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Do Decision-Making Skills During Defensive Scenarios in Soccer Transfer Across Similar and Dissimilar Sports?

Matthew Andrew, Allistair P. McRobert, and Joe Causer

The Football Exchange, Research Institute for Sport and Exercise Sciences, Liverpool John Moores University, England

Correspondence: Matthew Andrew, M.Andrew@ljmu.ac.uk

Abstract

Expert performance in highly dynamic and time pressured team sports such as soccer is underpinned by successful decision-making. Little research exists examining whether these decision-making skills associated with defensive scenarios can be transferred across similar and dissimilar sports. A shortened participation history questionnaire was used to identify 98 soccer players, 35 invasion sport players (e.g., rugby) and 52 other sport players (e.g., swimming), as well as skill level (hours of engagement/competition level). These participants completed a video-based temporal occlusion test designed to measure decision making in 11 vs. 11 defensive soccer scenarios. Results indicated that the skilled soccer players were more accurate than the skilled and less-skilled invasion sport players and skilled and less-skilled other sport players. Skilled soccer players were also more accurate than the less-skilled soccer players, with less-skilled soccer players exhibiting similar accuracy to both the skilled and less-skilled invasion sport and other sport players indicating that processes associated with decision-making in defensive scenarios may be specific to their sport.

Keywords

Expertise, soccer, transfer, decision-making, talent identification

Introduction

Expert performance in soccer match-play requires a simultaneous interaction between motor and perceptual-cognitive skills (Williams & Ford, 2013). These perceptual-cognitive skills underpin decision-making, which is fundamental to expert performance in highly dynamic and time pressured team sports such as soccer (Roca et al., 2013). Decision-making refers to the ability to use information from the current situation to plan, select and execute an appropriate goal-directed action(s) (Memmert & Roca, 2019). Successful decision-making by skilled soccer players in defensive scenarios are underpinned by acquired visual search behaviors and tactical knowledge (Roca et al., 2011; Roca et al., 2012; Vítor de Assis et al., 2020), yet the examination of whether decision-making skills can transfer across similar or dissimilar sports remain limited.

The concept of transfer of learning was first put forward by Thorndike (1914) through his identical elements theory. The concept holds that the level of successful transfer is dependent upon the level or amount of similar (i.e., identical) motor, perceptual or conceptual elements between the two performances, sports,

or domains. Soccer is an invasion sport similar to rugby or basketball and contains similar perceptual (e.g., tracking ball flight) and tactical elements (e.g., patterns of play), signifying that bi-directional transfer could occur between these sports (Smeeton et al., 2004). In contrast, sports that do not share these elements are less likely to transfer and rather suggest that they are specific to their sport, where motor and tactical skills can only be performed mainly (sometimes only) in the environment in which they were acquired (i.e., practice; Schmidt & Lee, 2020).

Over the years, researchers have attempted to extend our understanding of the extent in which decision-making skills can be transferred across similar and dissimilar sports, with evidence of positive transfer being observed (Rienhoff et al., 2013; Christopher & Müller, 2014; Müller & Rosalie, 2019). For example, the decision-making ability of skilled and less-skilled players from soccer, invasion sports (e.g., basketball; hockey) and other sports (e.g., tennis; golf) were compared during a video-based soccer temporal occlusion test (4 vs. 4 offensive scenarios). Skilled soccer players were more accurate compared to the less-skilled players. Moreover, no differences were observed between the soccer and invasion sports that share similar elements, who were both more accurate than the other sports group that do not share these elements (Causer & Ford, 2014). Roca and Williams (2017) extended this work when skilled and less-skilled soccer players completed a video-based temporal occlusion decision-making test of offensive scenarios in soccer, basketball, and tennis. Response accuracy was higher for the soccer players in their own sport compared to basketball and tennis. Furthermore, they responded more accurately in basketball which shares similar elements when compared to tennis.

The examination of the transfer of decision-making skills, particularly from soccer to similar and dissimilar sports has predominantly employed play sequences from offensive scenarios (Causer & Ford, 2014; Roca & Williams, 2017). Though ecologically similar to offensive scenarios, the decision-making processes during defensive scenarios can differ based upon the position of the player (e.g., left-back, central defender etc.), the opposition-player-in-possession and typically involve whether to move left or right (i.e., in anticipation of the player passing to their teammate), press the ball (e.g., player-in-possession or opposing-teammate), hold their position, or tackle/block. While previous studies have examined within sport (i.e., playing position) transfer using defensive scenarios and showed some positive transfer (Williams et al., 2008; Bruce et al., 2012), further research is required to understand whether acquired decision-making skills can transfer across sports.

