Making the wrong decision in an individual sport affects the competitors themselves, but making the wrong decision in a team game not only lets the players down around you, it can also influence the success of the team. On the other hand and more importantly, making the correct decision can produce success for a player and a team and at the high-performance level, it is the speed and accuracy of those decisions under pressure that separates the elite from the novice. “Effective decision making is important to the successful execution of skills” (Turner and Martinek 1995). Using the stages of information processing and various theories behind decision-making, a practical approach can be developed in order to improve decision-making skills by limiting anxiety, increasing anticipation, and reducing reaction time. Adapting the length of training sessions can influence improvement as research suggests that shorter and more frequent training sessions are optimal for cognitive development (Magill 2007). Shorter training sessions create opportunity to train at a high intensity and with the addition of variety, the focus on motor learning can be enhanced, (http://lib.oup.com.au). This paper will look at developing decision-making in attack within the sport of Rugby and focus on the position of fly-half as they are a key decision maker on the field.

A simple task specific training game has been created to improve the decision-making capabilities of the fly-half using the Information Processing Model, (Schmidt & Lee, 1999; Schmidt & Wrisberg, 2000) as the foundation. The aim of the practice drill is to develop a player’s perceptual hardware (sensory systems) by improving their cue selection, capability and choice of response.

The Information Processing Model

The Information Processing Model involves interpreting stimuli via one or more of the sense organs, choosing a response, and then initiating that response through muscular or joint movements. As shown in figure 1, the Information Processing Model comprises of 3 stages. The stimulus that is presented to the player enters the ‘stimulus identification’ stage, where the information must be identified or recognised as part of a pattern, (Schmidt & Lee, 1999). For example, the fly-half has to identify the position of defenders using recall and recognition memory (Williams et al, 1999), a memory developed from past experiences. Once the fly-half has identified the stimulus, it then enters the ‘response selection stage’, where the appropriate decision is made whether to act or ignore the stimulus. In practical terms, this can be seen when the fly-half is running a switch with another player, when suddenly another option becomes available due to defensive changes, giving the ball player the decision whether to react to the new cue or continue with the pre-arranged move. Another example from a problem-solving point of view could be when a kick has been planned but the space previously available changes and the angles and length of kick needs to be adapted. The ‘response programming stage’ involves the response being initiated through the movement of joints and muscles in the body. The increased number of joints and body segments needed to complete a task adds to its complexity, and this is where the speed accuracy trade-off comes into perspective. When kicking the ball for example, the accuracy of the skill may have to be sacrificed due to the urgency of getting the ball into touch because of opposition players attempting a charge down.
Trainings regularly comprise of skill development and then application of these skills into game-based scenarios. The next stage of training is to apply skills within closed and open scenarios with opportunities to develop making the correct decision. This practice game however, develops a more complete understanding of tactical and spatial awareness, incorporating visual cues and team play, to challenge and reduce response time with the objective of improving the speed and accuracy of the decision. This game has been constructed to simulate a game situation, so that the fly-half can recognise vital cues produced by the configuration of the opposition or from their own team, and make the correct decision quickly and correctly, (Gréhaigne et al, 2005).

**The Practice Game**

The game comprises of 8 attackers and 7 defenders, playing 2-hand touch and played within one-half of a rugby pitch. The aim of the game is to score a try as per a regular rugby match with the attackers having unlimited possession. The attackers move forward by either running with the ball, passing, or kicking. The attackers who receive the kicks having no offside line to be concerned with which allows them to be as much in front of the kicker as desired. The attackers place three of their players anywhere in between the defensive line and the try line, with the rest making up the backline, (see Figure 2). A tackle counts when a defender touches the ball carrier with two hands below the waist. The defensive team must decide how many players defend the 3 attackers waiting for a kick, whilst also worrying about the attacking line of 5. Coaches can adapt the numbers depending on the number of players involved in the training session.

