Original Article

Practice using performance goals enhances basketball free throw accuracy when tested under competition in elite players

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ABSTRACT

The present study tested whether practice using a performance goal enhances accuracy when later tested under the demands of a competition outcome goal for a basketball free throw task. Thirty male elite-level basketball players with a mean age of 24.67 years practiced free throws either with or without a performance goal. The performance goal was constructed with the challenge of bettering an individualised accuracy level. Players were later tested under an outcome goal that emphasised performance in an external competitive situation. Performance was best in players that practiced using performance goals and greater gains were seen in players that showed an initial lower level of performance. Practice using performance goals may improve free throw accuracy in a game situation, particularly for players that are at a relatively lower skill level. **Key words:** GOAL SETTING, PERFORMANCE, BASKETBALL, COACHING, MOTOR SKILLS.

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INTRODUCTION

Scoring from a free throw is an important skill in the competitive sport of basketball. Free throws can make up to 35% of points scored during the last five minutes of basketball games and are especially crucial in games where the teams are separated by small point-margins (Gómez, Lorenzo, Jiménez, Navarro, & Sampaio, 2015; Kozar, Vaughn, Whitfield, Lord, & Dye, 1994). Moreover, forwards who show a higher free throw shot percentage are a significant positive predictor of winning (Choi, Kim, Lee, Suh, & So, 2015). Despite its importance, Ryan and Holt (1989) noted statistics showing that individual free throw performance percentages for collegiate basketball players had not improved in the 20 years prior to their study, but had remained at 68-69% on average. More recently, research has showed that players almost always have better free throw shooting percentages in practice than in a competitive match (Dandy, Brewer, & Tottman, 2001; Kozar et al., 1995). The development of training strategies that can enhance free throw performance during games is thus of importance to coaches and players.

Research on basketball free throw performance to date has suggested that practicing under pressure (Oudejans & Pijpers, 2009) or simply to "do your best" (Liao & Masters, 2002) can result in better accuracy when subsequently tested, even when that test is done under competitive or anxiety inducing conditions. However, in this research participants were not given explicit instructions on what to focus their attention on during practice. The instruction to "do your best" could lead to a range of attentional strategies that differ markedly across players. Accordingly, coaches and sport psychologists may not find such techniques particularly useful as a way to develop players' psychological skills.

Giving athletes specific instructions on what to focus on is a common approach in coaching. However, not all instructions are equally effective or for all athletes. Gröpel (2016) showed that giving instructions that induced self-focused attention resulted in worse free throw accuracy in state-oriented basketball players whereas there was no effect of the instructions on action-oriented players. These findings are in line with research showing that it is better to focus externally, on specific cues associated with movement, to achieve better accuracy in aiming sports (Wulf & Lewthwaite, 2016) and movement economy (Neumann & Heng, 2011; Neumann & Piercy, 2013). Another method, which is broader in approach than to adopt a specific type of attentional focus, is require the athlete to achieve a given standard of performance through setting goals (Gould, 2006; Locke & Latham, 1990; Weinberg, 2013). In contrast to setting no explicit goals, research has suggested that setting specific goals can enhance sport performance (Burton & Weiss, 2008; Weinberg, 2013) and that the improvement can be up to 0.34 of a standard deviation (Kyllo & Landers, 1995).

Three main types of goals are process goals, outcome goals, and performance goals (Burton &Weiss, 2008; Gould, 2006; Weinberg, 2013). Process goals relate to making improvements in technique, form, or strategy. Performance goals will encourage a player to focus on improving individual achievement levels. Outcome goals will emphasise the aim of outcompeting other individuals or teams. The different goals can be conceptualised as lying along continuum (Burton & Weiss, 2008). Setting process goals (e.g., take free throw shot with good technique) may help to obtain a performance goal, but a certain performance goal (e.g., achieve over 90% accuracy in free throws) must be reached in order to achieve an outcome goal (e.g., make the game winning basket). The most common situations in a game occur in the context of trying to achieve outcome goals (e.g., win the game). This suggests that process and performance goals would be advantageous to adopt during practice. However, elite players in a sport have generally well-learned skills and are able to perform these skills relatively automatically. Attending to aspects of the movement involved in the skill could be counterproductive because it leads to an internal focus of attention (Wulf & Lewthwaite,

2016). As such, the setting of performance goals during practice could be a beneficial approach when elite athletes later play in a competitive game.

