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# **Developing decision-making in rugby**

**A 152.786 (50 point) research report presented in partial fulfillment of  
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## Abstract

The purpose of the study was to examine how fifteen-year-old rugby players' perceive their ability to make decisions in game situations, after participating in a seven-week decision-based training intervention. Data was collected from six players, pre, during, and post the intervention using semi-structured interviews. Two further training sessions were provided six weeks post intervention to review content and skills and determine player retention of learning; a final interview was then also conducted. Content analysis of the descriptive data involved identifying the main concepts and then categorising them into common themes using NVivo (N6), a qualitative software programme. Video analysis of the player's games (early, mid and end of season matches) as well as analysis of a post intervention interview with the facilitator allowed methodological triangulation. Comparison of the main themes from the findings enhanced the data's trustworthiness, reliability (dependability) and validity (credibility and transferability). The findings showed that all six players who participated in the study developed some perception and motor skills (such as: peripheral vision; attention strategies; spatial and tactical awareness; and motor skills), and tactical sport specific knowledge (such as: functional roles as ball carrier, support player, and defender; understanding of defence patterns and positional play) similar to that of an expert player. The findings also showed that better intra-communications among the players were critical in their ability to make informed decisions. These findings, as a result of the intervention, suggest that deliberate and purposeful decision-based training may add-value to player decision-making on the rugby field as the players' knowledge representation and game understanding have improved. However, the ability of players to execute and demonstrate transfer of skills from intervention to games, varied among the players. Further research is needed in tracking and monitoring individual players and their ability to make effective decisions from intervention to games and from season to season.

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## **Glossary of Terminology**

- Action schemata** – abstract structure applied to different situations
- Anticipation** – prediction of what and when something is going to happen
- Attentional flexibility** – switching attention from one source to another
- Ball Carrier** – player in possession of the rugby ball, roles are to stress the defence and listen and be aware
- Boot man** – stands back and in between ‘rocks’ on both sides of a ruck or maul and defends if attacker breaks first tackle
- Channel** – line to run on attack or defence
- Chunking** – grouping items of information in memory
- Cognitive knowledge** – decision on strategy about movement to make
- Cue utilisation** – feedback, directing attention to the most relevant information
- Declarative knowledge** – knowledge of what to do
- Defender** – prevent ball carrier from making advantage – roles are to scan for cues, align inside shoulder communicate what’s happening control the collision and regain the ball
- Divided attention** – ability to divide attention to more than one sensory stimulus, as attention is needed
- Dummy runner** – run and pretend to receive the ball from ball carrier to confuse and draw the defender in to create space for ball carrier
- Encode** – processing of information into memory
- Environmental cues** – feedback, regarding specific sensory information
- Expert** – consistent athlete performance over extended period
- Functional role** – term used to understand player positional role in either attack, defence position on field or in relation to the ball
- Guard dog** – second defender off ruck or maul responsible for first attacker
- L running** – straightening running line instead of running across the field, draws the defence in to create space
- Long Term Memory (LTM)** – information committed to memory
- Pattern recognition** – identifying patterns of play
- Perceptual skills** – interpretation of stimuli that lead to the correct performance

**Peripheral vision** – ability to see left and right outside direct line of vision (where the player needs to be looking in relation to the role)

**Procedural knowledge** – knowledge of how to do it

**Production system** – allows athlete to handle particular information tasks in an automatic fashion

**Push/Pressure pass** – Non spiral pass used under pressure and when time and space is limited, also enables ball carrier to keep head up to see the options

**Retrieval** – how memory is assessed to respond to task at hand

**Rock** – first defender off the ruck or maul responsible for first space inside first attacker

**Selective attention** – selects some sensory information for further processing

**Situational probabilities** – likely expectations of what is to happen in a given situation

**Short Term Memory (STM)** – memory store capable of holding moderately abstract information for up to 60 seconds

**Space** – instant in time where the opportunity exists to break the defence through manipulating the defence

**Spiral pass** – pass used to cover longer distances takes more time and space to position ball in hands and execute the pass

**Stress the defence** – position or use ball to force the defence to commit to a course of action

**Support player** – player from same team as ball carrier and in position to receive a pass or assist in control play

## **1. Introduction**

Decision-making is the ability to analyse a situation, formulate options, select and then act (Dunn, 2003), and is considered to be vital in sport performance. The importance of decision-making in sport has been well documented. However, according to Williams and Grant (1999) only a few studies have attempted to outline whether perceptual and decision-making capabilities can be enhanced through training. There is a need to investigate decision-based training and determine how to develop players' cognitive processing and ability to make better decisions. Dunn (2003) argues that too much emphasis has been placed on physical skills and too little on players' awareness of game strategies and their decision-making capacities. There also appear to be few coaches who are actually implementing player decision-making strategies with players (McMorris, 1999). The major problem when researching live decision-making in players is not being able to get 'inside someone's brain' to gain the immediate feedback and understanding of the processing and retrieval of information. Literature is also lacking in 'when' and 'should' perceptual and decision-making skills be trained in players and does decision-making training transfer to improve performance in a game (Williams & Grant, 1999).

### **1.1 Research Aim**

The Canterbury Rugby Football Union (CRFU) approached the researcher initially as an advisor on perceptual and decision-making skills. The current study was a development of this relationship. The decision-based training is an intervention programme designed and facilitated by the CRFU, and funded by the New Zealand Rugby Football Union (NZRFU). The intervention is constantly being shaped and developed in the hope to enhance decision-making capabilities in rugby players. The study was, in part, to help provide feedback to the CRFU, as to how their training of decisions making can help rugby players acquire and use motor and cognitive skills more effectively to improve game decision-making skills. The aim of the current study was to examine how players' perceive their ability to make decisions in game situations, after participating in a decision-based training intervention.



## 1.2 The Intervention

The CRFU intervention involved a total of nine, one hour per week, sessions:

- Three, one hour sessions of run-catch-pass skills, with decision-making drills and skills being gradually introduced implicitly
- Followed by three, one hour sessions focusing more explicitly on decision-making drills and activities, moving from structured to unstructured drills, skills and situations simulating more game like conditions
- One further session was provided in the classroom, which reviewed content and skills covered in the course, players reviewed and up-dated their notebooks, that they were provided at the beginning of the course, to record their thoughts and reflections
- Five of the seven sessions included a short video clip to reinforce the aim and main decision making skills the session focused on
- The run-catch-pass skills were reinforced in the decision-based intervention programme, but the emphasis was on the cognitive domain rather than the physical domain of the players
- A further two, one hour, sessions were included six weeks post intervention to review application of knowledge and skills to determine retention of learning

Data was collected via interviews pre (one week prior to the intervention commencing), during (one day after week four of intervention), post (one week after intervention), and again after two review sessions (one week later) held six weeks post intervention, towards the end of the rugby season. The facilitator was also interviewed post intervention and games were video recorded (early, mid, and end of season) for video analysis purposes. Six fifteen year-old rugby players (three forwards and three backs) were selected via stratified random sampling from the fourteen players involved in the intervention. Research by Williams and Ward (2003) suggest that the perceptual maturity and recall memory capacity of this age has the perceptual and cognitive abilities to improve their decision-making skills in a specific sporting context. The decision training was additional to the player's normal (technical-based) rugby training programme (two sessions, one hour per session, per week), and was not explicitly related to the team's other training sessions with their coaches.

### 1.3 Research Questions

The central research question of this study is as follows:

- What are players' perceptions of their decision-making on the rugby field after participating in a decision-based training intervention?

The study, and especially the data-gathering process, was also guided by the following questions:

- What are the players doing (skills and strategies they use) differently, if at all, when they make decisions on the field?
- What changes, if any, players in their processing of making a decision have made?
- What skills taught in the CRFU decision-based intervention programme, if any, have transferred from the intervention to the game?

The study is likely to be of interest to motor learning and sport pedagogy scientific communities, and to coaches and players of other sporting codes.

## **2. Literature Review**

The inquiry into decision-making in sport can not be studied without understanding and making links between expert and non-expert players as these differences help determine 'what' effective decision-making is and 'how' it can be improved. Memory and the encoding and retrieval of information are important in determining the process of 'how' decisions are developed and made. Attention strategies; cue utilisation; pattern recognition and situational probability; as well as spatial and tactical awareness are the main approaches, skills and strategies identified by the literature in the development of perception and decision-making (Starkes, Ericsson, & Anders, 2003). Perception is the process of interpreting and organisation sensory information (Jackson & Farrow, 2005) that is essential in the players' ability to make faster and more accurate decisions.

Motor skill proficiency and technical versus tactical training needs to be addressed to better understand decision-making capabilities. Tactical sport specific knowledge appears to be critical for effective decision-making, particularly at expert levels of performance. The dynamics of team sport suggests communication among players is also likely to be important in player decisions. This review highlights previous decision-making research and decision-based training to determine how best to approach the research process in developing decision-making in rugby players.

### **2.1 Expert Performance**

Most research on decision-making has looked at the differences between expert and non-expert players (Grehaighe, Godbout, & Bouthier, 2001). According to Williams and Ward (2003), expert's perceptual superiority over the novice is due to enhanced sport-specific cognitive knowledge structures acquired through years of purposeful practice. The research identifies four domains in which the player must excel to obtain expert status: physiological (physical training and conditioning), technical (specific motor skills), cognitive (tactical/strategic; perceptual/decision-making), and emotional (regulation/coping; psychological) (Janelle & Hillman, 2003). There is a move towards the integration and inclusion of decision-making skills into training of players in sport,

however, the cognitive domain is under researched and little is known about how to best design and implement this form of training, particularly perceptual and decision-making skills.

Empirical evidence demonstrates that expert performers are better at anticipating due to contextual information (advance visual cues, pattern recognition) and are more accurate in their expectation of what is likely to happen given a particular set of circumstances (knowledge of situational probabilities). Novice performers generally have a 'wait and see' focus to a given situation where as elite performers focus on a planned action (Williams & Grant, 1999). Experts are able to take in more information at a glance, and then group the information in meaningful units. According to Williams and Grant (1999) expert decision makers have three advantages:

- Ability to select the most relevant cues – based on perceptual chunking
- Understand a tighter coupling between cue recognition, hypothesis formation and decision-making, thus improving ability to respond appropriately to stimuli presented based on recognition
- Have greater repertoires of possible hypothesis and possible actions stored in Long Term Memory – which means a more extensive knowledge of patterns and situational probabilities

## **2.2 Memory, Encoding and Retrieval of Information**

From an information-processing point of view, motor behaviours in competitive settings consist of encoding the relevant environmental cues through the use of attention strategies. Information is encoded and transferred into a form stored in memory (Tenenbaum, 2003). The ability to encode and retrieve task specific information is assumed to be an important part of sport. Retrieval refers to the way information in memory is assessed in order to respond to the task at hand (Williams & Grant, 1999). Directing information to the appropriate actions or cues as they unfold involves selective attention. A selective attention mechanism selects some sensory information for further processing. The selection of further processing is then related to the information relevant to the task (Schmidt & Lee, 1999).



Selective attention directs information into Short Term Memory where information processing can be applied to relevant information (Schmidt & Wisberg, 2000). Information processing theorists would argue that decision-making also requires a person to accurately perceive the display, and hold that in Short Term Memory. Based on a comparison between the present display and past experience held in Long Term Memory, that athlete then makes a decision on what action to make (McMorris, 1999). A player needs to be able to identify cues or relevant, from irrelevant, information in the playing environment. Effective selective attention strategies will improve this searching process and action response time.

The results of a soccer study by Ward and Williams (2003) point out that by the age of fifteen-seventeen years players continue to improve 'structured recall', suggesting they are beginning to develop a more organised and accessible encoding and retrieval system (Ward & Williams, 2003). It is believed that elite performers can index and code task-relevant information that can later be maintained, accessed, retrieved, and future demands anticipated (Helsen & Starkes, 1999). Therefore, recognition memory matches previously stored working memory to the current environmental situation.

According to Ripoll and Benguigui (1999) the last attentional mechanism to develop in children, is from around the age of ten or eleven, when they become capable of devising filtering strategies that enable them to select relevant information in an efficient manner. However, children's ability to retrieve information from memory and match then execute an action is still developing until fourteen to fifteen years. However, those children exposed to intensive sport training can become increasingly capable of coping with complex sport situations. Therefore, exposure to complex sporting situations and problem solving settings will facilitate decision-making capabilities particularly with those over the age of fifteen years (Ripoll & Benguigui, 1999).

### **2.3 Perception and Motor Skills**

Perceptual skills are central to performance in sport (Jackson & Farrow, 2005; Farrow & Abernethy, 2002). Perception is the process of acquiring, interpreting, selecting and

organising sensory information present in the environment and within the body (Jackson & Farrow, 2005). Having the ability to 'read' opponents intentions and perception, and formulate an appropriate response based decision on tactical and strategic decision is crucial to successful performance in sport (Williams, Ward, & Smeeton, 2004). The more effective the players perceptions, the more effective the response of that player, thus enhancing informed decisions (Peddie, 1995). Perception directs athletes to the important aspects of movement; therefore they must develop effective visual search patterns, to identify what is relevant and what is not, to make their decision (McMorris, 1999).

### **2.3.1 Attention Strategies**

Williams et al (2004) suggests that search behaviour may reflect that unique role played by the peripheral vision system. It extracts relevant information to guide performance by identifying the visual information around the display. Not only does peripheral vision provide the player with information from the total display area, but it ensures that decision-making is flexible and the response is adequate, using the full range of information available (Jones, 1995).

Visual attention should be directed toward appropriate cues (Williams & Grant, 1999). From the analysis of a coach, players' attention can be drawn to typical patterns of play. This way under time constraints, players have at their disposal an already worked out mental representation, instead of irrelevant information (Grehaigne et al, 2001). Hagemann, Strauss, and Canal-Bruland (2006) point out that visual information processing can be trained in specific sports. Orienting attention towards a certain region or a certain object makes it possible to detect a stimulus more quickly and identify it more precisely. Cue utilisation, pattern recognition, situation probability and perceptual skills have all been identified as important attention strategies in the development of decision-making (Williams & Hodge, 2004).

### **2.3.2 Cue Utilisation**

Cue utilisation refers to an athlete's ability to locate specific sensory information, i.e., gaps, open spaces, hip movement, the ball, the body position, and is crucial for further

processing in decision-making (Tenenbaum, 2003). Players identify cues in the environment that help them to anticipate and make decisions. More skilled players have more time to focus their attention to the environment rather than the execution of the skill and therefore learn to recognise more relevant information and ignore irrelevant information (selective attention) (Nougier & Rossi, 1999). According to Tenenbaum (2003), few researchers have attempted to train perceptual skills other than cue utilisation.