The fly-half has 3 main decisions to make. They can:

1. run with the ball if gap is in front of them or whether they are presented with a miss match, i.e. a quicker player against a bigger slower one.
2. kick if one of the 3 players up front are unmarked or just behind the defensive line (any type of kick permitted).
3. pass the ball to another player on their team.
All of these decisions depend upon the cues presented by the opposition. With more attackers than defenders there will be overlaps to be exploited or a spare player to kick to. If the defensive team places 3 players back to defend the attackers waiting to receive kicks, the attacking team will have a numerical advantage in the attacking line. And if the defensive team matches up on the players in the attacking line, there will be a spare player to kick to. Relating this game to a match scenario, the kick receivers up front are the key. They would represent space in a match in which a player can kick to gain field possession. The player with the ball should be scanning and constantly assessing his options. The coach should apply basic rugby laws and adapt the game as they require. They should consider adjusting the number of attackers and defenders in certain parts of the field and create specific open and closed decision-making scenarios.

Prior to training, videos of past matches should be used to assess the fly-half's usual game performance, with the coach sitting down with the player and talking their way through phases of each play. This game provides the opportunity for a player who tends to pass a lot the chance to kick, and gives a player who kicks all the time plenty of space to attack. Questions on why certain decisions and options were or were not made should be asked. Learning is not directly observable and is seen through a change in performance (Tolman), so although the player may be able to participate in the practice game effectively, the real test and observation of learning should come from a match, (Turner & Martinek, 1995). To receive the most out of any training session, it is suggested that players develop their skills through variability of practice rather than in scenarios that are always the same as this positively effects the transfer of learning, (Van Rossum, 1990).

**Factors influencing decision-making**

For a player to think critically, to problem solve and to improve on the speed and accuracy of their decision-making, they must first have an extensive knowledge of both the sport itself and its tactics, (Voss et al, 1983; as cited in Turner & Martinek 1995). Turner and Martinek (1995), suggest that games players need knowledge to help decision-making be more effective. It is also important that players have the ability to apply the necessary skills in the ‘response programming phase’ to achieve the desired outcome after the decision has been processed. With this in mind, players need to give time to the development and the practice of skills outside of training hours to maximise the productivity of the training session itself. The fly-half should know the main defensive tactics that the opposition are likely to use because dealing sufficiently with a pattern of opposition play helps make a comprehensive analysis of its characteristics which will lead to making an appropriate decision, (Gréhaigne et al, 2005). The coach is responsible for continually changing the formation of the defence within the training game so that the fly-half has a chance to recognise different tactics and apply different responses. Being able to recognise different environmental cues relates to the Information Processing Model. Possessing the ability to identify important cues and to dismiss irrelevant cues, will in turn develop the memory stores from which effective decisions are made. Through their own vision and from verbal help from fellow team members, the fly-half should pick out weaknesses in certain aspects of the opposition and exploit them, (Turner & Martinek, 1995). As the fly-half develops his decision making skills, the next task is to work on deceiving the opposition to keep them guessing through body posture and verbal cues in order to overload the opposition with stimulus. As a result, the opposition must either slow down or sacrifice accuracy themselves (Hicks Law*).
*Hicks Law:* when somebody is faced with making a decision, the greater the number of potential choices-decisions, the longer it will take for them to make a choice. [https://msu.edu/~malogian/hickslaw.html](https://msu.edu/~malogian/hickslaw.html)

Since Rugby is such an open skilled sport, the training conditions should be varied so that learning can be seen through transfer tests (Magill, 2011), which would include practicing the newly developed decision making skills in a variety of environmental conditions, (Van Rossum, 1990). Some player’s struggle playing under lights, in wet and/or windy weather, so not only would this act as a test, but it would further develop their decision-making capabilities because of new environmental conditions.

Anxiety, attentional difficulties, arousal, and stress can affect decision-making and performance, but with control strategies such as positive thinking, relaxation, imagery, and focussing on the task at hand, it can be developed to aid performance, (M. Sidhu 2014). Hardy et al, (1996 as cited on www.athleticinsight.com), noted that individuals who are low in trait anxiety, but experience high state anxiety would find it beneficial to peak performance. The coach can help with lowering anxiety levels of the fly-half by limiting the capabilities of the defence in the practice game so that the fly-half initially finds success. After this stage, the coach can progressively make the task more difficult by cutting down decision-making time and options available. When challenging the mental cognition of players, coaches must take into account that each player will have a different ‘Individual Zone of Optimal Functioning’ (IZOF) (Hanin 1997, 2000 as cited on [https://academy.sportlyzer.com](https://academy.sportlyzer.com)) and that performance will change depending on the environment. The IZOF proposes that individual differences dictate whether players will perform optimally when experiencing low or high anxiety and that too high or low anxiety can affect performance. Figure 3 below outlines how IZOF differs between players and how too much or too little anxiety can hinder performance.


