Attentional focus and practice variability on tasks acquisition and retention.

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As a task is learned there are many different paths in which feedback in both the body and environment contribute to learning a new skill. As humans started to question how a skill is learned different theories have been created. Many have been disproven and some still hold strong in the realm of motor behavior development. Coaching skills have changed little in the past 60 years even though numerous studies have proven that two-a-day practices do not assure efficient skill retention or that informing a player how to perform a task by telling players how to move their body will help them learn the task. The current generation of activity instructors has a new strategy for increasing the ability for participants to learn a skill and utilize it for year to come. Though these strategies were the most efficient five years ago there are many advances in motor learning behavior since then that their strategies are near obsolete. Now that the future in activity instructors are being taught the most efficient strategies for our time no one knows where it will go next.

This study was designed to examine the effectiveness of having an external focal point and practice variability on the effectiveness of learning and retaining a new motor skill. Does having and external focus increase the effectiveness of distributed practice compared to mass practice? Many studies recently have looked at how focal points effect skill acquisition and retention and with great results.
Gabriele Wulf at the University of Nevada Las Vegas first studied this with the “Instructions for motor learning: differential effects of internal versus external focus of attention” (Wulf, G., Hoess, M., & Prinz, W. 1998). She then examined another aspect of using external focus, when she did “Attentional focus on suprapostural tasks affects balance learning,” to see how far external focus extended (Wulf, G., Weigelt, M., Poulter, D., McNevin, M. 2003). This was then refined by Michal Emanuel, Tal Jarus, Orit Bart when they looked at age and the difference age makes on skill acquisition when having different focal points in “Effect of Focus of Attention and Age on Motor Acquisition, Retention, and Transfer: A Randomized Trial” (Emanuel, M., Jarus, T., Brat, O. 2008). Many studies in the past looked at practice variability and which type is most effective in skill acquisition and retention and there were very clear results. The combination of these two types of studies was the inspiration to conduct research. The present research corresponds with current studies by incorporating aspects from both focal points and their influence on retention and practice types influence on retention. We predict that the group with distributed practice will have a greater increase in their points over the mass practice group. As well we believe that teaching technique is not required to improve results in specific skills. Limitations that presented themselves as this study progressed were that the time required doing a full study with four different groups for both internal and external focus and distributed and mass practice. The challenge of finding enough participants to get a population that somewhat represented the general demographic of society became apparent as we continued. The last
limitation that was brought to our attention was a time frame in which both the participants and investigators could perform the tests together. The study was limited to only using half the participants groups that we would have preferred and with a much smaller sample size. The time frame wasn’t what we would have liked for the practice sessions but we did what we could with what he had. In this study the term used are internal and external focuses, and distributed and mass practice. Internal focus refers to a focal point in a skill or task that resides within a specific part of the body where as external focal points are as close to the body as gloves, socks and shirts and extend away. Distributed practice is where skills or tasks performed are limited to the number of trials and in a random order. Mass practice is when a particular task in performed numerous times without disruption in between trials.

**Literature Review**

Recently, coaching method of instructing by creating an internal focus, by telling players how to perform a skill with references to body parts, has come into question. Gabriele Wulf and colleagues have devised studies in which participants were asked to learn a skill in which they were either given an internal or external focal point (Wulf, G., Hoess, M., & Prinz, W. 1998). As internal and external focal points became the center of studies they began to use distance as an effect to performance and skill retention. Again Wulf and colleagues tested this theory, at first they had participants keep an internal or external focus that differed by inches. They then used markers to create a larger difference between focal points to see how
much improvement was made between participants (McNevin, N., Shea, C., Wulf, G., 2003).

People have wondered what type of practice would permit the best way in which skill learning would be at its optimal capacity. In the research article Part-Whole Practice of Movement Sequences written and conducted by Jin-Hoon Park, Heather Wilde, and Charles H. Shea. They were attempting to discover whether or not practicing a movement in its whole sequence or only doing part of the sequence would promote the best skill learning. They had 8 people in each group either practice the whole movement or practice the first half of the movement in one trial then practice the other half in another trial. Our study is the same as theirs in the fact that we are trying to find which type of practice permits increased skill learning. Our research experiment differs in that the distribution group practiced a completely different skill instead of being allowed to keep practicing the baseline test.

In Part and Whole Practice: Chunking and Online Control in the Acquisition of a Serial Motor Task conducted and written by Steve Hansen, Luc Tremblay, and Digby Elliott. They looked at whether or not a “No Overlap” group which only got to practice the first segment on the first day and then on the second day got to practice the second part would learn the skill just as effective as the other groups. The first group of the other two got to practice the all the segments together as a unit. The second group overlapped what they were learning by getting to practice the first to the third segments the first day, then the second day they were allowed to practice the second to the fourth segments of the movement with an overlap of the third part
of the segment. This is also like our experiment in how participants were able to keep practicing the baseline test in a whole part. It differs in that in our second group they did a completely different task that asked them to aim at different areas of the dart board.