According to Tenenbaum, Stewart and Sheath (1999) information processing under extremely demanding conditions, such as rugby and other dynamic team ball sports, tends to be more efficient as age and skill increase, because of their attentional flexibility. Results from their study showed that the fifteen to eighteen year old age group showed significant improvements in attentional condition on reaction time, compared to younger age groups, but not quite as significant as the eighteen plus age group. Janelle and Hillman (2003) suggest an expert athlete uses attentional flexibility, thus evaluating the orienting of attention (Nougier & Rossi, 1999) and the potential costs and benefits through anticipation via the manipulation of expectations and conditional probabilities. Therefore, it is the compatibility to switch attention from one source of information to another that enables players to make faster decisions. Schmidt and Lee (1999) point out that historically filter attention theories, assume that attention has a fixed capacity for processing information and that performance would deteriorate if this capacity was exceeded by the task requirements. However, Schmidt and Lee (1999) argue that attention can be divided, but this is dependent on task complexity of input and output tasks and the sensory information being used (Jackson & Farrow, 2005).

### **2.3.3 Pattern Recognition**

According to Williams and Grant (1999), exposure to specific patterns of play results in the development of specialised receptors or detectors through a process termed 'imprinting'. This exposure enables increased speed, accuracy and fluency with which stimuli are processed. Williams et al (2004) point out that video sequences have been well used in perceptual and decision-based training, to improve selective attention

strategies by identifying relevant cues through feedback from the video. However, Williams and Grant (1999) argue that problems occur when there is an appearance or disappearance of relevant sources. Visual information by film does not always appear to transfer to the field, as simulation training does not require the player to use all the sources of sensory information as in a real game situation. It is important that realistic time constraints are imposed to replicate the demands of real life, as video fails to supply contextual information prior to response selection.

It is still unclear if the use of video enhances perceptual skills. As Williams and Ward (2003) and Williams and Grant (1999) suggest players need to be engaged kinesthetically in the environment and involved in the repeated exposure to patterns and game-like situations to develop an 'action schemata' and therefore, select the most appropriate procedure for action based on the characteristics of the situation.

#### **2.3.4 Situational Probability**

Situational probability is another strategy used by players to make decisions. Situational probability is the process of eliminating what is unlikely to happen and predict the most likely response to the situation. According to Starkes et al (2003) there are no published studies that have identified whether situational probabilities can be trained. Match analysis data is a method that may help develop this decision-making strategy. According to Wright, Pleasants, and Gomez-Meza (1990) some decisions are made on partial visual information that occurs prior to critical action; and it is likely that decisions are made with some statistical reference (situational probability). Particularly, when high demands are placed on the perceptual system, expert players revert to a strategy based on the probability that an event will occur. Experts use their knowledge stored in Long Term Memory to establish accurate expectations of likely events as they unfold. This proposal dismisses many events as being highly improbable, and attaches a hierarchy of probabilities to remaining events that in turn facilitates anticipation (Williams et al, 2004; Williams & Grant, 1999).



Understanding perception appears to be critical in the development of decision-making, deliberate and purposeful perceptual and decision-based training may promote perceptual skills. However, there is no one absolute approach accepted by the research that clearly identifies best practice.

### **2.3.5 Motor Skills**

Identifying relevant information and making a decision based on the situation have been discussed, but the decision maybe compromised depending on the players' physical motor skills. Grehaigne et al (2001) use the term 'players' resources' to include the players' sport specific motor skills and competencies, the players' physiological capacity, concentration and motivation as aspects that may enhance or hinder perceptions and/or decision-making.

According to McMorris (1999) players who have more technical capacity have a greater range of techniques from which to choose in order to solve a problem and are more capable of executing the movement skill. Furthermore, Rink, French and Graham (1996) point out that advanced players execute skills better in the tactics they choose, but they also have more strategies to choose from. For example, for a player who is not able to execute a grubber kick with the left foot on the run, is not able to make the decision to action and execute that response. Thus, the ability to execute skills constrains decision-making (French, Werner, Taylor, Hussey, & Jones, 1996; Nevett, Rovengo, & Babiarz, 2001). Ward and Williams (2003) argued that the " ... inclusion of cognitive and perceptual skills training that is relevant to the current strategies being implemented may be conducive for developing appropriate game-reading skills" (p. 13), but only when mastery skills are attained and the rules are understood.

However, 'The Teaching Game for Understanding' (TGUFU) approach developed by Bunker and Thorpe (1982) suggests an alternative view and supports a more tactical approach to developing 'game sense' skills and spatial and tactical awareness rather than just the physical skills. This approach to developing decision-making advocates teaching

motor skills, only when they are needed to solve a particular decision-making problem (Bunker & Thorpe, 1982; McMorris, 1999).

Individual differences in players' physical motor skills will always vary in team sports. Players have different genetic potential and produce very different rates and types of development (McMorris, 1999; Baker, Cote, & Abernethy, 2003a). The differing views on how best to facilitate decision-making in relation to motor skill proficiency are inconclusive. However, it is clear that if a player is not capable of executing the action and/or lacks the perceptual skills to identify the action rules, the player is limited in their ability to shift from declarative to procedural knowledge (Grehaigne & Godbout, 1995). Therefore, players are restricted on what they identify and what is the most appropriate response to take based on the specific environmental demands of the situation they are in (Grehaigne et al, 2001).

#### **2.4 Tactical Knowledge**

To develop decision-making in players requires the players to increase their knowledge and understanding of the game and develop workable strategies that increase the cognitive effort within the physical training environment (Vickers, Reeves, Chambers & Martell, 2004). Tactical knowledge is fundamentally 'knowledge in action'. Furthermore, Grehaigne and Godbout (1995) categorise knowledge in three ways; action rules (for example: leading to principles of action for attack and defence situations); rules for managing play organisation (for example: distribution of players on the field, space of the playing area and differentiation of roles); and motor capacities (for example: perceptual and motor skills).

Anderson (1976) proposed two distinct classifications of knowledge: declarative and procedural. Factual information is considered declarative knowledge and procedural knowledge is conceptualising information to form 'production systems' that create the procedures for completing a sequence of actions. Ward and Williams (2003) suggest experts have an extensive declarative knowledge and procedural knowledge base. Therefore, players are capable of identifying the most appropriate responses to meet

specific environmental demands (Grehaigine et al, 2001). Expertise is developed by transition from control by declarative knowledge to control by procedural knowledge. With practice a 'production system' develops, this is known as Anderson's Theory (1976), Active Control of Thought (ACT). Williams, Davids, and Williams (1999) suggest Anderson's theory of a production system is responsible for initiating appropriate actions under specific conditions. Williams et al (1999) and Summers (2004) suggest that simulating specific playing conditions can improve both declarative and procedural knowledge.

The acquisition of declarative knowledge provides the foundation for the development of procedural knowledge, such as what to do in attack or defence situations (Grehaigine et al, 2001; Grehaigine & Godbout, 1995). The performance process, in attack or defence situations converts commands in working memory into behaviour or actions. For example, a rugby player running at two defenders needs to make a decision. If the elements match those in the working memory then the 'production' initiates the response (i.e., run or pass). Tenenbaum (2003) suggests that information is accessed automatically without relying on conscious awareness, depending on a knowledge structure or schema. Therefore, the more the athlete practices specific conditions the more autonomous the decision can be made.

Nevett et al (2001) suggest that research in the motor development and sport and physical education pedagogy fields of study needs to examine the awareness aspects of decision-making components of sport performance in sport-specific contexts. Even after five to seven years of participation in a sport, athletes (children, novice adults and even expert youth) can still display poor knowledge representations. This supports the need to develop sport specific knowledge and awareness in a sport specific context. According to Grehaigine and Godbout (1995) if players are to improve their tactical knowledge they must establish guidelines on which to base their decisions. A system of knowledge in team sports based on a set of action rules and organisational rules needs to be understood and applied. Action rules relate to principles of action, for example, what to do on attack or defence in a given situation. Organisational rules relate to managing the play, for

example, patterns of defence or distribution of players on the rugby field (Grehaigne & Godbout, 1995).

Nevett et al (2001) looked at the changes in content knowledge after implementing a twelve-lesson unit. The instruction focus was on invasion-game tactics in elementary school children, looking at cutting and passing skills, as well as to determine the ability of the children to develop tactical solutions to game scenarios. Results showed that tactical action concepts increased. There was also an increase in awareness skills and better decision-making skills during their post-game play. Nevett et al (2001) conclude that coach instruction needs to focus specifically on cognitive tactical knowledge for both children and adults to enhance their overall decision-making skills.

## **2.5 Communication and Team Cohesion**

Grehaigne et al (2001) suggest team sports have both individual and collective aspects of decision-making. 'The competency network' is one collective aspect that relates to the various relationships between the players within a team. Communication between players in team sports assists players in making decisions on the sports field. "...when individual players combine to create a team environment, their success will depend upon the strategy of the individual performers and their ability to adhere to an agreed style of play" (Mortimer & Collins, 1998, p.98). Mortimer and Collins (1998) point out that total coherence seldom occurs; suggesting that the team is only successful when decision-making is coherent. Team players need to develop effective communication strategies; calls that all players understand and follow. Understanding each others roles, informing other team members, knowing what to do as well as communicate what is needed, will in turn increase coherence and better decisions on the field.

Holt and Sparkes (2001) conducted an ethnographic study on cohesiveness in a college level soccer team over a season. Key themes from the research identified 'communication' and 'clear and meaningful roles' as being crucial for the development of team cohesion. Mortimer and Collins (1998) and Eccles and Tenenbaum (2004)



suggest the need for more applied research on communication, team cohesion and decision-making and how they impact on each other in team sports.

## **2.6 Decision-Making Research**

McMorris (1999) states that, although there is a lot of empirical research supporting the information-processing model, it has been criticised on the grounds that it is laboratory based and so lacks validity. The research is limited in areas of player perceptions and examining chronological age group differences in decision-making. Most research on adult decision-making is by way of video presentations (video-analysis of player performance and decision-making), tachistoscopical testing – players had to state what they should do in a given game situation. More research is needed to determine the optimal frequency and duration of perceptual-training skills. Research has not yet examined how best to structure perceptual training into the practice schedule. Studies range from fifteen minutes to two hours and from a single session up to six and eight week training programmes (Williams & Ward, 2003). Interviewing and video analysis appear to be effective ways to determine player decision-making capabilities.

According to Grehaigne et al (2001) decision-making is linked to and effected by a number of other factors; execution of motor skills, cultural values and personal motivation, athletic potential, as well as self control and concentration. Therefore, it is hard to isolate and measure decision-making. However, quantitative studies on eye-tracking (fixation location, fixation duration, search order, and search rate) show that expert performers have better search strategies, fixate for longer and more often on the most relevant cues in a given display and exhibit fixation patterns that maximise the capability to extract information from peripheral visual sources (Janelle, Champenoy, Coombes, & Mousseau, 2003). Grehaigne et al (2001) point out that the expert player makes faster and more accurate decisions due to earlier detection of information in context specific situations. All this information contributes to develop specific expectancies about the event(s) to come. Therefore, the higher the expectancies for a particular event are, the greater the performance will be if the player's expectancies are accurate (Proteau, Levesque, Laurenelle, & Girouard, 1989).

According to Ward and Williams (2003) some of the well received research studies that have specifically looked at decision-making skills over the last twenty years have mainly looked at video and observational analysis, questionnaires and interviewing. French and Thomas (1987) used observation of performance, questionnaires, and interviews, French, Nevett, Spurgeon, Graham, and Rink (1996) interviewed participants and Nevett and French (1997) had participants verbalise their thinking during a game.

A study by Lyoka and Bressan (2003) aimed to discover what elite coaches perceive to be the critical characteristics of decision-making that distinguish expert players from novices in basketball. The key discriminating variables as defined by the elite coaches were: anticipation; cognitive knowledge (experts have a more comprehensive knowledge of the rules and of tactics), self-knowledge (experts have more accurate sense of their own abilities) and the quality of memory processes (experts make decisions faster than novices and show more adaptability in their decision-making). The results of this research confirm expert-novice differences in anticipation and quality of memory processes. This study reinforces the importance of perceptual skills and strategies in the development of anticipation; and tactical knowledge in making informed decisions.

## **2.7 Decision-Based Training**

A key gap among the players and expert decision-makers is not just knowing the 'what and how to do' but also the 'doing'. These dimensions are important areas of study. The complex relationships between these concepts require further investigation (Blomqvist, Luhtanen & Laakso, 2000). However, Turner and Martinek (1999) discuss the debate between technique training and tactical training approaches. In examining the two approaches, until recently, the tactical approach has failed to demonstrate superiority over the technique approach in relation to better decision-making. However, Turner and Martinek (1999) point out that the duration of the treatment period, in most studies, which have looked at both tactical and technical approaches, has prevented any significant differences from emerging between the two approaches for understanding game decision-making. Research conducted by Turner and Martinek (1999), with a longer intervention/treatment period of fifteen lessons, showed that players participating

in the Teaching Games for Understanding Model (Bunker & Thorpe, 1982) made better decisions during games and had greater declarative and procedural knowledge, in both high school and intermediate school related age groups. Furthermore, Farrow and Abernethy (2002) support the inclusion of retention and review sessions and data collecting. A retention interval and dissipate period is used to determine if the training affect is temporary or enduring over time.

Raab, Masters and Maxwell (2005) study showed that a combination of both technical and tactical training is most beneficial, particularly during early seasonal training. However, the variability in findings of previous research suggests that more research is needed to determine the effectiveness of differing methods of games instruction, particularly in relation to both cognitive and skill components of game performance. The tactical and technical instruction approaches need future research comparing the two models - focusing on identifying the level of motor skill proficiency, response selection and decision-making capabilities in high-strategy team sports (Blomqvist et al, 2000; Turner & Martinek, 1999).

Baker et al (2003a) point out that competition (match play) in team sport was rated the most helpful form of training for developing perceptual and decision-making skills by both expert and non expert players. Baker et al (2003b) examined the quantity and type of both sport-specific and non-sport specific practice and concluded that the 'ten-year rule' remains a good indicator with respect to the minimal sport-specific practice base needed for the development of expertise in team sports. Janelle and Hillman (2003) oppose this view, suggesting that efficient training practices, notably the attainment of pattern recognition advantages, is due to the direct and repeated training in the specific task environment (i.e., two vs three in rugby), developing an extensive and procedural knowledge base. It remains difficult to determine the most meaningful training recommendations to accelerate decision-making skills in players. Further insight is needed in looking at the benefits of purposeful and deliberate practice in comparison to the benefits in competition relating to perceptual and decision-making skills.

If tactical decision-making in sport does develop gradually as a result of extensive task-specific practice (Ward & Williams, 2003), this suggests coaches need to act as facilitators (Bond, 2000) by providing verbal and visual cues to improve perceptual skills. According to Janelle and Hillman (2003) researchers recently have looked toward multi-method assessment of attentional allocation, perceptual processing, and information extraction. For example, video analysis and verbal reporting on one-on-one and three-on-three situations have been used.