As noted, a performance goal is one that it made in relation to an athletes own standard of excellence (Weinberg, 2013). The athletes own performance is evaluated against the performance goal to determine if the goal is being met or not. Particularly for a closed-skill like basketball free throw shooting, the goals are under the control of the athlete because they do not depend on the performance of others. The athlete might incorporate other psychological skills, such as self-talk, imagery, focussing on processes, and attentional focus strategies, as part of their efforts to achieve the performance goal. As such, these elements can be tailored to suit the individual even though all individuals in a team might have the same performance goal (e.g., better their performance by 5%). It has also be recommended that any goals that are set should have certain attributes, including that they be specific and measurable, realistic but challenging, be different to that met during competition, adaptive to the progress made by the athlete, and constantly re-evaluated (Weinberg, 2013).

One of the most important aspects of performance goals is that they should be challenging but not too difficult. Goals that are unattainable can result in a loss of motivation whereas goals that are too easy will not result in sufficient mobilization of effort to improve (Weinberg, 2013). In the context of basketball shooting, the appropriateness of using a moderate goal was demonstrated by Ambrósio, Pacheco, Santos, Palhares, and Bruzi (2015). In this study, collegiate athletes were asked to practice 3 m shots under one of two performance goal instructions. One group was asked to achieve a performance goal of 10% more than their baseline level of performance and a second group was asked to achieve a goal of 30% more than baseline. Although both groups showed the same level of performance at a posttest, adherence to the performance goal was poorer in the group set to achieve a 30% improvement. The study did not include a control group and thus it was not possible to determine whether setting a performance goal per se was more beneficial to performance than setting no goals or a do your best goal.

The present study examined the effectiveness of practice using a performance goal on subsequent performance when players were later tested under the demands of a competition to achieve an outcome goal. Elite basketball players were tested and free throw shooting performance was measured by recording the number of baskets that the player made and by using a point scoring system based on accuracy. The approach during practice adapted the technique of using an individual-based performance goal in which players had to better their own level of accuracy (Locke & Latham, 1990). A target of 15% better than their baseline level was chosen to ensure that the goal was sufficiently challenging but not impossible. The goal was constantly updated during practice to ensure that it was adaptive to the players' own level of performance. The outcome goals during post-test were designed to approximate the external evaluation that might be experienced in a competitive game situation. It was hypothesised that practicing a free throw under a performance goal would lead to better accuracy when later tested with outcome goals than practicing with no explicit goals. Subjective ratings of anxiety and perceived exertion were also taken to examine group differences in these factors during the test session.

METHOD

Participants

Thirty male basketball players aged between 18 and 36 years (M = 24.67 years, SD = *0*.97) participated. All were members of a local Australian Basketball Association club training side in the South-East Queensland region (n = 19) or were members of the local Australian National Basketball League team (n = 11). All men

had played between 1 and 21 years of basketball at a State or National Representative level (M = 6.73 years, SD = 0.84). Players were randomly assigned to either a Goal setting or Control group (n = 15 in each). Groups did not differ in age (Goal setting: M = 23.33 years; SD = 4.73; Control: M = 25.93 years; SD = 5.74), $t(28)$ = 1.32, p = .20 or years of experience (Goal setting: M = 5.53 years; SD = 4.12; Control: M = 7.87 years; SD = 4.96), $t(28)$ = 1.37, p = .18.

Equipment and Measures

All sessions were conducted in an indoor basketball stadium on an empty half-court. All shots were taken from the standard free throw line 4.6 m from a standard sized ring set at the 3.05 m regulation height and attached to a 1.80 m by 1.05 m backboard. A Molten GF7 ball was used.

The Sport Competition Anxiety Test for Adults (SCAT-A; Martens, Vealey, & Burton, 1990) was used to measure competitive trait anxiety and has a good reliability coefficient of .87 (Vealey, 1990). State anxiety during the testing session was measured using the State Anxiety (A-State) scale of the Competitive State Anxiety Inventory-2 (CSAI-2; Martens et al., 1990). Only the Cognitive A-State measure was used because it has shown the greatest predictability of skill-performance in previous literature (Martens et al., 1990). This measure has demonstrated good internal consistency with Cronbach's coefficients between .80 and .88 (Martens et al, 1990; Liao & Masters, 2002). To keep the nature of the questions hidden, a questionnaire called a "Mental State Survey" was developed in which items from the Cognitive A-State from the CSAI-2 were intermixed with items adapted from the Physical Activity Enjoyment Scale (Moore et al., 2009). Ratings of perceived physical exertion were obtained using Borg's Ratings of Perceived Exertion Scale (Borg, 1982). This is a 15-point measure, with values ranging from 6 (*No exertion at all*) to 20 (*Maximal exertion*), with a midpoint of 13 (*Somewhat hard – it is quite an effort*; *you feel tired but can continue*).

