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Introducing Sport Psychology Interventions: Self-Control Implications

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Evidence from sequential-task studies demonstrate that if the first task requires self-control, then performance on the second task is compromised (Hagger, Wood, Stiff, & Chatzisarantis, 2010). In a novel extension of previous sequential-task research, the first self-control task in the current study was a sport psychology intervention, paradoxically proposed to be associated with improved performance. Eighteen participants (9 males, 9 females; mean age = 21.6 years, *SD* = 1.6), none of whom had previously performed the experimental task or motor imagery, were randomly assigned to an imagery condition or a control condition. After the collection of pretest data, participants completed the same 5-week physical training program designed to enhance swimming tumble-turn performance. Results indicated that performance improved significantly among participants from both conditions with no significant intervention effect. Hence, in contrast to expected findings from application of the imagery literature, there was no additive effect after an intervention. We suggest practitioners should be cognisant of the potential effects of sequential tasks, and future research is needed to investigate this line of research.

***Keywords**:* sequential task, motor imagery, skill acquisition, human performance.

One role of sport psychologists working with teams or individuals is to enhance psychological aspects that influence sports performance (Williams & Straub, 2010). In doing so, sport psychologists might typically focus on improving psychological skills. Weinberg and Gould (2007) defined psychological skills training as a "systematic and consistent practice of mental or psychological skills for the purpose of enhancing performance, increasing enjoyment, or achieving greater sport and physical activity self-satisfaction" (p. 250). One psychological skill commonly addressed by sport psychologists is motor imagery, which is the mental representation of a movement or action without any corresponding body movement (Guillot & Collet, 2005; Wakefield, Smith, Moran, & Holmes, 2013). Motor imagery is a mental skill used by many athletes to facilitate sport performance (Guillot & Collet, 2008), and specifically swimming, the focal sport of the current study (Post, Muncie, Cruces, & Simpson, 2012).

In a survey of psychological skills use, Jowdy, Murphy and Durtschi (1989) found imagery techniques are regularly used by 100% of consultants, 90% of athletes, and 94% of coaches sampled. Imagery is arguably the most widely practiced psychological skill used in sport; athletes believe that it benefits performance (Hall, Mack, Paivio, & Hausenblas, 1998; Jowdy et al., 1989). Therefore, imagery is proposed to be a useful skill to teach athletes beginning psychological skills training.

Although motor imagery has been proposed to lead to improved performance, this is not always the case, especially when people are beginning to use it (Cumming & Williams, 2012). One argument forwarded to explain this finding has been failure to effectively capture images. For example, comparisons between expert and novice athletes demonstrate different patterns of brain activation during motor imagery of a corresponding task. This is proposed to arise from the fact that experts find it easier to visualize an action because they see/experience the action extensively in daily life (Debarnot, Sperduti, Di Rienzo, & Guillot, 2014). A second theory that might explain the finding that imagery may not always benefit performance is the strength model of self-control (Baumeister, Vohs, & Tice, 2007). Self-control is conceptualized as the deliberate act of overriding habitual behavioral responses, which means the person exerts effort to bring about change. For self-control theory to explain why imagery might not be effective, it is important to be cognisant of theory and methods that have been used in the social psychology literature (Baumeister et al., 2007; Hagger et al., 2010).

Central to the model is the hypothesis that engaging in an initial self-control task uses and thereby reduces available resources, leading to worse performance on subsequent tasks. Baumeister et al. (2007) referred to this process as *depletion* on the basis of an assumption that the resources available were constant, and therefore reduction implies depletion. When this theory and method are applied to learning new skills, including psychological skills such as imagery (which is a complex skill), learning is likely to

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take time and effort. According to a wealth of experimental data using a sequential-task design (Hagger et al., 2010), if imagery is a self-control task, then it would deplete resources and lead to the availability of fewer resources for subsequent tasks. An important aspect of the sequential task model is the fact that the second task is performed shortly after the first; that is, there is not a sufficient recovery period. In the experimental tasks that provide support for the strength model, participants performed two tasks, one after the other. A limitation is that the time between tests is rarely reported. The implication is that it is done minutes or seconds later, possibly analogous to performing imagery shortly before performing a motor skill, such as a swimming tumble turn.