The greatest challenge in dynamic team sports is how to find clarity amongst the players and the chaos of the game environment, effective communication and shared knowledge promotes decision-making in team sport (Eccles & Tenenbaum, 2004). Levels of performance are not limited by factors associated with talent alone, but acquired through sustained investment in practice and deliberate efforts to improve i.e., effective learning occurs when activities are well defined, useful feedback is presented, and the opportunity for repletion, error detection and correction is provided through multiple structured and unstructured conditions (Vickers et al, 2004).

Deliberate practice and simulation techniques are crucial for the development of decision-making. However, teaching decision-making must be a gradual process. Players must internalise the process and learn to 'see' the options (Hollier, 2005). Vickers et al (2004) developed a three step decision-making training process. The first step is to frame practice events so that decision-making skills are at the fore. This highlights a specific cognitive skill within the context of the sport (space, options, opponent awareness, and specific environmental cues). Therefore, develop the ability to retrieve from memory the correct solution, to solve a problem under time constraints.

The second step requires the coach to design drills/sequences of drills that best trains the decision similar to game conditions (remember the cognitive trigger), that simulates those found in competition. This enables the player to identify, encode and retrieve information from memory of different settings so they learn to make the best decision based on the practiced situation.

The third and final step requires the use of one or more of the seven decision training tools. According to Vickers et al (2004) each decision-making tool outlined below, are well supported by the literature in the development of promoting cognitive, perceptual and decision-making skills:

- *Variable practice* – defined as a schedule of practice in which many variations of a class of actions are practiced
- *Random practice* – a practice sequence in which individuals perform a number of different tasks in no particular order, thus avoiding or minimising repetition of a single task
- *Bandwidth feedback* – reducing the frequency of feedback, providing less corrective feedback as the season progresses
- *Questioning* – questions engaging the athlete in the development of decision making
- *Hard first instruction* – introduces the athletes to the complex knowledge the need to know about sport. Provided early in the season in order to maximise the amount of time the athletes have to cognitively incorporate the material into their motor performance.
- *Modelling* – demonstration of skill or tactic using a demonstrator, or peer performer. Should be used early in season as a method of developing analytical and cognitive skills that are sport specific
- *Video feedback* – using video as a tool to reinforce situations and patterns and problem solve

## 2.8 Summary

The literature review has highlighted the ‘what’ and ‘how’ of decision-making in sport. There appears to be a lack of research into player perceptions and if decision-based training can enhance players’ decision-making capabilities and performance in game situations. Research shows a number of well supported cognitive, perceptual, motor and knowledge-based skills and strategies that promote decision-making, but it is not clear exactly how best to deliver and design training and if, in fact, training can accelerate and



improve decision processing in players, particularly from the players point of view. The tactical decision-based training approach, such as 'The Teaching Games For Understanding' model, with a longer treatment/intervention period, shows promising results towards improving declarative and procedural knowledge and decision-making (Turner & Martinek, 1999). This instructional approach requires further investigation to establish the benefits, if any, to player decision-making, particularly in regards to age level and motor skill proficiency, as research appears to be unclear. The players' skill level, among other factors, such as communication, team cohesiveness, motivation, and player genetic potential (Grehaighe et al, 2001), are likely to be determining factors in the development of player decision-making capabilities in game situations.

### **3. Methodology**

The interpretative research approach used in this study focused on the players' meanings and understandings, where as a quantitative approach would tend to exclude discovery from the domain of scientific inquiry (Gephart, 1999). Summers (2004) points out that it is the qualitative methodology that has enabled the scientific community to get a better understanding of attention, memory, and decision-making and allow the athlete to be actively involved in the research process. Decision-making has been studied extensively in the last two decades with a growing range of research methodologies and all have contributed to the understanding of the how, when and what of decision-making (Tenenbaum, 2003). In this current study self-reflection by the players enabled a better understanding of their decision-making processes via on going self-discovery (Kidman, 2001). This study of player decision-making in rugby was best suited to an interpretative paradigm and qualitative survey methodology. It focused on understanding the players' perceptions of their decision-making on the rugby field.

#### **3.1 Participants**

Participants involved in the study consisted of six Under 16A rugby players from an independent private boys' high school in Christchurch. Initially all players in the rugby squad were sent out information letters (Appendix A). All players volunteered for the study. The six players who participated in the four sets of interviews were all male and fifteen years old, and had similar rugby playing experience. Three participants played in forward positions and three in back positions. Following procedural requirements consent forms were sent out to all those participating in the study, all of which were signed by players and a parent or guardian (Appendix B).

The facilitator of the intervention programme was a 45-year-old male who had several years' rugby playing experience at a senior representative level and has worked for the Canterbury Rugby Football Union as a Rugby Development Officer for the past five years.

### **3.2 Sampling**

A representative sample was obtained using stratified sampling (Thomas & Nelson, 2001). Team players were stratified into forwards and backs before a random selection was made to provide an equal representation of player positions within a rugby team. A fullback/2<sup>nd</sup> five eighth (Player R), half back (Player S) and winger (Player W) in the backs and a hooker/open side flanker (Player H), number eight (Player G) and flanker/lock (Player L) in the forwards made up the stratified random sample. A group of fourteen players attended the decision-based intervention from a total team squad of nineteen players, as other commitments restricted their availability to participant in the intervention.

### **3.3 Intervention**

An exemplar study by Nevett et al (2001) looked at the changes in content knowledge after implementing a twelve lesson unit on instruction of invasion-game tactics in elementary school children, looking at cutting and passing skills, as well as to determine the ability of the children to develop tactical solutions to game scenarios. The method of data collection included a post-knowledge test and pre as well as post-interviews. Children were grouped by gender and skill level to maintain consistency and previous research completed in motor development. Interview transcripts were read and divided into individual concepts (Nevett et al, 2001). According to Nevett et al (2001) the primary purposes of the study was to describe the changes in athletes' knowledge of cutting and passing and simple invasion-game tactics, and to generate their ability to generate tactical solutions to simple invasion-game situations after a twelve-lesson unit of instruction.

This current study followed a similar structure and design in the decision-based intervention programme (Refer to Appendix C for session plan outlines). The seven sessions, one-hour per session intervention was based around the run-catch-pass skill set, so players could then focus on decision-making skills. Two further review sessions followed six weeks later. Farrow and Abernethy (2002) recommend retention sessions and data collecting to determine learning versus performance effect, as post intervention

or training may not be a consequence of learning and heightened results may dissipate or improve. A retention interval and dissipate period of thirty-two days was used by Farrow and Abernethy (2002) when looking at perceptual training approaches to improve 'anticipatory skills' in junior tennis players.

However, it is important to emphasise the purpose of this current study was not to assess the design and content of the intervention programme, but the ability to make decisions before, during, and after participating in the intervention from the players' perspective. The CRFU used several instructional techniques, such as variable and random practice, open-ended questioning and problem solving, video analysis, and feedback. These decision-training tools are based on recommendations provided by Vickers et al (2004) to facilitate the development of perceptual and decision-making skills.

### **3.4 Data Collection Methods**

The study used semi-structured interviews of players and the facilitator, as well as game video analysis of three rugby matches (early season, mid-season, and late season) to determine if the participants actually do transfer skills/strategies from the intervention to game situations.

#### **3.4.1 Semi Structured Interviews (Players and Facilitator)**

This qualitative descriptive study focused on using semi-structured interviews of players (pre, during, and post) to gain insight and perception of their decision-making skills whilst participating in a decision-based intervention. Interviewing players' provided a better cognitive insight into the internal and mental processes of the players' thinking (Neuman, 2000; Schmidt & Lee, 1999). The CRFU facilitator of the intervention programme was also interviewed at the end of the seven-weeks to reflect on what he felt the players had learnt from his perspective.

Verbal report techniques are important tools to obtain information on thought processes as it simulates critical thinking and focuses the learner's attention to the context learning (Grehaigine et al, 2001). Interviews were used to determine player understanding and

self-knowledge, as well as their perception of whether they felt they had enhanced their live decision-making skills based on their involvement in the CRFU decision-based training programme.

Before interviews commenced participants were provided with an information sheet regarding the study (Appendix D). The interviews were conducted individually and in the same way for consistency and reliability before, during, and after intervention and then again nine weeks post intervention (Refer to Appendix E for the semi-structured questions for each stage of the intervention). The facilitator was interviewed only at the end of the intervention programme, to validate (or not) the information provided by the players. The questions were open-ended in nature to enable the interviewee some ability to express their opinions in a manner of their choosing (May, 2001). This method of collecting data allowed respondents to use their 'unique ways of defining the world'; as no fixed sequence of questions were suitable to all respondents; and enabled respondents to raise important issues not contained in the interview schedule. However, three baseline questions were consistently used in all four interviews sessions with all six players to determine any shift in the players' responses during the period of the intervention and review sessions.

- When you have the ball – what are you thinking? (ball carrier)
- When your teammate has the ball – what are you thinking? (support player)
- When the opposition has the ball – what are you thinking? (defender)

The baseline questions were modelled from Ericsson and Simon (1993) who suggest using probes such as - what were you thinking? This minimises front-loading questions or probes that lead participants to give the response the interviewer is wanting, and is important in eliminating researcher bias. The researcher completed all interviews after practicing/trialling the delivery of questions with independent individuals prior to undertaking the interviews with the six participants. According to Sekaran (1992) it is important for the interviewer to deliver questions to all participants in the same manner and structures. The skill of the interviewer to rephrase questions, for participant understanding, and seek elaboration or clarification from the participants as needed, as

well as probe the participants was left to the discretion of the interviewer and was within the realms of a semi-structured interview method (May, 2001).

### **3.4.2 Video Clips**

Video clips (Refer to Appendix F for outline and back cover for pocket of DVD) were selected from recordings of three randomly selected rugby games at the beginning, middle and end of the season to validate (or not) what the players' said they are doing and if they actually did. One video camera was used each game and filming was positioned from behind the intervention teams attacking try line to enable more effective visual representation of data. Eleven different video clips were transferred onto DVD in slow motion, to best illustrate the player and team performance. Each clip is recorded twice, the second slightly faster. Five clips (1a/b, 3a/b, 4a/b, 5a/b, and 7a/b) are used twice to illustrate a different example as well as demonstrate multiple applications of skills and strategies being employed at the same time and context. Therefore, a total of sixteen clips/examples are used and include all three key themes and all six players.

## **3.5 Data Analysis**

### **3.5.1 Content Analysis**

Data analysis is a process that identifies patterns in the data collected; this process is guided by the central research questions (May, 2001). The data analysis technique used in the current study based on semi-structured interviews was content analysis. Content analysis is a systematic way of identifying all the main ideas and concepts and then categorising and developing them into common themes (Neuman, 2000). A major step in analysing the qualitative data was labeling/coding the responses into meaningful themes, enabling the researcher to organise large amounts of text and discover patterns that would be difficult to detect by just listening to a tape or reading a transcript.

All the transcribed data was returned to the participants for content verification and reliability, to complete a member check. This helped ensure comments were true and accurate. One player made a minor addition to their transcribed data for one interview, as



the background noise made transcribing the data difficult. All players signed authority for the release of the audiotape transcriptions. Trustworthiness of the interview data was improved further through the use of an audit trail (Lincoln & Guba, 1985; Denzin & Lincoln, 1994). An audit trail confirmed that the data analysis was internally coherent, logical and systematic.

NVivo (N6), a qualitative research programme, was used by the researcher to store, edit, and organise the interview data as well as code, search, and retrieve the data units from the interview transcriptions to provide structure and effective processing of the data (Crowley, Harre & Tagg, 2002). Twenty-eight codes were identified from the four sets of interview data for each of the six players. The coded data was then grouped into ten themes. These themes were then categorised into three main themes (Appendix G).

### **3.5.2 Video Analysis**

The researcher and facilitator analysed the video recordings of the rugby games collectively over several weeks. Videotapes were converted onto Silicon COACH computer software for ease of game and player performance analysis as well as the ability to manipulate images and categorise video segments of play into video clips (Liebermann, Katz, Hughes, Bartlett, McClements, & Franks, 2002). Examples of the players performing skills were those that:

- Could only have been learnt from the intervention programme
- Determine if player's cognitive understanding and sport specific knowledge provided in the interviews were applied in a game situation during the rugby season

### **3.5.3 Methodological Triangulation**

Comparison of the video-analysis of three rugby matches (early, middle and end of season games) with the analysis of the interview data from the six players and facilitator allowed methodological triangulation. The data was analysed independently from each source of information first then examples were gathered and matched collectively to provide triangulation (Gratton & Jones, 2004). The interview data from the individual

players was matched to examples from the video analysis. Then facilitator interview data was then added that complemented or contradicted the other results. This methodological approach strengthened the trustworthiness, dependability (reliability) and credibility and transferability (validity) of the findings (Denzin & Lincoln, 1994; Gratton & Jones, 2004).

### **3.6 Limitations**

There are a number of limitations to conducting interviews. The main limitation is interpretation of data. Transcripts were reviewed by participants to determine accuracy and signed to provide creditability (Neuman, 2000). Another limit is the ability of players to reflect about their decisions. Some research suggests players who are more skilled have less ability to reflect on what they did as they do not need to think about what they are doing compared to those less skilled. The timing of when the interviews were conducted could also be considered a limitation to the study, as French and McPherson (1999) suggest interviews are best during actual game performance and retrospective reports (immediate after game performance) to accurately trace an individual's thoughts during perceptual motor performance. There are also other factors that can influence decision-making skills on the rugby field that may not be directly influenced by the player's participation in the decision-based intervention, such as self-reflection, skill transfer from participation in other sports, and other outside influences, such as: parents, other coaches, genetic potential, motivation and concentration, previous playing experience and motor skill proficiency (Grehaigine et al, 2001). The generalisation (transferability) of the study is also limited (Neuman, 2000) due to the small sample size (six fifteen-year-old males from one private secondary school in Christchurch).

Only three rugby matches were video-analysed and not all six players were in each game. In future research, video footage of each player exclusively for each game would provide a more in-depth analysis.

The researcher has acted as an advisor and provided feedback on the intervention programme as it was implemented to the players. The researcher was aware of this potential bias and always kept advice and research as a separate entity to maintain research objectivity (Neuman, 2000).

### **3.7 Ethical Considerations**

Any research involving human participants has ethical considerations. The data collection technique of interviewing was not likely to cause any physical or emotional harm or violate the informant's right to privacy (Neuman, 2000). All methods relating to any potential issues were dealt with from the on-set of the study, as all respondents were informed of their participant rights and involvement before signing to confirm voluntary participation and data confidentiality. Low Risk Notification was provided and approved by Massey University.

