

The impact of a player scoring system on cognitive, affective and behavioural outcomes of players in a talent identification and development environment

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ABSTRACT

Rule changes in sport are relatively common. They are typically instigated in response to concerns around player safety (e.g., tackle height in rugby), game flow and entertainment (e.g., shot clock in basketball), or to facilitate talent development processes (e.g., reduced team size in junior football). The purpose of this study was to monitor the impact of a modified scoring system created by the Rugby Football Union as a vehicle to shape desired cognitive, affective and behavioural outcomes in a talent development setting. We asked players to describe their learning experiences of the scoring system preceding competition, their approach to the scoring system, and its impact on their decision-making. Key performance indicators (Total Carries, Total Points & Points Per Carry) were collected to monitor player effectiveness across three competitive games. Semi-structured interviews and psychometric scales were used to gain insight into the players learning experiences, feelings, decision making and declarative knowledge. Our findings indicated that players learning experiences affected how well-prepared players felt to perform (affective); the acquisition and use of task-specific declarative knowledge (cognitive); and the effectiveness of players carrying the ball into contact (behavioural).

1. Introduction

Invasion team sports are known to follow a common set of concepts: there must be an opponent to play against, team mates to coordinate with, an opponent's camp to attack, and a home camp to defend (Grehaigne, Godbout, & Bouthier, 1999). Typically, these sports have one common goal, to outscore the opponent, but teams must operate within the boundaries of rules and laws that shape how a game is played (Suits, 1987). The rules are the root cause of problems that must be solved through a permissible menu of tactical, technical, mental and physical solutions (Ashford, Abraham, & Poolton, 2021a; Suits, 1987; Tee, Ashford, & Piggott, 2018). Given there is a clear connection from rules to player behaviour, rule changes in sport are relatively common. They are typically instigated in response to concerns around player safety (e.g., tackle height in rugby), game flow and entertainment (e.g., shot clock in basketball) or to facilitate talent development processes (e.g., reduced team size in junior football).

In short, rules play an important role in shaping the creative solutions players, teams, and coaches use to overcome problems posed by the sport (Arias, Argudo, & Alonso, 2009).

Williams et al. (2005) found experimental law variations (ELV's) introduced by World Rugby (Union) in 1999 resulted in an increase in passes, carries, phases of play and ball in play time. Law variations included restrictions on how defending players were allowed to challenge for possession of the ball following a tackle and the introduction of the 'sin bin', where players are expelled from the game for a ten-minute period following repeated infringements and/or foul play. ELV's were also trialled in professional rugby union in the Southern Hemisphere (Super 14 Rugby) in 2006 (Van den Berg & Malan, 2012). These variations were designed to increase the frequency and effectiveness of player actions (i.e., tackles, carries, passes) and decrease the number of set pieces (i.e., lineout and scrums). Performance analysis of match play found these ELV's to cause increases in tackles made and meters gained, evidenced by large

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effect sizes. Additionally, increases in the frequency of rucks, defenders beaten and passes made, were evidenced by medium effect sizes whilst large effect sizes were found for the reduced number of scrums and lineouts in matches (Van den Berg & Malan, 2012).

Empirical evidence therefore suggests that rule modifications to full competitive games can be engineered to affect positive changes in player behaviour (Montero, Vila, & Longerele, 2013; Van den Berg & Malan, 2012; Williams et al., 2005). While the research cited above was conducted in adult sport, competition is also widely considered as a central mechanism of Talent Identification and Development (TID) systems across sports, especially regarding the prospect of talent selection and perceiving player's characteristics when under competitive situations (Capranica & Millard-Stafford, 2011). Capranica and Millard-Stafford (2011) suggest that those governing youth competition at regional and national levels tend to abide by the main principle of scaling down their sport from adult competition models. Scaling down can refer to alterations of pitch and equipment dimensions, or the reduction of players on each team in order to create an environment that better meets the needs of the players' stage of development. For example, there has been a focus on constraining field size, reducing the number of players and shortening durations of play in soccer under the name of small-sided games across multiple age groups across a pathway (Bennett et al., 2018; Burgess & Naughton, 2010; Fenner, Iga, & Unnithan, 2016; Ortega-Toro et al., 2018; Silva et al., 2016; Unnithan et al., 2012). Findings from these studies have suggested that the modification of pitch parameters, goal size or the number of players on each team has been shown to directly and positively influence the behaviour of the player in possession of the ball, for example, an increase in touches of the ball (Ortega-Toro et al., 2018; Silva et al., 2016; Travassos et al., 2014).