To that end, the aim of the present study was to examine whether acquired decision-making skills associated with defensive scenarios in soccer can transfer across sports that share similar elements, and those that do not. Skilled and less-skilled soccer players, invasion sport players and other sport players completed a video-based temporal occlusion decision-making test during 11 vs. 11 soccer defensive scenarios. Invasion sports were defined as those that require teams to score points in goals and lines positioned at the end of the pitch behind the opposition team (e.g., rugby, basketball), while other sports included classifications such as athletics, net/wall games (e.g., tennis), striking/fielding games (e.g., baseball) and target sports (e.g., golf) (Launder, 2001). If consistent with previous literature (e.g., Causer & Ford, 2014; Roca & Williams, 2017) decision-making skills associated with defensive scenarios are transferable across similar sports, then we can predict that soccer players' response accuracy would be higher than other sport players, but not when compared to invasion sport players because they share similar elements. If, however, these decision-making skills are specific to their sport, then we can predict that the skilled soccer players' response accuracy would be higher than both the invasion sport players and other sport players.

Method

Participants

A total of 185 participants (124 M; 61 F) with a

mean chronological age of 18.4 (*sd* = 0.8) years were recruited from the undergraduate student body within the School of Sport and Exercise Science at the host university. All participants provided informed consent and were free to withdraw at any time. The study was designed in accordance with the Declaration of Helsinki and was approved by host university ethics committee (16/SPS/015). Ninety-eight (98) outfield soccer players, 35 outfield other invasion sport players (netball = 14; rugby = 12; hockey = 5; basketball = 2; handball, American football = 1) and 52 other sports players (athletics/gymnastics = 21; combat sports = 2; horse = 1; net/wall games= 4; striking/fielding = 6; target sports = 1; water sports = 17) were identified based on their participation history data collected via a shortened version of the Participation History Questionnaire (Ford et al., 2010). No other invasion sport or other sport players had engaged in soccer. In each of these classifications, participants were further divided into 95 skilled (e.g., national level) players and 90 less-skilled (e.g., regional level) players based upon a combination of current and/or highest level of performance and hours of engagement in their primary sport (Swann et al., 2015). Many of the skilled players were athletes who were representing the host universities in their respective sport. Skilled players engaged in total of 4416.9 (*sd* = 1163.6) hours in their primary sport, with 1595.5 (*sd* = 409.4) hours for the less-skilled players (for a breakdown of each group, see Table 1).

Table 1. Mean (*sd*) characteristics of each group and skill level.

Group	Skill	Sport/ Class	*n*	Gender	Age	No. Oth Sports	Total Hrs in Prim Sport
Soccer	*Skilled*		45	42M; 3F	19.0 (1.6)	5.2 (3.0)	4214.9 (2147.6)
	Less-Skilled		53	46M; 7F	18.6 (1.0)	4.4 (3.3)	2054.0 (1378.9)
Invasion	*Skilled*		22	9M; 13F	18.1 (0.3)	4.4 (2.6)	3367.6 (1967.0)
		Basketball	2	2M; 0F	18.5 (0.7)	3.5 (2.1)	3528.0 (1149.4)
		Handball	1	0M; 1F	18.0	2.0	2304.0
		Hockey	2	2M; 0F	18.0 (0.0)	6.0 (4.2)	3168.0 (2036.5)
		Netball	8	0M; 8F	18.1 (0.4)	5.0 (2.8)	3060.0 (1910.7)
		Rugby	9	5M; 4F	18.0 (0.0)	3.9 (2.4)	3768.0 (2307.6)
	Less-Skilled		13	4M; 9F	18.2 (0.4)	5.2 (2.5)	1266.5 (618.9)
		Am Foot	1	1M; 0F	18.0	7.0	1920.0
		Hockey	3	2M; 1F	18.0 (0.0)	6.0 (1.7)	1776.0 (793.1)
		Netball	6	0M; 6F	18.0 (0.6)	5.5(3.2)	1136.0 (487.3)
		Rugby	3	1M; 2F	18.7 (0.4)	3.0 (0.0)	800.0 (308.6)
Other	*Skilled*		28	12M; 16F	18.3 (0.7)	5.3 (3.3)	5668.3 (3125.2)
		Ath/Gym	8	4M; 4F	18.5 (0.9)	5.5 (2.8)	7740.0 (4501.0)
		Combat	2	1M; 1F	18.5 (0.7)	4.0 (2.8)	3528.0 (101.8)
		Horse	1	1M; 0F	18.0	2.0	4704.0
		Net/Wall	4	1M; 3F	18.8 (1.0)	8.0 (6.3)	4290.0 (1098.3)
		Strike/Field	4	1M; 4F	18.3 (0.5)	3.8 (1.3)	5592.0 (1936.1)
		Target	1	0M; 0F	18.0	7.0	4704.0
		Watersports	8	4M; 4F	18.0 (0.0)	5.0 (2.8)	5100.0 (2531.5)
	Less-Skilled		24	11M; 13F	18.2 (0.8)	5.8 (4.0)	1466.0 (1048.8)
		Ath/Gym	13	5M; 8F	18.0 (0.0)	6.8 (4.8)	1606.2 (1100.8)
		Strike/Field	2	1M; 1F	20.0 (2.8)	7.0 (4.2)	1224.0 (644.9)
		Watersports	9	5M; 4F	18.0 (0.0)	4.2 (2.1)	1317.3 (1147.7)

