error	369.71	135	2.74	
Among of residuals	176.83	135	1.31	
Total	555.07	273		

Note. \*  $p < .05$ . Source: Authors' own creation

TABLE VI  
Among Groups and Phases on Amotivation.

Source	SS	DF	MS	F
Among groups (A)				
Baseline (B1)	.12	1	.12	0.06
Post-test (B2)	8.22	1	8.22	4.06*
Error	546.75	270	2.03	
Baseline, post-intervention (B)				
Experimental (A1)	3.53	1	3.53	2.70
Control (A2)	1.80	1	1.80	1.37
Error	176.85	135	1.31	

Note. \*  $p < .05$ . Source: Authors' own creation

exhibited significantly lower amotivation (mean =  $3.18 \pm 1.30$ ) compared to the control group (mean =  $3.67 \pm 1.59$ ), as shown in Figure 5.

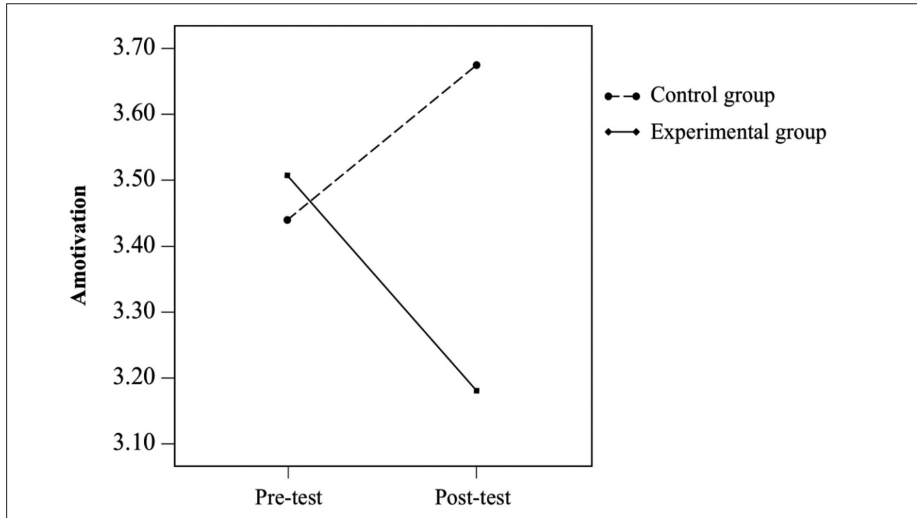


Figure 5. Simple main effect of amotivation between groups.

## Discussion

This study builds upon prior research examining that has examined the effects of incorporating mindfulness into physical education classes. The results demonstrated that the experimental group showed significantly higher mindfulness states and lower amotivation compared to the control group after 18 weeks of participation. This study focused on core elements of mindfulness, including continuous cues to thoughts, emotions, and bodily sensations. By shifting the emphasis from more external stimuli to internal experiences and promoting present-moment attention, these findings are consistent with previous research indicating that mindfulness enhances awareness of physical sensations and mental states by promoting present-moment attention (Brown and Ryan 2003; Cox et al. 2016a; 2016b; Tanay & Bernstein, 2013).

Our findings support prior research, confirming that engaging students in physical activities can elevate their mindfulness states (Cox et al. 2016a; 2016b). It is worth noting that while previous studies on mindfulness interventions in physical education have primarily focused on yoga (Cox et al.

2016a; Knothe and Flores Martí 2018), our study provides meaningful and significant results despite not involving a yoga class. This demonstrates that incorporating core mindfulness principles and integrating exercises, such as breath awareness, body scans, and Sun Salutations, within a 15-minute timeframe during physical education courses over a semester can effectively sustain or enhance students' mindfulness states. In contrast, the control group, which experienced physical education without mindfulness prompts, showed a decrease in their mindfulness states as students were less likely to actively attend to their thoughts or bodies. Although the effect size was small, there were significant differences in mindfulness states between the experimental group and the control group, suggesting that physical education incorporating mindfulness may generate beneficial effects. The small effect size observed in our study may be attributed to various factors, including the timing and duration of guided mindfulness practices.

Based on SDT (Ryan and Deci 2017), we hypothesized that the experimental group's intrinsic motivation would improve through the enhancement of mindfulness states. Although we did not observe a significant increase in intrinsic motivation, there was a significant decrease in amotivation. Intrinsic motivation tends to be more resistant to change compared to other extrinsic motivations because it falls under the category of highly autonomous internalized motivation (Ntoumanis 2001; Standage, Duda, and Ntoumanis 2005). Internalization is recognized as a challenging objective in physical education, as not all tasks and activities inherently possess intrinsic motivation (Deci et al. 1991), despite their potential importance to students. There is a consistent positive relationship between mindfulness states and intrinsic motivation (Cox et al 2016b). Therefore, cultivating students' internalized value and autonomous motivation for physical education through mindfulness is a key goal in teaching (Vasconcellos et al. 2020). It is possible that longer mindfulness sessions may be necessary to observe changes in intrinsic motivation. Further investigation is needed to explore these speculations. Another possible explanation is that the awareness and curiosity component of present experiences fostered by mindfulness could increase sensitivity to activities that evoke interest and enjoyment, making engagement in intrinsically motivated activities more likely (Donald et al. 2020). Unfortunately, the aspect of curiosity is not emphasized in our mindfulness practice.

