DECISION MAKING THROUGH HEURISTICS

SAM NORTON-KNIGHT

INTRODUCTION

There has been a clear shift in recent years to expose players to more decision-making opportunities in their training environment, with coaches encouraged to utilise a game-based approach in their session design. With strong links to pedagogical literature (Piaget, 1962), open-skill activities where players can learn through discovery have replaced the closed skill drills favoured by our forebears. The implication of this training style is that coaches will take a less hands-on approach, create a positive learning environment and offer feedback at an opportune moment to reinforce learning. It is often noted in these sessions that coaches encourage players to 'play what's in front,' or as we may also refer to it, play intuitively. It is also somewhat curious that this instruction is rarely provided to the defensive team. Why? Are we overstating the value of playing what's in front, need it be selective, or are we misinterpreting what intuition truly is? Herbert Simon, a Nobel Prize laureate who first introduced the concept of bounded rationality, defines intuition thus: "The situation has provided a cue; this cue has given the expert access to information stored in memory, and the information provides the answer. Intuition is nothing more, and nothing less than recognition" (Simon, 1992). It is important to first consider therefore whether the player has developed the requisite skills to take the appropriate action at the appropriate time from the relevant cue, and what role a coach plays in supporting their journey from novice to expert. Additionally, are coaches spending sufficient time developing both the cognitive and motor skills required to formulate and execute skills effectively? Research indicates that in fast-paced, dynamic sports, experienced players frequently employ heuristics to arrive at decisions more efficiently than less experienced performers (Raab & Johnson, 2007), so it should be inherent that coaches provide a learning environment that enhances this process relevant to the player's development. This paper looks to explore how coaches might better understand the decision-making process to enhance player development.

NOVICE TO EXPERT

Starkes & Ericsson (2003) have shown that compared with novices, “experts make faster, more accurate decisions, recall game structured information better, detect game related signals faster and predict events from advanced cues better.” This is clearly an outcome both player and coach are striving for, so it is important to understand how an athlete moves from novice to expert and for a coach to be aware of the needs of their players at each stage of development. Côté & Hay (2002) suggest there are three distinct phases an athlete will go through before being considered an expert in their field. Between the ages of 5-12, children will participate in a wide-range of sports, which is referred to as the “sampling” phase. Between the ages of 13-15 they will begin to gradually narrow their focus in what they refer to as the “specializing phase”, and from age 16 years, athletes will become devoted to a single sport, which is known as the “investment” phase. There are many who would advocate that expertise can be attained more quickly through early specialization, however “explicit support of specialization is scarce in the youth sport literature” (Wiersma, 2000). In fact, “exposure to practice in other sport settings, especially in generic aspects of pattern recognition and decision-making, may circumvent the need for, or perhaps partially substitute for, some of the many hours of sport-specific practice needed to become an expert in team ball sports” (Baker et.al, 2003). We all enjoy hearing the story of the all-round athlete who excels at cricket, rugby and athletics, yet at the same time may be creating an environment where a player feels compelled to focus on rugby year-round, potentially damaging their enjoyment of the game to the point of withdrawal. Perhaps instead we should be focusing on ensuring the talented athlete remains in a stimulating environment, with the awareness that there are transferrable skills which may benefit the athlete as much as direct instruction. Finally, research indicates that “experts possess superior perceptual-cognitive skills, such as pattern recall, anticipation and decision-making … and all of these skills have been attributed to a higher level of automaticity in experts, compared to novices (Lorains et.al, 2013).