Procedure

All participants completed a video-based temporal occlusion decision-making test that required them to predict the outcome of 11 vs. 11 defensive soccer scenarios. The task was akin to the study of Roca et al. (2011) examining decision-making during soccer defensive scenarios. The participants viewed soccer footage that was life-sized on a large video screen (1.5 m wide x 1.5 m high, 0.5 m

from floor to bottom of screen; Figure 1a). Videos were viewed from the first person-perspective of a central defender (Figure 1b). Each videoclip started with a red dot on a black screen to indicate where the ball would be located at the start of the film sequence (this allowed participants to know where the ball was prior to the sequence commencing and thus not have to conduct a visual search). Each video lasted 5 sec and ended when an opaque screen occluded the video 120 msec prior to the player-in-possession of the ball making an attacking pass, shooting at goal, or maintaining possession of the ball by dribbling forward. The opaque screen remained for approximately 4 sec (consistent across all trials). During this time, participants were required to confirm 'what would you do next?' (Roca et al., 2011). This was based on five options: (1) move left; (2) move right; (3) press the player-in-possession; (4) stay where they are; (5) block the shot/tackle of the player-in-possession. Participants were instructed to select their response as quickly as they could, to closely replicate the requirements of the task, yet the time taken to select their response was not recorded. The most appropriate decision/action to each scenario always contained one of these five options. As reported in the work of Roca using the same soccer video clips (Roca et al., 2011, 2012, 2013), a panel of three UEFA (Union of European Football Association) qualified soccer coaches watched all clips and independently selected the most appropriate decision/action for the player to execute in the final situation on screen, with 100% agreement for all clips. Participants completed 5 familiarization trials and 20 experimental trials. All sessions were completed in approximately 15 min. The order of the presentation clips remained constant across all participants.