We suggest research findings regarding depletion effects could have significant practical implication for sport and exercise psychologists looking to introduce unfamiliar psychological skills to athletes. The implication is that individuals engaging in two self-control tasks, one after another, are at risk for performance on the second task being compromised. For example, an athlete asked to perform motor imagery and then immediately perform a physical skill also requiring self-control is completing two sequential self-control tasks, whereas an athlete just performing the physical skill is doing one. Applying findings of the strength model to this scenario, we would predict that the second athlete would perform better on the physical skill (i.e., in terms of technical and outcome proficiency) than the first because they have not depleted resources in undertaking a prior self-control task.

It is acknowledged that motor imagery may be undertaken away from physical practice and actual performance (Smith, Wright, & Cantwell, 2008) and thus does not present a sequential task design. However, motor imagery can immediately precede motor skill execution (Battaglia et al., 2014), or follow a combination of independent use and usage immediately before execution (Post et al., 2012). In which case, this presents a sequential task. As such, the aim of the current study was to examine the potential paradox in which psychological skills interventions impair performance via depletion effects. This study involved a sample of participants learning two new tasks: (a) imagery and (b) a motor skill. This sequential-task design was used to examine how exertion of self-control on an initial motor imagery task affected the subsequent performance of a novel motor skill. We set two hypotheses (Guillot & Collet, 2005; Wakefield et al., 2013). First, in accordance with the imagery literature, we hypothesized that imagery would lead to improved performance on the experimental motor task. Second, in contrast, and as proposed by the self-control literature (Baumeister et al., 2007), we hypothesized that imagery would deplete resources and performance would deteriorate on the second performance of the experimental motor task.

Method

Participants

Eighteen volunteer participants (nine males, nine females; mean age = 21.6 years, *SD* = 1.6), none of whom had previously performed the self-control task (motor imagery of the front crawl tumble turn) or the experimental motor task (front crawl tumble turn) took part in the current study. All participants consented participation and were free to withdraw consent at any time.

Measures

The movement imagery questionnaire (MIQ; Hall & Pongrac, 1983) was used to assess participants' imagery ability. The MIQ presents nine imagery tasks, each of which is imagined once using the visual sense and once using the kinesthetic sense. For example:

Starting position.

Stand with your feet slightly apart and your arms fully extended above your head.

Action.

Slowly bend forward at the waist and try and touch your toes with your fingertips (or if possible, touch the floor with your fingertips or hands). Now return to the starting position, standing erect with your hands above your head.

Mental task.

Assume the starting position. Form as clear and vivid a mental image as possible of the movement just performed. Now rate the ease/difficulty with which you were able to do this mental task.

Participants rated the ease/difficulty with which they were able to do the nine imagery tasks on a scale ranging from 1 (*very easy to see/feel*) to 7 (*very hard to see/feel*); therefore, scores range from 9 to 63.

The original MIQ was used as opposed to revised shorter versions because of the wider range of imagery tasks covering more movements that feature to some extent in the execution of the tumble turn. The reliability of the MIQ is acceptable, with α values of .89 for the visual subscale and .88 for the kinesthetic subscale (Hall et al., 1998). Therefore, the MIQ is an acceptable test to assess an individual's movement imagery ability.

Pre- and posttest tumble-turn performances were assessed by four national swimming coaches using assessment criteria developed by the coaches in conjunction with the first author. The criteria were as follows: Approach to turn (3 composite scores), rotation of the turn (4 composite scores), foot plant (2 composite scores), and transition into stroke (3 composite scores). Turn performance was rated on a scale ranging from 1 (*very poor*) to 5 (*very good*).

