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**Effects Of a Short-Term Mindfulness Meditation on a Battery of Muscular Fitness in
Active College Individuals**

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EXHS 369: Research Seminar

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5/8//2023

Effects Of a Short-Term Mindfulness Meditation on a Battery of Muscular Fitness in Active College Individuals

Abstract

Mindfulness meditation programs of long-term duration have been used by prior research as long-term meditation programs implemented for collegiate athletes. However, there was a lack of short-term based programs and the effects on exercise performance. **PURPOSE:** To examine the effect of short-term mindfulness meditation effect on exercise performance by examining the effects of mindfulness on strength, power, and endurance exercises. **METHODS:** Nine college individuals, ages of 20.7 ± 1.0 , who were physically active participated in this study. Participants completed pre- and post- exercises of hand grip, vertical jump for height, and plank hold for time. Participants were randomly assigned to either complete the mindfulness meditation or control at the first session. During the second testing session, participants completed the opposite intervention from the first testing session. A paired samples t-test was used to determine the significance of the mindfulness meditation intervention on the difference of pre- to post- measurements for control and intervention groups of the hand grip, vertical jump, and plank hold. **RESULTS:** There was no significant difference between the pre- to post- means of the control and intervention measurements for each exercise; hand grip ($t=-2.01$, $p=0.79$), vertical jump ($t=-0.84$, $p=0.42$), plank hold ($t=-2.20$, $p=0.058$). **CONCLUSION:** There was no significant effect of mindfulness meditation on a battery of muscular fitness in this study. **ACKNOWLEDGEMENTS:** This study received funding from the OURS grant from the College of Saint Benedict Experiential Learning department.

Introduction

The quality of an individual's mental health determines how they cope with external/internal stressors, relate to others, and make healthy decisions (Saeed et al., 2019). Mental health dictates all aspects of an individual's life. Therefore, many avenues of research stemming from mental health investigate different forms of managing, caring for, and finding effective interventions when treating mental health (Saeed et al., 2019). Mindfulness meditation is an avenue that researchers look to in search of bettering mental health. However, mindfulness can offer more benefits in more aspects than just the mind, it can benefit physical exertion as well.

Mindfulness is a type of meditation that focuses on non-judgmentally experiencing the present moment (Kabat-Zinn, 2009). Mindfulness can be achieved through a variety of different meditation techniques including breathing exercises, body scans, visualization, mantra meditation, and positive-self talk (Mayo Clinic, 2020). Breathing exercises are used to defer negative thoughts by sitting down, closing the eyes, and focusing on the breath as it passes through the body (Mayo Clinic, 2020). The underlying mechanisms of mindfulness can be attributed to the 5 components of mindfulness including acting with awareness, non-judging inner experiences, non-reactivity to inner experience, describing, and observing (Brown et al., 2015). These 5 components all work together as the underlying mechanisms of mindfulness with the goal to bring the mind into the present moment.

In exercise, the body is required to meet specific tasks and goals. The body must be able to exert a certain amount of energy and be able to exceed its energy stress in different situations, including power lifting and competitive athletics (Stocker, et Al., 2019). During exercise, it is important that the individual or athlete stay engaged in the activity taking place. Especially in

athletic competitions, it is necessary the athlete say full engaged or “in the zone”. Another term for this is “flow”. Flow refers to when an athlete is absorbed in the present moment within athletic performance where an optimal performance state is attainable (Glass et al., 2019).

When mindfulness is applied to the science of exercise, self-control is an important characteristic to understand and define. Self-control is a cognitive process that regulates one’s thoughts, behaviors, and emotions to complete a task regardless of temptations or impulses (Stocker et al., 2019). The characteristic of self-control is important in exercise because physical demands are being put on the body that are not always desired. If an individual has strong self-control, it is more likely the individual will either see greater results or push themselves to the next level, also referred to as mental toughness (Stocker et al., 2019). Mental toughness has been referred to by coaches, trainers, and athletes as the most critical characteristic to determine success in sports (Liew et al., 2019). Mental toughness is characterized by the ability of an individual to cope with the demands of set training and competitions, in other words the athlete’s resiliency can determine the quality of performance (Liew et al., 2019). Exercise overlaps with meditation, as meditation overlaps with mental health. Mental health can be greatly improved by both meditation and exercise, while exercise performance can also be greatly improved through learned mindfulness by practicing meditation (Liew et al., 2019).