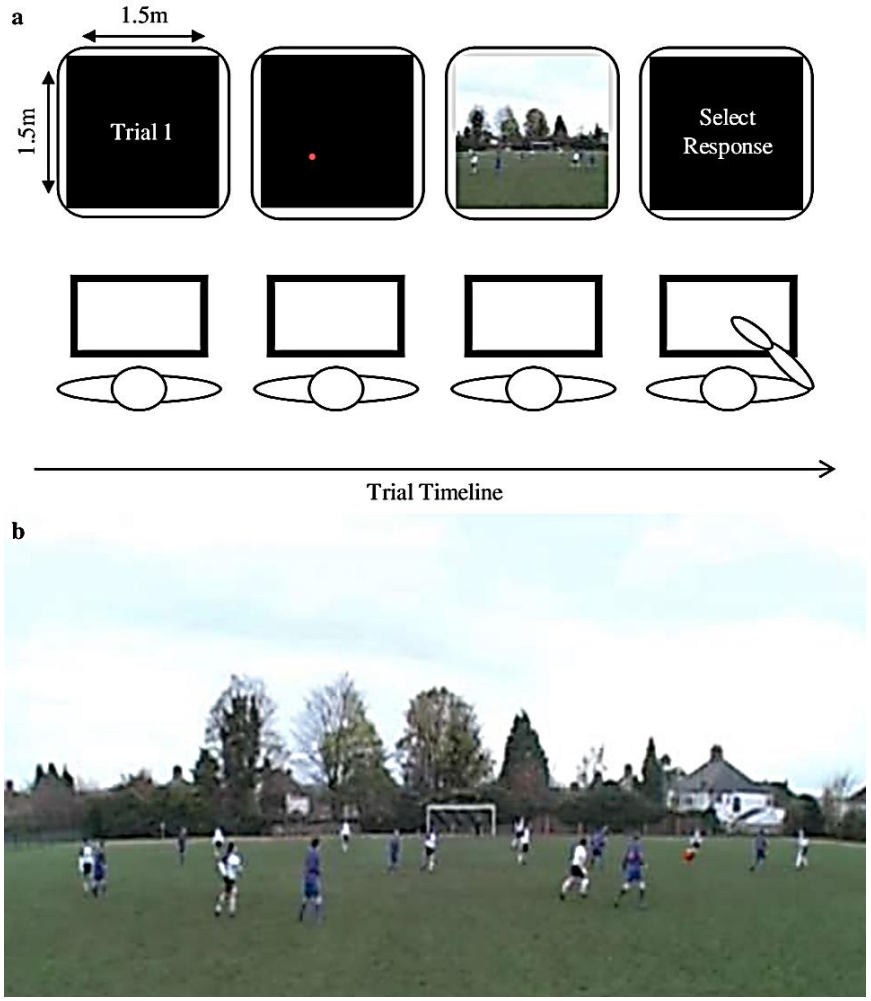

Figure 1. (a) Schematic representation of the experimental set-up for the decision making test. **(b)** Example of a frame from the test demonstrating the perspective of the participant.

Data Analysis

Participants were provided one point for each answer in the decision-making task that matched up to that selected by the UEFA coaches and was deemed the most appropriate decision/action. A total score was calculated for each participant and was expressed as a percentage (%) for response accuracy.

A two-way, between groups ANOVA was conducted on the data to analyze response accuracy score with sport classification (soccer; invasion sports; other sports) and expertise (skilled; less-skilled) as the between group factors. Any violations to sphericity were corrected using Huynh-Feldt procedures when the Greenhouse-Geisser value was greater than 0.75. Effect sizes were reflected as Partial eta squared (η_p^2) (Small = 0.01; Medium = 0.06; Large = 0.14; Field, 2013) as appropriate. Significant main and/or interactions effects involving more than two means were analyzed using LSD post-hoc procedure. Thresholds for statistical significance were set at $p < 0.05$.

Results

Though there was no significant main effect of expertise [$F(1, 179) = 1.48$, $p = 0.23$, $\eta_p^2 = 0.01$], the ANOVA revealed a Group x Expertise interaction effect [$F(2, 179) = 3.70$, $p = 0.03$, $\eta_p^2 = 0.04$] indicating a significant difference between the groups dependent on expertise level. The skilled soccer players ($m = 66.4\%$, $sd = 15.1\%$) were significantly more accurate compared to the to the skilled and less-skilled invasion sport players (skilled: $m = 51.8\%$, $sd = 20.0\%$; less-skilled: $m = 56.9\%$, $sd = 14.9\%$), and skilled and less-skilled other sport players (skilled: $m = 56.1\%$, sd 14.9%; less-skilled: $m = 53.1\%$, $sd = 15.1\%$). Furthermore, skilled soccer players were significantly more accurate than the less-skilled players ($m = 54.5\%$, $sd = 16.3\%$), with less-skilled soccer players exhibiting similar response accuracy to both the skilled and less-skilled invasion sport and other sport players. There was also a main effect of sport type [$F(2, 179) = 3.03$, $p < 0.05$, $\eta_p^2 = 0.03$]. Soccer players ($m = 60.5\%$, $sd = 15.7\%$) were significantly more accurate compared to the invasion players ($m = 54.4\%$, $sd = 17.5\%$), but there was no difference between the soccer players and other sport players ($m = 54.6\%$, $sd = 15.9\%$), or between the invasion sport players and other sport players.