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Procedure

Beedie and Lane (2012) highlight the importance of taking task meaning into account in self-control research. They argued that decrements in performance in the second task could be due to low motivation. Consequently, the recruitment strategy was to include participants with good intentions to learn the skills used in the current study. Participants were recruited to the current study via posters placed around University campus' requesting volunteers who wished to learn how to perform a front crawl tumble turn. This helped to ensure participants were recruited for whom the self-control task was meaningful. Participants were assigned to one of two conditions, a self-control condition (imagery) or a control (no-imagery) condition. Participants were matched for gender and swimming ability. An acknowledged limitation of the study is the relatively small sample size. Before collection of pretest data, imagery-condition participants completed the MIQ (Hall & Pongrac, 1983) to screen for and exclude individuals with high imagery ability while also ensuring that participants could generate images, as indicated by MIQ scores less than 18, an arbitrary criterion selected by using the descriptors on the MIQ to gauge ease of imagery use. A score of 18 or less would indicate imagery was easy to do; therefore, it would not be acting as a self-control task because the task was well learned. No exclusions were made on the basis of MIQ data.

All participants were then introduced to the front crawl tumble turn. A competent swimmer demonstrated the front crawl tumble turn. A qualified swimming instructor highlighted the key technical aspects of the turn verbally. Participants then completed two 1-hr training sessions undertaken over 1 week to practice the tumble turn. After completion of these two sessions, pretest data were collected. During the pretest, each participant was filmed completing 10 tumble turns. It should be noted that filming performance is a method used to increase stress in experimental research (Wilson, Smith, & Holmes, 2007), and although we observed no indications of stress, this aspect of the research design is relevant because it served to maintain the importance of performance.

All participants then completed the same physical training program designed to enhance tumble turn performance. This comprised two 30-min training sessions per week for 5 weeks. Participants were provided with immediate feedback throughout training from a qualified swimming instructor to facilitate error correction.

Imagery-condition participants were provided with an imagery script that included both visual and kinesthetic elements of the front crawl tumble turn. The following illustrative sentence from the script describes the initial stages in the execution of a tumble turn:

> Feel/see your dominant arm, which is outstretched in front of you sweep across your body; first downward through the water, then inwards and upwards toward your body. While you are pulling down through the water with your dominant hand feel/see your head simultaneously drive downward.

Participants were instructed to use the imagery script and verbal feedback provided to imagine performing the tumble turn correctly before each execution of the turn. Therefore, for imagery-condition participants, the sequence of events was as follows: perform imagery, perform skill, receive feedback, perform imagery, perform skill, and so on (see Table 1). This approach was intended to help participants generate personalized images of the front crawl tumble turn by incorporating modifications to imagery content on the basis of individual performance feedback. This facilitated usage of imagery that met each participant's stage of skill acquisition and learning needs. On completion of the fifth week of training, a posttest was completed in which a further 10 tumble turns were recorded.

\insert table 1 here

During their research examining the effects of a short-term (45-min) imagery intervention, Wright and Smith (2007), suggest that imagery interventions require a higher level of functional equivalence when being used over a short period of time. The present study attained high levels of functional equivalence because imagery took place in a swimming pool, surrounded by the relevant sounds and smells, with participants wearing swimming attire. Furthermore, the imagery scripts and performance feedback provided to support imagery use were bespoke, taking into account personal learning. Participants in the imagery condition completed an imagery diary that acted as a manipulation check on whether participants engaged with the intervention; it also gave an insight into participant's experiences with the imagery intervention.

Assessors (four national swimming coaches) rated 19 pre- and posttest tumble turns, comprising 18 participants' best performances derived from pre- and posttest data, and also a duplicate turn (the exact same turn presented on two occasions). To control for possible expectations of improved performance across pre- and posttest, we presented the data in a randomized order. The coaches discussed each performance before reaching a consensus as to each participant's score. Agreement on each score was reached without dissent for all performances assessed, including the duplicate performance, for which an identical test-retest score was recorded.