Whilst desirable changes have been found as a result of small-sided games within soccer, this approach to rule adaptation may not be as useful within other team invasion sports. Small-sided games run the risk of removing too much of this important contextual demand thus reducing the reality of the performance environment (Ashford, Burke, Barrell, Abraham, & Poolton, 2020). This is particularly relevant in games like rugby where player numbers and specialist positions are crucial to reproducing reality for players. For example, a small-sided game that encourages more touches on the ball for all players may remove a full back or wingers' capacity to make effective decisions in the backfield.

An alternative perspective to viewing rule changes has been offered by Burton, Gillham, and Hammermeister (2011) who introduced the concept of competitive engineering. This approach is described as the process of modifying a competitive environment by altering a sport's structure, rules, facilities, or equipment to develop desired cognitive, affective and behavioural results. Rather than scaling a sport down from its adult form (Top-Down), it is an attempt to create a format that best meets the intended developmental outcomes (Bottom-Up). As is often the way in professional sport settings, practitioners are implementing ideas without necessarily being aware of academics who are

theorising in a very similar way. This was very much the case for the context providing the basis to this study.

1.1. The Wellington Academy Rugby Festival – An Example of Competitive Engineering

The Rugby Football Union (RFU), England's National Governing Body for Rugby Union, oversees a TID pathway made up of fourteen Regional Academies. Since 2016 all fourteen Regional Academies have attended the Wellington College Rugby Festival for the under sixteen age group.

The Wellington Rules were introduced in 2017 with the aims of engineering an increase of ball in play time, increasing ball movement (pass, offload, kick) and, in turn, increase decision-making opportunities for all players at the festival. In 2019, the RFU developed a player scoring system (See Table 1) intended to engineer players to be more effective in a single moment of the game, carrying the rugby ball into contact (Ashford et al., 2020). This scoring system was in addition to previous rule changes that stayed in place. Gregaigne et al. (2005) suggested that rules within team sports can be broken up into four categories: 1) players rights, 2) modes of scoring, 3) liberty of action and 4) physical engagement. The scoring system was introduced to increase a player's opportunity to elicit i) cognitive outcomes, specifically, players development of task-specific knowledge to perceive and respond to information available whilst carrying the ball; ii) affective outcomes, especially, player confidence in carrying the ball into contact and player understanding of the relevance of the scoring system to their development; and iii) behavioural outcomes, especially, technical and decision-making capability. Therefore, within the context of this TID environment, the scoring system does constitute a rule change (Grehaigne et al., 2005).

We have already reported on the impact of the rules introduced in 2017 (see Ashford et al., 2020). The goals of the rule changes were to increase the number of decisions players needed to make and thus the number of actions they needed to implement. Performance analysis data measuring the duration of ball in play and the number of passes, offloads and kicks per minute, were taken from all matches played between 2016 and 2019. The findings indicated that the introduction of engineered rule modifications resulted in desired increases via the time the ball was in play and ball movement (pass, offload & kick frequency). While this study displayed that competitive engineering aligned with an increase in desired behavioural outcomes, it was also limited by the nature of the observational descriptive nature of the data (Ashford et al., 2020).

