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An Investigation of the Relationship Between Mindfulness, Preshot Routine, and Basketball Free Throw Percentage

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Seventeen (17) members of three NCAA Division I men's basketball teams completed measures of mindfulness and sport-related anxiety to examine the relationship between mindfulness, preshot routine, trait arousal, and basketball free throw shooting percentage. It was hypothesized that (a) mindfulness scores would predict game free throw shooting percentage, (b) practice free throw percentage (indicative of basic skill) would predict game free throw percentage, and (c) consistency in the length of prefree throw routine would predict game free throw percentage. Results indicate that levels of mindfulness significantly predict game free throw percentage and that practice free throw percentage also predicts game free throw percentage. Length and/or consistency of preshot routine were not predictive. Although not proposed as a hypothesis, a statistically significant relationship was also found between an athlete's year in school (which reflects competitive basketball experience) and game free throw percentage. Together, these results clearly suggest that the combination of mindfulness, skill (practice free throw percentage), and competitive experience (year in school) all contribute to the prediction of competitive free throw percentage and that these variables are more central to successful free throw percentage at this level of competition than length/consistency of one's preshot routine.

Athletes are, by nature, competitive and as a result are constantly striving to perform at higher levels. An important component of competitive athletics is the need for athletes to perform under pressure (Craft, Magyar, Becker, & Feltz, 2003). As a result, athletes must be mentally ready to perform under what will inevitably be stressful circumstances. Orlick and Partington (1988) described the mental state of an athlete before and during competition as a decisive outcome factor in competitive athletics. Athletes often develop routines to aid in the mental preparation for competitive performance, and research has indicated that athletes who

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used preperformance routines are better able to overcome adversity and distraction (Orlick & Partington, 1988). In a qualitative study of 1988 U.S. Olympic Wrestlers, it was reported that a common element of successful athletes was the quality of mental preparation for competition. Common factors included refined precompetition plans, competitive focus and refocusing plans, self-confidence, power, control, commitment, and ongoing postcompetitive analyses (Gould, Eklund, & Jackson, 1992). In addition, when athletes are faced with stressful and anxiety provoking situations, some have experienced mild to moderate decrements in performance, while others reach the point of "choking," which reflects a more significant impairment in competitive performance (Craft et al., 2003).

Preperformance Routines

In basketball, one of the most important, and at times anxiety provoking, game situations is free throw shooting. Many contests are won or lost in the final minutes by slim margins, and the outcomes of these games are often decided by how accurate athletes are at free throw shooting (Lobmeyer & Wasserman, 1986). As previously noted, athletes, including basketball players, often have some type of precompetitive/preshot routine. Precompetitive routines are comprised of a combination of cognitive and behavioral strategies used before the execution of a motor skill (Cohn, Rotella, & Lloyd, 1990) and are intended to function as a form of stimulus control.

As a form of preperformance routine, preshot routines in basketball allow athletes to focus their thoughts on a series of well rehearsed cues, thus reducing the likelihood that they will focus on outcome, extraneous distractors, or their own negative cognitions (Boucher & Crews, 1987). There are some empirical findings that suggest that preparatory strategies in the form of precompetitive routines can positively impact subsequent performance (Gould et al., 1992).

While preperformance routines have been suggested to have an influence on athletes' performance, the exact mechanism by which they work is not clear (Hardy, Jones, & Gould, 1996). An athlete's preperformance routine may develop for a number of very different reasons. Some have suggested that athletes develop precompetitive routines as a way of coping with the intense performance demands placed upon them (Boucher & Crews, 1987). The routines help establish a sense of normalcy or familiarity in an often unpredictable environment (Lidor & Singer, 2000) and have been found to be consistent over many hours of play (Crews & Boucher, 1986). In addition, adherence to one's preperformance routine has qualitatively been found to be associated with successful performance, while failure to adhere to one's routine has been found to have a relationship with less successful performance. For example, in a qualitative study by Gould et al. (1992), it was concluded that Olympic medalists consistently relied on mental preparation routines as opposed to nonmedalists, who used preperformance routines only in particular situations. In addition, it was concluded that athletes reported that they use routines as a way to arrive at an optimal mental state, and 53% of those interviewed about their worst performance stated that they had not adhered to their preperformance routine.