## 4. Results

The content analysis from the interview data identified ten themes from twenty-eight coded areas of data. The ten themes being: peripheral vision; perceptual skills; attention, anticipation, spatial and tactical awareness; motor skills; functional roles; player organisation and structure; communication; and team cohesion. These themes have been grouped further into three main themes: 'perception and motor skills, 'tactical knowledge', and 'communication and team cohesion'.

### 4.1 Perception and Motor Skills

#### 4.1.1 Peripheral Vision

Before the decision-based programme typical responses when asked about what the player looks for on the rugby field focused on the ball,

*Go straight ahead, I just like to pick out the big guys and try and go at them. I just follow the ball and whatever is happening around the ball within a couple of metres and that's where I try and stay;*

*Based on looking ...just based on what's around the ball and what options are available to you.*

After the decision-based programme the use of vision and what the players looked for on the rugby field changed considerably. All six players commented about the use of peripheral vision and the importance of looking not just at the ball but the support players and opposition, which helped them, make decisions while playing on the rugby field. A representative response, from one of the players was,

*Looking up and peripheral vision and not having to rely at looking at one person, I can look between two people in two different spots. Identifying more, just look at my attack but knowing that some of my teammates were there and to sort of look at both teams as once, so using peripheral vision.*

*Video Clip 1a* shows Player S efficiently using his peripheral vision in a mid-season game, immediately post intervention. Player S made the following comment,

*Use the eyes and just identify. Try and scan across – not just look in the middle first you've got to look everywhere – scan. So I can see both the defence coming up and like my support player. So I can sort of...it helps me to assess what I should do and...helps me to decide to be in space, if I can see the space.*

#### **4.1.2 Perceptual Skills**

##### **4.1.2.1 Cue Utilisation**

Before the decision-based programme the players generally made comments regarding cues (relevant information) in the playing environment around the ball and ball carrier, a typical comment was “...just watch what's happening with the ball”. After the decision-based programme all players made more comments about environmental cues away from the ball, compared to pre intervention. Typical comments were,

*More conscious now, whereas before it was all sort of just playing the game ... I'm more conscious of where the space is – the gaps in the defence;*

*Always watching their support players as well looking for spaces a lot, looking where the defence is, looking where your support players are as well.*

##### **4.1.2.2 Pattern Recognition and Situational Probability**

There were only a few comments relating to situations and patterns of play pre intervention, “*Identifying what's on*”. The players didn't make specific comments relating to game situations or reflect about patterns or schemas of play. As the programme continued more comments referred to game situations and or patterns of play on attack and defence, in relation to likely options and best responses to take, for example after four weeks typical responses were,

*The best option at the time ... I'd look around at the situation, see who's around you, see where you are with what you need to do;*

*Thinking what they're going to be thinking to do in that situation. Looking like at what different plays they could do – what options they have – which way they will they'll run and stuff.*

**Video Clip 2** shows a 'Team Pattern of Play' that includes Players S, R & W – the pattern of play demonstrates how the team dragged the opposition to one side of the field, which holds the defence over. This situation and pattern shows how the ball is quickly returned back to other side where the space was created from the previous phase of play. Player W commented that the players have started to think more deeply about their play and setting up to have a better attacking advantage,

*Kind of more tactical instead of just thinking, at the start of the season some people just sort of go out there and make big hits and sort of things, but we're thinking like more in depth than that and just thinking like how we can get at them and what situation we are in and where we should run it.*

The facilitator comments about the pattern of play from *Clip 2* also support the notion that the players are starting to show signs of thinking ahead and looking at the 'big picture' and all the options available, by identifying and recognising patterns and situations that provide advantages of go forward play,

*We [the players] slowed down their time and space and in some of the Burnside games, we'd [the players] see them particularly when they got that try that went from one side of the paddock to the other and back again, their was principles of playing, of go forward, draw and pass, hold the ball in two hands, look for the opportunity, break the line, get the pass away and the winger scored. That would also lead me to believe that there's a little bit of bigger picture stuff understanding happening as well in the game.*



### 4.1.3 Attention

The players' ability to focus their attention to specific information (relevant cues) on the rugby field changed as the programme was implemented. Data collected over the four interviews showed players shifted their attention from a focal area to generally more than one area. Players made comments regarding how they shifted their attention to different cues and sometimes how they divided their attention to different visual and auditory cues.

#### 4.1.3.1 Selective Attention and Attentional Flexibility

Before the decision-based intervention representative comments were, "*Focus on one thing, one area at a time*" and "*which guy is the smallest in front of me and where abouts is there any holes*". After four weeks of the programme some representative responses were more detailed, in terms of quality of information and thinking more specifically about position of defence and space as well as shifting focus from the ball to more off the ball cues,

*Looking ahead instead of looking at the ball all the time;*

*Improved the way I think on the field. It's given more things to think about when I'm on the field;*

*You're always kind of looking more now – looking for support player and the defence – looking where they are, looking where the gaps are, a lot of that sort of thing, it's helped with that.*

#### 4.1.3.2 Divided Attention

**Video Clip 1b** shows Player S dividing his attention in the mid-season rugby game (immediately after the intervention), by looking ahead to the right side (looking at defence) as he runs straight forward and then he passes to his left side to a support player who called for the ball (auditory cue). Player S made the following comment,

*First thing, look up, run straight...look for where the defence is positioned and like listening to, say if someone's calling for it – listening to my support players*

*and give it to someone whose in a better position then me...Looking at defence and support player as well as listening”.*

Some of the players commented about dividing their attention to visual and verbal cues to help them make the decision on what action to take. Pre intervention data provided no indication, from the players’ perceptions, that players divided their attention. However, the following is a typical response, from the final interview (nine weeks post intervention) at the end of the rugby season, related to the improvement of visual strategies and attention,

*Looking...just looking all the time, looking at the other players, looking for your support player, looking for defenders, where your team, that’s one of the things that the course has probably helped us do is just keeping our heads up more instead of just concentrating on one thing at a time. It’s always just the looking around for different options and what you should do.*

#### **4.1.4 Anticipation**

The term and meaning of ‘anticipation’ was used more within the players’ answers to a variety of questions during all interviews once the intervention commenced. Only one player used the word in the pre intervention interview session, before the programme started. Player L said, *“Try and anticipate where they’re going to move and which way I should pass it or whether I should take it and maul it or go down to a ruck”*. By the end of the programme all six players referred to the use of anticipation, as follows,

*You can get a picture of what move they’re going to do, where the support players are and where the gaps are;*

*I think about things a lot more. I didn’t used to sort of think about things like space and gaps...just reading where opposition defence and trying to pick up on their moves like the lines outs or something;*

*Anticipating where they’re going to go and if they’re going to run the gap or if they’re going to take the tackle and go to ground in which case just be first there.*

#### 4.1.5 Spatial and Tactical Awareness

A shift in the players' awareness and thinking has occurred, due to the intervention. Before the programme started players were generally aware of themselves and the ball only and at the moment action was required, typical responses were,

*I just base my decisions on kind of where the ball is and where all the players are compared to the ball;*

*It happens on the spot;*

*I'm looking at right then – not really looking at the big picture.*

Player W demonstrates a shift in his awareness, which is representative of the six players. Before the programme started he indicated “*Focus on your own game, not be worrying about what the other team's always doing, but just focusing on your own thing*”. After four weeks of the intervention programme Player W totally changed his perspective of his game awareness in relation to where he was concentrating and thinking about on the field,

*Instead of just concentrating on your own team, watching what the other team's doing and how they're performing their players especially like being a back, watching their backs.*

At the end of the programme considerably more comments were made about their awareness skills. The following comments from Player W are typical of all six players about their spatial and tactical awareness and show the player's awareness of their surrounding away from the ball and also their thinking and positioning based on the space available and their role as support player and/or ball carrier,

*Instead of just sort of running just beside him and just calling, looking where the defence is positioned and seeing where the best place is for you to like be around him is. Like what the best option is, where the space is and stuff. And am I in the right position;*

*Oh ah a little bit like getting into their mind a little bit – thinking what they'll be thinking. Positioning yourself into like something that helps the ball carrier so you don't get them in trouble. Just to help them out and get in the right position.*

**Video Clips 3a and 4a** provide examples that show Player W demonstrating his improved spatial and tactical awareness of positioning in relation to space and his role as ball carrier (Clip 3a) and support player (Clip 4a). The intervention included drills and activities that promoted game awareness and tactical knowledge of attack and defence to heighten player game awareness. In both video clips the backline runs and spread it wide to Player W, in *Clip 3a* he uses his spatial awareness to maintain his position and space on attack as support player and then ball carrier; in *Clip 4a* he changes his line in response to understanding his functional role as winger and tactical awareness of the situation as a support player only, by cutting back in side to be in the best attacking position for the ball carrier in terms of space available and defence alignment.

#### **4.1.6 Motor Skills**

During the intervention programme players were introduced to new motor skills to help promote and develop their ability to make effective decisions on the rugby field. Some skills included: the push/pressure pass; head up; stressing the defence; two hands on the ball; L running; fast feet and slow hands or slow feet and fast hands.

**Video Clip 5a** of Player R demonstrates the use of the 'push/pressure pass', in an early season rugby match after 4 weeks of the intervention, as the technique allows the ball to be moved on quickly and it enables the player who is passing the ball to keep their 'head up' to see the opposition and playing environment and 'stress the defence' (draw the opposing defender in to create space for the receiver of the pass). Player R commented,

*I just keep trying to make sure like my pass – like I've been taught to pass and then I try and take what I've been told here and practice it like at practice it and in the game.*

The facilitator confirmed the development of the players' ability to execute skills, such as head up, two hands, push/pressure pass, learnt in the intervention programme in their rugby games,

*The ability to execute an action and bring it all together. The various bits of seeing, reacting, understanding, manipulating the defence, the timing of executing the action.*

**Video Clip 6** shows the entire backline, which includes Player S & W, demonstrating the 'push/pressure pass' and keeping their 'heads up', which enables them to keep their eyes up at the opposition and therefore help them determine the best option to choose from the visual search strategies. By week four Player G commented, *"I think the back lines definitely picked up a lot of stressing the defence a lot more than what they did in the start of the season"*. This comment also illustrates players are noticing improved changes in other players around them.

**Video Clip 7a** shows Player G demonstrating 'fast feet and slow hands' during an end of season (9 weeks post intervention) rugby match, a skill learned only from the intervention programme. He also provides an explanation of when he would use fast or slow feet and fast or slow hands in the final interview session,

*I would use slow feet/quick hands when the opposition are running up at me in a line quite fast and when they're not really running up, I'll use quick feet/slow hands. Because if I was running...if we're running together...it wouldn't allow me...give me as much time to make a choice like where I could put the ball.*

The motor skills of the six players varied throughout the season. From video analysing the three rugby games players sometimes reverted back to their old style of spiral passing and didn't use the new skills taught in situations when they were best suited. This was particularly evident in the mid season match analysis. The intervention team lost 50

points to nil. The result may have influenced the lack of skill transfer from intervention to game.

The facilitator commented about players' understanding of the game and roles and awareness improving, as they answer questions well during intervention sessions, but this varied between the players. The following comment reinforces this,

*There's some highly skilled and well coordinated [guys]. Some guys are seeing things, some guys ...they've got an awareness and they understand within themselves, but they're not always picking up the right cues or able to execute the right actions in sync with the right cues.*

There appears to be development of the physical skills in some players more than others, which may affect their ability to make decisions. Player competency in carrying out the skills trained and also their motor skill proficiency pre-intervention may be indicators of individual differences from the results gathered. Some of the following physical movement skills were trained during the intervention: head up, use two hands, stress defence, fast feet/slow hands (when opposition are slow to come up on defence) or slow feet/fast hands (when opposition come up quickly on defence), L running, push/pressure pass.

## **4.2 Tactical Knowledge**

A key theme that has developed from the data collected was the development of the players' sport specific tactical knowledge of the game. Player H commented before the programme "*I can't really think too much when I am on the field*", in contrast to a comment made four weeks later,

*Makes me think more about when I'm running, like – it's changed everything I've done I think. Just like stressing the defence, just keeping my awareness up and just... the small things, which I had never really thought about. I just keep*



*thinking about now. Just like stressing the defence, handling the ball with two hands, keeping the head and ball up and stuff.*

All six players have made comments about their increased 'thinking' on the field and how important it is to know what their role is in given situations as the ball carrier, support player or defender. A representative comment reinforces this,

*I think a lot more on the field and making it more of a thinking game than more of a...just skills. And like thinking more about roles like of where I am or other support players.*

#### **4.2.1 Functional Roles**

The three baseline questions used in each interview link directly to the three main functional roles a player has on the field, that of 'ball carrier', 'support player', and 'defender'.

##### **4.2.1.1 Ball Carrier**

Before the intervention began the players, when asked to reflect on what they were thinking when they had the ball, players tended to respond mainly about "*looking for space/gaps*"; "*take it straight up*"; and "*look for players around you*". There appeared to be no clear criteria or set of rules identified by all the players in the pre-intervention interview. However, once the intervention programme commenced, all six players commented about 'stressing the defence', 'holding the ball in two hands', and 'listening to support players'. A typical response was,

*I'll look for the space, look where ... try work out where my support players are and what I can do, if there isn't a space, what I can do to try and open the space – like a cut or something*

Generally the players started to think more about trying to create space for their support players rather than just looking for space to run themselves. All six players comment in more detail about their role as ball carrier. It is important to note that this greater level of understanding was maintained throughout the intervention programme and at the final interview session, nine weeks post intervention. A representative response was,

*Putting the defence under pressure like all that just sort of comes from - putting it into space or running it straight and yeah and creating space, get into space as quick as possible...set it up for the next player.*

**Video Clip 5b** shows Player R demonstrating the functional role of the ball carrier, of 'stress the defence', keeping head up, using 'two hands' and executing a 'push/pressure pass' to his outside support player. The following response from Player R is representative of all six players and their demonstration of skills and understanding of their role as ball carrier.