A variety of programs have been used by athletic institutions in prior research examining long term mindfulness mediation effects on athletic performance (Gross et al., 2018). The long-term mindfulness mediation programs used included Mindfulness Acceptance Commitment (MAC), Mindful Sport Performance Enhancement (MSPE), and Psychological Skills Training (PST) (Glass et al., 2019). Together these programs share similarities as they were implemented in college athletic programs for weeks to months with the goal of improving sport performance

(Gross et al., 2018). While, individually these programs are geared in different directions as they try to achieve similar goals. MAC aims to increase mindfulness by promoting acceptance and non-judgmental present moment awareness. While PST is geared towards anxiety reduction, boosting confidence, decreasing negative thoughts and emotions as it promotes non-judgmental and present-moment awareness (Gross et al., 2018). MSPE sessions were focused on creating a connection between mindfulness and the construct of flow in sports (Glass et al., 2019). MSPE, MAC, and PST are all long-term mindfulness meditation interventions. While, long-term programs exist in past research, there is a lack of short-term mindfulness interventions that have still yet to be explored.

Mediation practices vary in duration of session and length of program (Kim & Kim, 2021). Effectiveness of mindfulness meditation is subjective to duration and length built into the program. A systematic review of randomized control trials looked at 5 studies that examined sport enhancement through meditation in athletes. All included studies consisting of a mindfulness meditation intervention that programmed mindfulness sessions for 5 weeks to 8 weeks in length. While duration of each session varied depending on the sessions per weeks (Kim & Kim, 2021). The longest intervention was Dehghani et al., (2018), consisting of a MAC intervention of a 90-minute session once a week for 8 weeks. While the shortest intervention was John et al., (2011), consisting of 20-minute sessions, six times per week for 5 weeks. These studies are all considered long term and concluded similar results. Stating that the intervention groups saw increases in performance and positive psychological effects. Only one study within this systematic review concluded with a non-significant difference, therefore finding no difference in flow from the effects of mindfulness meditation (Kim & Kim, 2021). Overall, there is a large variety of research opportunities regarding mindfulness programs comparing length,

duration, and frequency of sessions. Studies done on mindfulness meditation typically center around long-term meditation practices such as MSPE, MAC, and PST in collegiate athletes (Glass et al., 2019). However, most research neglects to study the effects of short-term mindfulness meditation programming and the impact of self-control by challenging participants with targeted exercises.

Overall, the mechanism that links mindfulness meditation to exercise is the necessary state of flow, also known as being in the present moment. By being in the present moment, an individual increases their ability to focus on the current activity. As there is no prior research targeted towards short-term mindfulness meditation intervention, the intervention used within this study is an adaption for the long-term mindfulness meditation program known as MSPE (Glass et al., 2019). Therefore, the purpose of the present study is to examine the effects of short-term mindfulness meditations on exercise performance using a battery of muscular fitness; strength, power, and endurance exercise. The researcher hypothesizes that completing a short-term mindfulness meditation prior to completing a battery of muscular fitness exercises; including hand-grip test (strength), vertical jump (power), and plank-hold (endurance), will result in an increase of strength or time held compared to initial stretch or time held initially.

Subjects

The subjects recruited for this study included physically active men and women between the ages of 18 and 23 currently enrolled as a student at the College of Saint Benedict and Saint John's University. Inclusion criteria required that the subjects had prior knowledge or practice with mindfulness meditation. The researchers obtained data from nine college aged individuals. Subjects were recruited by email using a script and word of mouth.

Methods

Procedures

Individuals who decided to be a part of this study met at the College of Saint Benedicts Exercise and Health Science Lab, in the Henrietta Academic Building (HAB), in room 011. Nine college individuals, ages of 20.7 ± 1.0 , who were physically active participated in this study. Participants arrived one to two at a time. Upon entry they were presented with the informed consent. Time was allowed for the individual to thoroughly read through it and ask questions before signing. The participant was asked to not do any sort of strenuous exercise at least 36 hours prior to testing to ensure the best results; to refrain from consuming any alcohol at least 24 hours prior; to be well rested with a minimum of 8 hours of sleep the night prior; to come hydrated and have eaten prior to testing; and to have prior knowledge of and experience with mindfulness meditation. Workout attire and athletic shoes were required to participate in the study.