Orlick and Partington (1988) suggested that precompetitive, competitive, refocusing, and postcompetitive evaluation plans were crucial for optimal performance, overcoming blocks to performance, and managing the competitive environment.

These well-learned routines have been deemed necessary when competing in intensely competitive events such as the Olympics (Gould, Eklund, & Jackson, 1993). In addition, elite level athletes often use their routines so frequently that they become automatic (Lidor & Singer 2000). These routines are reinforced by successful performance following the use of a certain routine. As the athlete believes that the routine "works," he or she may continue the regular use of the routine, which then continues to be intermittently reinforced (Lobmeyer & Wasserman, 1986).

The use of preshot routines before free-throw shooting is prevalent in the sport of basketball. In the previously cited study by Lobmeyer and Wasserman (1986), subjects were given training in the use of preshot routines. The subjects in the study experienced a 7% increase in success when using the routines as opposed to not using the routine in practice situations. As this difference was relatively small, a follow up study was performed and it was found that this difference was greater under competitive stress, as shooting accuracy was 23% higher with the preshot routine.

Additional factors such as length of routine and/or consistency of routine have also been found to be related to performance. Southard and Miracle (1993) noted that altering a college basketball player's time of the preshot behavior significantly reduced free throw success. When high school male basketball players were asked to shoot free throws with and without their usual preshot routine, 20 of the 25 athletes demonstrated lower scores during the no-routine condition (Gayton, Cielinksi, Francis-Keniston, & Hearns, 1989). Wrisberg and Pein (1992) investigated the length of one's preshot routine and the accuracy of free throw shooting. They argued that successful free throw shooters more consistently execute preshot routines than less successful free throw shooters. The consistency of the routine was found to be more closely associated with accuracy than was the average duration of the preshot routine (Wrisberg & Pein, 1992). This consistency may help the athletes cope with the variability of each shot. No significant differences have been found between gender and preshot interval; and preshot interval, shot accuracy, and situational factors (Wrisberg & Pein, 1992). The average length of an athlete's preshot routine has been suggested to be a matter of personal preference, as no optimal time length has been found to predict accuracy of free throw shooting (Wrisberg & Pein, 1992).

Differences in routine have been observed based on skill, however. Significant differences in preshot routine have been found between Division I basketball players and male intramural players. In one study, intercollegiate athletes shot free throws more accurately, took a longer amount of time to prepare for the shot, and were more consistent with their routine than the intramural players (Wrisberg & Pein, 1992), suggesting that college athletes may have developed a solid preshot routine and have more than likely been using that same routine for many years. No significant results were found based on game importance or time of game (Wrisberg & Pein, 1992).

In another study of Division I basketball players, athletes who maintained a preshot routine had a higher free throw percentage (74%) than those who did not maintain a preshot routine (68%; Czech, Ploszay, & Burke, 2004). In an interesting study, practice and game free throw performances of one NCAA Division I men's basketball team were examined over a two-year period. Results indicated that the performance on the first two free throws in each practice grouping was an accurate indication of game free throw performance (Kozar, Vaughn, & Lord, 1995; Whitehead, Butz, Vaughn, & Kozar, 1996). This finding was interpreted to suggest that an additional factor, that is, level of arousal may account for the similar accuracy in the two conditions.

Arousal

Stress, anxiety, and arousal are all internal states that can either improve or impair performance (Basler, Fisher, & Mumford, 1976). Anxiety "integrates a wide variety of experiences, including memories, thoughts, evaluations, and social comparisons among others" (Hayes, Wilson, Gifford, & Follette, 1996, p. 1155). There are both strong social and self evaluations that occur during competition that result in more consistent performance decrements (Gould, Petlichkoff, Simons, & Vevera, 1987). An athlete's ability to regulate his or her level of emotional arousal is often thought to influence performance. This arousal refers to how intense, nervous, and emotionally activated an athlete becomes before or during competition (Gould & Udry, 1994).