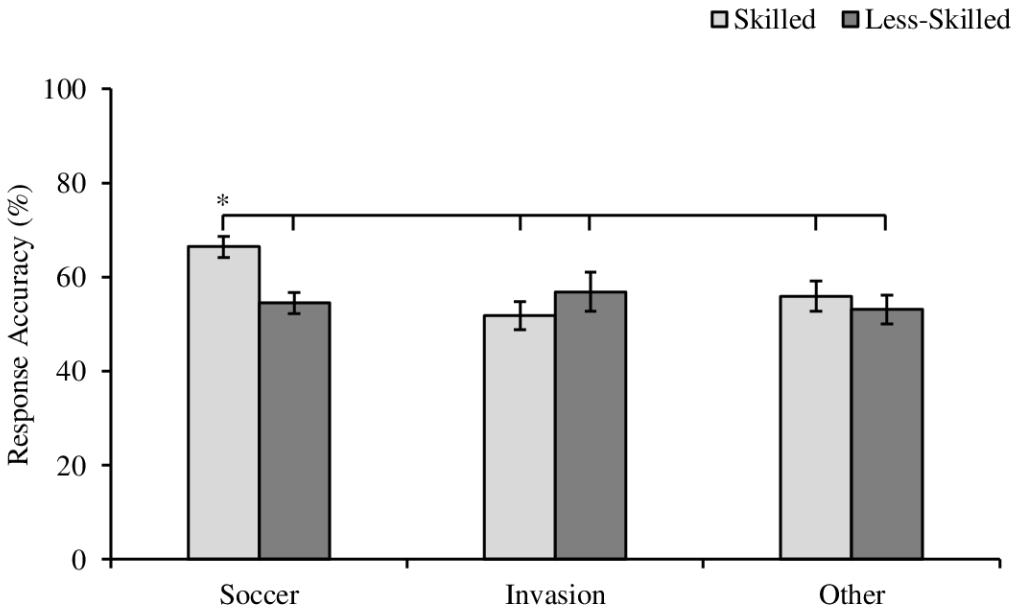

Figure 2. Mean response accuracy (%) in the soccer anticipation task for the skilled (light-grey bars) and less-skilled (dark-grey bars) soccer players, invasion sport players and other sport players (error bars represent standard error of the mean; * = $p < 0.05$).

Discussion

The aim of the current study was to examine whether decision-making skill in defensive scenarios in soccer transfers between sports that share similar elements, or whether they are specific to their sport. Consistent with previous literature and the identical elements theory (Thorndike, 1914; Causer & Ford, 2014; Roca & Williams, 2017) it was hypothesised that skilled soccer players would be more accurate at decision-making than skilled other sport players that do not share similar elements but would not be when compared to skilled invasion sports players that do. Inconsistent with our hypothesis, findings indicated that there was no transfer of decision-making skills between similar or dissimilar sports during defensive scenarios in soccer, as the skilled soccer players were more accurate compared to the skilled invasion sport players as well as other sport players (Figure 2). The response accuracy data indicates that underlying processes underpinning decision-making skill in soccer are sport-specific.

Previous literature has shown that successful decision-making in defensive scenarios in soccer are underpinned by acquired visual search strategies and tactical knowledge (Roca et al., 2011; 2012; Padilha et al., 2017). Tactical knowledge refers to a player's ability to execute an appropriate decision in any situation presented according to the constraints of the game (Gréhaigne & Godbout, 1995). When skilled soccer players were grouped by an on-field tactical knowledge test, players with high tactical knowledge showed better decision-making compared to players with low tactical knowledge. Players with high tactical knowledge employed visual search strategies that were akin to those observed by Roca et al. (2011), with a high number of fixations of shorter duration towards the attackers, defenders, and free space (Vítor de Assis et al., 2020). Though visual search behaviors were not recorded in the present study, given the identical stimuli and similar participant characteristics to Roca et al. (2011), we can speculate that skilled soccer players in the present study employed similar visual search strategies, facilitated through tactical knowledge leading to greater response accuracy. Our findings provide further support that skilled soccer players develop and refine domain-specific memory structures that allow rapid and reliable retrieval of information from long-term memory (Ericsson & Kintsch, 1995). In some contexts, these structures are sport-specific and in others they can transfer across similar sports with minimal adaptation (Causer & Ford, 2014; Roca & Williams, 2017).

