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Where to Focus Attention When Performing the Jump Float Serve in Volleyball

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Abstract

The purpose of this study was to determine if an external attention focus was more effective than an internal attention focus for college female volleyball players practicing the complex open skill of the jump float serve. Sixteen college females with prior competitive volleyball playing experience were matched into either an internal or external attention focus group, each serving a total of 30 balls in three blocks of ten serves. After the pre-test, two days of practice and day off, a post-test was conducted for both groups. Results demonstrated a 25% improvement for the internal focus group and a 26.8% improvement for the external focus group. These results suggest that both internal and external focuses of attention are beneficial for practicing the complex jump float serve. However, a paired t-test from the improvement scores of both groups demonstrated no significant difference between the two practice conditions suggesting that either an internal focus or an external focus of attention is effective for practicing the complex jump float serve. In this particular study, external focus of attention was not found to be more effective than an internal focus of attention. Since these results do not support much of the research done with attention focus and sport skills, additional studies are needed comparing internal and external focus of attention, especially when practicing open sport skills.



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Traditionally when practicing and learning motor skills, the attention focus is on the actual movement pattern itself (internal focus) rather than on the intended outcome (external focus). Teachers and coaches provide movement feedback, while players direct their attention to the physical movement patterns. According to Schmidt and Wrisberg (2000), motor skill performance requires a conscious execution of the skill with an internal focus being most effective. However, focusing on the movement itself and its execution in a conscious manner has often resulted in what has been termed “paralysis by analysis” (p.108) and this type of focus may not be as effective as an external focus of attention.

The rationale for focusing on the movement effects rather than on the movement itself is explained by the “constrained action hypothesis” (McNevin, Shea, & Wulf, 2003; Wulf, McNevin, & Shea, 2001). This hypothesis suggests that directing one’s attention to the actual movements (internal focus) might “constrain” the motor system and interfere with the automatic control processes, while focusing on the effects of the movement (external focus) actually frees up the performer and enhances the automatic control processes. According to Wulf et al., (2001):

...trying to consciously control one’s movements constrains the motor system by interfering with automatic motor control processes that would “normally” regulate the movement. Focusing on the movement effect, on the other hand, might allow the motor system to more naturally self-organize, unconstrained by the interference caused by conscious control attempts—resulting in more effective performance and learning. (p.1144)

While focusing on the movement itself may have a negative impact, focusing on the external movement effect actually frees the learner from concentrating too much on the actual movement, and as a result is more effective. Overcoming this analysis paralysis, participants focus on the effects of their actions so the movement pattern becomes more “automatic”, demonstrating a smooth, coordinated response.

It is also interesting to note that although the emphasis is not on actual technique, players “do not need direct references to their body movements in order to acquire the correct technique” (Wulf, Gaertner, McConnel, & Schwartz, 2002, p. 176). This concept is not new; in fact, Prinz (1997) suggests that for actions to be effective, movements need to be planned in terms of their intended outcome. This “*action effect hypothesis*” suggests that the attention focused on the intended outcome of the performance of a skill will be more effective than attention focused on one’s own movements.

Although evidence is convincing regarding the effectiveness of an external focus in practicing motor skills, there is still much to be discovered. Conflicting findings demonstrate that age (Emanuel, Jarus, & Bart, 2008), skill level (Perkins-Ceccato, Passmore, & Lee, 2003; Wulf, 2008), gender (Wulf, Waechter, & Wortmann, 2003), complexity of the skill (Poolton, Maxwell, Masters, & Raab, 2006), and individual preferences (Wulf, Shea, & Park, 2001) might all play a role regarding the efficacy of internal and external attention focus in skill performance.



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While several studies have investigated motor skills in general, (Wulf, McNevin, & Shea, 2001; Wulf, Shea, Park, 2001; Totsika & Wulf, 2003; Wulf, 2008), others have looked specifically at the athlete's focus while performing sport skills in sport settings. Several studies have explored the effectiveness of focusing on movement effects versus focusing on the actual movements. These studies demonstrate the benefits of an external focus for learning various sport skills such as golf, (Perkins-Ceccato, Passmore, & Lee, 2003; Wulf, Lauterbach, & Toole, 1999; Wulf, & Su, 2007), tennis (Wulf, McNevin, Fuchs, Ritter, & Toole, 2000) basketball (Al-Abood, Bennett, Hernandez, Ashford & Davids, 2002), soccer and volleyball (Wulf, McConnel, Gartner, & Schwarz, 2002), baseball (Castaneda, & Gray, 2007), and even dart throwing (Marchant, 2007). All demonstrate support for using an external focus of attention when practicing specific sport skills.