Through the practice game we are looking to develop our decision making capabilities, referring to the cue-utilization hypothesis. (Easterbrook, 1959, as cited in Schmidt & Wrisberg). The fly-half can improve on their decision making through attending to significant cues, and disregarding the rest. High arousal levels and concentration while training and playing will result in narrowing the focus and looking for relevant cues, with the optimal focus level being narrow enough to exclude unnecessary cues, yet wide enough to pick up on important cues, (Schmidt and Wrisberg, 2000). When decisions become more automatic, players won’t need to attend to all cues on the pitch, which in turn will free up time to read the play, and better
anticipate the oppositions next movement, (Mann et al, 2010). Reducing the number of possible responses during the response selection stage lowers the reaction time, and the findings of Merkel (1885) and Woodworth (1938), demonstrated that a curvilinear increase occurs in relation to reaction time and the number of response alternatives. Hick’s Law (Hick, 1952 & Hyman, 1953) expanded on these findings to discover that choice reaction time appeared to increase at a constant as the response alternatives doubled. The fly-half should only be looking for cues which are relevant to his 3 main options of attack, as discussed earlier. The coach can add cues and irrelevant cues during training, so that the fly-half can develop their selective attention.

The practice game will increase anticipation of opposition movements. The ability to anticipate and to make accurate predictions stems from the experience of playing games, (Davies & Armstrong, 1989 as cited in Turner & Martinek, 1995). The ability to anticipate the opposition’s next defensive move will reduce reaction time by eliminating or shortening some of the stages, (Schmidt & Lee, 1999). During the practice game the coach can ask the defence to move up on the count of 2, rather than 3, which will result in the fly-half having less time to make a decision, also forcing the player to anticipate faster, consequently the decisions become more automatic, (www.sports-training-adviser.com). Training sessions should not simply be confined to Rugby as incorporating other sports into training that share similar characteristics to Rugby can enhance performance. Variety in training can also maintain interest and enthusiasm amongst players. Choose sports that require repeated, dynamic decision-making during play; are played in a confined space that necessitates well-developed pattern recognition and spatial awareness skills to know where teammates and opponents are at all times; and all require a high degree of physical ability for success (Abernethy et al, as cited in www.yorku.ca/bakerj/JASP%20paper.pdf)

Mental fatigue is caused by demanding cognitive activity but can also be related to physical fatigue, so together, they can both affect the decision-making capability, (M Strother, 2015). With this in mind, training sessions should regularly overload the cognitive and physical aspects of each player to prepare the team for competition and to offset the impact of fatigue on performance (Marcora et al, 2009).

Evaluating success

To assess whether the fly-half is improving their speed and accuracy of decision making, the coach should once again sit down with the player and evaluate through video feedback. Questions should again be asked about decisional choices, because sometimes when plays go wrong, the player may have made the right decision, but the execution of the movement was poor. Therefore, it is important to remember that learning is not always limited to improvement in performance, (Magill, 2007).

Conclusion

Through the Information Processing Model and from various studies and theories, you can gain an edge on your competitor by increasing the speed and accuracy of decision-making. Using the practice game as an example, you can develop the factors that are essential to this process, so that players and the fly-half in particular, can improve on their decision making capabilities. With increased knowledge through observation and experience, experts differ from novices in the amount of information they possess, and it is through this information that they
increase anticipation and decision-making capabilities, (Williams et al, 1999). The aim of this practice game is to help players increase both. Overloading the perceptual foundations through training under even more pressure than in competition will help players make their decisions more automatic when it comes to matches, (Abernethy et al, 2001).

References