While it is clear that rules alter the behaviour of players, how this behaviour change occurs will always be speculative if studies solely rely on descriptive methods to identify objective changes in performance measures (Ashford et al., 2020; Spencer & Brady, 2015; Van den Berg & Malan, 2012). Such methods rely heavily on the deductive reasoning of performance analysts to code behaviour and make sense of their observations (Spencer & Brady, 2015; Van den Berg & Malan, 2012). This approach overlooks the cognitive and behavioural impact of rule modifications from the players perspective (Clarke, Cushion, & Harwood, 2018; Messner

& Musto, 2014; Piggott, 2010; Pitchford et al., 2004; Weissensteiner, 2015). Weissensteiner (2015) has strongly articulated the need for sincerity in research design by incorporating inductive analysis of youth athlete perspectives (Tracy, 2010; Tracy & Hinrichs, 2017). By doing so, findings will generate more holistic coverage of a topic and uphold Brunswick’s (1956) concept of representative design. In sum, there is a need for descriptive research to be augmented by research that gives the participant a voice. For example, Johnstone and Morrison (2016) interviewed professional and semi-professional rugby league players to compare levels of game understanding and the perceptual capacity. The participants response to game images by eliciting descriptions and representations of the cognitive processes they would use when perceiving game information. Their findings highlighted that the professional group relied on pre-existing task-specific knowledge to inform their perceptual strategies, whilst lower-skilled players were driven by the information presented in the task. This finding is well corroborated by past studies with similar designs (e.g., Johnstone & Morrison, 2016; Lex et al., 2015; Mulligan, McCracken, & Hodges, 2011). Therefore, players who possess higher levels of task specific knowledge tend to actualise their knowledge in the game more effectively to make better decisions (Ashford, Abraham, & Poolton, 2021b). In giving players a voice, insight into the knowledge and cognitive processes underpinning decision making and player behaviour can be gleaned (Gleeson & Kelly, 2019; Johnstone & Morrison, 2016; Macquet & Kragba, 2015; Mulligan, McCracken, & Hodges, 2011).

While there is good reason to capture the cognitions of players with respect to the way they play a game, there is evidence to suggest that cognitions may not always be facilitative. Poolton et al.’s (2004) ‘rules for reinvestment’ suggest that the more task-specific knowledge players accrued during acquisition of skill the more likely they were to draw on this knowledge under pressure. With regard to the cognitive process of decision-making, the Decision-Specific Reinvestment Scale (DSRS) is a validated

means of capturing a tendency to consciously process decisions and to reflect on past poor decisions (Kinrade, Jackson, & Ashford, 2010; 2015). Furthermore, Poolton, Maxwell, and Masters (2004) modelled the relationship between task specific knowledge of a technical skill (a golf putt) and scores on the original Reinvestment Scale validated by Masters, Polman, and Hammond (1993).

Thus, the purpose of this study was to monitor the impact of the Wellington Festival engineered scoring system on cognitive, affective and behavioural outcomes through the voice of the player. To achieve this aim, the following research objectives were considered; (i) to consider the player’s perceptions of their Regional Academies approach to the player scoring system; (ii) to identify the individual player’s approach to the scoring system; and (iii) explore the impact of the scoring system on player decision-making.

2. Methods

2.1. Background Information and Preparation for Teams At 2019 Festival

The festival in 2019 lasted a week, with games played on Day 1 - Matchday 1 (2 x 42-minute games); and Day 6 - Matchday 2 (1 x 70-minute game). Six weeks before the festival, each Regional Academy was sent documentation with the regulations and expectations regarding the scoring system (See Table 1 for description of scoring system). Supporting videos were also sent to enhance clarity of understanding. Furthermore, the academies were informed that the scoring system would be trialled two weeks before the Wellington festival at smaller regional festivals. Finally, each Regional Academy analyst was educated on how to score players against the above criteria using SportCode Elite software (SportsCode Elite, V11, Hudl, Lincoln, Nebraska, United States of America).

Table 1: Player scoring system used at the 2019 Wellington Academy Rugby Union Festival

Points Awarded	Description of Action
1 point	Footwork before contact
2 points	Fend (hand-off); leg drive; change in speed into contact
3 points	Fight to work on the floor; hands through to make offload ¹
4 points*	Effective ball carry/make a line break

Note: *Players could score a maximum of 4 points per carry when at least one action (footwork, fend or fight) led to an effective ball carry or line break.