Wulf and her colleagues have provided a solid basis for the benefits of using external focus in performing various physical activities and motor skills. Wulf, Hoess, and Prinz (1998) discovered external focus was effective in teaching skills with a ski simulator, and later in 2003, Wulf and McNevin discovered similar results testing balance using a stabilometer. Totsika and Wulf (2003) did a study on the influence of external and internal attention on transfer to novel situations and demonstrated an external focus had a positive effect on motor performance in both retention and transfer tests. Recently while working with Parkinson's patients, Wulf, Landers, Lewthwaite, and Töllner (2009) studied the effects of the different types of attention focus on postural instability while walking, standing, or interacting with the environment. The results found that patients who used an external focus balanced better and swayed less on inflated disks than patients using internal focus or no attention focus. These results again support previous studies regarding the effectiveness of an external focus in a variety of physical settings.

The ability to generalize these findings regarding physical abilities and motor skills to the sports setting has also been established. When investigating specific sport skills such as the basketball free throw, Al-Abood, Bennett, Hernandez, Ashford, and Davids (2002) compared external focus to internal focus. The findings demonstrate that, in shooting a basketball free throw, the movement effects such as ball trajectory relative to the basket were superior to the use of verbal instructions on movement dynamics. Wulf, McConnel, Gartner, Andreas, and Schwarzon (2002) studied novice and advanced volleyball players doing overhand serves as well as experienced soccer players shooting lofted passes at a target to examine the benefits of feedback that avoids references to the performer's body movements and uses an external focus. In the first study, the volleyball players that received external-focus feedback were more accurate than the group that was given internal-focus feedback. During the second study dealing with the soccer players, the practice and retention test scores of the external focus group were again better than the internal focus group.

Besides investigating team sport skills, golf has also been studied to determine the effectiveness of internal versus external focus. In an earlier study, beginners who were practicing the pitch shot found an external focus of attention to be more effective (Wulf, Lauterbach, & Toole, 1999). In a similar study by Perkins-Ceccato, Passmore, and Lee, (2003), the performance of a pitch shot by high- and low-skilled golfers were measured and the highly skilled golfers performed better with external focus feedback while the low-skilled golfers performed



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better with internal focus feedback. Poolton, Maxwell, Masters, and Raab (2006) specifically studied the skill of putting and found negative effects on internal focus because of overloading during processing of information and knowledge.

While using an external focus has been determined to be beneficial in the sport setting, variables could alter results. In a study on gender differences, Wulf, Wächter, & Wortmann (2003) focused on whether women could benefit more than men from using external focus. Forty students, 20 boys and the other 20 girls had to kick a ball at a target at a distance of 2 ½ meters being measured on the target by where the ball hit. The results of the tests showed that the male external group scored higher than any other group. The females in the internal group spent more time caring about the internal movements than the actual outcome, but when given an external focus, they begin to have successful performances. Therefore, women may actually do better with an external focus during more demanding situations than men.

Emanuel, Jarus, and Bart (2008) investigated the variations between children and adults who received either internal or external focus feedback during a dart throwing activity. The results indicate that the focus of attention varies between children and adults in the acquisition, accuracy, and transfer stages but not in the retention test. This study concluded that external focus was more effective than internal focus in adults, while internal focus was more effective than external focus in children. Thus, age may play a role in the effectiveness of different types of focus feedback.

Skill level is another variable to consider regarding the effectiveness of using an external focus. A study by Castaned and Gray (2007) studied the hitting of less-skilled and highly-skilled college baseball players in regards to internal and external focus and discovered that for the highly-skilled athlete an external focus was better than an internal focus. However, for the less-skilled players, batting performance was better using the internal focus of “step by step execution of the swing” (p. 60). In a study with soccer players, Ford, Williams, and Hodges, (2005) investigated the effects of skilled and less-skilled performers who were required to dribble a soccer ball under different task conditions which included a skill-relevant (the foot) and irrelevant component (the arm) of execution. The skilled group was negatively affected by the internal focus on the arm and the foot, while the less-skilled group showed negative results only with irrelevant attention to the arm. Wulf (2008) examined the effect of external and internal focus on world class acrobats and discovered that the control group did significantly better than either the external or internal focus groups. These results are contrary to previous studies and may be explained by the high skill level of the participants. Wulf’s study concluded that “the optimal attentional focus should depend on the level of expertise” (p. 319). Additional studies using elite athletes will help clarify these findings.