Preperformance routines may serve as a way to attain an activation or arousal state most appropriate for optimal performance (Hardy et al., 1996). Singer (2002) suggested that the ability to self regulate one's arousal level, expectations, confidence, and attention during performance may be as important as becoming skilled in the sport. Lidor and Singer (2000) stated that the general purpose of a performance routine is to put oneself in an optimally aroused, confident, and focused state before and during performance. In addition, the routine may allow an individual to become immersed in the performance with the belief that the performance will be successful. As a result, a well learned routine may lower arousal levels that are generated by stress while at the same time serve to enhance one's concentration (Boucher & Crews, 1987)

There are a number of theories that have been presented to explain the seemingly complex relationship between arousal and performance. Yerkes and Dodson (1908) formulated a seminal theory regarding the relationship between arousal and performance. Their inverted U hypothesis posits that there is an optimal level of arousal for athletes and states that arousal levels that are either too high or too low can have a detrimental effect on performance. Martens, Vealey, and Burton (1990) expanded the theory to provide a multidimensional explanation of sport anxiety. Consistent with findings in clinical psychology, the authors suggested that sport anxiety consists of both cognitive and somatic components. A negative linear relationship between the cognitive components of anxiety and performance was proposed; however, the somatic components of anxiety were believed to have less of an impact on performance than the cognitive components (Craft et al., 2003).

Another theory, the cusp-catastrophe theory, suggests that performance is determined by the interaction of cognitive and physiological arousal. This theory states that heightened cognitive and physiological arousal increase performance only up to a point, at which time there can be a rapid deterioration in performance (Hardy & Parfitt, 1991). Therefore, the relationship between physiological arousal and performance is mediated by one's cognitive arousal (Gould & Udry, 1994).

Finally, the individual zones of optimal functioning (IZOF) theory is a theory proposed by Hanin (1997), which suggests that an optimal level of arousal exists for each individual, which in turn is related to optimal performance. As this level varies from person to person, the determination of a nomothetic description of an arousal-performance relationship is simplistic. Thus, to be successful, an athlete must determine his or her own personal optimal level of arousal (at which he or she performs best) and then be able to regulate arousal to this predetermined level.

As a specific form of arousal, the relationship between anxiety and competitive performance has been frequently studied. Anxiety alone may not be a good predictor of performance, however, as it may be highly dependent on other factors. These other factors can include coping strategies, confidence in one's ability, and interpretation of the meaning of anxiety (i.e., as it may be labeled as "bad," which may negatively affect performance). Schachter and Singer (1962) stated that an emotional experience requires a cognitive interpretation of a person's arousal. Another possibility is that performance is dependent on coping strategies, such as the athlete's confidence in how he or she can handle anxiety and the athlete's perception of the demands of the sport situation (Craft et al., 2003). In addition, the amount of anxiety experienced can differ from one athlete to the next (Hassmen, Raglin, & Lundqvist, 2004). Over time, through positive and negative experience, athletes can become trained to not only recognize when they are appropriately aroused, but to adjust the level of arousal as needed (Ebbeck & Weiss, 1988). This provides some indirect support for Hanin's (1997) IZOF theory and suggests that athletes who develop adequate coping strategies for their arousal, such as a preshot routine, may be more successful during competitive performance.

Mindfulness

The rather inconsistent empirical findings for the relationship between arousal and performance suggest that at least in part, success in free throw shooting may be due to other variables. When at the foul shot line, basketball players are faced with many distractions: crowd noise, opposing players, coach instructions, game pressures, or even their own cognitions and affective states. It has been suggested that athletes who are capable of focusing on task-relevant cues and contingencies experience greater levels of performance than those who engage in self-focused attention and therefore are not fully "in the moment" during the competitive situation (Gardner & Moore, 2004). Based on this, it is certainly possible that those athletes who are better at focusing on task-relevant cues rather than on task-irrelevant cues (including both internal and external stimuli) may have better free throw shooting percentages. This general concept is related to the construct of mindfulness, which has garnered significant attention in the clinical psychology domain and more recent attention among a handful of sport psychology researchers and practitioners (Gardner & Moore, 2004, 2006, 2007; Kee & Wang, 2008). More specifically, *mindfulness* has been defined as " . . . paying attention in a particular way: on purpose, in the present and nonjudgmentally" (Kabat-Zinn, 1994, p. 4). Mindfulness has been suggested to represent the "nonjudgemental observation of the ongoing stream of internal and external stimuli" (Baer, 2003, p. 125). Originally derived out of Eastern philosophical traditions, mindfulness training emphasizes acceptance of both internal and external experiences (Kabat-Zinn, 1994). *Acceptance* has been defined as "taking a stance of non-judgmental awareness and actively embracing the experience of thoughts, feelings, and bodily sensations as they occur" (Hayes, Strosahl, Bunting, Twohig, & Wilson, 2004, p. 7). It has been suggested that a present-moment focus is related to athletic performance, as it allows one to eliminate distractions from past, future, and other current events (Gardner & Moore, 2004, 2006, 2007; Kee & Wang, 2008). These authors have suggested that one's level of mindfulness is linked to clear goals, task concentration, sense of control, and loss of self-consciousness. As such, these authors suggest that individuals who are more mindful may also be more likely to experience the elusive flow state during athletic performance.