*I just keep an eye on trying to make sure like my pass – like I've been taught to pass and then I try and take what I've been told here and practice it like at practice it and in the game;*

*Listening and I'm thinking about passing and stressing the defence like what I have to do to stress the defence. Hold the ball in two hands and run at the player I'm wanting to stress. Yeah, and I'm looking for any communication from support players.*

#### **4.2.1.2 Support Player**

Typical comments provided pre intervention regarding what a player is thinking when their teammate had the ball were, "*Try and get there as fast as I can. So when one of the backs does hit it up, that the forwards can be there to drive it and secure it and stuff like that*"; "*Support him and be in position to ... if he gets in trouble to take the ball and react to what I think he's going to do*". Noticeable additional comments from players when the programme started and in the final interview relate to additional roles of what support

players can do i.e., dummy runner, penetrator, and communication. Representative responses were,

*Staying with him not too close ... once we've got the dummy runners... if I'm in space.... calling for the ball;*

*Should I dummy run or should I cut with them, stay on the outside and follow him or will he need me to support him when he goes into a tackle;*

*I watch the defence and identify what the defence is doing and then communicate with the ball carrier and then react to that situation.*

Player R provides a representative comment about how he thinks more about his role as a support player, since the intervention commenced,

*Like roles of the support player, I didn't really think about much when I was a support player – I just like thought more about what to do when I get the ball, but yeah now it's been really good. Yeah, I've just...I now know that I've got to think about my position, what just when I'm a support player as well as the ball carrier.*

**Video Clip 8** shows Player H and G demonstrating their functional roles as ball carrier and support player in an early season match (two hands, head up, stress defence, staying close, and communication) four weeks into the intervention. Player H & G commented, respectively,

Player H: *Keeping the ball up. Keeping your head up and just listening to where my support is or what's happening like in calls and stuff and just set up for a back move, for example, whether there's space out wide or any gaps or anything.*

Player G: *I think hold it in two hands. Shall I run, shall I pass or hold it until....see where the overlap is and I kind of look whose outside me and whose inside me. What's the best option here. And like shall I offload or shall I go for the gap.*

Video analysis of the three games often showed players executing their functional roles as ball carrier and support player, particularly at the end of the season.

#### 4.2.1.3 Defender

A representative comment relating to what a player is thinking when the opposition has the ball pre intervention was, *“shutting them down – make sure that someone’s on someone and there’s no gaps in our defence”*.

*Video Clip 9* shows Player L demonstrating the functional role moving from ‘rock’ to ‘bootman’ position around a maul situation in an early season match four weeks into the intervention, the roles of ‘rock’, ‘bootman’ and ‘guard dog’ were unknown to the players pre intervention. Player L identifies the need for him to become the ‘rock’, he uses his arm to signal that he has taken up this positional role, he then drops back to become ‘bootman’ as cover defender. As the Prop – indicates he now is the first defender off the maul, becoming the ‘rock’. Player L commented, *“the other players help a bit with their position on the rugby field compared to where I am ...”*

It is important to note that some players were not able to recall or reflect about what they did in a game. For example Player L in the above *video clip 9* was not able to recall actually ‘doing’ or executing his functional role as rock or bootman, the following comment by Player L supports this, *“I’m not really aware that I’m doing it – I’d like to think that I’m doing it better than I did before”*.

*Video Clip 10* shows Player G in the ‘guard dog’ position and then moving to the ‘rock’ position in an end of season game, nine weeks post intervention. Player G uses his arm to inform other players that he is assuming the role of ‘guard dog’ (2<sup>nd</sup> person outside of ruck or maul) he then moves in to become ‘rock’, his eyes are looking up at the defence rather than looking down at the ruck/ball. Player G commented,

*It's made me think a lot about kind of attack and defence and kind of not just where I am on the field, but where all my other players on my team are and where their players (opposition) are and things like that.*

Player G provides an explanation during the final interview of what he did in the weekend game, *"If I was a guard dog, I'd be calling up to the back line – making sure we run up in a line so that there's no holes opened up for them..."*. A further comment by Player G below reinforces how some players' ability to recall actions from a game varied among players when compared to Player L,

*...I was calling the back line up quite a lot that game I think. Yeah, they were...they were paying a lot more attention to who was calling up. Like they were paying attention to where the ball was at. If someone else was guard dog and I was out in the back line, I'd usually be looking at like or just listening for the players if he was calling up or not.*

However, the facilitator commented, post intervention, about the development of the players' ability to answer questions provided to them during intervention sessions regarding their knowledge and understanding of what to do in attack and defensive situations,

*Questioning...it's a process that I'm able to use to assess their level of understanding and their answers are at such a stage that they're quite in depth as to why...you know...what happened – they're able to tell you what you've got to do to improve.*

#### **4.2.2 Player Organisation and Structure**

The ability of the players to understand player and team organisation and structure in relation to 'defence patterns' and 'positional play' was limited before the commencement of the intervention programme. Players' comments tended to be reactive to a situation; typical responses were,

*Staying right behind him so that when he hits it up just getting the rest of the forwards and myself over them and just carrying on;*

*Where there's a lot of players, I would just fan out where there's not so many players.*

#### **4.2.2.1 Understanding Defence Patterns**

The intervention programme focused on attack mainly in the first three sessions, but the facilitator soon realised the players lacked understanding of defence and therefore positional play. He began to include defence drills and this soon became an important development in the players decision-making processing. The players were taught different defence patterns and learnt how to identify, understand and manipulate defence situations. After four weeks representative responses by two players were,

*Our defence system is a bit better and talking between each other and who we've got and stuff instead of getting all sort of muddled up and confused about who we're going for – more organised;*

*Generally like looking at how they're formed and stuff and sort of predicting where they're going to run. And "we've like learnt quite a lot of sort of different types of defence which has helped and actually practicing them, so we should be a lot more organised in our defence patterns...but kind of organising it and getting everyone together has been the problem having a set and everyone thinking the same thing and knowing how it work.*

It is clear that the team was still developing their understanding of defence patterns, this continued throughout the season, but communication was an important part of getting players' organised on defence and better prepared while on attack.

#### **4.2.2.2 Positional Play**

Positional play relates closely to understanding functional roles and communication. A typical comment pre intervention was *"If someone is in a better position than I am, I will*



*make the decision to pass it or put them into space*". The programme developed player perceptual strategies and tactical knowledge as well as improved communication on the field. This has led to better positional play. Typical responses since the programme started are,

*Well like if I can see space, I'll communicate it to him – talk to him more or get myself into a position where I can attack that space;*

*Where's the best place I should be in terms of attack. Where's the space. Where's the best place to attack from;*

*Fanning out - keeping the defence wide – wide defence. Don't leave any major gaps.*

**Video Clips 3b and 4b** show the backline running, at the end of the season, with the ball and spreading it wide to the winger, Player W, who demonstrates the importance of holding his position and comments on what the intervention programme has taught him in terms of player positioning and his improved decision making ability,

*Concentrate on two things at once and learn to look at the defence and look at our...look for our own players' sort of how everyone's positioned. That's like taught us to be just a lot more confident in what we're doing.... that's changed our decision making because we're looking and thinking a lot more rather than just sort of catching runners.*

**Video Clip 7b** shows Players S & G in an end of season game and illustrates how communication and positional play, by getting into position early, enables improved decision-making options. Player G gets into position in advance to show Player S he is available. Player S responds by making the decision to pass to Player G. The following comment, post intervention, by Player S supports the way players are thinking about positioning on the field of play,

*Give it to the guy in space, so give it to the guy if he's in a better position. Not just pass cause I think I have to...pass because it's the best thing to do or run if it's the best thing to do...so identify more what's on.*

Player G comments about how the intervention has made him think more and increased his sense and understanding of the game,

*Made me think a lot more when I'm out on the field and made me a lot more aware of where the opposition are and what my role is as ball carrier or just in support play. And it's helped a lot with yeah, just the general sense of the game.*

Video clip 7b shows both players are aware of their roles and positions to each other as well as in relation to the defence. Player G prepares himself in advance by getting in the best position to receive the ball. However, Player G was the only player out of the six players interviewed that seemed to reflect accurately and recall segments of play and team performance in detail in the interview sessions. The other players tended to be less capable of providing examples of what they did in their games.

### **4.3 Communication and Team Cohesion**

#### **4.3.1 Intra-communication**

Initially, communication was identified by two of the six players as important in making decisions on the rugby field, comments were “communicating ...just talking”; “just listening to the players, ah ... Not listening to guys out in the back line, but listening to the guys around the edges of the rucks and the mauls”. However, after the second interview session, four weeks into the programme, all six players recognised the importance of communication and making informed decisions, as players established team calls, and players knew their functional roles. Typical responses were,

*Now we all communicate more, so we probably play the same. Like who is there in support for me, then that helps me make like...whether to pass it on, whatever*

*and just...and now that we've got the calls like for yes and names at dummy, so we just, yeah that help;*

*Trying to get there and support him, just be right there so he can see me as well as the defence and communicate to him.... like 'yes, yes, yes' – now that's happening in practices now, quite a few people are doing that. Just dummy runners and saying yes, yes, yes and no. So it helps them make the decision.*

Player R and G comment about the increased amount of team communication post intervention, “communication with teammates is the main thing, keep the same channel instead of crossing each other and getting confused”; “There's much more communication in the game”.

**Video Clip 11** shows the mid backline demonstrating communication and teamwork in defence. The clip shows the ‘centre’ talking to ‘2<sup>nd</sup> five eight’ about the defence situation, and shows them looking at their opposition rather than ball gazing. Player G makes further comment about the change he has seen in the backs communication,

*A key change in the backs relates to communication and watching the opposition more. The backs use to pay ....too much attention to the our own men rather than his opposite number. And I think our backs talk more and have picked up on those sorts of things...like the last week, they've been matching up numbers rather than looking to where the ball is.*

All six players highlight communication as a significant factor in the decisions they make on the rugby field. They are constantly listening to their other players and this has increased over the playing season as the team has developed cohesion and trust among each other. This may be due to their shared knowledge and understanding of functional roles.

### 4.3.2 Team Cohesion

By the end of the intervention programme a typical response was, *“Like everyone’s responding as a team rather than individuals coming up at different times and things like that”*. The players’ built up their cohesiveness and showed they were starting to think about the same options in front of them, more coherent collectively in their decisions. The following comment from the facilitator reinforces that the players, post intervention, a starting to think alike,

*The mental checklist .... identify the options – positioning themselves, second checklist was communicate, the third one was react.....The ultimate thing that we’re after with the ball carrier and the support player is they all start to see this picture in front of them similarly because that’s when we’re in sync. So if we’ve got three people attacking an area and the space is on the left of the ball carrier, the guy...the person on the right of the ball carrier should be able to see it and he’ll instantly understand – well my role here is to be a dummy runner so I can put the defence under stress by playing that role.*

The facilitator’s comment above provides an example of the ball carrier and support player seeing the situation in front of them collectively and knowing not only what to do in their roles, but also knowing that the other player is thinking in the same way, he uses the term ‘in sync’. He then goes on to say, *“I’d like to think we’ve [the players] made an improvement in the understanding of the game”*.

Some typical player responses, post intervention, relating to improved levels of communication, team coherence and trust are as follows,

*Pretty much when the half back’s got his hands on the ball. Like if they had the ball, and I’m standing at rock, I’d come in and say I’ve got first channel and the person outside of me, I’d probably trust him to take the second channel;*

*Communication for the team seems to be getting better. Just like generally talking a lot more and kind of like trust is building up so instead of having the ball*

*carrier having to look around for support, the support players are just talking to him, so he knows they're there.*

It is clear that communication and team cohesion are important in helping the players make informed decisions, but the players understanding of their functional roles and awareness of the game situation appear to be crucial in their ability to communicate and make good decisions.

The ten themes inter-relate and the players have integrated the skills and strategies gained from the intervention to collectively improve their decision-making skills. For example, if a player keeps their head up and holds the ball in two hands, their ability to scan and take in relevant cues from the game situation are enhanced. The use of peripheral vision and increased spatial and tactical awareness through more tactical knowledge then enables the player to communicate to other team members to organise and structure the attack or defence in advance. If a player has less knowledge or ability to use peripheral vision they are less likely to make a decision as accurate or as fast.

## 5. Discussion

The aim of this study was to examine how players' perceive their ability to make decisions in game situations, after participating in a decision-based training intervention. Additional to the seven-week intervention were two further review sessions, six weeks post intervention. Analysis of the results identified three main themes: perception and motor skills; tactical knowledge; and communication and team cohesion.

### 5.1 Perception and Motor Skills

#### 5.1.1 Peripheral Vision

Peripheral vision provides the player with information from the total display area and ensures decision-making is flexible, and response is adequate, using the full range of information available (Jones, 1995). The findings suggest players have changed their vision from ball gazing and tunnel vision to the use of more peripheral vision and off the ball gazing. This relates to decreases in their lateral head movements and keeping their heads up more frequently in games. The following are typical player responses,

*Like looking through my peripheral vision – I never used to be able to do it and now I can see more and I can do it and actually see the ball at the same time and I can actually see in front of me as well;*

*Keeping the ball up so you can pass it both ways. Keeping your head up looking around, not turning your head like the full way...like right round so that it can cut your vision off from one half to the whole side of you...*

Peripheral vision used by the players is supported by similar results of eye tracking studies conducted on expert performers (Janelle et al, 2003). Players are starting to detect key sensory cues in the environment earlier and according to Grehaigne et al (2001) this leads to faster and more accurate decisions.



### 5.1.2 Perceptual Skills

Players are selecting more relevant cues (perceptual chunking) by taking more information in a glance and grouping the information in meaningful units. The players' are starting to glance at cues more specifically,

*I use to kind of look around for a bit, now I just glance up and know where to look rather than.....I used to maybe turn to one player and then look for a pass that way – now I can look both ways.*

According to Martell and Vickers (2004) expert players have more time to focus their attention to the environment and therefore, learn to recognise more relevant information and ignore irrelevant information (selective attention). The following typical statement supports the notion that the players' selective attention skills have developed,

*Kind of the senses have sharpened up. I used to be able to like kind of look at their back line and then take a look out at ours, now I can just glance both ways and I know what's going on in general.*

Cues should strongly influence the players' treatment of the configuration of play (Grehaigine et al, 2001). This is notably demonstrated when players identify a player out of position or a gap in the defence. The players have become more consistent in their selection of moves and ability to know what to do in a given situation on attack or defence. McPherson (1993) points out expert players' decision-making and planning are based on 'content' – such as environmental cues and tactical conditions and 'structure' – such as patterns of play. The players are better at monitoring changes in game situations and in planning for possible actions, similar to that of experts,

*We're like looking up more and the support player was doing the things that they'd taught us and not just concentrating on...like the ball handler and watching the ball, but they were looking at where the defence is and how they're running out and that sort of thing.*

The players' comments reinforce Anderson's theory (1976) that players have formed a set of productions or actions, developed from declarative knowledge to procedural knowledge (Williams et al, 1999). The players are starting to adapt and develop their perception skills and knowledge, namely procedural (how to do it), and declarative knowledge (what to do), and their ability to encode and retrieve such information (Grehaigne et al, 2001). This promotes the development of pattern recognition and identifying situational probabilities. This suggests the intervention has enabled the players, at varying levels, to respond appropriately to stimuli presented based on recognition (Proteau et al, 1989).