The complexity of the skill is another variable for investigation. Poolton, Maxwell, Masters, and Raab's (2006) suggested that an internal focus of attention increased working memory load, which might be expected to detrimentally affect learning a more challenging task. Wulf, Töllner, and Shea (2007) studied the effects of varying degrees of balance requirements as they related to internal and external focus and discovered that



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external focus became more necessary as the surface area became less stable concluding that the more challenging the task, the greater the need for an external focus of attention.

The majority of literature on the subject of movement effects versus actual movements indicates that external focus is more effective when performing a motor skill or a specialized sport skill. However, there are numerous variables that must be considered which may play a factor in the overall effectiveness of using an external focus. One variable of interest needing further investigation relates to closed versus open motor skills. While open skills involve an unpredictable environment where the environment, person and/or object are in motion, closed skills involve less variability where the environment, person and/or object are stationary. Because of a great deal of variability, open skills are more difficult to perform than closed sport skills so where to focus attention may be different. When reviewing the literature on attention focus, the majority of the motor skills investigated were closed rather than open motor skills, demonstrating a need to study internal/external focus effectiveness based upon the closed/open classification system.

Much has been learned about the benefits of attention focus when executing a skill, but there is still much to be learned about where to direct one's attention when performing motor skills for optimal performance. While numerous studies provide a good basis for the practitioner, more studies on attention focus researching various sport skills are needed, especially as it relates to open sport skills. Since only one study was found in the sport of volleyball, and that only investigated the standing overhand serve, which is a closed sport skill, the purpose of this study was to determine if an external focus was more effective than an internal focus for college female volleyball players practicing the complex open skill of the jump float serve.

Methodology

Participants

Participants (N=16) were college females with prior competitive volleyball playing experience. All had competed on interscholastic volleyball teams in high school; five had also played club volleyball, six had intercollegiate playing experience at the National Christian College II level, and one had two years at a National College Athletic Association I university. There were six freshman, two sophomores, five juniors and three seniors. They ranged in ages from 17 to 22 years, and had between three to ten years of playing experience. Six had played on the intercollegiate team the previous year and all were trying out for the current year's squad. The college has no athletic scholarships with open tryouts every year during the week prior to the opening of the fall semester. These players came early to participate in the tryout week. All signed a consent form to be a participant in the study, but the exact purpose of the study was not revealed until all data was collected. All participants had the opportunity not to be involved in the study and were told they could withdraw at any time. All participants were informed that the study had no relationship of whether or not they would make the intercollegiate volleyball team.



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Movement task

The task involved was the jump float serve which is considered an open sport skill and more complex than the regular standing float serve. To add to the openness and complexity of the skill, the participant could stand anywhere behind the end line (distance= 9 meters to the net) and change serving locations along the end line anytime throughout the trials. The goal of the movement was to score as many legal, inbounds serves as possible by serving a regulation multicolor volleyball into the opposing court.

Procedure

The participants were assigned to one of two experimental groups (n=8) based on their pre-test scores of 30 jump float serves. The two matched groups were assigned one of two practice conditions. The systematic sample was ranked ordered with every other participant being placed in either the internal or external practice condition. Group One was the movement mechanics group (internal focus) while Group Two formed the movement effects group (external focus). The internal focus group was told to focus on the actual movements of the serve such as the hand making contact with the ball as they jumped. The cue words, “feet to the ball” and “hop and pop” were emphasized. The external focus group was told to focus on the flight of the ball to a specific zone on the other side of the court. The cue words, “see the ball to target” and “hand to ball to target” were emphasized. These cue words were also listed on the individual’s scoring sheets of the two groups. All participants followed the same warm up prior to each day’s practice and the serving practice was done immediately following the five minute warm up period. On the first day of the study, all participants received the same initial instructions regarding the ball toss, footwork, and ball contact. All participants performed a total of 30 jump serves – three blocks of 10 serves. This occurred during the pre-test, on the two consecutive days of practice and during the post-test, after a day off. After each block of 10 serves, the player would rest for a minute and record scores on the scoring sheet provided. The sheets were turned in at the end of the 30 serves each day. During the practice days, the participants were reminded of their attention focus goal, but no other augmented feedback was provided by the researcher or anyone else. Following the two practice days and after a day of rest, participants performed a post-test consisting of 30 trials of three blocks of ten serves.