In the Gould et al. (1992) study of Olympic wrestlers, it was noted that before worst performances, wrestlers reported prematch mental states that included negative feeling states and negative, irrelevant, or irregular patterns of cognitive activity. It has been found that successful and elite athletes are less likely to become distracted or preoccupied with thoughts of failure and/or their own anxiety (Mahoney, Gabriel, & Perkins, 1987). In another study by Gould, Weiss, and Weinberg (1981), it was concluded that more successful college wrestlers are more frequently prepared for competition by focusing their attention on only match (i.e., task) related cognitions. Likewise, successful athletes have been found to be better able to become nonresponsive to cognitions and emotions (Mahoney & Avener, 1977). These results, when viewed in aggregate, suggest that successful and elite athletes may be better able to attain and maintain mindful attention to the task at hand and in so doing not allow their internal experiences (i.e., cognitions and emotions) to become a source of distraction. Similarly, Cohen, Tenenbaum, and English (2006) suggested that as a result of athletes not being able to identify their own personal optimal level of arousal, they must learn to perform with "negative" emotions.

Since the idea that negative cognitions and/or emotions inevitably result in reduced athletic performance has not been empirically verified (Gardner & Moore, 2006), newer, nontraditional performance enhancement techniques have recently been developed to increase mindfulness and acceptance. One such theory and protocol, which has already garnered some empirical validation, is the Mindfulness-Acceptance-Commitment (MAC) approach to performance enhancement (Gardner & Moore, 2004, 2006, 2007). A manualized protocol, the ultimate goal of MAC has been described as helping the client maintain attention without the need to reduce, limit, or otherwise control naturally occurring internal experiences such as thoughts, emotions, and physical sensations. The protocol uses acceptance, values-commitment, and mindfulness training to promote the development of present moment acceptance of all forms of thoughts, feelings, and physical sensations, along with attention to competition-appropriate cues and contingencies (Gardner & Moore, 2004, 2006, 2007). Since its initial development in 2001, case studies, open trial, and randomized controlled trials have suggested the efficacy of this particular approach for performance enhancement (Gardner & Moore, 2004, 2006, 2007; Lutkenhouse et al., 2007; Wolanin, 2005)

On the other hand, an additional technique known as Cognitive Affective Stress Management Training (SMT) is a traditional cognitive behavioral technique developed to help athletes *control* emotional states. While the goal is more oriented toward control and reduction of internal experience, this technique does include a meditative component toward the goal of relaxation (which is not mindfulness), in addition to coping skills training, both of which are intended to improve focus in-the-moment and help athletes respond to their emotional experiences (Crocker, Alderman, & Smith, 1988). While the empirical support for SMT is limited, preliminary findings from a nonrandomized controlled trial suggested improved performance among volleyball players, although interestingly, it did not significantly reduce emotional states (Smith, 1980; Smith & Smoll, 1978; Ziegler, Klinzing, &

Williamson, 1982). The study (Crocker et al., 1988) suggested that no reductions in anxiety were found; however, significant improvements in performance were noted among the nonrandomized groups. Thus, it is possible that as would be predicted based upon the theoretical presentation of mindfulness in athletic performance, improving moment-to-moment task-relevant focus (mindfulness) was the mechanism for the observed performance improvements, even as anxiety levels were unaffected. Similarly, the importance of task-relevant attention in optimal performance has been highlighted in the professional literature. Edwards, Kingston, Hardy, and Gould (2002) found that when elite athletes shifted their attention to a self-evaluation of their performance, a detrimental effect on performance occurred. Consistent with these findings, Orlick and Partington (1988) have suggested that one of the major components of successful athletic performance is the ability to focus attention on the competitive task. Olympic athletes in their study who did not perform up to ability level indicated that they were not prepared to deal with distractions and were not able to refocus after distractions occurred.

