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### Meditation and Action Observation Effect on Putting Performance

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## **Meditation and Action Observation Effect on Putting Performance**

The understanding of meditation and action observations effect on performance can be extremely beneficial for sporting success. A new method of preparation could be the deciding factor of the next national champion, Master's winner, or NFL dynasty. Psychological factors have not been thoroughly studied, and any science in this field is still new. Because of the infancy of this field, there are a lot of unknowns about the effectiveness of a physiological routine on performance.

When researching this area, we were hoping to find a conclusion about the effectiveness of meditation or action observation on putting performance so we could test this hypothesis ourselves. The first paper we studied was "The Impact of Mindfulness Meditation Programs on Performance-Related Outcomes: Implications for the U.S. Army" (Hepner et al. 2022). This study looked at the impact that mindfulness intervention and meditation could have on quantifiable performance aspects of the US army population and their families. The paper aimed to test the effect of mindfulness on thirteen performance related outcomes, with a systematic review of subsequent studies trying to answer the question: what is the effect of mindfulness meditation on U.S Army performance? Starting with six thousand publications, it was narrowed down to one hundred. Unfortunately, the results claimed the quality and quantity of specific research was limited, and there was no evidence to support the claim that meditation affects performance. Although this study did not provide insights to an experimental aid for our study, it did benefit us in other avenues.

One of the different ways this study helped was in the process of how we approached our research questions. With the help of this study and time in class spent learning experimental design, we were able to better understand how to formulate a usable research question. Reading

about how the researchers conducted a review of over six thousand publications gave us a good idea about the size of data surrounding the effect of meditation on performance. Another benefit of this study was the various definitions of performance. We did not know how varied metric performance was and learned quickly that our parameters needed to be more specified. These were both defining factors of our study that we did not know before starting our research, and this study helped us decide the path that we wanted to take with our other two research articles.

The second article we studied once we narrowed down our question was “The Instantaneous effects of mindfulness meditation on tennis return performance in elite junior athletes completing an implicitly sequenced serve return task” (O'Connor et al. 2022). This article focused on whether focus-attention or open monitoring meditation is best for improving performance in tennis players when compared to a control group. This study was extremely beneficial for our project because we were able to see several things we wished to implement.

One of the major elements of this study that we integrated into our study were the researcher’s chosen methods. We wanted to compare both meditation and action observation to a control group, but we did not have a order of how to do this. This study showed us the steps needed in order to successfully run a single trial. O’Conner’s study used a system that included a warm up, a fifteen minute session of experiment (Meditation or Control group), and then the test which consisted of three sets of twenty four return serves. We were intrigued with this model and decided to implement it into our own. Another element of this study we found helpful was the meditation routine. We had not decided on a guided meditation routine for our study but once we saw O’Conner’s meditation routine we wanted to test it ourselves because their results were surprising. Their results showed no significant difference between the meditation groups and the

control group. We did not expect to see this in the results of a study we wanted to follow so closely, so we decided to change a few factors in our own model.

One of the faults of this study was that they divided the participants into one of three groups. We wanted to see the effects of three different sessions on a singular participant to better compare the effect of meditation for each participant. Another thing we disliked was the amount of returns. We liked the model of three separate sets, but felt as if twenty four reps per set was too much. We decided to cut that number in half and do twelve per set to allow for consistent results and less fatigue in the athletes. We figured these steps would give our study more validity.

After researching meditation thoroughly and having a order of operations for our study, we were still missing research involving action observation which lead us to our third research article “Kinaesthetic imagery ability moderates the effect of an AO+MI intervention on golf putt performance: A pilot study”(McNeill et al. 2020). This study focused on the effects of action observation and motor imagery, both independently and the effectiveness of both combined. In the study they took forty four right handed golfers, and had twenty two of them undergo the intervention; the remaining twenty two were the control group. The classification was not random; rather they assigned people to groups based on their kinesthetic ability. Then, each golfer performed twenty putts at a distance of fifteen feet. After twenty putts, they underwent a three and a half minute action observation and motor imagery intervention before taking twenty more putts. The control group did the same, except instead of the intervention, they underwent a reading task. In their results they found that action observation and motor imagery intervention did significantly affect putting scores.