The researcher then collected the participants age (years), height (inches), and weight (kg) as descriptive data. As well as the last 4 numbers of their student ID to track data, this was deleted after data collection to ensure confidentiality. After being debriefed about the study and the order of events, the participant completed a dynamic warmup to reduce injury and prepare to complete maximal effort exercises. The dynamic warmup was 10 minutes in length and consisted of: knee pulls, lunges with twist, high knees, leg swings, and karaoke shuffle. The lab instructor led the participants through the dynamic warmup.

Data collection occurred over a span of two days for two sessions with 24 hours between to provide rest. On the first day, the researcher randomly assigned the first treatment group

(either control or intervention) via a coin flip (tails being intervention and heads being control). The intervention was a 5-minute mindfulness meditation for focus, which was an adaptation from a long-term mindfulness meditation program known as MSPE (Glass et al., 2019). While the control was a 5-minute rest period with no meditation (Great Meditation, 2021).

After the dynamic warmup, the participant completed pre-exercises that represented a battery of muscular fitness. The exercises included a hand grip test using a dynamometer to measure strength, vertical jump using a jump mat to measure power, and plank-hold until failure to measure muscular endurance. These exercises were close to the ground, therefore limited the risk of injury and instructed with specific techniques to limit differences between participants. The participants completed one set of each exercise, followed by a the randomly assigned treatment group, either control or intervention. After completing the treatment group, exercises were performed once more (post-exercises). During the second session, the participants completed whatever treatment group they did not complete during the first session following the order of steps above. For example, mindfulness meditation was completed during session one, then 5-minute rest was completed during session two and vice versus. The hand grip in kilograms, vertical jump in centimeters, and plank hold in seconds were collected in an excel file.

When assigned the 5-minute mindfulness meditation as the intervention, the researcher instructed the participant to sit in a comfortable position (sitting against a wall, sitting crisscross, or laying on back or stomach), the lights on or off, and eyes open or closed. These factors were chosen by the participant to maximize comfort during meditation to promote focus. The 5-minute mindfulness meditation was guided through a video to regulate variables between

participants. When assigned the 5-minute rest period as the control, the researcher instructed the participant to sit comfortably for the length of 5-minutes with no meditation.

Internal validity was ensured by instrumentation. All participants completed the same exercises including hand grip test (strength), vertical jump (power), and plank-hold (endurance) until exhaustion the same number of times with the same technique, as it was instructed for each participant by the researcher. Each exercise was completed the same amount of times for each participants at maximal effort.

Data Analysis

The data was analyzed using three paired samples t-test. All three paired samples t-test compared each exercise independently by calculating the pre- to post- measurement differences and then comparing those differences between both control and intervention groups for each exercise: (1) grip hold, (2) vertical jump, and (3) plank hold. The independent variable was the treatment groups, either the intervention (mindfulness mediation) or control (no mindfulness meditation). The dependent variable was the strength for grip hold, height jumped for vertical jump, and time held for plank hold. The alpha level for all statistical analysis was set at .05.

Results

The results in this study did not indicate any changes following the intervention of a short-term mindfulness meditation on hand grip strength, vertical jump, or plank hold. Therefore, there was no significant difference between the pre- to post- means of the control and intervention measurements for each exercise; hand grip ($t=-2.01$, $p=0.79$), vertical jump ($t=-0.84$, $p=0.42$), plank hold ($t=-2.20$, $p=0.058$).

Table 1*Participant Characteristics*

| Variable | M | SD |
|-------------|-------|------|
| Age (yrs) | 20.7 | 1.0 |
| Mass (kg) | 72.1 | 10.0 |
| Height (cm) | 165.2 | 15.9 |
| Female (n) | 7 | |
| Male (n) | 2 | |

Table 1. Participants characteristics are represented for all nine participants (n=9).