Looking at attentional processes from a different perspective, Boucher and Zinsser (1990) examined the role of cardiac deceleration on golfers' performance. Their research indicated that greater cardiac deceleration was associated was superior putting performance. More importantly, the data suggested that cardiac deceleration was more strongly influenced by attentional processes than by the absence of motor activity. This provides further support for the role of attention and focus in superior performance. In essence, those who can more mindfully attend to the task would have superior putting performance.

Finally, consistent with theoretical propositions with regard to mindfulness and performance, while elite and nonelite performers do not appear to differ in the intensity of the anxiety they experience, elite performers are significantly more likely to interpret their anxiety as facilitative (Jones, Hanton, Swain, & Hardy, 1993). From the perspective of mindfulness theory, it is very possible that elite performers are typically more mindful when performing, and thus, they exert little effort at controlling or in any way reducing their cognitions and emotions. Rather, they are usually capable of performing *with* whatever cognitions and emotions they experience. The success of top professional golfers has been attributed to their ability to focus on one shot at a time, another phrase for "attentional skills" (McCaffrey & Orlick, 1989). The ability to focus one shot at a time reflects core aspects of the mindfulness construct.

The purpose of the current study was to examine the relationship between mindfulness, preshot routine, and trait arousal, and game free throw shooting percentage among NCAA Division I men's basketball players. Three main hypotheses are suggested. First, mindfulness scores will predict game free throw shooting percentage. Second, practice free throw percentage (indicative of basic skill) will predict game free throw percentage. Third, consistency/length of prefree throw routine will predict game free throw percentage.

Method

Participants

All 43 members of the three NCAA Division I men's basketball teams were asked to participate in this empirical investigation. All of these individuals completed the informed consent, the packet of questionnaires, and the practice free throw shooting portion of the study (described below), all of which occurred before the start of the competitive season. Once this was completed, to qualify for inclusion in the competitive free throw shooting portion of this investigation, upon which this study is based, these athletes must have subsequently had at least 30 total competitive free throw attempts across all regular season games in the upcoming season and must have been at least 18 years old. At the end of the competitive season, 26 of the 43 athletes had not meet inclusion criteria. As a result, 17 of the 43 athletes were ultimately included in the study.

The ages of the 17 athletes upon which the study was based ranged from 19 to 24. The participants included 4 college sophomores, 7 juniors, and 6 seniors. Among them, 1 was Caucasian, 14 were African-American, 1 was Hispanic, and 1 was biracial.

Measures

All 43 members from the three Division I teams were administered the demographics questionnaire (to assess participants' age, ethnicity, and year in college), the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003), and the Sport Competition Anxiety Test (SCAT; Martens et al., 1990).

Sport Competition Anxiety Test. The Sport Competition Anxiety Test (SCAT; Martens et al., 1990) is a 15-item self-report instrument measuring one's tendency to perceive competitive situations as threatening, which can lead to increased intensity of one's state-based reaction to competitive situations (Martens et al., 1990). The instrument utilizes a 3-point Likert scale with *hardly ever*, *sometimes*, and *often* as anchors to questions such as "Before I compete I feel uneasy" and "Before I compete I get a queasy feeling in my stomach" (Martens et al., 1990). The SCAT is labeled as the Illinois Competition Questionnaire to help decrease social desirability effects. The SCAT has an internal consistency of approximately 0.89 for females and 0.88 for males (Ostrow & Ziegler, 1978).

Mindful Attention Awareness Scale. The Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) is a 15-item self-report measure of mindful attention and awareness (Brown & Ryan, 2003). The MAAS utilizes a 6-point Likert scale to rate how often participants have experiences such as, "I forget a person's name almost as soon as I've been told it for the first time," or "I find it difficult to stay focused on what's happening in the present." The Likert scale ranges from 1 (*almost always*) to 6 (*almost never*). The MAAS has an internal consistency of .82. The MAAS was chosen due to its length and understandability.

Procedure

After completing the informed consent form and demographics questionnaire, all 43 athletes were given the Mindful Attention Awareness Scale and the Sport Competition Anxiety Test in the fall before the beginning of the basketball season. Each assessment packet was numbered, and immediately upon completing the measures, the individuals' identifying information on the informed consent was removed to protect confidentiality. The athlete's names and accompanying identification numbers were kept in separate locked locations to which only the primary investigator had access. All 43 athletes were also asked to take 50 noncompetitive (i.e., practice) free throws. Each shot was recorded as a "make" or "miss." After completion of the practice free throws, a mean practice free throw percentage was recorded for each athlete.