The players are starting to 'read' and 'recognise patterns of play' based on their understanding of identified cues (i.e., depth, space) and patterns of defence taught in the intervention, this leads to 'imprinting', which increases speed, accuracy and fluency of processing (Schmidt & Lee, 1999). The following comment reinforces these points,

*Instead of just concentrating on your own team, watching what the other team's doing and how they're performing their players especially like being a back, watching their backs... but you can tell by the way like their depth, like you can tell...you can read sort of what they're going to be doing.*

During the intervention players were repeatedly exposed to a variety of action sequences. According to Williams and Hodges (2004) pattern recognition skills can be developed through repeated exposure to a variety of related action sequences. Video clips were used at the beginning of six of the seven intervention sessions to demonstrate skills in action, rather than patterns of play or situations that required specific responses. Future interventions may benefit by including video clips highlighting situations and cues that may promote understanding of patterns and situational probabilities. However, Williams and Grant (1999) suggests video footage does not always transfer to the field as sensory input and contextual information prior to response selection is needed. Therefore, the use of video sessions should be immediately followed by practice simulation to develop 'imprinting' and the contextual and sensory information to formulate patterns and improve decisions in a game.

As the intervention continued players' perceptions showed their decisions were based more on situations and patterns/configurations of play. This is likely to be attributed to the players becoming more familiar with 'what to do'. For example,

*The fact that I now know what to do in more situations, sometimes when I ...didn't know what to do, now I do sort of thing. Like as a support player, I didn't know what to do like lines to run and stuff like that – now I know a bit more.*

Ward and Williams study (2003), similar to the rugby intervention in design, of fifteen to seventeen year old soccer players, also showed players' improved their 'structured recall'. This supports the notion that players are beginning to develop a more organised and accessible encoding and retrieval system. Therefore, the intervention is likely to develop the players' ability to recognise previously stored working memory to the current environmental situation, therefore promoting anticipation (Helsen & Starkes, 1999).

### **5.1.3 Attention**

The fifteen-year-old rugby players, as a result of the intervention, have developed more attentional flexibility and improved levels of anticipation. These findings are similar to those of Hagemann et al's study (2006) of novice badminton players who improved their anticipatory skills with video-based and attention-oriented perceptual training. The following typical statement supports this development,

*So I can see both the defence coming up and like my support player. So I can sort of...it helps me to assess what I should do and...helps me to decide to be in space, if I can see the space.*

The intervention helped develop faster processing due to the use of attention strategies and the ability to concentrate on more than one visual cue. Tenenbaum et al (1999) also showed that the fifteen to eighteen year old age group made major improvements in attentional condition on reaction time, compared to younger age groups, all of which participated in the same perceptual and attention training. The following typical comment from this current study indicates improvement in attention strategies,

*Helped us to be looking instead of just concentrating on one thing, catching the ball, one thing at a time and then looking...then looking for our support player, then looking where the defence is, we're sort of starting to do it all at once instead of doing it in different processes – just bringing it all together so that we're looking all...yeah...thinking quicker really.*

#### **5.1.4 Anticipation**

Pre intervention some of the players demonstrated a 'wait and see' focus based on the video analysis and pre-intervention interview data. Now all six players are more skilled and better at anticipating due to contextual information. The following statement shows how players perceive their anticipatory skills have developed,

*The course has helped me with my ability to anticipate because before I wasn't aware sort of how to open up space, but now I think I'm much more aware of how to open up space and so are my other team mates but I sort of anticipate that they might try to open up space, then I've got to react if I'm needed.*

Players are starting to think more about their role in relation to the other players in advance. This suggests that players are starting to make decisions based on the support players and spatial and tactical awareness of the game situation, rather than just picking up the ball and then reacting to the situation. Williams and Grant (1999) and Baker et al (2003b) suggested that the shift from a 'wait and see focus' to a more anticipatory approach is due to contextualising the information and situation more effectively.

#### **5.1.5 Spatial and Tactical Awareness**

The players' spatial and tactical awareness skills have improved over the intervention period, a point noted by the facilitator,

*I think they've started to learn what they don't know. So there's a greater awareness of what they actually couldn't or didn't know.*

The players have become aware of things they previously didn't know about and this has enabled players to make more informed decisions. As with Nevett et al's (2001) findings, the tactically focused intervention has enabled players' to be more aware of the environment in helping them make better decisions,

*I'm more aware of what's happening around me. I didn't used to be able to...I just used to run;*

*Space, that's helping me make the decisions...being aware of my surroundings like my support players, where they are and what they're doing.*

The players' increased tactical awareness skills are related to their improved understanding of organisation rules in attack and defence settings and the role and action required of them in that situation. Grehaigne and Godbout (1995) reinforce the importance of understanding and applying action rules and organisation rules to improve game awareness and make better decisions. This typical comment reinforces the increased awareness and understanding,

*Made me think a lot more when I'm out on the field and made me a lot more aware of where the opposition are and what my role is as ball carrier or just in support play. And it's helped a lot with yeah, just the general sense of the game.*

Players are now 'seeing the options' more clearly and organising themselves in-advance to take advantage of the situation they are in. According to Grehaigne et al (2001) the current findings are similar to expert performers, as player awareness is helping prepare player positioning in advance, compared to novices who react rather than anticipate. This is illustrated in the following statement:

*I think we've also sort of learnt a bit about trying to think what the team with the ball's thinking, like looking if there's a space out in the backs or something, reacting to that so that they don't go for it. Sort of just thinking in their yard a little bit, seeing what they'll be looking for.*

### 5.1.6 Motor Skills

From the players' perceptions, improvements were made in their cognitive and physical motor skills. However, their ability to execute and demonstrate these newly developed perceptual and motor skills and strategies were not always demonstrated or observable from the game video analysis. The mid-season match analysed showed only one observable finding, from one of the four players that played in the game, which indicated transfer of skills from intervention to game. Rink et al (1996) concluded that players in a six week programme who were introduced to skill tasks, as well as tactical tasks, showed slow improvement until the second half. Rink et al (1996) suggests the programme may have been overloaded with too many tasks, particularly for less skilled players. These findings may indicate why players showed little transfer from the intervention midway through the season. A longer intervention to allow players to absorb and apply the information may enable more effective processing and transfer of information.

Further findings from Rink et al's (1996) study concluded that tactics used by a player are to some extent dependent upon the tactics used by an opponent. The intervention team lost the mid-season match by 50 points to nil. A reason for this lack of skill transfer, in the mid-season game could be because players only execute skills and strategies that are within the context of their ability as well as their opponents (Rink et al, 1996). This suggests that playing a team slightly less skilled or equal in ability maybe advantageous in promoting transfer of skills to games and developing game understanding. This would provide opportunity for players to take more risks in relation to anticipation and attacking opportunities and therefore, lead to greater levels of improvement and 'imprinting', compared to playing a more skilled team (Nevett et al, 2001). Furthermore, the results of video analysis of the first and third games showed many good examples of skill transfer from intervention to game. Interestingly, the intervention team won both these games comfortably. This was an interesting finding, however, further study is required in investigating skill transfer when playing more skilled or less skilled teams in relation to maximising transfer of learning from intervention to game and the affect this has on decision-making.



All six players made comments relating to how skills and strategies learnt from the intervention have started to come through in the practices and games towards the end of the season, for example,

*I didn't do anywhere near as much, but now it's starting to happen more. I think a lot of it I didn't really think about;*

*I really pick up on it well and I've noticed at practice like, I think I've finally found I've been able to come through just near the end. I've just noticed at practice like people are looking, having their heads up more and just skills are kind of a little bit better and everyone's sort of concentrating on two things at once;*

*Not instinctively, but it's getting there. A lot better than it was at the start. There was a lot of "L" running and just more stuff that the further that we got on and learnt, became more instinctive to us.*

The players' perceived they have progressed in their physical and cognitive-perceptual skills. However, some players demonstrated the motor skills learnt more frequently in the games than others, particularly Player G, W and R, which highlights individual differences and genetic potential among the players, as well as the motor skill and knowledge base pre-intervention. No motor skill proficiency testing or assessment was carried out pre intervention it was only pointed out to the researcher that all six players had similar rugby playing experience.

The levels of improvement have become more noticeable in all players towards the end of the season. This indicates that the intervention may not benefit the players immediately as the player technical competence and process to conceptualise and apply the perceptual and motor skills and strategies as well as tactical knowledge learnt may take time to process (Starkes et al, 2003; Baker et al, 2003b). However, 'The Teaching Game for Understanding' (TGUFU) approach developed by Bunker and Thorpe (1982) and advocated more recently by Griffin and Butler (2005) support that decision-making should be taught first. Furthermore, research by Turner and Martinek (2003), point out a

longer treatment period of fifteen lessons allows for skill transfer and processing, as both intermediate and high school related age groups, showed better decisions during games and greater declarative and procedural knowledge.

Chatzopoulos, Tsormbatzoudis, and Drakou (2006) also found the 'game approach' to provide a positive effect not only on tactical behaviour, but also improved skill execution. The final review session in the current study was conducted sixteen weeks after the commencement of the intervention. Findings showed similar improvements to Turner and Martinek (2003) and therefore, support that the 'Teaching Games for Understanding' approach shows greater benefits when treatment periods are longer than fifteen weeks. The facilitator made the following comment at the conclusion of the intervention, that highlights individual differences among the six players as well as suggesting the players are still in a transitional phase of development, from declarative to procedural knowledge and application,

*I think within the group...there's some highly skilled and well coordinated. Some guys are seeing things, some guys are...they've got an awareness and they understand within themselves, but they're not always picking up the right queues or able to execute the right actions in sync with the right queues.*

The current findings highlight the need for further investigation to determine transfer of skills from intervention to games. A longitudinal study tracking individual players' motor and cognitive skills would be critical in better understanding individual differences and level of improvement in their decision-making.

## **5.2 Tactical Knowledge**

Blomqvist et al (2000) argue that a player, who possesses an extensive game related knowledge base, has advantage in decision-making in various sport situations compared to a person without this kind of knowledge base. The findings support a greater knowledge base and understanding of the game,

*I think about the game a lot more. The lines to run, the L running, to sort of create gaps and draw the defender, that's when I've got the ball, and just sort of*

*looking for gaps to run, listening for support players to try and work out where they are.*

Eccles and Tenenbaum (2004) and Janelle and Hillman (2003) argue that deliberate and purposeful practice can accelerate the development of knowledge representation. The current findings suggest the intervention enhanced sport specific cognitive knowledge structures, as all six players increased their tactical knowledge of the rugby game. However, it is likely that the players are in the transition of converting declarative knowledge into control by procedural knowledge (Grehaigue et al, 2001). This shift will affect player reaction time and therefore, players' ability to make decisions under time constraints (Araujo, Davids, Bennett, Button, & Chapman, 2004; Shuttleworth, 2006). The intervention appears to promote this shift; however, more research needs to be done on following individual players over more than one season to see notable changes in target (declarative) to control (procedural) processing and successful decisions under time constraints. Analysis of the results showed that tactical knowledge was developed in areas of understanding relating to: functional roles, positional play and understanding of defence patterns.

### **5.2.1 Functional Roles**

A major finding from the study is the understanding of player 'functional roles' and the importance these roles have on player decision-making. It appears that the functional roles as ball carrier, support player and defender combined with other skills and strategies discussed promote decision-making capabilities in game situations. As ball carrier, the findings show a significant shift in tactical understanding and knowledge from pre to post intervention. A typical response pre intervention was, "*I kind of stay with my loosies*", and then post intervention,

*Hold the ball in two hands, show the opposition the ball. Run straight to not allow the opposition to drift and cover my players outside of me. I'm thinking, can I hear my opposition.....ah hear my team mates around me? Whose calling*

*for it, who wants it, where the hole is and should I use quick hands/slow feet or quick feet/slow hands.*

McPherson (1993) looked at interview comments defined as action concepts and categorised them to determine quality of content. Statements from novices generally had one visual or motor action concept, whereas, experts tended to have two or three action concepts relating to visual and motor characteristics. The contrasting typical example above, suggests players' have increased their depth and quality of action concepts from pre to post intervention, similarly to differences between novice and expert performers identified by McPherson (1993). The following comment made by the facilitator supports that players are developing a greater understanding of the game and action concepts highlighted by McPherson (1993),

*... I think we're [the players] starting to get there...I think that you could start to sign off that players are starting to understand the concept which means we've moved on from ticking boxes and a thinking process, which is the ultimate aim.*

Player W illustrates the functional role of the support player in the following verbal response and demonstrates it very well in *video clip 4*. This reinforces the shift from declarative to procedural knowledge in attack situations and the development of a 'production system' that demonstrates a sequence of actions (Grehaigne et al, 2001; Grehaigne & Godbout, 1995),

*Watching where they're going to go and where they could go. So if there's a space then I might anticipate that they'll use that space and then I've got to be right on the tail and really aware of what they're likely to do and also, just making sure that they don't get isolated.*

The players have changed their approach to defending based on their increased understanding of functional role as defender and knowledge and understanding of

patterns of defence. The following comment provides an example of what and how to respond in a defensive situation,

*When I'm going to tackle a player that you don't get sucked in. So you don't go in too quick.*

The 'what' (declarative knowledge) is not to get sucked or drawn in by the attacker when making a tackle as the defender. The 'how' (procedural knowledge) is not to move in too quickly to make the tackle, therefore, hold position to force the attacker to move and reduce the attacker advantage. This analysis shows players have increased understanding and declarative and procedural knowledge, and according to Grehaigne and Godbout (1995) this should improve the quality of the decision-making process.

### **5.2.2 Player Organisation and Structure**

The intervention exposed players to complex structured and unstructured game and problem solving situations. Ripoll and Benguigui (1999) suggest this type of practice environment will facilitate decision-making capabilities, particularly those over the age of fifteen years. A schema of play (Grehaigne & Godbout, 1995) makes it possible to take the opposition by surprise to gain an initial advantage to make the next pattern/phase of play (simply speeding up the game) even more advantageous. *Video clip 2* – shows how players just knew what to do in the situation and everyone demonstrated their functional roles and player organisation and structure based on schemas or patterns of play.

The players are more aware of where the opposition players are standing in defence in relation to the ball and their position and functional role on the field. A typical response, *"say if I've got the ball and I might run in the angle to create a space, so looking for space and gaps in their defence"*. The players' understand more about defence patterns and organisation, and therefore can think more about predicting and problem solving by improved game understanding, the following response supports this point,

*Trying to think what their moves are and where that ball would be going, if we've got a gap out wide, they'd probably spread it wide. Just trying to close it down...looking at where our players are in defence and seeing if I can close gaps...*

All six players have identified player organisation and understanding of defence patterns are important for decision-making on 'what and how' to respond to defensive and attacking situations on the rugby field. The players are more aware of their position in a given situation helps not only the decision they make but assists in helping their teammates make a more informed decision, based on the positioning of surrounding players. A typical response from the players was,

*If you're there doing the right thing in the position that helps them, then it will help them make a good decision to carry on the play.*

Player G provides a commentary example of positional play and *video clip 10*, also shows him demonstrating this in a game,

*Whereabouts I should be in the line, just who I've got, calling saying I've got this man, I've got this man, which channel I should be taking. If... maybe [the] half back's gone down in a maul and there's no one playing boot man, then I would go into that position to cover for the line. Or if I'm there first, guard dogs or rock.*

The findings reinforce that "knowledge about the organisation of the game, sport specific knowledge, and knowledge about configurations of play provide the basis for understanding the game" (Grehaigne & Godbout, 1995, p. 500). The findings support French and McPherson (1999) results, which showed that the fifteen to sixteen year old age group (compared to eight, ten and twelve years olds) used encoding and retrieval strategies to remember patterns of play that enabled them to modify and adapt their position on the field in advance. Furthermore, the key tactical knowledge areas are highlighted as being essential for effective decision-making in team sport (Grehaigne &



Godbout, 1995); action rules relating to defence and attack situations; rules for managing play organisation in relation to player positioning, and space and functional roles.