Table 2*Pre to Post Differences of Control to Intervention Mean Measurement*

| Variable | Control | | Intervention | |
|--------------------|---------|-------|--------------|-------|
| | M | SD | M | SD |
| Hand Grip (kg) | -0.43 | 2.08 | 1.77 | 2.39 |
| Vertical Jump (cm) | -.17 | 0.85 | 0.05 | 0.72 |
| Plank Hold (sec.) | -13 | 11.97 | .00 | 15.54 |

Table 2. Pre- to post- differences of control to intervention mean measurements for all nine participants (n=9).

The difference between the control and intervention pre- to post- means in hand grip showed an increase in intervention and a slight decrease in the control (figure 1).

Figure 1

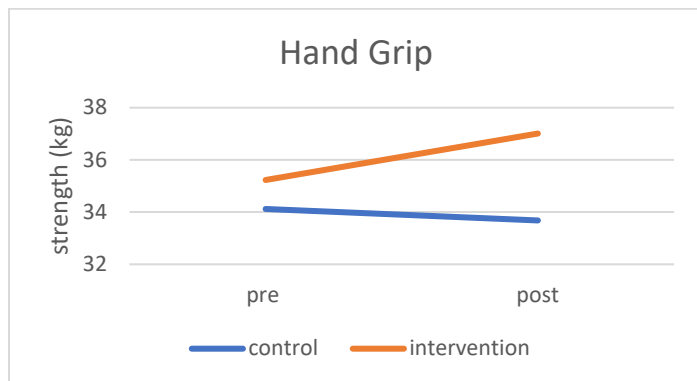


Figure 1. Hand grip saw an increase in the intervention group from pre- to post- measurements, while a slight decrease took place in the control.

For the control and intervention pre- to post- means in vertical jump showed no change for the intervention and a decrease in the control (figure2).

Figure 2

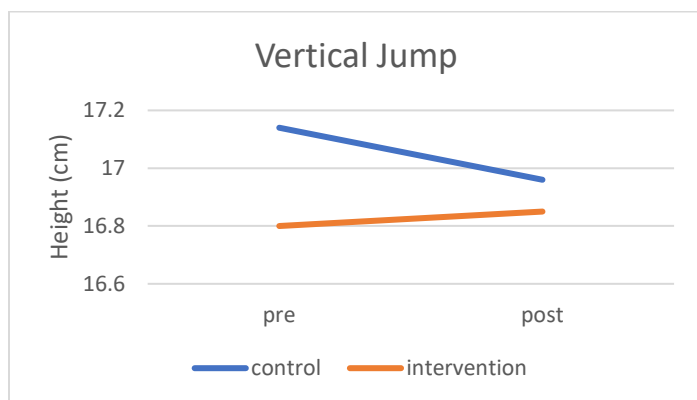


Figure 2. Vertical jump saw a slight increase in intervention; however, control group measurements were higher on average. The control group saw a decline from pre- to post-measurements.

While the plank holds pre- to post- means showed another decrease in control and no change in the intervention (figure 3).

Figure 3

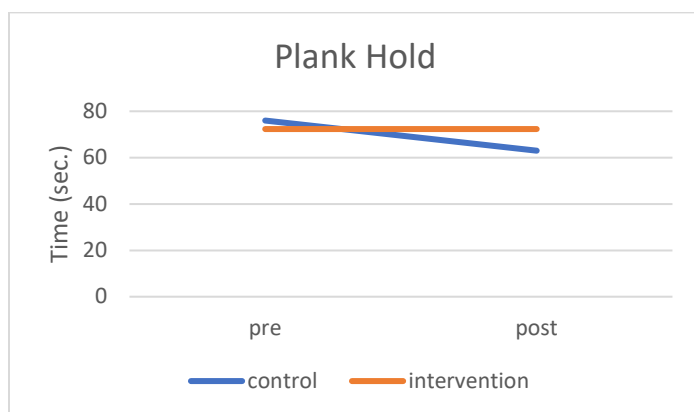


Figure 3. Plank hold saw nearly no change in the intervention group, while the control decreased. Plank hold saw the most effect, as its mean intervention was 0 and the p value was 0.058. Therefore, a pattern leaning towards significance.

Although there was some increase to no change in intervention it was of no significance.

