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Examining the accuracy and in-game performance effects between pre- and post-performance routines: A mixed methods study

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ABSTRACT

Objectives: Researchers have identified that pre-performance routines improve performance under pressure, yet have not investigated the effects of post-performance routines. Thus, the purpose of the current study was to examine whether the type of performance routine training could improve tenpin bowling accuracy and in-game performance.
Design: A mixed-method design was adopted, whereby the impact of a performance routine intervention on performance accuracy and in-game performance was examined. This was followed by participants completing semi-structured interviews which explored the perceived effect of those routines.
Method: Thirty-six experienced tenpin bowlers completed 30 accuracy shots pre- and post-intervention training, with league scores obtained for in-game performance comparison. Four groups (i.e., pre-performance routine [PPR], post-performance routine [POST], combined pre-post routine, and a control group) practiced 12 games across four weeks while listening to the group specific routine instruction on an IPod.
Results: It was noted that accuracy improved (albeit non-significantly) for the PPR and combined pre-post routine group, but not the other groups. Critically, all intervention groups (PPR, POST & COMBO) improved in-game performance. The qualitative data indicated that both the PPR and POST was perceived to influence positively performance, attentional and emotional control, self-awareness, self-confidence, motivation. The PPR was also considered to enhance a state of readiness, and perceived control.
Conclusions: Results indicate that the PPR training enhanced accuracy and in-game performance, with the POST training acting as a supportive role for in-game performance as evidenced by the qualitative and quantitative data. Future research should continue to investigate the effects of POSTs.

Applied sport psychologists attempt to improve athlete performance, in part, by educating them to become more aware of performance inconsistencies, apply volitional control to reduce negative spontaneous reaction to competitive situations, and use more adaptive self-regulation (Hemmings & Holder, 2009). Self-regulation is the management of cognitive, emotional, motivational, and social processes to make decisions, engage in behaviour, and process stimuli in the pursuit of goals (Cameron & Leventhal, 2003). Baumeister, Vohs, and Tice (2007) explain that self-regulation is any effort by an individual to alter thoughts, emotions, and actions in accordance with his/her desires. Therefore, functional self-regulation facilitates desirable behaviour because the individual resists inappropriate impulses and persists with correct behaviour (Baumeister, Heatherton, & Tice, 1994).

One self-regulation strategy offered by applied sport psychologists to improve their athletes' attentional and emotional control is a pre-performance routine (PPR). Moran (1996) states that a PPR is a sequence of task-relevant thoughts and actions an athlete systematically engages in prior to performance of a sport skill. Moran's definition is the most widely adopted among studies investigating PPRs (see Cotterill, 2010 for a review). To date, PPRs have been adopted predominantly to improve the performance of closed and self-paced tasks (e.g., putting in golf, free-throw shooting in basketball, or executing a ten-pin bowling delivery).

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Researchers have provided equivocal results regarding the effectiveness of PPRs, with novices appearing to benefit the most (Beauchamp, Halliwell, Fournier, & Koestner, 1996; Crews & Boutcher, 1986; McCann, Lavallee, & Lavallee, 2001); while studies involving experienced athletes have indicated mixed results following PPR training (e.g., Boutcher & Crews, 1987; Cohn, Rotella, & Lloyd, 1990; Kingston & Hardy, 2001; Lobmeyer & Wasserman, 1986; Marlow, Bull, Heath, & Shambrook, 1998). Cohn et al. (1990) for example, examined the effects of a cognitive-behavioural PPR intervention on three male collegiate golfers during competition and reported that although the intervention increased PPR adherence, there was no immediate performance increase. During subsequent interviews however, the participants expressed immediate subjective improvements in unobservable mental skills, such as concentration and confidence. Though such perceptions were not directly observable in objective performance scores. Follow-up testing after four months verified an improvement in all three players' performances, with the golfers' interview data indicating they believed the PPR was beneficial. These results should be viewed with caution however, for the perceived benefit may be due to other variables such as physical practice. Marlow et al. (1998) also found the penalty shot accuracy of three experienced water polo players increased by between 21% and 28% immediately following the implementation of a PPR. Furthermore, Velentzas, Heinen, and Schack (2011) investigated whether two types of routine methods (i.e., imagery or introduction to a PPR), trained over a 7-week intervention period could improve volleyball serving performance. Velentzas et al. found that both intervention groups improved serving performance from pre-to post-intervention, with the imagery group being the most effective routine training. In addition, it has also been established that PPRs may lower arousal levels (Boutcher & Crews, 1987), increase intrinsic motivation, reduce negative introspection (Beauchamp et al., 1996), and increase attention to task (Cohn et al., 1990; Cotterill, Sanders, & Collins, 2010).