The players have increased their knowledge and understanding of the game, and developed workable strategies that increase cognitive effort within the training setting (Vickers et al, 2004). The current findings replicate those found by Nevett et al (2001), indicating an increase in the number of tactical action concepts in games as well as better decision-making skills after intervention implementation.

### **5.3 Communication and Team Cohesion**

The quality of intra-communication between players improved as their understanding and reading of the game improved. By week four of the intervention, all six players were familiar with the roles and principles of team play and provided content specific information that enabled them to communicate more effectively as their ability to understand each others roles and adapt to game situations improved. According to Holt and Sparkes (2001) and Beauchamp, Maclachlan and Lothian (2005) maintaining positive patterns of communication enhances cohesion in sport teams enables players to 'adapt and connect' with other team members. Results of the Holt and Sparkes (2001) study showed that by the end of the season 'valuing of individual roles' and 'positive communication' by players improved cohesiveness, which was lacking mid way through the season. There is some support to show that the intervention may not only help with player decision-making but also improve team cohesion.

Grehaigne et al (2001) discuss how individual and collective aspects of decision-making in team sports are interwoven and contribute in combination to determine the final action response taken by a player. Eccles and Tenenbaum (2004) also believe 'shared knowledge' is achieved by intra-communication between players. These current findings exemplify the value of intra-communication in making informed decisions,

*My players around me, they like contribute to a lot of the decisions. Like yeah actually quite a lot of them because if they call for it and they want it, I'd definitely pass it rather than thinking, oh no, I'll just have a go myself ...*

Player G commented about his functional role and how that is communicated to the team. This communication can be non-verbal as *video clip 10* shows Player G signalling with his arm that he has taken up the 'guard dog' position in defence,

*I was calling the back line up quite a lot that game I think. Yeah, they were...they were paying a lot more attention to who was calling up. Like they were paying attention to where the ball was at. If someone else was guard dog and I was out in the back line, I'd usually be looking at like or just listening for the players if he was calling up or not.*

Eccles and Tenenbaum (2004) believe 'teamwork knowledge and communication' are critical in team sport decision-making. The following typical comments reinforce the importance of player communication and collective knowledge that aids in making the best decision given the situation and the surrounding support players,

*My support players, they definitely help. Worked out that they're pretty much key to whether I'm going to pass it, hold it, run it, kick it, yeah, just listening to support players.*

*When we're on defence, looking where...looking at you know which players to go for and yeah, communication, for example, just talking more about the defence, that's one of the things like when he's told us about defence, I think it's helped...it will probably help us...it has a little bit, and will help us more to talk and communicate with each other in a game.*

There are very few studies that have looked at intra-communication and decision-making in sport (Eccles & Tenenbaum, 2004). Further research is needed to determine the importance this has on player and team decision-making in game situations. The players'

perceptions clearly highlight how intra-communication between players promotes their decision-making.

If players have a greater understanding of the game collectively and know what their role is compared to other team members, decisions should improve as configurations are more likely to be coherent among the team and should improve the quality of the communication as players will be thinking in the same manner (Grehaigine et al, 2001). The following comment at the end of the intervention indicated that the player perceived that the level of communication didn't increase just the quality was better,

*Where we are on the field and calling – communication is pretty huge and probably down to one as well like... communication has improved. But it's not that we're talking a lot more, it's just better calls and it's more effective.*

Further investigation is warranted to compare and contrast training patterns of play in small and large groups to determine if there are differences in player configurations and team decision-making. The facilitator commented about how the players have learnt to understand the importance of knowing and being aware of the other fourteen players on the team and making sure communication is used to keep players 'thinking' cohesively as a team unit,

*I think that's the big step that we've probably made with the individuals is their understanding of the role when they haven't got the ball and lets look at the game of rugby at any one stage in attack – there's fourteen of your team mates don't have the ball that are supporting you and that's a valuable...we need those 14 to be in the game.*

The methodological triangulation approach of the current study included analysis of player and facilitator interviews as well as video analysis of games to provide greater dependability, trustworthiness, transferability and credibility in the findings (Gratton & Jones, 2004; Denzin & Lincoln, 1994). All six players have reflected with more game

understanding and awareness since the commencement of the intervention. The final interview (which was conducted one week after the two review sessions) showed that the players' levels of understanding and content specific information provided during the intervention (during and post interviews) was maintained through to the end of the season, nine weeks post intervention. However, some players' ability to execute and demonstrate skills and strategies in game situations varied between the six players. Data provided by Players G, R and W showed more similarities to expert levels of decision-making compared to Players S, L, and H, but all players gained considerably more game understanding and awareness of their perception, tactical knowledge and intra-communications. All players perceived the intervention added value to their ability to make decisions in a game, particularly towards the end of the season. There are several reasons for individual differences among the six players, for example; their ability to self-reflect, memory recall and retrieval capabilities, verbal communication skills, motivation, and player genetic potential (Baker et al, 2003a; Grehaigne et al, 2001; McMorris, 1999).

## **6. Conclusions**

All six players have improved their decision-making capabilities, as a result of the intervention, with improvements within three key themes:

### **6.1 Perception and Motor Skills**

Players have improved their perception through developed peripheral vision and attention strategies. An increased level of spatial and tactical awareness of attacking and defensive situations in a game combined with improved search strategies has facilitated player anticipatory skills. Player ability to execute and demonstrate transfer of motor skills and decision-making skills from intervention to game varied among the six players.

### **6.2 Tactical Knowledge**

Players increased their tactical sport specific knowledge in functional roles as ball carrier, support player and defender. Knowledge representation and understanding was developed in patterns of defence and positional play. It is likely players' have shifted from declarative to a more sophisticated procedural form of knowledge application, compared to their knowledge base before commencing the intervention.

### **6.3 Communication and Team Cohesion**

An improved level of intra-communications among players in the team has enabled players to make better and more informed decision on the field of play. The intervention may have not only improved individual and team decisions but also promoted team cohesion through shared knowledge and identifying meaningful roles early in the season.

The decision-based intervention manifests development in cognitive, perception and perceptual-motor skills and strategies as well as tactical knowledge and intra-communications in fifteen-year-old rugby players. The individual differences among players' and their ability to transfer skills from intervention to game situations varied. These differences are likely to be due to: their base knowledge and motor skills

competence pre intervention; levels of motivation; ability to self-reflect, communicate, recall and retrieve information; as well as their genetic potential.

The study has provided a greater understanding of decision-based training from the players' perspective and provided valuable information for the development of future decision training. The study provides support that deliberate and purposeful training can add value to player decision-making on the rugby field as the players' ability to think and act in advance has improved.

#### **6.4 Implications for Future Research**

- Further investigation in developing the ability of players (in team sports) to think the same (configuration of play) in given game situations would add value, as there is currently very little literature on this area;
- Intra-communications among players in dynamic team sports requires further inquiry as to the affect it has on individual and player decision-making;
- A longitudinal study is required to track and monitor individual player's motor and cognitive skills from season to season as the length of time to reach expert levels of decision-making is still not clear;
- Future research identifying expert and non-expert players from the same age group with similar years of training experience will minimise any experience-related biases, and may help determine differences to the current findings that may provide further insight into training needs of differing ability groups, particularly in relation to motor skill abilities and decision-making capabilities.



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## 8. Appendices

### Appendix A Information Letter for Participants and their Parents/Guardians



College of Business, Department of Management

4<sup>th</sup> May 2006

My name is Darryl Parrant. I am working towards a Masters in Management at Massey University. I will be working under the supervision of Dr Andrew Martin, a Senior Lecturer in the Department of Management Systems at Massey University in Palmerston North.

My project is called: *Developing decision making in rugby.*

#### **What is the aim of the project?**

It has been suggested that 15 year olds who are moving towards the autonomous stage of learning in their motor skills have the perceptual maturity, memory recall and capacity to improve their perceptual and decision-making skills in a specific context. I am looking to determine from the player's perspective the success of a 7 week - one hour session per week, decision-based rugby programme implemented by the Canterbury Rugby Football Union (CRFU). It would be helpful to know if the player feels their development in decision-making ability on the rugby field has improved/accelerated due to their direct participation in the CRFU's seven week intervention programme.

#### **What types of participants are being sought?**

I am looking for rugby players aged 15 years.

#### **What will participants be asked to do?**

Players will be asked to participate in a seven week, one hour session per week, programme and complete on-going interviews before, during and after the programme relating to their perceptions of how they make decisions on the rugby field. The sessions will be video-taped for analysis. No finding which could identify any individual participant will be published. The player's anonymity will be protected because names will be removed from all interview transcriptions and replaced by code numbers.

#### ***How long will it take to complete the interviews?***

*The player interviews will take approximately 15 minutes to complete and will be done at lunchtime under the supervision of the researcher.*

#### **Do I have to participate in this study?**

No. Participation is voluntary.

#### **If I choose to participate, can I change my mind and withdraw from the study?**

*If you agree to participate you may withdraw your consent at any time. Players may withdraw by notifying me by phone or in writing.*

Please contact me if you have any other queries or concerns about the project or would like to be informed of the aggregate research finding. I can be reached by phone on: 03 345 8329 or by email:

[darryl.parrant@cce.ac.nz](mailto:darryl.parrant@cce.ac.nz)

Thank you, Darryl Parrant



## Appendix B Consent Form for Participants and their Parents/Guardians



College of Business, Department of Management

### Research Project: *Developing decision making in rugby.*

#### ***Participant***

I consent to participate in the project: *Perceptions of a player's ability to make decisions on the rugby field: After participating in a decision-based intervention programme.* Under the conditions set out in the Information Sheet.

I have understood the information provided to me about the research project and what will be required of me if I participate in the project.

I understand that the information I provide to the researcher will be treated as confidential and that no findings that could identify either me or my school will be published.

I understand that my participation in the project is voluntary and that I may withdraw from the project at any time without incurring any penalty.

I agree to be interviewed before, during, and after the decision-based intervention programme and that my interviews will be audio taped.

Signature: \_\_\_\_\_

#### ***Parent/Guardian***

I give permission for \_\_\_\_\_ to participate in the project, *Perceptions of a player's ability to make decisions on the rugby field: After participating in a decision-based intervention programme.*

I have read and understood the information provided to me concerning the research project and what will be required of participants.

I am satisfied that \_\_\_\_\_ understands what will be required of participants in the project.

I understand that the information participants provide to the researcher will be treated as confidential and that no findings that could identify either them or their school will be published.

I understand that participation in the project is voluntary and that either I or the participant may choose to withdraw from the project at any time without incurring any penalty.

Name: \_\_\_\_\_ Date: \_\_\_\_\_

Signature: \_\_\_\_\_

**NB:** *All sessions follow the three steps of decision-based training adapted from Vickers, Reeves, Chambers and Martell (2004). The facilitator uses a range of the seven tools of decision training to promote cognitive, perceptual and decision-making skills: Tools are - variable practice; random practice; bandwidth feedback; questioning; hard first instruction; modelling; video feedback.*

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**Session One:**

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**Objective:** Establish terminology and identify key factors in catching and passing

**Warm-up:**

- Dominate and non dominate hand, holding and gripping
- Paired passing two balls left and right side of body
- Game sideline touch spiral and non-spiral

**Skill Development:**

- Large square – two balls continuous passing through centre player
- Static relays building to running relay
- ‘Wild West Draw’ strong arms and soft hands

**Warm down:** Side line touch – no spiral passing

**Review:**

- Types of pass, gripping and holding, passing action
- Players’ fill in notebook

**Player Skill Development:**

- Juggling left and right hands
- Catch and pass in pairs left and right side of body
- Blind reaction catch

## **Session Two:**

---

**Video:** Crusaders try versus Brumbies

**Objective:** Perform functional roles of ball carrier and support player

**Warm-up:** - Game sideline touch – functional roles

**Skill Development:**

- Large square – two balls continuous passing through centre player
- Passing waves – fours in lanes
- 3 vs 2 pass to space start ball middle and sides

**Warm down:** Side line touch

**Review:** - Functional roles of ball carrier and support player  
- Players' fill in notebook

**Player Skill Development:**

- Blind reaction catch
- Left and right side body – two balls in pairs
- Dropped ball over head
- Two ball juggling with alternative hands

## **Session Three:**

---

**Video:** Crusaders working the defence angles running lines hold/drag

**Objective:** Identify options in defence too attack

**Warm-up:** - Two balls alternative juggle and call numbers  
- Lateral passing in threes while calling numbers

**Skill Development:**

- Continuous attack 6 vs 3 points for successful attack rotate teams of 3
- Extend drill to have two players attack from depth
- 3 vs 2 pass to space start ball middle and sides

**Warm down:** Side line touch

**Review:** - Functional roles and running lines in attack situations  
- Players' fill in notebook and complete skill sheets

**Player Skill Development:**

- Two ball juggling
- Kick – catch – attack in pairs
- 5m x 5m attack defender

#### Session Four:

---

**Video:** NZRFU – Defence CD

**Objective:** Understand defensive systems in order to make better decisions in attack

**Warm-up:**

- Lateral passing in threes while calling numbers (middle catch and pass above post)
- Extend by moving receivers short long pass
- Extend by adding coloured cones to depth

**Skill Development:**

- Piggy in the middle
- Backline attack – bootman, rock, guard dog and two defenders attack what you see change groups

**Warm down:** Mini game of ball slaid

**Review:**

- Functional roles and head and eye movement on and off the ball
- Players' fill in notebook and complete skill sheets
- Divide into two groups practice 3 x attack and run against defence next session 7 vs 4

**Player Skill Development:**

- Kick – catch – attack in pairs
- 5m x 5m attack defender
- 2 vs 1 narrow channel

#### Session Five:

---

**Video:** NZRFU – Defence CD

**Objective:** Fulfil functional roles in attack by identifying space and cue recognition

**Warm-up:**

- 3 vs 3 half pass to first receiver who must pass to gap, one defender not to move forward