Our data also have practical implications for those responsible for talent identification (e.g., scouts), providing an opportunity for their athletes with several options for competition (Weissensteiner, 2017). There are ~ 4.5 million children (5-15 years of age) participating in soccer in England (The FA, 2020) with some being selected and deselected (i.e., released) from elite academes during development. For instance, the annual turnover of academy soccer players in Germany is 25% and 7% progress from the U10's to U19's categories (Güllich, 2014). These players have the opportunity to be recruited into other sports that may be considered less 'mainstream' in England (e.g., Gaelic football) but share similar motor and perceptual elements (i.e., talent transfer; Collins et al., 2014). Though participation in sports that share similar elements may augment the development of decision-making in another sport (e.g., Berry, Abernethy, & Côté, 2008), yet some contexts such as those in the current study may require sport-specific practice to become expert performers (Güllich et al., 2020). However, more research is required to examine the effectiveness of video-based tasks to identify talent (Bennett et al., 2019).

To conclude, our findings from the present study support the notion that decision-making in soccer defensive scenarios are sport-specific, since skilled soccer players response accuracy during a soccer decision-making test in defensive scenarios was significantly higher than other invasion sport players that share similar elements, and other sport players that do not. One limitation of the present study was we did not measure decision time. In sports such as soccer, decisions are made in time-constrained scenarios and thus measuring decision time

would allow us to better understand how players utilise perceptual-cognitive processes (Cardoso et al., 2020), and how they contribute towards transfer of decision-making skills. We recommend that future work also attempt to record visual search behaviors or tactical knowledge (Roca et al., 2011; Vítor de Assis et al., 2020) in an attempt to better understand the mediating mechanisms that either account for the transfer (e.g., Causer & Ford, 2014) or specificity of decision-making skills. Moreover, we encourage future work to examine potential methodologies that may expedite learning/transfer of decision-making skills. One way to achieve this may be to provide a set amount of sport-specific training (e.g., soccer), that is then compared with improvements in decision-making skills following a similar amount of time in perceptual-cognitive training in another sport (e.g., rugby) that share similar elements.

Authors' Declarations

The authors declare that there are no personal or financial conflicts of interest regarding the research in this article.

The authors declare that they conducted the research reported in this article in accordance with the Ethical Principles of the Journal of Expertise.

The authors declare that they are not able to make the dataset publicly available but are able to provide it upon request.

ORCID iDs

Matthew Andrew
https://orcid.org/0000-0003-2007-910X

Joe Causer
https://orcid.org/0000-0002-8939-8769

Allistair P. McRobert
https://orcid.org/0000-0002-0964-7199

References

Bennett, K. J., Novak, A. R., Pluss, M. A., Coutts, A. J., & Fransen, J. (2019). Assessing the validity of a video-based decision-making assessment for talent identification in youth soccer. *Journal of Science and Medicine in Sport*, *22*(6), 729-734.

Berry, J., Abernethy, B., & Côté, J. (2008). The contribution of structured activity and deliberate play to the development of expert perceptual and decision-making skill. *Journal of Sport and Exercise Psychology*, *30*(6), 685-708.

Bruce, L., Farrow, D., & Raynor, A. (2012). How specific is domain specificity: Does it extend across playing position?. *Journal of Science and Medicine in Sport*, *15*(4), 361-367.

Cardoso, F. D. S. L., Neves, J. A., Roca, A., & Teoldo, I. (2020). The association between perceptual-cognitive processes and response time in decision making in young soccer players. *Journal of Sports Sciences*, *8*, 926-935.

Causer, J., & Ford, P. R. (2014). "Decisions, decisions, decisions": Transfer and specificity of decision-making skill between sports. *Cognitive Processing*, *15*(3), 385-389.

Christopher, G. M., & Müller, S. (2014). Transfer of expert visual anticipation to a similar domain. *Quarterly Journal of Experimental Psychology*, *67*(1), 186-196.

Collins, R., Collins, D., MacNamara, Á., & Jones, M. I. (2014). Change of plans: An evaluation of the effectiveness and underlying mechanisms of successful talent transfer. *Journal of Sports Sciences*, *32*(17), 1621-1630.

Ericsson, K. A., & Kintsch, W. (1995). Long-term working memory. *Psychological Review*, *102*(2), 211-245.

Field, A. (2013). *Discovering Statistics Using SPSS*. London, UK: Sage publications.

Ford, P. R., Low, J., McRobert, A. P., & Williams, A. M. (2010). Developmental activities that contribute to high or low performance by elite cricket batters when recognizing type of delivery from bowlers' advanced postural cues. *Journal of Sport and Exercise Psychology*, *32*(5), 638-654.