A number of researchers (e.g., Anshel, 1995; Bartholomew, 2003; Dale, 2004) have posited that a PPR is a suitable intervention to aid athletes in coping effectively with pressure during real-world competition. Mesagno, Marchant, and Morris (2008) employed a single-case design method to demonstrate improved performance under pressure of three "choking-susceptible" (i.e., likely to experience "choking under pressure") ten-pin bowlers using an extensive PPR. The extensive PPR included modifying or incorporating cognitive and behavioural elements into their pre-existing PPR, such as a deep breath, cue word and behavioural steps. Due to limitations associated with a single-case design, Mesagno and Mullane-Grant (2010) subsequently conducted a follow-up experimental study with a larger cohort, to assess which elements of the PPR were most effective for improved performance. Participants were assigned into one of five groups: deep breath (i.e., took three diaphragmatic deep breaths); cue word (i.e., developed a cue word to focus attention to the task); temporal consistency (i.e., counted down aloud from five to maintain temporal consistency); extensive PPR (i.e., educated on extensive PPR similar to Mesagno et al., 2008); and control (i.e., no intervention training). Results indicated the extensive PPR group improved performance under pressure more than groups using only independent PPR elements, with the control group decreasing performance. In support of Mesagno and Mullane-Grant (2010), Hill, Hanton, Matthews, and Fleming (2011) demonstrated, in a longitudinal study of elite golfers, that a PPR could alleviate choking under pressure as part of a mental skills program through increased perceived control, lowered debilitative anxiety, and improved focus. Collectively, these studies indicate a PPR may be an effective intervention to improve in-game performance when pressure may be heightened.

Despite the considerable research attention exploring the effectiveness of PPRs on performance, few studies have investigated behavioural or psychological routines undertaken after performance execution (i.e., post-performance routine). We define a post-performance routine (POST) as a series of behavioural or psychological strategies undertaken after performance execution, yet prior to the PPR of the next performance attempt. Hill, Hanton, Matthews, and Fleming (2010) were the first to identify that the use of POSTs may be a mechanism to improve performance under pressure. Hill et al. interviewed six elite golfers who frequently experienced choking under pressure and five elite golfers who frequently excelled under pressure. They found those golfers who excelled under pressure, performed a consistent POST after each shot, which tended to include constructive task-related reflection, followed by a behavioural response (i.e., removal of glove) that triggered attention to be directed towards the next shot. However, those who experienced choking under pressure appeared to rarely or intermittently complete a POST. Much of the psychological turmoil that athletes encounter during competition may stem from maladaptive thoughts associated with unacceptable shot performance, which in turn may lead to misdirected concentration and emotional upheaval during the POST. As Hill et al. explained, "participants who excelled under pressure were less self-critical (than "chokers") after poor performances, as they accepted mistakes and used negative experiences to improve their game … interventions that encourage the "chokers" to accept poor performances … could prove beneficial" (p. 235).

Similarly, Oudejans, Kuijpers, Kooijman, and Bakker (2011) used concept mapping to analyse written responses of seven expert athletes from a range of sports about their focus of attention in high-pressure situations. Concept mapping involves a sequence of group activities focused on qualitative analysis that provides thematic clusters of aggregated text across participants. Oudejans et al. found that worries related to negative thoughts and uncertainty/doubt were two of the five clusters with the highest importance rating of cognitions associated with performance under pressure, and thus in-game, real-world cognitions. The Oudejans et al. study did not differentiate when these worries occurred, nevertheless, it would be logical that these worries could be present either prior to, during, or following skill execution within real world (rather than laboratory based) competitions.

From the aforementioned research, using POSTs as an intervention could improve coping responses and minimize negative reactions to skill errors that lead to self-deprecating cognitions and performance inconsistency, by providing athletes a central attentional focus after performance execution. This could prove particularly helpful for athletes who have a tendency to be highly self-critical (i.e., dysfunctional perfectionists), and who suffer from low confidence and poor attentional control. Thus, it could be inferred that focussing on a routine may decrease negative introspection, increase functional self-regulation and improve performance outcomes (Singer, 2002). Further research on POSTs and their effectiveness for in-game performance (and under pressure) would be advantageous. Such information could help applied sport psychologists augment their psychological skills repertoire to implement empirically tested and validated interventions related to after shot psychological recovery.

Purpose and hypotheses of the current study

Through a mixed-method approach, the purpose of the current study was to examine whether the type of performance routine training (e.g., pre- or post-performance) could improve tenpin bowling accuracy and also in-game performance using real-world competition (i.e., league averages). It was hypothesized that the