**Skill Development:**

- 3's lateral passing call numbers and colours in depth
- Right-angled movement 3 x stages of drill
- Run groups attack moves against defence 7 vs 4 talk functional role in move

**Warm down:** Mini game of ball slaid

**Review:**

- All skills, concepts and principles of attack and defence covered to date
- Players' fill in notebook and give out skill sheets

**Player Skill Development:**

- 5m x 5m attack defender
- 3 vs 2 narrow channel attack
- Explosive passing drill ball on hip left and right hands

## Session Six:

---

- Video:** Intervention U16 Team vs Burnside
- Clip 1: Decision making at break down tackle, clean out
  - Clip 2: Ball watching see things early being stressed in defence
  - Clip 3: moving ball to space, clean out, functional roles in attack
- Objective:** Functional roles unstructured attack – see the option collectively and anticipate from cues identified early
- Warm-up:** - Spiral above head left and right, 2 x balls paired passing
- Skill Development:**
- Right-angled movement 3 x stages
  - 2 x groups and run Henry Drill (NZRFU)
  - Unstructured attack and defence
- Warm down:** n/a
- Review:** - Need to look identify relevant cues early to select best option
- Player Skill Development:**
- Explosive passing off hip
  - Spiral above head
  - Kick – catch – attack 1 vs 1 and 2 vs 2

## Session Seven:

---

- Video:** Unstructured attack Crusaders and Chiefs
- Objective:** Revise all learning and principles of attack and defence, head and eye movement, passing, catching and running angles
- Warm-up:**
- Paired passing 2 x balls
  - Spiral above head
- Skill Development:**
- Classroom session – review of content knowledge and understanding – through questioning, problem solving scenarios
- Warm down:** n/a
- Review:** - All aspect and terminology and give out skill sheets
- Player Skill Development:**
- Right angled grid extend to numbers
  - Overhead reaction catch
  - blind reaction catch
  - Kick - catch – attack single and paired

### **Review Session 1:**

---

**Objective:** Revise functional roles and terminology in attack in order to create space

**Warm-up:** - Piggy in the middle one and two

**Skill Revision:**

- Left and right 'L' Running drill utilise per observed feedback
- Build to add in support from depth position

**Warm down:** 4 vs 5 mini game

**Review:** - Functional roles and head and eye movement identify options and cues on and off the ball and

### **Review Session 2:**

---

**Objective:** Identify cues/options in attack to beat defenders

**Warm-up:**

- Target passing static and moving
- Magic circle 1L – 2R – 3L – 4R – 5L and down
- Introduce soccer ball inside circle

**Skill Revision:**

- Quick hands drill, add in flash cards
- Quick hand and 4 vs 3 attack
- Left and right 'L' Running

**Warm down:** 7 vs 7 mini game

**Review:** - Look for options/cues off the ball

## Appendix D

## Information Sheet for Participants



**Massey  
University**

College of Business, Department of Management

**Research Project:**  
*Developing decision making in rugby.*

### Researcher Introduction:

#### *Student researcher contact details:*

Darryl Parrant  
Student ID: 98237119  
158d Edgeware Road,  
St Albans  
CHRISTCHURCH  
Ph (03) 345 8329 (wk)  
Ph (03) 379 5756 (hm)  
Mobile 021 1091235

#### *Researcher supervisor contact details:*

Senior Lecturer, Andrew Martin  
Massey University  
PALMERSTON NORTH  
Ph (06) 350 5799 Extn 2788  
Email: A.J.Martin@massey.ac.nz

#### *Purpose:*

It has been suggested that 15 year olds who are moving towards the autonomous stage of learning in their motor skills have the perceptual maturity, memory recall and capacity to improve their perceptual and decision-making skills in a specific context. The purpose of the research project is to determine from the player's perspective the success of a seven-week, one-hour session per week, decision-based rugby programme implemented by the Canterbury Rugby Football Union (CRFU). It would be helpful to know if the player feels their development in decision-making ability on the rugby field has improved/accelerated due to their direct participation in the CRFU's seven-week intervention programme.

This is a research project towards the completion of my Masters in Management degree at Massey University in Palmerston North. I have selected an open-ended and semi-structured interview technique to allow me to have a deeper insight into the player perceptions and understanding of their decision-making abilities on the rugby field.

#### *Participant Recruitment:*

- ❖ I have coordinated my research method and design with the Canterbury Rugby Football Union (CRFU) through their Rugby Development Officer, Brent Frew.
- ❖ The participants are 15 year old students from Christ College in Christchurch and rugby players in the 2<sup>nd</sup> Fifteen Rugby team.
- ❖ I will randomly select 6 players (3 back players and 3 forward players) from the 14 players participating in the decision-based intervention programme implemented by the CRFU.
- ❖ No control group is required for the purpose of this interview exercise (student assignment).
- ❖ There are no risks to you as a result of being involved in research project, outside of potential injury during participating in rugby skills, drills and activities carried out within the intervention programme.



***Project Procedures:***

- ❖ The data from the interviews and video recordings will only be used for the purpose of the research project outlined above.
- ❖ The data from the interview will be transcribed and included in my research report. It will not be used for any other purpose.
- ❖ The tape-recording of the interview will be stored in a safe locked draw in my office and be disposed of at the completion of the interview process.
- ❖ Total confidentiality and anonymity will be provided to all participants.

***Participant Involvement:***

You will be involved in the interview process pre, midway and post intervention programme as well as mid season and each interview will take approximately 10-15 minutes. The first interview (pre intervention programme) will be conducted in the following way (following interviews will require less procedural time due to familiarity):

- ❖ Introduction – explain the interviewee and interviewer roles during the interview and that the interview will be recorded. (2 minutes)
- ❖ Aim and purpose of the interview and research project and provide copy of the information sheet. (2 minutes)
- ❖ Provide the consent form and request signature before commencing the interview. (1 minutes)
- ❖ Begin the open-ended and semi-structured interview. (10-15 minutes approximately)
- ❖ Debrief – reinforce my contact details so you may contact me at anytime for more information or complete withdrawal from the project. (2 minutes)

***Participant Rights:***

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- ❖ Decline to answer any particular question;
- ❖ Withdraw from the interview;
- ❖ Ask any questions about the research project at any time during participation;
- ❖ Provide information on the understanding that your name will not be used unless you give permission to the researcher;
- ❖ Be given access to a summary of the project findings when it is concluded;
- ❖ Ask for the audio tape recording to be turned off at any time during the interview;
- ❖ You are invited to contact the interviewer/researcher and/or supervisor at any time.

***Committee Approval Statement:***

This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher named above is responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher, please contact Professor Sylvia Rumball, Assistant to the Vice-Chancellor (Ethics & Equity), telephone 06 350 5249, email [humanethicsouthb@massey.ac.nz](mailto:humanethicsouthb@massey.ac.nz).

**Appendix E****Interview Questions**

<b>“Developing decision-making in rugby”</b>	
<b>Pre CRFU Intervention Programme Interview Questions</b>	<b>Date: 4<sup>th</sup> May 2006</b>
<i>Currently how do you think or make decisions on the rugby field?</i>	
<i>What strategies/ways/approaches do you use to make decisions?</i>	
<i>When you have the ball – what are you thinking?</i>	
<i>When your teammate has the ball – what are you thinking?</i>	
<i>When the opposition has the ball – what are you thinking?</i>	
<i>What are you aware of in the environment that contributes to your thinking/decision-making?</i>  <i>Is there anything else you are aware of that contributes to your thinking/decision-making?</i>	

Name: \_\_\_\_\_

Position: \_\_\_\_\_

<b>“Developing decision-making in rugby”</b>	
<b>During CRFU Intervention Programme Interview Questions</b>	<b>Date: 2<sup>nd</sup> June 2006</b>
<i>Has the programme changed the way you think or make decisions? How?</i>	
<i>Do you do anything differently in your other team practices and/or games? What?</i>	
<i>When you have the ball – what are you thinking?</i>	
<i>When your teammate has the ball – what are you thinking?</i>	
<i>When the opposition has the ball – what are you thinking?</i>	
<i>What are you aware of in the environment that contributes to your decision-making?</i>	
<i>Is there anything else you are aware of that contributes to your decision-making?</i>	

Name: \_\_\_\_\_ Position: \_\_\_\_\_

<p align="center"><b>“Developing decision-making in rugby”</b></p> <p><b>Post CRFU Intervention Programme Interview Questions</b> <span style="float: right;"><b>Date: 29<sup>th</sup> June 2006</b></span></p>	
<i>What has the programme done for you?</i>	
<i>What influences your decisions when you play rugby?</i>	
<i>What helps you make decisions?</i>	
<i>When you have the ball – what are you thinking?</i>	
<i>When your teammate has the ball – what are you thinking?</i>	
<i>When the opposition has the ball – what are you thinking?</i>	
<i>Is there anything else you are aware of that contributes to your decision-making?</i>	

Name: \_\_\_\_\_

Position: \_\_\_\_\_

<p align="center"><b>“Developing decision-making in rugby”</b></p> <p><b>Post Intervention Facilitator Interview Questions</b>      <b>Date: 30<sup>th</sup> June 2006</b></p>	
<p><i>What do you think the programme has done for the players?</i></p>	
<p><i>What do you think they have learnt, or not learnt, from participating in the programme?</i></p>	
<p><i>When a player has the ball – what do you expect them to be thinking?</i></p>	
<p><i>When a player's teammate has the ball – what do you expect them to be thinking?</i></p>	
<p><i>When the opposition has the ball – what do you expect them to be thinking?</i></p>	
<p><i>What are the key things that you believe the players have developed during the programme?</i></p> <p>.... on the rugby field?</p> <p><i>Is there any thing that you believe the players have not developed during the programme?</i></p> <p>... on the rugby field?</p>	
<p><i>Is there anything else you would expect them to be aware of that contributes to their decision-making?</i></p>	

Name: \_\_\_\_\_
Position: \_\_\_\_\_

**“Developing decision-making in rugby”**

**Final CRFU Intervention Programme Interview Questions**

**Date: 24<sup>th</sup> August 2006**

<i>What are you doing differently, or not, when you play rugby?</i>	
<i>What helps you make decisions on the rugby field?</i>	
<i>When you have the ball – what are you thinking?</i>	
<i>When your teammate has the ball – what are you thinking?</i>	
<i>When the opposition has the ball – what are you thinking?</i>	
<i>Is there anything else you are aware of that contributes to your decision-making?</i>	
<i>What do you think could improve the programme to help you develop your decision making skills on the rugby field?</i>	

Name: \_\_\_\_\_

Position: \_\_\_\_\_

**Appendix F**

**Video Clips Format**

*NB: The clips on the DVD are in slow motion. Each clip was recorded twice, the second slightly faster. Clips 1a and 1b, 3a & 4a and 3b & 4b, 5a and 5b, 7a and 7b are the same clip used again to illustrate a different example as well as demonstrate multiple applications of skills and strategies being employed at the same time and context.*

**4.1 Perception and Motor Skills**

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**4.1.1 Peripheral Vision**

- Video Clip 1a* - Player S
- Example* - Peripheral Vision

**4.1.2 Perceptual Skills**

**4.1.2.2 Pattern Recognition and Situation Probability**

- Video Clip 2* - Team
- Example* - Team Pattern of Play

**4.1.3 Attention**

**4.1.3.1 Divided Attention**

- Video Clip 1b* - Player S
- Example* - Divided Attention

**4.1.5 Spatial and Tactical Awareness**

- Video Clips 3a & 4a* - Player W
- Examples* - Spatial and Tactical Awareness

**4.1.6 Physical Motor Skills**

- Video Clip 5a* - Player R
- Example* - Push/Pressure Pass, Two Hands, Head Up
  
- Video Clip 6* - Backline
- Example* - Push/Pressure Pass, Two Hands, Head Up
- Video Clip 7a* - Player G
- Example* - Fast Feet and Slow Hands



## 4.2 Tactical Knowledge

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### 4.2.1 Functional Roles

#### 4.2.1.1 Ball Carrier

- Video Clip 5b* - Player R
- Example* - Stress the Defence

#### 4.2.1.2 Support Player

- Video Clip 8* - Player H & G
- Example* - Support Play

#### 4.2.1.3 Defender

- Video Clip 9* - Player L
- Example* - Rock to Bootman position
- Video Clip 10* - Player G
- Example* - Guard Dog to Rock position

### 4.2.2 Player Organisation and Structure

#### 4.2.2.2 Positional Play

- Video Clip 3b & 4b* - Player W
- Examples* - Positional Play
- Video Clip 7b* - Player S & G
- Example* - Positional Play

## 4.3 Communication and Team Cohesion

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### 4.3.1 Intra-communication

- Video Clip 11* - Mid-Backline
- Example* - Intra-communication

## Appendix G

## Data Coding System

Developing Decision-making in Rugby		
<i>Data Codes</i>	<i>Themes</i>	<i>Key Themes</i>
1. Tunnel Vision (TV) 2. Peripheral Vision (PV)	1. Peripheral Vision	<b>Perception &amp; Motor Skills</b>
3. Cue Utilisation (CUE) 4. Pattern Recognition (PR) 5. Situational Probability (SP)	2. Perceptual Skills <ul style="list-style-type: none"> <li>▪ Cue Utilisation</li> <li>▪ Pattern Recognition &amp; Situational Probability</li> </ul>	
6. Selective Attention (SA) 7. Divided Attention (DV) 8. Attentional Flexibility (AF)	3. Attention <ul style="list-style-type: none"> <li>▪ Selective Attention &amp; Attentional Flexibility</li> <li>▪ Divided Attention</li> </ul>	
9. Spatial Anticipation (SP) 10. Temporal Anticipation (TA)	4. Anticipation	
11. Spatial Awareness (SAW) 12. Tactical Awareness (TAW)	5. Spatial & Tactical Awareness	
13. Head Movement (HM) 14. Push/Pressure Passing Technique (PP) 15. Two Hands (2H) 16. L Running (RUN)	6. Motor Skills	
17. Ball Carrier (BC) 18. Support Player (SUP) 19. Defender (D)	7. Functional Roles <ul style="list-style-type: none"> <li>▪ Ball Carrier</li> <li>▪ Support Player</li> <li>▪ Defender</li> </ul>	<b>Tactical Knowledge</b>
20. Organisation (O) 21. Structure (S) 22. Understanding Defence Patterns (UDP) 23. Positional Play (PP)	8. Player Organisation & Structure <ul style="list-style-type: none"> <li>▪ Understanding Defence Patterns</li> <li>▪ Positional Play</li> </ul>	
24. Calling (CAL) 25. Non verbal Communication (NON) 25. Teamwork (TW) 27. Motivation (M) 28. Concentration (C)	9. Intra-Communication 10. Team Cohesion	<b>Communication &amp; Team Cohesion</b>