Furthermore, we expected mindfulness to significantly reduce amotivation. This study initially explored the relationship between mindfulness states and motivation in the context of physical education. In Taiwan, freshmen are required to enroll in a physical education course as a graduation requirement, without the freedom to choose courses, types and schedules. As a result, stu-

dents' motivation to engage in these courses is lower compared to scenarios where they have the freedom to select courses based on personal interest. Previous research has indicated that students enrolled in required physical education exhibit higher levels of amotivation compared to those in elective physical education (Liu 2004). The presence of higher amotivation in situations lacking self-determination aligns with the principles of SDT proposed by Ryan and Deci (2017). Previous studies in the United Kingdom have revealed that students with amotivation tendencies, primarily those in required physical education classes, engaged in behaviors such as absences, excuses for nonattendance, and low participation in physical activities (Ntoumanis et al. 2004).

The findings of this study contribute to previous research and provide valuable evidence supporting the effectiveness of mindfulness in reducing amotivation. This is consistent with the findings of a meta-analysis that revealed negative associations between mindfulness and amotivation (Ryan, Donald, and Bradshaw 2021). Under the condition of improved mindfulness states, the experimental group successfully reduced controlled motivation, which aligns with previous research findings (Ludwig, Brown, and Brewer 2020; Weinstein, Brown, and Ryan 2009). Mindfulness assists students in establishing and attaining goals within physical education, and these adjustments require students to engage in cognitive focus regarding their commitment to physical activity while simultaneously managing other responsibilities to uphold their goal of engaging in regular physical activity (Ennis 2017). Overall, by cultivating mindfulness, individuals can effectively align their actions with their internalized values, resulting in a reduction in learned helplessness, including feelings of ineffectiveness, lack of purpose, or internal resistance toward certain actions.

### **Limitations And Future Research**

While this study has expanded upon existing research, there are several limitations that should be addressed in future studies. First, the quasi-experimental design employed in this study, with a control group, revealed a small effect size for the integration of mindfulness into general physical education on mindfulness states and amotivation. One potential reason for this could be the short duration of the 15-minute mindfulness prompt. Future studies could compare the effects of different durations of prompts and employ long-term interventions to evaluate the effectiveness of mindfulness pedagogy. Secondly, the sample in this study had limitations, including a significantly smaller number of female participants compared to males, and primarily



consisting of freshman-aged participants. Future studies should include a more balanced representation to adequately test gender differences in the role of mindfulness integrated into physical education in terms of motivation. Thirdly, this study focused solely on required physical education classes. Future research should explore the role of mindfulness in different cultural, social, and educational contexts, including elective physical education classes, to confirm its adaptive effects. Moreover, given that the teacher in this study may have been influenced by personal beliefs, preferences, and perspectives, it is advisable for future research to incorporate post-intervention interviews and additional qualitative surveys with participants. This approach would help provide further insights into the specific experiences of mindfulness in physical activities and validate the accuracy of the measurement scores.

## **Conclusion**

Our study provides valuable insights into the effects of mindfulness pedagogy on students' state of mindfulness and motivation in university physical education. By employing a comparison group experimental design and a diverse sample over an extended period, our findings contribute to the existing literature on physical education and motivation. The results demonstrate that incorporating mindfulness into physical education can effectively enhance their state of mindfulness and reduce participants' amotivation. This suggests that mindfulness-based strategies have the potential to address the issue of amotivation among students in physical education settings. However, while the findings are promising, further research is needed to establish specific recommendations for practical implementation.

Given the crucial role of physical education in shaping individuals' exercise habits, our study advocates for the integration of mindfulness into the physical education curriculum. By enhancing students' awareness and alignment with their physical and mental states, mindfulness promotes active engagement and persistence in physical activity. Moreover, it empowers students to overcome barriers and cultivate positive psychological well-being. The implications of this study extend beyond the university setting and have relevance for physical education curricula at various educational levels. Incorporating mindfulness practices can provide a valuable reference for designing future physical education programs that prioritize students' holistic development and long-term engagement in physical activity.

In summary, our study highlights the positive impact of mindfulness pedagogy on students' mindfulness and motivation in university physical

education. It underlines the importance of further intervention research to explore the full potential of mindfulness-based strategies and their practical implementation in educational settings. By fostering mindfulness, we can create a more supportive and empowering environment that promotes students' well-being and active participation in physical education.

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