Free throw performance was measured in two ways. First, the number of baskets made out of the 20 shots was recorded. Second, an accuracy score was calculated based on a scoring system employed in past studies (Hardy & Parfitt, 1991; Liao & Masters, 2002; Oudejans & Pijpers, 2009). For each shot, a score of 5 was given for a clean basket (i.e., did not hit the rim or backboard), 4 for a rim-and-in, 3 for a backboard-and-in, 2 for a rim-and-out, 1 for a backboard-and-out, and 0 for a complete miss. If the ball hit the backboard at any time the scores 3 or 1 were awarded, as appropriate.

Procedure

The experiment was completed over two sessions. In the first session, players provided informed consent and gave demographic details. Players were informed that the study aimed to investigate "thought processes during free throw shooting" and were aware that they would have to take 120 free throws in the initial session (players were explicitly not informed what the second session involved other than it would require making additional free throws). Following this, each player had 20 practice shots to warm up. Next, each player was asked to take their first set of 20 shots under the instruction to make as many shots out of the 20 as they could. All players completed the "Mental State Survey" after these instructions but before taking their set of shots. The performance score for this set was used as their pre-test score for analysis. The perceived exertion measure was completed after this initial set.

After the pre-test, all players completed a further 5 sets of 20 shots. Players in the Control group were informed to simply attempt to get as many shots out of 20 as they could. Players in the Goal setting group were informed that their task for the next set of 20 shots was to increase their initial performance by 15%. The players were informed that they had earned $1 for each shot out of 20 that they had made in their initial set and they could earn an additional $3 for reaching their target of a 15% increase, but could alternatively

lose $1 for each shot that they failed to make below that target. Each player's target was readjusted based on the cumulative average after each practice set, and the player was informed of the adjusted target and the possible monetary gain or loss. After completing the five practice sets, players were offered the money they had won.

The follow-up (post-test) session was conducted between two and four days after the player's initial session (Goal setting: M = 2.87 days, SD = .83; Control: M = 2.67 days, SD = .62), $t(28) = 0.75$, $p = .46$. Each player was tested individually and warmed up with five practice shots. In this session, the outcome goal was explained. All players were informed that they were in a competition with all the other players in the study and that a cash prize of $300 would be awarded to whoever obtained the highest score out of 20 for this post-test. The players were also informed that a table of results would be circulated to all players at the end of the study, displaying how they had performed in relation to all other players. Finally, a video-camera was set up at a right angle to the player, with an appropriate view of the player and the hoop. Players were informed that the footage would be given to a coach for evaluation of the player's free throw movement action and technique as well as accuracy. In reality no footage was recorded. Prior to the final set of 20 shots, but after the instructions were given, players filled in the "Mental State Survey". A final perceived exertion measure was administered following the set of free throws.

RESULTS

To examine performance change from pre-test to post-test, percentage change scores were calculated using the formula Percent Change = (Post-test performance – Pre-test performance) / Pre-test performance $\times$ 100. A positive change represents a performance improvement. Change scores are easily interpreted in terms of the amount of improvement relative to a baseline while accounting for individual differences in performance with high reliability (Dimitrov & Rumrill, 2003). Independent samples t-tests showed a significant difference between groups for both number of baskets made, $t(28) = 2.39$, $p = .024$, $d = 0.87$, and accuracy score, $t(28) = 2.12$, $p = .043$, $d = 0.77$, with each showing a large effect size. As shown in Table 1, performance was better in players that practiced using performance goals than in players that practiced under no goal setting instructions.

Table 1. Means (and standard deviations) for the percent change in number of baskets made and accuracy score for the Goal Setting (n = 15) and Control (n = 15) groups.

Measure	Group	
	Goal Setting	Control
Baskets made	5.91% (13.82)	-3.50% (10.19)
Accuracy score	13.06% (24.61)	-4.59% (14.66)

Further analyses examined the correlation between pre-test scores and percentage change scores. Change scores in the Goal setting group were negatively associated with pre-test performance for both number of baskets, $r = -.83$, $p < .001$, and accuracy score, $r = -.86$, $p < .001$. Performance gains were thus greater for players that scored lower during pre-test. In contrast, there was no significant association in the Control group for number of baskets, $r = -.28$, $p = .31$, or accuracy score, $r = -.13$, $p = .65$. The lack of an association suggests that the significant correlation observed in the Goal setting group was not merely due to lower performing players getting the most benefit from practice. Rather, lower performing players particularly benefited from using performance goals. Moreover, the smaller gains in the higher performing players was not due to a ceiling effect because only two players in the Goal setting group scored 20 out of 20 baskets during post-test.