The primary investigator was supplied with copies of each team's regular season game tapes at the conclusion of the competitive season, which were used to study every single free-throw shot taken by the athletes in the study over the course of the entire season. As such, a mean and standard deviation of each athlete's length of preshot routine was precisely determined. The time began to be recorded the moment the athlete received the ball from the referee until the moment that the athlete released the ball to shoot his free throw. Time was measured to the hundredth of a second.

Statistical Analyses

To measure length of preshot routine, each athlete had the length of his preshot routine calculated (from video recording) to include a mean and standard deviation. A series of linear regression analyses were performed to predict game free throw percentages using one's practice free throw percentages, mindfulness score (MAAS), trait arousal (SCAT), mean and standard deviation of one's length of his routines, as well as a player's year in school, as predictor variables. Correlations between variables were also examined. Each player was given a difference score (practice-game free throw percentage) to determine if mindfulness would predict the difference between an athlete's practice performance and competitive game performance.

Results

As previously noted, 43 participants completed the measures from the three Division I men's basketball teams and participated in the practice free throw shooting component. At the completion of the competitive season, 17 participants qualified for inclusion in the study. Table 1shows that the mean game free throw percentage was 67.84 with a standard deviation of 10.70. The mean practice free throw percentage was 80.71 (SD = 11.07), the mean MAAS score was 4.12 (SD = .0.95), and the mean SCAT score was 18.00 (SD = 3.5). Each player's length of their preshot routine was measured to receive a mean length of one's routine (M = 5.76, SD = 1.57) and a standard deviation (M = 1.06, SD = 0.46).

Table 1 Descriptive Statistics for Variables

	N	Mean	Standard Deviation
Game free throw percentage	17	67.84	10.7
Game percentage	17	80.71	11.07
MAAS	17	4.12	0.95
Mean	17	576	1.57
Standard deviation	17	1.06	0.46

Statistically significant correlations (see Table 2) were found between game free throw percentage and practice percentage ($p < .05$); game free throw percentage and mindfulness (as measured by the MAAS; $p < .05$); and year in school and trait arousal (as measured by the SCAT; $p < .05$). Linear regressions were then used to analyze the variables. A statistically significant model (see Table 3) was found for practice percentage predicting game free throw percentage ($p < .05$), and for levels of mindfulness (MAAS; see Table 4) predicting game free throw percentage ($p < .05$). The MAAS regression model (see Table 4) indicates that a one standard deviation ($SD = .95$) increase in mindfulness scores would result in a 5.75 percentage point increase in game free throw percentage. In addition, an athlete's year in school (representing collegiate basketball experience) was found to be a statistically significant ($p < .05$) predictor of game free throw percentage. None of the remaining variables (SCAT, mean length of routine, and standard deviation of length of routine) were found to be statistically significant predictors of game free throw percentage (see Tables 5–8).

Table 2 Significance of Correlations Between Variables (1-Tailed)

	Correlations					
Variable	**1**	**2**	**3**	**4**	**5**	**6**
1. Game free FT percentage	—	—	—	—	—	—
2. Practice percentage	.021*	—	—	—	—	—
3. MAAS	.013*	.269	—	—	—	—
4. SCAT	.064	.260	.251	—	—	—
5. Mean	.441	.307	.072	.065	—	—
6 Standard deviation	.257	.266	.104	.095	.000	—
7. Year in school	.012*	.344	.055	.026*	.319	.341

Note. * Correlation is significant at the .05 level (1-tailed).

Table 3 Summary of Linear Regression Analysis for Practice Percentage Predicting Game Free Throw Percentage

Variable	B	*SE* B	Beta	*t*	Sig.
(Constant)	29.105	17.651		1.649	.120
Non stress percentage	0.48	.217	.496	2.214	.043

Table 4 Summary of Linear Regression Analysis for MAAS Predicting Game Free Throw Percentage

Variable	B	*SE* B	Beta	*t*	Sig.
(Constant)	42.991	10.342		4.157	.001
MAAS	6.036	2.452	0.536	2.462	.026

Table 5 Summary of Linear Regression Analysis for SCAT Predicting Game Free Throw Percentage