Data Analysis

Descriptive statistics were calculated to report the mean performance of the two practice groups for the pre-test, two practice days and the post-test scores (Figure 1 & 2). Individual scores for the pre-test and post-test for both practice conditions were presented along with the improvement score of each participant as well as the group improvement scores (Table 1 & 2). A paired t-test from the improvement scores was conducted to determine if there was a significant difference between the internal and external focus of attention practice conditions (Table 3).



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Results

The total scores on each 30-trial blocks for the pre-test and post-test for the eight individuals in each of the two practice groups are shown in Table 1 along with the individual improvement scores. From the pre-test to the post-test, improvement was demonstrated in both the internal and external practice groups, with the most improvement seen with the external focus group (Table 2). Percentage of improvement for the internal group was 25% from the pre-test to the retention test while the percentage of improvement for the external group was slightly higher at 26.8% improvement. All participants in the internal focus group improved from the pre-test to the retention test, while all but one of the participants in the external focus group improved from the pre-test to the post-test, and that participant remained the same (Table 1 & 2).

For both groups, improvement was demonstrated between the pre-test and post-test scores. The external focus group improvement score was slightly higher than the internal focus group improvement score, but when a paired t-test was conducted between the improvement scores of the two group means, there was no statistical significance found between the two practice conditions ($p=.699$).

Discussion

The purpose of this investigation was to determine if an external focus would be better than an internal focus when performing a volleyball jump float serve. Among numerous studies on attention focus, few have considered the effects of attention focus on open skills such as the jump float serve. Also while several sport skills have studied attention focus effectiveness, volleyball skills have been minimal except for the standing overhand serve (Wulf et al., 2002).

Traditionally, coaches and teachers have been trained in teaching sport skills using an internal focus of attention. Although a common practice, some have questioned the value of an internal focus and suggest it may actually hinder performance (McNevin et al., 2003). The results of this study did not support that an external focus was more effective than an internal focus when performing the jump float serve in volleyball since no significant difference was found between the internal and external practice groups. While this finding appears to be counter to several studies exploring the benefits of an external focus when compared to an internal focus, one explanation may be the type of sport skill involved which determines the type of focus needed. In several of the previous sport skill studies, tasks were a closed sport skill rather than an open sport skill. Such examples include, the basketball free throw (Al-Abood et al., 2002), the standing soccer shot (Wulf et al., 2002), the golf pitch shot (Wulf et al., 1999) and putting (Poolton et al., 2006). The only study done in volleyball (Wulf et al., 2002) also demonstrated the effectiveness of an external focus when performing the standing overhand serve, which is also a closed sport skill.

Another explanation suggesting why an internal focus may not be detrimental in skill acquisition takes into account the preferred attention focus of the performer. Recently Weiss, Reber, and Owen (2008) discovered that



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one's preferred focus of attention could play a role in the effectiveness of attention focus, suggesting that an internal focus did not necessarily lead to a decrease in performance if it was the participant's preferred strategy. In fact, "one might speculate that if you let people perform the way they prefer to perform, a heightened self esteem and thus better performance will result" (p.1055). These findings suggest that developing instructions which help direct the participants' focus of attention to their preferred attention focus may be the best method for effective skill instruction.

The jump float serve used in this study was an open sport skill involving several variables, including the attention preference of the performer. These factors may explain the difference in the results of this study compared to other studies done on this topic. The results of this study suggest that when performing a more complex open skill with several uncontrollable variables, perhaps a focus on the actual movement is as beneficial as the focus on the movement effect. Additionally, the effectiveness of which type of attention focus may also be dependent on the participants' preferred attention focus.