**Methodology**

In the baseline test everyone came in and threw 25 darts at the bull’s-eye of the boards. We recorded each throw for where the darts hit on the board, or off, by using a diagram of the board and a space provided to make tic marks for each missed dart. Nothing will be said to the participants in any way besides general instructions on what will be the target for the test and general rule for the test. With the variability group participates were placed into a group and played a game of 501. We will be giving specifically external feedback and external focal points. The only instruction given was how to play the game. The repetition group participants were asked to throw 49 darts at the bull’s eye of the board. For all practice groups we encouraged an external focus. We determined the number of darts to be thrown by the massed practice group from averaging the number of darts thrown by the two practice sessions for the distributed group. The retention test we had everyone return to perform 25 more throws in which the bull’s-eye was the point of focus. Each throw was recorded on a diagram of the dart board and a space provided to make tic marks for each missed dart. Nothing will be said to the participants in any way besides general instructions. The participants for this study were chosen by
having little to no experience playing darts and they are college students and you have normal or corrected to normal vision. There was an even number of male and female participants that had varying athletic experiences as well as strength capabilities. A variety of body sizes and heights were prevalent within the groups. All participants were of Caucasian decent.

To determine the results a scoring system was put in place. A diagram of the dartboard was taken and used to record where each of the baseline and retention test darts hit on the actual dartboard (See figure 1). The dartboard diagram was labeled with each specific section to allow for accuracy of each point of contact made by the darts. We marked the points of contact of each dart on the diagram by using two different colored sharpie permanent markers to differentiate between the first set of twelve darts and the second set of thirteen darts. For scoring the dart board was broken into five even circular sections that progressed from the bulls-eye to the outside edge (see figure 2). Each section was given a point value were the bulls-eye equaled five points and the furthest from the bulls-eye was only one point. Missed darts were not given a point value.
Results

The findings of our study have shown that distributed practice promoted an increase in skill acquisition and retention over mass practice. The difference between the baseline and retention test for the distributed practice group was 6.8333 points. The baseline test averaged 55.333 points where the retention test averaged 62.1667 points for the distributed group. There were a total of 22 missed darts and 2 bulls-eyes on the baseline test compared to 22 misses and 7 bulls-eyes.

The findings show that the mass practice group improved but not at as high of a rate as the distributed group by having a difference of 2.667 points between the baseline and retention test. An average of 61.5 points was accumulated on the baseline test and an average of 64.1667 points for the retention test. A total of 22 missed darts and 5 bulls-eyes were recorded on the baseline test compared to 15 misses and 7 bulls-eyes. (See figure 3)

<table>
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<th>1</th>
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<th>4</th>
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<td>60</td>
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Retention Test  |  69  |  59  |  52  |  63  |  89  |  41  |

Average Baseline | 55.33333
Average Retention | 62.16667
Difference of Tests | 6.833333

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<th>3</th>
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Average Baseline | 61.5
Average Retention | 64.16667
Difference of Tests | 2.666667

| Difference of Baseline | 6.166667 |
| Difference of Retention | 2 |

Figure 3

In figure 3 all the data that was collected shows that an increase in points in group one which supports our hypothesis by providing evidence that distributed practice will encourage an increase in skill acquisition and retention. We believed that the test scores for the two groups would have been closer due to the assignment of the groups. We had expected that the baseline scores would have been closer than what had finally been recorded.

Summary, Conclusion and Recommendations
The focus of this project was to determine if there is a correlation between skill acquisition and retention and specific practice types. Determining a skill in which little to no experience was crucial and important so that any previous experience would not influence how the participant performed during the study. Many practice types have been used to establish an efficient method for skill acquisition and retention for many decades and task. The absence of the specification of focal point may have influenced the test results in many of these studies. Our purpose was to eliminate this inconsistency and use specifically external focus. Our subjects were broken into two different practice groups which each had a different practice type. Group one used distributed practice and group two used mass practice. Each group was performed a baseline test, two practice sessions and a retention test. An external focal point was given for each of the groups during their practice sessions. No focal point or advice was given for the baseline and retention tests, only instructions on how to perform the test. The results of the test showed that the distributed practice group had a higher increase in points between their baseline and retention tests compared to the mass practice group. With this study we have shown that the elimination of the focal point inconsistencies that distributed practice is still a more effective practice type compared to mass practice. Some limitations that occurred were a limited time frame in which the study was able to be conducted which limited the number of people to perform in the study which limited the number of groups that could have been utilized to further determine how influential internal and external focus are in studies. Future research should incorporate larger
numbers of participants and use both internal and external focus as a controllable variable.
Bibliography


Appendices

The appendix includes:
   a) Dartboard Diagram
   b) Points Ring
   c) Test Results table
   d) Informed Consent Form
   e) Point Recording Page
   f) Group Tests
      a. Group One – Distributed Practice
         i. Baseline Point Recording Pages
         ii. Retention Point Recording Pages
      b. Group Two – Mass Practice
         i. Baseline Point Recording Pages
         ii. Retention Point Recording Pages
      c. Score calculations page