



## Does decision making transfer across similar and dissimilar sports?



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### ABSTRACT

**Objectives:** The ability to make decisions under time pressure is crucial to performance in sport. However, there remains a paucity of research that examines whether the skills underpinning decision-making transfer across similar or dissimilar sports. We examine whether decision making transfers from soccer to other sports that may be deemed to be either similar (basketball) or dissimilar (tennis) based on sports taxonomy.

**Methods:** Skilled soccer players ( $N = 20$ ) completed a video-based temporal occlusion test designed to measure decision-making involving offensive sequences of play from soccer, basketball, and tennis. Participants were required to decide on an appropriate action to execute for each situation presented.

**Results:** Response accuracy was higher in the soccer decision-making task compared to the basketball and tennis tasks. Furthermore, accuracy scores were higher on the basketball compared to the tennis task.

**Conclusions:** There appears to be some positive transfer of decision-making between sports that share similar elements, supporting the importance both of specificity and generality in expert performance.

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## 1. Introduction

In sport, adaptations occur during practice which lead to the development of perceptual-cognitive skills that underpin *decision making* and these have been shown to be crucial to high-level performance (Williams & Ford, 2008). The ability of athletes to make decisions is based on their capacity to integrate information relating to the current situation with existing knowledge/experiences so as to plan and select an appropriate action to execute. Such adaptations are essential, particularly in sports where the speed of play and ensuing time constraints often go beyond the capacity of athletes to process information (e.g., Laurent, Ward, Williams, & Ripoll, 2005; Roca, Ford, McRobert, & Williams, 2011; Shim, Carlton, Chow, & Chae, 2005). Although over recent decades researchers have enhanced our understanding of the processes and mechanisms that facilitate decision making (for a review, see Causer & Williams, 2013), there remains a paucity of research that examines whether the skills underpinning decision making in one sport can transfer to another sporting domain. The study of transfer

can provide important insights into the nature of expertise and whether experts can apply knowledge derived in one sport to other sports that are similar or dissimilar in nature (Smeeton, Ward, & Williams, 2004).

The notion of transfer of learning was first introduced by Thorndike and Woodworth (1901) in their "Identical Elements Theory". These authors proposed that the level of successful transfer depends on the level or amount of similar/identical elements (i.e., movement, perceptual, and conceptual or strategic elements) that exist between two performance tasks or domains. For example, it is argued that soccer and basketball contain similar relational and tactical elements, involving the interpretation of positions and movements of players on/off the ball and shared offensive/defensive principles of play, and consequently, bi-directional transfer may be possible between these two sports (e.g., see Moore & Müller, 2014; Smeeton et al., 2004). A second theory that is somewhat analogous is "Transfer-Appropriate Processing". This theory argues that instead of skill elements, what is important to transfer is the similarity of the mental/cognitive operation processing elements shared by the skills (see Lee, 1988). In contrast, the specificity of learning hypothesis suggests that learning effects or the attributes acquired by a performer through previous practice or experience in one task or domain will not transfer to another (see Proteau, 1992). The concept of specificity is

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also integral to many theories of motor control (see Adams, 1971).

A few scientists have started to investigate the extent to which perceptual-cognitive skills in a particular sport can successfully transfer to another sport (e.g., Abernethy, Baker, & Côté, 2005; Rienhoff et al., 2013; Smeeton et al., 2004). Smeeton et al. (2004) used a recognition paradigm to examine whether pattern recognition skill (i.e., the ability to recognise task-specific patterns of play as they emerge) transfers between sports presumed to be structurally similar (soccer and field hockey) and another believed to be structurally dissimilar (volleyball). Players across the three sports viewed structured action sequences from each sport in a recognition phase and had to determine quickly and accurately whether these scenes had been shown in a previous viewing phase. There were no differences in response accuracy across sports, however, the response times of skilled soccer and hockey players were quicker than volleyball players at recognising both soccer and hockey clips, providing partial support for the notion that some aspects of pattern recognition transfer between these two sports.

Abernethy et al. (2005) used a recall task to examine the transfer of pattern recall skill in groups of expert netball, basketball, and field hockey players. Experts from other sports performed at or near the level of domain-specific experts on the recall of player positions despite having no, or relatively limited experience, in the particular sport. Findings suggest that some aspects of recall skill may be generic and in part transferable between other similar sports. Some of the findings reviewed above should, however, be interpreted with caution as it has been suggested that successful performance on recall tests may be a by-product of experience in the domain rather than it being a measure of the perceptual-cognitive processes employed when making anticipation and decision-making judgements (Causser & Ford, 2014; Roca & Williams, 2016).