Results

Inspection of participants' imagery diaries revealed that all participants reported performing imagery before physical execution of the tumble turn as instructed. All participants also perceived imagery to be helpful in learning how to tumble turn. The following illustrative extracts taken from imagery diaries detail the benefits and challenges as perceived by participants. One participant felt that "it helped me to focus on the turn and particularly areas of weakness, remembering the component parts of the skill." A different participant reported "it allowed me to rehearse the turn establishing a vivid mental picture of the actions. But it was difficult to transfer the images to real life." A further participant observed that "it helped to see the turn, but I could not imagine the feelings of buoyancy in the water, and my images were slower than the actual turn."

Using the descriptors on the Likert scale of the MIQ as a guide to interpreting how vividly participants could use imagery, results of the MIQ visual scale (*M* = 21.89, *SD* = 8.23) and MIQ kinesthetic scale (*M* = 22.78, *SD* = 10.20) indicated that participants found imagery to be neither very easy nor very hard to do. Diary data indicated that all participants in the imagery condition actively used motor imagery before performance; hence, data from all participants went forward for further analysis.

Table 2 presents the descriptive statistics and confidence intervals for pre- and posttest tumble-turn performance scores by condition. Results indicate that performance improved in each group, as might be expected among a group of novice swimmers receiving coaching. However, repeated-measures multiple analyses of variance revealed significant improvements on all performance criteria within conditions, Wilks's lambda [4,13] = .39, $p < .05$, $\eta^2 = .61$, with no significant between-condition differences, Wilks's lambda [4,13] = .62, $p > .05$, $\eta^2 = .38$, and no significant interaction effect, Wilks's lambda [4,13] = .20, $p > .05$, $\eta^2 = .20$. The absence of a significant interaction effect indicates that the intervention condition did not improve faster than the control condition.

\insert table 2 here

Discussion

The present study investigated the effects of imagery training on the performance of a swimming tumble turn and examined results in relation to two contrasting areas of literature, imagery research and self-control. We used a sequential-task design, commonly used in self-control studies, in which imagery acted as an act of self-control. In accordance with the imagery literature (Wakefield et al., 2013), improved performance was hypothesized. However, studies using a sequential-task design typically report worse performance after acts of self-control, and so it was also plausible that the control condition might improve at a faster rate (Baumeister et al., 2007; Hagger et al., 2010). Interaction results showing no significant effects (see Table 2) refute both explanations. Further, results show that posttest performance improved significantly among participants from both conditions.

The finding that teaching novice athletes to use imagery might not lead to enhanced performance (compared with no-imagery conditions) is not unique (Cumming & Williams, 2012, Nordin & Cumming, 2005). It is suggested that attempting to learn two new skills simultaneously does not *initially* bring about greater gains in performance. Self-control theory posits that learning skills discretely rather than sequentially could not only improve performance because of greater allocation of resources but also improve self-control strength. Self-control theory would suggest that imagery be learned away from the pool, rather than attempting to do imagery followed by a complex physical skill. It should be noted that many sport psychologists do this as routine practice.

The present study used a 5-week training program between pre- and posttest performance, and therefore greater performance gains might be evidenced in longer programs. On the basis of the present findings, we suggest that practitioners should counsel participants when introducing new psychological skills interventions to establish realistic performance expectations. Further, it might be advisable to teach new tasks in sequence. In other words, the introduction of imagery is possibly more suited to enhancing a task that is already well learned (Olsson & Nyberg, 2010) or, alternatively, develop imagery ability first before using it with the intention of aiding skill acquisition. A small to moderate amount of experience with a motor task may be sufficient to enhance the potential benefits to be accrued from motor imagery usage (Olsson & Nyberg, 2011). The benefits of these approaches are that participants may be better able to recreate the components of performance in detail and thus be able to develop more vivid, multisensory, and complete images (Guillot & Collet, 2005).