This study was very beneficial to us in two ways. First, because this study dealt with golfers, we were able to copy and adjust the methods to implement them into this study. This was

beneficial to us because this is where we gathered the idea to make our putts eleven feet along with other techniques used. This study was also useful in giving us our action observation technique. Previous studies only looked at meditation so we were excited to learn about the strategy of action observation and motor imagery. We chose to use action observation instead of motor imagery because of its better relation to those who are not proficient in imagery, but also the easiest to administer in the five minute window.

With all of this research done, we came to the hypothesis “There will be a difference in putting scores between preparation by meditation, preparation by action observation, and no preparation.” Along with this, our null hypothesis was “there will not be a difference between preparation by meditation, preparation by action and no preparation.”

To begin our research project we had to decide on the population we wished to test. We decided to test recreational golfers with more than one hundred and eight holes of golf or six times playing eighteen holes of golf. This was to eliminate anyone who is too new to golf to have an understanding of how to make a putt or the strategy involved. We also wanted to stray away from division one athletes or professional golfers to avoid anyone with a skill set above average to influence data.

Once our population was decided, we had each participant come, fifteen in total (two girls and thirteen guys), and pick a time in which they would go through a session. These participants picked the same time to come in for all three sessions to avoid any variables about time of day or the day of the week affecting sleep routine. Once they came in for their initial session they were randomly counterbalanced so that each participant did the trials in a different order. Each participant would complete all three tests, meditation, action observation, and control, but they would be in a different order for each participant.

After each participant arrived, they would immediately be walked through the meditation or action observation, unless it was their control session, in which they would start their putting. The meditation and action observation consisted of four minutes of auditory stimulus, walking the participant through the protocol and one minute of reflection. Afterwards, the participants started their putts. The hole was set eleven yards from the position of the ball, and each participant took thirty six swings (three sets of twelve repetitions) per session with a two minute break in between to avoid fatigue. To keep variables to a minimum, the tests took place in the racquetball room of the student activity center to create an environment of consistency, and the participants used the same putter and ball for every repetition.

Once the data was collected, it was analyzed using a repeated measures ANOVA. These tests showed us that there was a significant difference between the three protocols ( $P=.0002$ ,  $F=11.68$ ). After seeing a significant difference in the repeated measures ANOVA, we ran a follow up Tukey test to determine which conditions were different from each other. In the Tukey follow up test, there was a significant difference in putting scores between intervention protocols meditation and control ( $p=.0005$ ). There was also a significant difference in putting scores between intervention protocols imagery and control ( $p=.0010$ ). There was not a significant difference in putting scores between intervention groups imagery and meditation ( $p=.97$ ). The mean for the meditation protocol was 5.06 and the mean for the imagery protocol was 5.00. Both of those were significantly higher than the control trial of 3.87.

After seeing our results, we can conclude that pre-putting meditation or imagery does improve putting efficiency for college age recreational golfers based on the data in our repeated measures ANOVA and the Tukey test. These results allowed us to reject our null hypothesis that “there will not be a difference between preparation by meditation, preparation by action and no

preparation.” Our research prior to testing did not agree with our final results, which we concluded had mostly to do with the protocol in which they tested. Although we had less participants in this study, we believe our research avoided the problems from previous failed studies and applied needed changes to create a positive correlation.

For future studies on meditation and action observations effect on performance, we suggest a bigger population size. We also believe it would be interesting to test the results of meditation and action observation on elite or professional level athletes to determine if small adjustments can strongly affect performance. One improvement that was brought up during our student scholar presentation that we would like to see added is a mental health survey before each session. Meditation and action observation have a strong correlation with mental health, and we did not take into account where our participants were before each session. If this was recorded, we could have been able to see stress factors outside of the study that could have affected the results for that session. Another element we would like to track is nutrition, as it has a huge impact on mental health, and food can determine the mood of the participants and can therefore affect performance.

Altogether we felt as if our study was effective in the goal of testing the effect of meditation and action observation on putting performance. We believe these results show a promising correlation of mental health and performance that can hopefully be used by other athletes to improve their athletic achievement but also on non-athletes to improve classroom and job performance.

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