MOTOR SKILLS & COGNITIVE SKILLS

To paraphrase Voigt et.al (2023), the rugby player with an accurate long-passing game who is unaware when to pass the ball will no sooner succeed than the player who knows when to throw such a pass but is unable to do so. The best coaches understand that success in any sport, and most certainly rugby will depend on a player developing both the cognitive component of a skill, which guides the decision, and

the motor component of the skill, which allows for its execution. We would like to hope that by the time athletes reach the "investment-phase" of their development, that they have acquired a well-rounded set of motor skills through some level of deliberate practice. In fact, "Research on the hierarchy of motor skill development supports the approach that sport involvement should progress from a focus on fundamental motor skills in early childhood to more sport-specific skills in adolescence and early adulthood (Baker et.al 2003). Rugby Australia's coaching curriculum now strongly encourages a whole-part-whole approach to training design, and it is critical that coaches are aware of their role in positively influencing motor skill development by having a thorough understanding of the key factors of various skills. Equally, applying a games-based approach to training can help expose players to scenarios that may present in competitive match play, allowing them to draw on prior experience to guide future decisions. However, "the cognitive side of athleticism is not just a matter of gaining predictive knowledge but of gaining the self-assurance to act on it unhesitatingly" (Bandura, 1997, p. 375). Self-efficacy, or one's belief in their capability to successfully perform a task, has been shown to be positively related to decision making performance in various settings (Horcajo & Higuero, 2022). People with high efficacy beliefs tend to perceive situations as realistic challenges, visualize success, and exhibit efficient analytical thinking (Hepler & Feltz, 2012). As players gain competence and confidence, they are likely to perform complex skills sub-consciously. Indeed, Fitts and Posner (1967) suggest that "elite athletes perform with a higher level of automaticity than do novices, with little need for thought to the detailed aspects of the skill." (Lorains et.al, 2013). This is not just limited to physical skills; it has also been used to explain cognitive skills, such as decision-making.

DECISION MAKING IN A DYNAMIC ENVIRONMENT

Another important consideration for coaches when reviewing and providing feedback on performance, specifically as it relates to decision making, is to be aware of the dynamic environment in which players are operating. Johnson (2006) describes how in a static environment, there "is not so much a single point of decision as there is a course of deliberation. Information is not instantaneously gathered and processed; rather a decision maker must accrue information over time." Contrast this with a dynamic environment, such as rugby. The first-receiver may be able to scan the field and identify an option at a specific moment in time, however this information will continue to evolve in the time it takes for the ball to arrive in their hands. The player will either make their decision while acting, or they may act while deciding. There is a volume of research that looks at the perception-action cycle, which falls outside the limitations of this paper, however of particular interest is the study of heuristics and how they apply to

decision making in sport. A heuristic is a mental shortcut, a rule of thumb, that can be applied to respond rapidly to a cue in a dynamic environment. Decisions made in sport often require quick responses and the decision maker may therefore have to take a satisficing option without considering whether or not a better option exists (Voigt et.al, 2023). It is hard to reconcile as a coach that players will not consider every possible option available to them, however this is engrained in human behaviour; we can not possibly have all the information at hand, so we instead apply an "adaptive toolbox," making "affordable and efficient decisions in useful tim" (Balague et.al, 2008).

TABLE 1 | Heuristics applied to medicine and sport.

Heuristic	Definition	Ecologically rational if	Bold predictions	Example
Recognition heuristic (RH) Goldstein and Gigerenzer, 2002	If one of two alternatives is recognized, infer that it has the higher value on the criterion.	Recognition validity >0.5	Contradicting information about recognized object is ignored, less-is-more effect if a >b, forgetting is beneficial	RH predicted the winners of the Wimbledon tennis matches better than the predictions by Wimbledon experts' seeding and ATP rankings Serwe and Frings, 2006; Scheibehenne and Bröder, 2007
Take-the-best Gigerenzer and Goldstein, 1996	Infer which of two alternatives has the higher value by (a) searching through cues in order of validity, (b) stopping the search as soon as a cue discriminates, (c) choosing the alternative this cue favors.	Cue validities vary highly, moderate to high redundancy, scarce information	Can predict as accurately as or more than multiple regression, neural networks, exemplar models, and classification and regression trees.	Professional burglars' choice of location to break-in is predicted more accurately by take-the-best than by a weighted-linear strategy. For novices' choice, the opposite holds Snook et al., 2011
Take-the-first Johnson and Raab, 2003	Choice from self-generated options by (a) searching through options in order of validity (b) stopping search after two to three options (c) choosing the first option generated	Option validity vary highly, option validity is learned through feedback	Can predict limited search better than memory models Raab, 2012	Handball playmakers allocations follow it Raab and Johnson, 2007
Hot-hand heuristic Csapo et al., 2015	If one of two alternatives has a positive streak of success, infer that this option has a higher probability of being successful again	Base rates are unknown or vary, correlation between sequential shots are performance is positive	Can predict choices better than models that ignore the sequential dependence of choices Raab et al., 2012, can perform better than base-rate models Burns, 2004	Basketball coaches and players use it Raab et al., 2012; Csapo et al., 2015
Fast-and-frugal tree Green and Mehr, 1997	Classify an object into two categories by (a) searching through cues according to their order, (b) stopping the search as soon a cue allows to do so, and (c) choosing the object the exit specifies (see **Figure 1**)	See take-the-best heuristic.	Can predict as accurately as or better than logistic regression Wegwarth et al., 2009	A fast-and-frugal tree predicted heart attacks better than the Heart Disease Predictive Instrument (HDPI; a logistic regression) and physicians.