¹ In reference to this third point, players needed to demonstrate a fight in contact following the point of the tackle. Examples include; leg drive in contact, fighting the hands through the opponents tackle to create an offload opportunity or rolling on the floor to improve the presentation of the ball.

2.2. Participants

Ethical approval was granted for this study through Leeds Beckett University and the RFU. All fourteen Regional Academies were approached to take part in the Study on day 1 of the festival. 4 Regional Academies consented to take part, however due to time constraints only three completed the full data collection process. From these academies, players who were injured or ill on Matchdays were excluded. All players were approached to volunteer for a semi structured interview, yet due to the time allocated by the RFU and the busy schedule for each Regional Academy, there was only scope to interview 3 players from each team. In total, 9 players volunteered to take part in a single semi-structured interview on Day 4 of the festival (Age $M = 15.70$ years, Years playing $M = 9.40$ years). Table 2 indicates the positions played during the Wellington Festival of those interviewed. For the quantitative data collection procedure, all 87 players consented to take part (Age $M = 15.75$ years, Years playing $M = 8.21$ years), comprising 30 players from Team 1 (Age $M = 15.73$ years, Years playing $M = 8.37$ years), 26 players from Team 2 (Age $M = 15.81$ years, Years playing $M = 8.00$ years) and 31 players from Team 3 (Age $M = 15.71$ years, Years playing $M = 8.23$ years). As per the RFU's regulations, players within each Regional Academy were given equal game time across the three fixtures.

Table 2: Positions played at the 2019 Wellington Festival by took part in the semi-structured interview.

Player	Team 1	Team 2	Team 3
Player 1	Prop	Prop	Hooker
Player 2	Hooker	Full-back	Fly-half/Centre
Player 3	Centre	Fly-Half	Wing/Full-back

2.3. Semi-structured Interviews

A semi-structured interview guide was developed and refined in connection with each of the research objectives. The guide consisted of core open-ended questions that targeted the core themes of the study; (i) player's perceptions of their Regional Academies approach to the player scoring system (i.e., how did your coaches prepare you for the demands of the modified scoring system?); (ii) player approach to the player scoring system (e.g., what would you say is the most important take home message from the scoring system? How did you feel coming into the festival knowing you were being scored on your effectiveness whilst carrying the rugby ball?); and (iii) the impact on player decision-making (i.e., Could you talk me through the scoring system? Was the scoring system in your mind when you were making decisions?). Follow-up probes and prompts were planned for and used to allow expansion on key points (Patton, 2002). Interviews took place in a quiet space two days after the first matchday (i.e., Day 3). An information sheet and pre-briefing encouraged the players to reflect on their feelings and experiences

of the modified scoring system during Matchday 1. The first author conducted each interview which lasted 15-25 minutes and were audio recorded for subsequent analysis. All players were informed that their answers would be anonymized and not used for selection purposes before giving consent to take part.

2.4. Performance Analysis

In the 2019 Wellington Festival, Regional Academies played two games of forty-two minutes on Matchday 1 ($N = 6$ games) and one game of a seventy-minute duration on Matchday 2 ($N = 3$ games), on full size pitches and following the Wellington rules introduced in 2016 (Ashford et al., 2020). Every game was recorded by a video camera placed on the halfway line. The RFU used SportsCode Elite software (SportsCode Elite, V11, Hudl, Lincoln, Nebraska, United States of America) to analyse the performance indicator (PIs), frequency of carries for each player. The RFU requested that the performance analysts of individual teams also collect data for each player ($N = 87$) on the number of carries and number of points scored for each carry (see Table 1) for all games played ($N = 3$ games per team). From this, Total points and Total Carries for each player were computed as dependent variables, and player scores were normalised by calculating a Points Per Carry score ($PPC = \text{Total Points} / \text{Total Carries}$) which denoted the Key Performance Indicator (KPI). To assess the reliability of the data, the first author conducted analysis for 1 game for all three Regional Academies (Chronbach's Alpha; Total Carries = .98 & Total Points = .95).