Although no statistically significant difference was established between the internal and external focus groups in this study, it should be noted that both groups did improve with practice. This improvement, although not significant, does have practical significance for practicing the jump float serve using either an external focus of attention or an internal focus. The decision of where to focus may be a decision of not what is right or wrong, but rather which is better under certain circumstances. Practitioners should consider that effective sport skill learning occurs using either an internal or external attention focus depending on various factors. These factors include whether the skill is open or closed, as well as the preferred attention focus of the participant. While this study may bring up more questions than answers, the questions are warranted. More studies need to be conducted using various open skills in numerous sport settings along with exploring attention preferences to determine if an external focus of attention is more effective than an internal focus for skill acquisition.

About the Author

Dr. Vickie Grooms Denny has coached volleyball on the collegiate level for 27 years. She has studied coaching pedagogy at The Ohio State University and Florida State University, and currently she serves as the head volleyball coach at Clearwater Christian College in Clearwater, Fla. She is also the chair of the Exercise and Sport Science Department, and she teaches courses in pedagogy, motor learning and sport psychology. She currently holds the CAP, Level III coaching certification through USA Volleyball.



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Tables and Figures

Table 1

N	Internal Focus Group		
	Pretest	Post Test	Improvement Score
1	1	8	+7
2	8	12	+4
3	11	20	+9
4	13	19	+6
5	20	25	+5
6	20	24	+4
7	21	25	+4
8	26	27	+1

N	External Focus Group		
	Pretest	Post Test	Improvement Score
1	1	9	+8
2	9	11	+2
3	13	19	+6
4	14	22	+8
5	15	28	+13
6	20	25	+5
7	23	25	+2
8	25	25	0



Table 2

	Internal Focus % of Improvement		External Focus % of Improvement
N		N	
1	87.5%	1	88.8%
2	33.3%	2	18.2%
3	45%	3	31.6%
4	31.5%	4	36.4%
5	20%	5	46.4%
6	16.6%	6	20%
7	16%	7	8%
8	37%	8	0%
	25%		26.8%

Table 3

t-Test: Paired Two Sample for Means

	<i>Internal</i>	<i>External</i>
Mean	5	5.5
Variance	5.714286	17.7142857
Observations	8	8
Pearson Correlation	0.553763	
Hypothesized Mean Difference	0	
df	7	
t Stat	-0.40347	
P(T<=t) one-tail	0.34932	
t Critical one-tail	1.894579	
P(T<=t) two-tail	0.69864	



Figure 1 – Internal Focus Groups

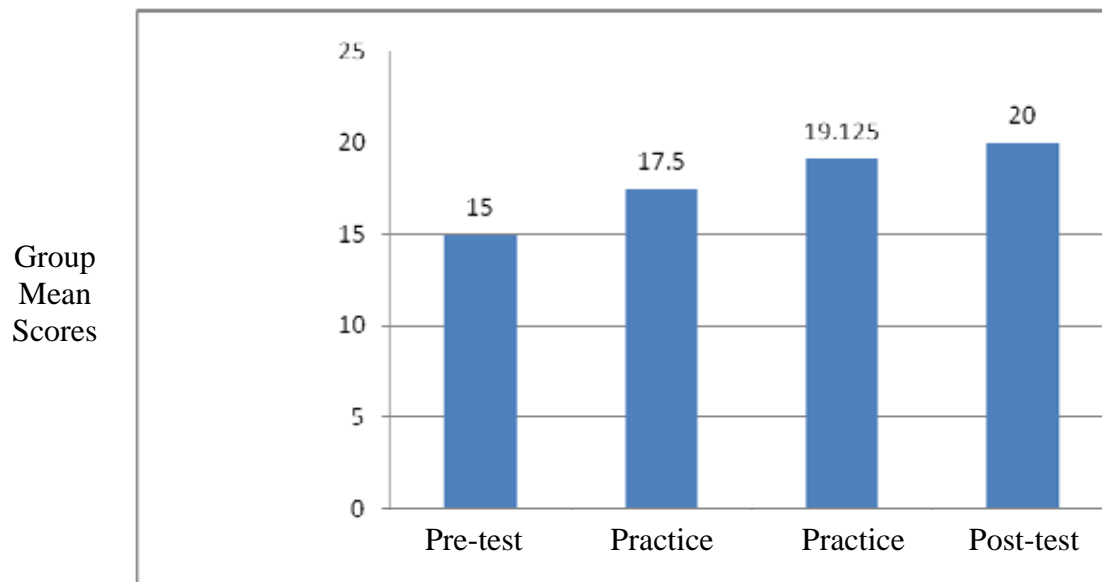


Figure 2 – External Focus Groups