Müller, McLaren, Appleby, and Rosalie (2015) attempted to extend theoretical understanding of transfer of learning by investigating whether anticipation transfers to a dissimilar sport (i.e., from rugby to baseball). Participants watched temporally occluded video footage of an opponent performing rugby skills as well as sequences involving a baseball pitcher throwing different pitch types. Participants were asked to anticipate the expected final action. The expert and near-expert rugby players could anticipate rugby movements significantly better than novices, however, none of the skill groups were capable of transferring their skill across to the baseball task. Findings support the prediction that transfer of anticipation is expertise dependent and restricted to similar domains.

Previously, researchers examining the transfer of perceptual-cognitive expertise have mainly focused on anticipation, even though the ability to plan and select fast/appropriate decisions is central to expert performance in sport. Causser and Ford (2014) examined whether successful decision making transfers between sports or whether this ability is specific to a sport. Skilled soccer, invasion sport (e.g., basketball and rugby union), and other sport (e.g., tennis and golf) players completed a soccer (5 vs. 5) video-based temporal occlusion decision-making test. There was no difference in response accuracy between the soccer players when compared to the other invasion sports groups providing support for positive transfer of decision making. Although the soccer players were not more accurate than the invasion sports group, these two groups outperformed the other sports group which, to some degree, provides partial evidence for the specificity of learning hypothesis. The lack of differences in soccer-specific decision-making accuracy between the soccer and other invasion sport players could be due to the decreased sensitivity and lower reliability of the test scoring system used in this experiment (i.e., correct-incorrect paradigm). Using a scoring system based on rating the quality of

decisions being made has been shown to improve the reliability of performance testing (see, Lorains, Ball, & MacMahon, 2013). Therefore, research is required to confirm and extend previous findings and to examine in greater detail whether decision making transfers across similar (near transfer) and dissimilar (far transfer) sports.

In this study, we examine whether the decision-making judgements made by a group of skilled soccer is sport-specific or whether there is some element of transfer either to another sport that shares similar elements or one that does not. Based on the classical sports taxonomy (see, Griffin & Butler, 2005), soccer and basketball would be considered as similar sports (i.e., both invasion games), whereas tennis would be a dissimilar sport compared to the first two (i.e., racket/net sport). Participants completed a decision-making video test that included offensive sequences of play from soccer, basketball, and tennis. In line with the transfer of learning hypothesis, we predicted that the increased tactical and strategic similarities between soccer and basketball would promote greater response accuracy on the decision-making tests for these two sports in comparison with tennis. Furthermore, we expected that skilled soccer players would be more accurate at decision making for the soccer-specific test when compared to the other two sport tests which would support the concept of specificity of learning.

## 2. Methods

### 2.1. Participants

Participants were 20 male soccer players ( $M$  age = 19.7 years,  $SD = 1.0$ ) who all played in the British Universities and Colleges Sports (BUCS) league representing the University Men's Football 1st team as well as playing for semi-professional clubs in England. Participants had an average of 10.6 years ( $SD = 2.5$ ) of playing experience and an average of 6.5 h ( $SD = 1.8$ ) training per week. None of the participants had received coaching instruction in basketball and tennis and none had played these sports at any level. Informed consent was provided prior to participation and ethical approval was gained through the lead institution's Ethics Board.

### 2.2. Materials and procedure

Participants completed a soccer (11 vs. 11), basketball (5 vs. 5), and tennis (1 vs. 1) video-based temporal occlusion decision-making test in which they were required to decide on which action to execute at the end of each video clip. The video test stimuli were projected onto a large video screen (SMART Board SPNL-4070, Calgary, Canada; 1.65 m wide  $\times$  0.90 m high, 1.50 m from the floor) and participants stood at a distance of approximately 1.75 m from the screen. The video sequences comprised of open-play attacking situations extracted from existing footage of various top national and international-level men's matches across the three different sports. To guard against differences in task difficulty across the sport-specific decision-making tests, a panel of three qualified coaches for each sport independently rated each offensive video simulation clip on their respective sport. Only those sequences with reasonable difficulty levels (i.e., between 0.3 and 0.8 out of 1.0) were included in the video tests (as recommended by Vaughn, Lee, & Kamata, 2012). The final video tests each consisted of 15 test and two practice trials involving structured offensive sequences of play. The sequences ranged in duration between 6 and 12 s and ended when a blank screen occluded the video on the frame in which the player in possession was about to execute an action. The blank screen remained on for 4 s (as employed by Causser & Ford, 2014) during which time participants were required to select a decision to

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