The main statistical result in this study was determined through a paired-samples T-test, comparing the effects of a short-term mindfulness meditation on the changes of hand grip strength, vertical jump, and plank hold. The results indicated that there was no significant difference within the the pre- to post- differences between the control and intervention groups for each exercise; hand grip ($t=-2.012$, $p=0.79$), vertical jump ($t=-.846$, $p=.422$), plank hold ($t=-2.206$, $p=.058$).

Discussion

The researcher intended to better understand the effects of short-term mindfulness meditation on a battery of muscular fitness by conducting this study. This study found no

significance within the pre- to post- differences between the control and intervention groups for each exercise (grip hold, vertical jump, plank hold). Referring to the raw data, the means from pre- to post- of control and intervention were graphed and although no significance was determined there was a small increase in hand grip, while no change occurred from control to intervention pre- to post- measurements in vertical jump and plank hold. A past array of studies, including Glass et al., 2019 and Gross et al., 2018 used long term mindfulness meditation programs including MSPE, MAC, and PST (discussed earlier) on athletic performance by implementing the programs on a large scale at athletic programs within institutions. From Gross et al., 2018, the findings concluded either no change in performance with increases in the state of flow, self-perceived sports performance, and symptoms of anxiety and depression and Glass et al., 2019 concluded in an effective intervention for sports performance and mental health.

This present study compared to past studies differed as it implemented a short-term intervention on a small scale. The findings of this study proved no significance in short-term mindfulness meditations on a battery of muscular fitness. However, it did show a pattern leaning towards significance regarding the plank hold with a p value of 0.058. An explanation for this could be due to the limitation in number of participants, as well as many different variables that must be controlled to maximize the effectiveness of the short-term mindfulness meditation. Background research regarding long-term mindfulness meditation led the researcher to believe there would be a positive relationship in each exercise being performed.

The results of this study are likely a result of limitations including a small participant population, causing a lack of data to consider the effects of short-term mindfulness effective. Other limitations include not enough rest times between sessions, not allowing the targeted muscles to fully recover. Or too much rest time between exercises, causing inadequate fatiguing

of the targeted muscles. Results could have also been impacted by the types of exercises chosen and the attention span or ability to focus during meditation.

This research is important because it investigates a gap in research surrounding the effects of short-term mindfulness meditation. The majority of past research has been centered around long-term meditations lasting weeks to months, while this study was centered around seeing meditations immediate effect on a battery of muscular fitness within two days of testing. More research is necessary with a larger participant population to prove if short-term mindfulness meditation has a significant impact on exercise performance.

Conclusion

Ultimately, short-term mindfulness meditation has no effect on a battery of muscular fitness. The exercises used in the battery of muscular fitness included hand grip for strength, vertical jump for power, and plank hold for endurance. Overall, no significant difference was noted in any of the exercises. The hypothesis was rejected by statistical analysis. The study concluded that mindfulness meditation is not a practical application when applied on a short-term basis. More research is needed to determine what variables should be changed in order to get different results.

Keywords

- Recreationally active/physical active is defined as meeting the recommended guidelines of 150 minutes of exercise per week.
- Mindfulness meditation is a type of meditation that focuses on non-judgmentally experiencing the present moment and is achieved through a variety of different meditation techniques including breathing exercises, body scans, visualization, mantra

meditation, and positive self (Kabat-Zinn, 2009). A 5-minute mindfulness meditation for focus will be used in this research study (Great Meditation, 2021) this is classified as a guided mediation, therefore, an individual would be directed through the steps of meditation by a person speaking within the video.

- Self-control is a cognitive process that regulates one's thoughts, behaviors, and emotion regardless of temptations or impulses (Stocker, et Al., 2019). If an individual has strong self-control, it is more likely the individual will either see greater results or push themselves to the next level, also referred to as mental toughness (Liew et al., 2019).
- Mental toughness has been referred to by coaches, trainers, and athletes as the most critical characteristic to determine success in sports. Mental toughness is characterized by the ability of an individual to cope with the demands of set trainings and competitions, in other words, the athlete's resiliency can determine the quality of the set performance (Liew et al., 2019).
- Flow refers to when an athlete is absorbed in the present moment within athletic performance where an optimal performance state is attainable (Glass et al., 2019). In other words, "flow" is a state that builds during exercise when an individual/athlete is in "the zone", meaning in an intense state of focus.

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