Variable	B	*SE* B	Beta	*t*	Sig.
(Constant)	46.676	13.351		3.496	.003
SCAT	1.176	0.729	0.384	1.613	.128

Table 6 Summary of Linear Regression Analysis for Mean Length of Routine Predicting Game Free Throw Percentage

Variable	B	*SE* B	Beta	*t*	Sig.
(Constant)	66.314	10.493		6.32	.000
Mean length of routine	0.264	1.761	0.039	0.15	.883

Table 7 Summary of Linear Regression Analysis for Standard Deviation of the Mean Length of Routine Predicting Game Free Throw Percentage

Variable	B	*SE* B	Beta	*t*	Sig.
(Constant)	72.083	6.887		10.466	.000
Standard deviation of mean length	-3.99	5.974	-0.17	-0.668	.514

Table 8 Summary of Linear Regression Analysis for Year in School Predicting Game Free Throw Percentage

Variable	B	*SE* B	Beta	*t*	Sig.
(Constant)	44.71	9.542		4.686	.000
Year in school	7.417	2.974	0.541	2.494	.025

According to Baron and Kenny's (1986) requirements for mediation, mindfulness did not mediate the relationship between practice percentage and game percentage, as practice free throw percentage was still significant ($p < .05$) when MAAS was added to the model (see Table 9), suggesting that both variables contribute independently to game free throw percentage. A linear regression (see Table 10) was also used to determine if mindfulness would predict the difference between game and practice free throw performance. Results indicated that mindfulness did in fact significantly predict the difference between one's game and practice free throw performance ($p < .01$).

As a result of the current findings, a hierarchical regression analysis was performed to determine if mindfulness was still a significant predictor of game free throw percentage if one's year in school was controlled for. Results (see Table 11)

Table 9 Mediation Model for Mindfulness Mediating the Relationship Between Practice and Game Percentage

Model	B	Std. Error	Beta	*t*	Sig.
1 (Constant)	29.11	17.65		1.65	.120
Practice percentage	.480	.217	.496	2.21	.043
2 (Constant)	-8.11	15.93		-.509	.619
Practice percentage	.579	.158	.598	3.66	.003
MAAS	7.12	1.84	.632	3.87	.002

Table 10 Summary of Linear Regression Analysis for Mindfulness (MAAS) Predicting Difference Between Practice and Game Percentage

Variable	B	*SE* B	Beta	*t*	Sig.
(Constant)	45.396	9.094		4.992	.000
Difference	-7.904	2.156	-.687	-3.666	.002

Table 11 Summary of Regression Analysis for Mindfulness (MAAS) and Year in School Predicting Game Percentage

Model	Variable	B	*SE* B	Beta	*t*	Sig.
1	(Constant)	44.71	9.54		4.69	.000
	Year in school	7.417	2.97	.541	2.49	.025
2	(Constant)	33.63	11.10		3.03	.009
	Year in school	5.32	3.06	.389	1.74	.104
	MAAS	4.28	2.51	.38	1.70	.111

indicated that when one's year in school was controlled for (entered at step one, with mindfulness being added at step two), both year in school and mindfulness lost their significance, suggesting that both competitive experience (year in school) and mindfulness predict free throw percentage through shared variance.

Discussion

The results of the study confirm the hypothesis that NCAA Division I men's basketball players' level of mindfulness significantly predicts competitive free throw performance. The mindfulness regression model (see Table 4) indicates that with one standard deviation increase in mindfulness score, game free throw percentage would increase 5.75 percentage points. The implication of this finding for intervention is that mindfulness-based interventions could thus be expected to result in a substantial and meaningful increase in free throw percentage, an amount that would likely impact a team's overall win/loss percentage dramatically.

Further, consistent with our hypotheses, a statistically significant relationship was found between practice free throw percentage and game free throw percentage, highlighting the importance of basic free throw shooting skill in game performance. An additional finding unrelated to our hypotheses (but in retrospect not surprising), a statistically significant relationship was also found between an athlete's year in school (which reflects competitive basketball experience) and game free throw percentage. Further, the finding that mindfulness and competitive experience (i.e., year in school) appear to work via the same *mechanism*, that is, by way of shared variance, suggests that to some degree increased experience results in some degree of mindfulness increase. Future research should explore this link to determine if early mindfulness training can result in more rapid increases in competitive mindfulness. Finally, our hypothesis that preshot routine consistency would predict free throw shooting performance was not supported. These results offer a clear suggestion that the combination of skill (practice free throw percentage), competitive experience (year in school), and mindfulness all contribute to the prediction of competitive free throw percentage and that these variables are more central to successful free throw percentage at this level of competition than consistency of preshot routine.