The final set of analyses compared groups in subjective ratings. Groups did not differ significantly in trait anxiety as measured by SCAT-A prior to completing the pre-test, $t(28) = 1.33$, $p = .19$, $d = 0.49$. Percentage change scores were also calculated to compare groups for perceived exertion and state anxiety. No significant differences were found between groups for either ratings of perceived exertion, $t(28) = 0.67$, $p = .511$, $d = 0.24$, or ratings on the CSAI-2, $t(28) = 0.01$, $p = .991$, $d = 0.004$. Finally, performance between groups during the practice session was compared using separate 2 (Group) $\times$ 5 (Practice Set) ANOVAs. The analyses yielded no significant main effects or interactions using either the number of baskets made or accuracy score, all Fs < 1.58, $p > .184$. Taken together, the findings suggest that the better performance in the Goal setting group relative to the Control group was not due to group differences in trait anxiety, state anxiety or effort during the test session.

DISCUSSION AND CONCLUSIONS

The present study showed that practice using performance goals can be effective in enhancing players' accuracy when tested in a situation that emphasised an external competitive outcome. Such external outcomes are more relevant to when players compete in a game than are individualised performance goals. The analyses yielded significant effects for both the number of baskets made and accuracy scores. Moreover, both these performance measures yielded a large effect size to suggest that the benefit of practicing using performance goals represents a meaningful effect. In addition, the results indicated that practicing under performance goals was particularly beneficial for players that had lower performance during the pre-test. Further analyses suggested that the group differences were not due to pre-existing differences in trait anxiety, differences in the pattern of performance during practice, or differences in physical effort and state anxiety during the post-test.

The present findings suggest that post-test performance was better in the Goal setting group than in the Control group because the former group practiced free throws in a situation of having to meet a performance goal. The players may have grown accustomed to shooting with a goal in mind, even though test performance was assessed against the requirement to achieve a different (outcome) goal. Players that practiced using performance goals may have also been able to adopt effective strategies for coping with the needs to meet these goals. Locke, Shaw, Saan, and Latham (1981) suggested that performance goals increase directed attention to a task, increase effortful performance, enhance persistence, and motivate strategy development. Part of this strategy development could be for more effective deployment of attentional resources and effort to enhance performance when placed under external demands. The implementation of a performance goal arguably requires the individual to be aware of their task performance (Kingston & Hardy, 1994) in order to focus on achieving a specific target above their current level. A focus on task performance (i.e., number of baskets made) is clearly important when also attempting to achieve an outcome goal. Future research could

use post-task interviewing (e.g., Emad, Neumann, & Abel, 2017) or a combination of physiological measures (e.g., Neumann & Brown, 2013; Neumann & Thomas, 2011) to examine the relationship between goal setting and attentional focus strategies.

There is a need for psychological research on training practices regarding basketball free throw shooting to inform sport psychologists on what strategies will be effective. Perhaps due to the team nature of the sport, there is not a lot of emphasis placed on individual free throw practice, and that this is left largely up to the individual player. This could mean that there is a general lack of specific, individualised training strategies for free throw shooting practice. Performance goals can be an excellent way to challenge players during practice because their scores are assessed relative to their own achievements. Weinberg (2103) recommended a rule of thumb that performance goals be set at 5% above the athletes current level of performance, although the specific amount will depend on the sport and level of the athlete. A higher level of 15% was adopted in the present study to ensure that the task was sufficiently challenging. Ambrósio et al. (2015) showed that there was no difference in 3 m shooting performance at posttest between basketball players who were given a goal to beat their baseline by 10% or 30%. However, the 30% condition resulted in poorer adherence to the goal setting instructions. It is thus recommended that in practical applications players be asked to adopt a moderate goal such as 5% to 15% of improvement in free throw shooting accuracy. In addition, the performance goal used here included a small monetary incentive to increase motivation. In practical applications, it would be possible to replace the monetary reward with alternative rewards or to use a point-based system.

It has been shown that specific, externally imposed performance goals are effective in achieving increases in skill performance and are commonly implemented in training across many sports (Cox, 2007). Broad, general aims (i.e., to simply increase performance) can often seem overwhelming. Breaking down these general goals, however, has been shown to increase their effectiveness by causing increases in directed attention, mobilised effort, persistence, and strategy development (Locke et al., 1981). This was done in the present experiment by giving players targets after each set of 20 shots. Different number of shots in a set could be used depending on the individual or training demands of the player and team.

Although prior research has examined free throw shooting (e.g., Dandy et al., 2001; Hardy & Parfitt, 1991; Kozar et al., 1995), until Oudejans and Pijpers (2009) and Ambrósio et al. (2015) few studies had looked at the usefulness of training approaches to enhance performance under pressure. The present study has extended this research to a training approach that enhanced performance under outcome goals that contained elements of a pressure situation (e.g., cash prize for best performer). While a better understanding of exactly what training techniques are needed for free throw shooting practice is needed, this study suggests that coaches and sports psychologists could set players appropriate performance goals as part of free throw practice. Moreover, there remains scope to extend this approach to enhance performance in other motor skills in basketball, such as passing and dribbling skills, and even to small-sided practice game play.

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