Gréhaigne, J. F., & Godbout, P. (1995). Tactical knowledge in team sports from a constructivist and cognitivist perspective. *Quest*, *47*(4), 490–505.

Güllich, A. (2014). Selection, de-selection and progression in German football talent promotion. *European Journal of Sport Science*, *14*(6), 530-537.

Güllich, A., Fass, L., Gies, C., & Wald, V. (2020). On the empirical substantiation of the definition of "Deliberate Practice"(Ericsson et al., 1993) and "Deliberate Play"(Côté et al., 2007) in youth athletes. *Journal of Expertise, 3*(1), 1-19.

Launder, A. G. (2001). *Play practice: The games-based approach to teaching and coaching sports*. Champaign, IL: Human Kinetics.

Memmert, D., & Roca, A. (2019). Tactical creativity and decision making in sport. In A. M. Williams & R. C. Jackson (Eds.) *Anticipation and Decision Making in Sport* (pp. 201–214). London, UK: Routledge.

Müller, S., & Rosalie, S. M. (2019). Transfer of expert visual-perceptual-motor skill in sport. In A. M. Williams & R. C. Jackson (Eds.) *Anticipation and Decision Making in Sport* (pp. 375–394). London, UK: Routledge.

Padilha, M., Bagatin, R., Milheiro, A., Tavares, F., Casanova, F., & Garganta, J. (2017). Visual search behavior and defensive tactical performance during small-sided conditioned soccer games. *Revista Portuguesa de Ciências do Desporto*.

Rienhoff, R., Hopwood, M. J., Fischer, L., Strauss, B., Baker, J., & Schorer, J. (2013). Transfer of motor and perceptual skills from basketball to darts. *Frontiers in Psychology, 4*, 593.

Roca, A., Ford, P. R., McRobert, A. P., & Williams, A. M. (2011). Identifying the processes underpinning anticipation and decision-making in a dynamic time-constrained task. *Cognitive Process*, *12*(3), 301–310.

Roca, A., Williams, A. M., & Ford, P. R. (2012). Developmental activities and the acquisition of superior anticipation and decision making in soccer players. *Journal of Sports Sciences*, *30*(15), 1643-1652.

Roca, A., Ford, P. R., McRobert, A. P., & Williams, A. M. (2013). Perceptual-cognitive skills and their interaction as a function of task constraints in soccer. *Journal of Sport and Exercise Psychology*, *35*(2), 144-155.

Roca, A., & Williams, A. M. (2017). Does decision making transfer across similar and dissimilar sports?. *Psychology of Sport and Exercise*, *31*, 40-43.

Schmidt, R. A., & Lee, T. D. (2020). *Motor Control and Performance: From Principles to Application (6th ed.)*. Champaign, IL: Human Kinetics.

Smeeton, N. J., Ward, P., & Williams, A. M. (2004). Do pattern recognition skills transfer across sports? A preliminary analysis. *Journal of Sports Sciences*, *22*(2), 205-213.

Swann, C., Moran, A., & Piggott, D. (2015). Defining elite athletes: Issues in the study of expert performance in sport psychology. *Psychology of Sport and Exercise*, *16*, 3-14.

The Football Association. (2021). The social and economic value of grassroots football in England. Retrieved April 1, 2021 from https://www.thefa.com.

Thorndike, E. L. (1914) *Educational psychology: Briefer course*. New York, NY: Columbia University Press.

Vítor de Assis, J., González-Víllora, S., Clemente, F. M., Cardoso, F., & Teoldo, I. (2020). Do youth soccer players with different tactical behaviour also perform differently in decision-making and visual search strategies?. *International Journal of Performance Analysis in Sport*, 1-14.

Weissensteiner, J. R. (2017). How contemporary international perspectives have consolidated a best-practice approach for identifying and developing sporting talent. In J. Baker, S. Cobley, J. Schorer, & N. Wattie (Eds.), *The Routledge Handbook of Talent Identification and Development in Sport* (pp. 51-68). London, UK: Routledge.

Williams, M. A., Ward, J. D., Ward, P., & Smeeton, N. J. (2008). Domain specificity, task specificity, and expert performance. *Research Quarterly for Exercise and Sport*, *79*(3), 428-433.

Williams, A. M., & Ford, P. R. (2013). 'Game intelligence': Anticipation and decision making. In. A. M. Williams (Ed.), *Science and Soccer III* (pp. 105-121). London, UK: Routledge.

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