The positive performance enhancing qualities inherent in mindfulness may be due to its relationship to the self-regulation of attention. Bishop et al. (2004) suggested that mindfulness training improves both awareness and the self-regulation of attention. In addition, increased mindfulness has been shown to enhance sustained attention and attention switching, which has been defined as "the ability to volitionally switch the attentional focus between stimuli" (Chambers, Chuen Yee Lo, & Allen, 2008, p. 304).

As the results of the current study suggest that mindfulness levels of collegiate basketball players (who received no prior training in mindfulness techniques) were strongly related to free throw performance, it can readily be inferred that basketball players may very well be able to improve their free throw performance with appropriate training in mindfulness-based strategies. As studies by Lutkenhouse et al. (2007) and Wolanin (2005) using the Mindfulness-Acceptance-Commitment (MAC) protocol found that MAC resulted in significant increases in both performance and mindful, present-moment attention, the present results offer support for the idea that efforts at improving present-moment focus in the form of mindfulness training may very well be an effective performance enhancement technique for athletes (Gardner & Moore, 2004, 2006, 2007; Kee & Wang, 2008; Lutkenhouse et al., 2007; Wolanin, 2005).

The results of this study also demonstrate that free throw shooting performance requires the interplay of numerous factors. The data suggest that experience in competitive situations (i.e., year in school) makes a unique and significant contribution to a player's free throw performance. In addition, practice free throw percentage predicted game free throw percentage, a result suggesting that skill level predicts competitive performance. This finding, while certainly not novel, is often understated in the sport psychology discipline's effort to enhance athletic performance. These results suggest that skill and experience along with relevant psychological factors (i.e., mindfulness) contribute to successful athletic performance.

Importantly, although no hypotheses were generated related to sport anxiety, we found that consistent with acceptance and mindfulness-based theoretical predictions (Gardner & Moore, 2004, 2006, 2007), there was no significant relationship between competitive anxiety and free throw shooting performance. In addition, there was no relationship between competitive anxiety and mindfulness, suggesting that the effects of mindfulness on free throw shooting performance are independent of competitive anxiety/arousal. These findings provide additional support for the suggestion that it is *not* arousal (or for that matter cognitive content) that influences performance, but the capacity to be mindfully aware and mindfully attentive to essential, task-related cues in competitive sport while *experiencing* that arousal.

Also of interest, this study found that consistency/length of preshot routine did not predict free throw performance. This result suggests that while a preshot routine may be a necessary component in the skill development phase of free throw shooting, it may not be sufficient to predict relative success among high level competitive athletes. That is, with high level basketball players, all of whom use routines to varying degrees, other factors such as experience, skill, and mindfulness appear to be significantly more important. The implication for the sport psychologist seeking to aid basketball players in their quest for enhanced free throw shooting performance is that mindfulness-based interventions seem to offer much more to the consultant than traditional preshot routine techniques when working with high-level athletes. Future studies should assess the relative contribution of preshot routine and mindfulness in younger, less accomplished athletes.

There are several limitations to the current study, including that only males were included in the study, the study focused solely on basketball players' free throw shooting performance, and the study only included NCAA Division I collegiate athletes. Future research should evaluate if these results can be replicated with female basketball players, with players of different ages and different competitive levels, and with athletes from additional closed- and open-skill sports.

Conclusions

This empirical investigation explored the role of mindfulness, preshot routine, and trait arousal in basketball free throw shooting performance among NCAA Division I men's basketball players. Findings suggest that the combination of mindfulness levels, skill level (practice free throw percentage), and competitive experience (year in school), all contribute to the prediction of competitive free throw percentage. Further, these variables are more central to successful free throw percentage at this high level of competition than consistency/length of an athlete's preshot routine. Given the recent increase in data suggesting mindfulness' role in athletic performance, future research should investigate mindfulness' role as a relevant psychological variable in performance across a variety of sports. This study adds to the growing body of scientific work suggesting the importance of mindfulness in human performance and well-being.

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