Regarding the second hypothesis, performance improved among the imagery condition in the current study, a finding that runs counter to proposals made in self-control theory (Baumeister, Vohs, and Tice, 2007; Hagger et al., 2010). Recent research has argued that motivation can offset the deleterious effects of self-control (Job, Dweck, & Walton, 2010), a finding consistent with results from the current study. Participants explicitly noted that they volunteered their time and involvement as they wished to learn how to perform a front crawl tumble turn, a behavioral indication of motivation. As such it is quite plausible that they maintained their motivation to perform to the best of their ability, and this enabled participants to override the potentially deleterious effects of self-control. Beedie and Lane (2012) argued that a limitation of research using the sequential-task design was that participants performed tasks of little personal meaning. Beedie and Lane challenged the notion that humans have fixed resources and argued that the evolved function of emotion was to increase energy, and so when performing a personally important task, emotions such as anxiety and excitement will generate arousal, and this can counter the effects of energy used in the first sequential task. The present study used a sample of volunteers interested in learning a new swimming skill, and video-recording performance acted as a further method to maintain the importance of engaging with the task.

The idea that teaching psychological skills requires acts of self-control and could be harmful to performance should be considered when developing psychological skills training programs (Williams & Straub, 2010). Although the current study offers support for the notion that acts of self-

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control do not necessarily have negative effects on performance, the concept of self-control does offer a possible explanation for poor adherence to ongoing psychological skills usage. Shambrook and Bull (1999) noted that people often struggle to adhere to psychological skills training programs; a finding that alludes to the possibility that the process is effortful and so might not lead to immediate benefits. Athletes may perceive effort invested as producing insufficient benefits, a possibility that again reinforces the value of counseling athletes to ensure that their outcome expectancies are realistic, particularly during the early stages of psychological skills training.

The present study brings together two distinct bodies of research that typically might operate in silos. Drawing synergies between distinct literatures has allowed examination of competing hypotheses. It has also enabled alternative explanations for poor adherence to psychological skills training to be proposed. Self-control is a well-established area of research inquiry within general psychology, and although its application to sport and exercise contexts is in its infancy, it holds great promise in better understanding human performance and the process of behavior change. We suggest that future research should investigate the processes through which people learn psychological skills, in particular the role of self-control. In doing so research should examine the timing of imagery use, specifically contrasting the effects of motor imagery use independent of and immediately before motor execution.

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Table 1 The Sequential Task Design

	Self-control group (imagery)	Control group
Task1	Participants instructed to imagine performing a tumble turn correctly before physical execution of the turn.	
Task 2	Participants asked to perform a tumble turn.	
	All participants provided with verbal coaching to facilitate improvements during the next execution of tumble turn. The self-control group repeats the cycle of imagery followed by physical execution. The control group proceed to physical execution.	

Table 2 Descriptive Statistics for Pre- and Posttest Tumble-Turn Performance Scores by Condition

	Imagery condition			Control condition		
	M	*SD*	95% CI	*M*	*SD*	95% CI
Approach to turn pretest	8.32	2.51	[6.56, 10.08]	8.34	2.78	[6.37, 10.31]
Approach to turn posttest	9.40	2.79	[7.71, 11.09]	10.34	2.14	[8.45, 12.23]
Spin through turn pretest	9.47	4.08	[6.84, 12.10]	10.31	3.71	[7.37, 13.25]
Spin through turn posttest	10.72	2.73	[8.41, 13.03]	11.93	4.18	[9.35, 14.50]
Plant of feet on wall pretest	4.23	2.13	[2.96, 5.50]	3.23	1.56	[1.80, 4.65]
Plant of feet on wall posttest	5.28	1.93	[3.92, 6.64]	5.53	2.16	[4.00, 7.05]
Transition into stroke pretest	8.69	2.94	[6.80, 10.58]	7.06	2.52	[4.99, 9.13]
Transition into stroke posttest	7.22	2.76	[5.37, 9.07]	9.23	2.89	[7.11, 11.34]

Note. CI = confidence interval.

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