FAST AND FRUGAL HEURISTICS – TAKE THE FIRST

As the table above indicates, an athlete's decision-making process can be considered through a simple heuristics approach, with fast and frugal heuristics specifically useful in fast-paced, dynamic sports because they rely on limited information to make quick decisions (Raab & Gigerenzer, 2015). One example of a fast and frugal heuristic that has been recently studied is the 'take the first' heuristic, which explains how experienced players choose an option (Raab & Johnson 2023), and how it is utilized more frequently as players gain expertise (Raab & Johnson 2007). Empirical evidence has suggested that

between 60-90% of athlete's decisions meet the description of take-the-first (Lorains et.al, 2013). Past Level 4 papers (Russell, 2007) have explored the OODA loop to outline the decision-making process, a training tool developed in the 1970s by John Boyd for US fighter pilots. It suggests there are four steps we take in the decision-making process: Observation, Orientation, Decision and Action (Jeffreys, 2016). The take the first heuristic outlines a similar process of rules an athlete goes through when formulating a response to a cue; search rules, stop rules, decision and execution rules, with the execution rule then providing feedback to the search rule (Voigt et.al, 2023). The feedback a player receives, both intrinsic and extrinsic, will help to formulate a future response to a similar cue. A major assumption of the take the first heuristic is that options are generated in a sequential, meaningful way based on option similarity, experience, strategy and environmental factors. Based on this, earlier options represent better decisions than later ones (Hepler & Feltz, 2012). Outside of the field of sport, Klein (1998) has proposed a recognition primed decision model that involves recognition of cue patterns to inform a response for emergency services workers. Interestingly, his findings have shown that serial evaluation of single options is considered typical, and the first option that matches the decision maker's goals and the situational constraints is chosen. What is relevant for coaches is the need to expose players to decision making scenarios at training to help prime an automatic response when faced with a comparable scenario in the future.

CONCLUSION

Whilst the commencement point for many coaches is to take what they know about the game and look to apply it to the team they are coaching, perhaps it would be more effective for them to understand how the various factors discussed in this paper interact and consider their role at each point in time. Does your training design reflect the level of expertise within your playing group? Have you considered how you can develop both motor skills and cognitive skills through the implementation of a whole-part-whole session to build this level of expertise? With an awareness that 60-90% of the time players are using the take-the-first heuristic given the dynamic nature of decision making in fast-paced sport, what are we doing within our training environment to ensure the 'first option' is the desired option, because this fact alone tells us that players are already 'playing what's in front.' They are playing what comes immediately to mind. Those fortunate enough to work with elite level athletes should expect that they have reached this level through their ability to efficiently and consistently select the right action at the right moment, not only by "accurate execution of motor behavior but also perceptual–cognitive skills" (Natsuhara et.al, 2020). The role of an elite level coach should now be to refine what has already been

developed, building on a strong foundation and accepting that although the environment may become even more dynamic, the player will in time be able to recognize and rapidly respond to these cues using information stored in memory. They will intuitively, ‘play what’s in front.’

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