2.5. Decision Specific Reinvestment Scale

Each player ($N = 87$) completed the Decision Specific Reinvestment Scale (DSRS, Kinrade et al., 2010). This scale comprises 13 items that measure an individual's propensity to engage conscious processing in decision-making (Decision Reinvestment, 6 items) and to reflect on past poor decisions (Decision Rumination, 7 items). Participants rated each item on a 5-point Likert scale from 0 (extremely uncharacteristic) to 4 (extremely characteristic). Players were asked to complete the DSRS with reference to the scoring system and the task of carrying the ball into contact. The scale was completed within the 48 hours following the first matchday of the festival.

2.6. Data Analysis

All interviews were audio recorded and transcribed verbatim. The first author read each transcripts numerous times to ensure familiarity and understanding (Taylor & Collins, 2019). Thematic data analysis was conducted using qualitative software (QSR NVivo12) to code player responses into meaningful units (Sparkes & Smith, 2014). Units were then further organised into higher and lower order themes employing an inductive approach initially which was then followed by a deductive approach (Macquet & Kragba, 2015; Taylor & Collins, 2019). Themes aligned to the prescribed themes of the interview: (i) players perceptions of their Regional Academies approach to the scoring system; (ii) player approach to scoring system; and (iii) the impact

on player decision-making. To ensure ‘rich rigour’ in our approach, the final author acted as a critical friend and consistently challenged the first authors interpretation of the data (Taylor & Collins, 2019; Tracy, 2017). Where disagreements occurred, discussion followed until mutual agreement was met.

One aim of this study was to understand how each Regional Academy approached the scoring system from a tactical and developmental point of view. As such, to ensure resonance in our approach, comparative quantitative analysis was driven by the qualitative findings (Smith & McGannon, 2018; Tracey & Hinrichs, 2017). Inductive analysis of semi-structured interviews demonstrated themes that were clearly reflective of team-based differences in approach to how the scoring system had been introduced to the players. Therefore, to triangulate the findings most effectively quantitative data analysis tested for between team differences (Tracey & Hinrichs, 2017). Firstly, we confirmed the assumption of parametric testing were met. Then, independent-samples t-tests were conducted to explore differences between each Regional Academy (with Bonferonni adjustments to protect against Type I error). The t-tests included Total Points, Total Carries, PPC, Reinvestment and Ruminations scores (0.05/3 between-team t-tests, $p < .014$). Effect sizes (Cohens D) were also be calculated. All statistical analysis was ran through SPSS (Version 16.0, IBM Corp. in Armonk, NY).

3. Results

3.1. Interview Data

In comparing the four Regional Academies, four higher-order themes were extracted from the analysis: players learning experiences; feelings towards the scoring system; knowledge of the scoring system; and impact of the scoring system on decision-making. Table 3 breaks down each higher order theme into lower order themes, with raw data examples provided for each.

3.1.1. Player Perceptions of Their Regional Academies Approach to the Scoring System

Learning experiences. Players from Team 1 reported receiving the RFU documentation and supporting videos through their Regional Academies online system. Each player also gave reference to the warm-up regional festival, where the player scoring system was trialled, with Player 3 stating “So, we all knew what we had to do”. Player 2 reported that a coach-led discussion occurred, and the players acknowledged that they had developed a base knowledge of the scoring system but described that their coaches believed they could already satisfy the requirements of it in performance. Whilst players from Team 1 acknowledged what was required in reference to the scoring system, each player describes that no preparation really took place. Players from Team 2 recounted that their training had been formed of small-sided and conditioned games in the six weeks leading up to the festival, where coaches held players accountable to the scoring system throughout. Additionally, each player from Team 2 referred to their coaches use of the online system as a reflective tool. Players described how coaching staff uploaded videos of training

alongside considered reflective methods to shape their learning experiences. Finally, each player from Team 2 detailed the benefit of receiving specific feedback from coaches toward the player scoring system, both positive, through praise, and negative, through corrective feedback allowing them to shape a clear understanding of what would be deemed ‘successful’.

Players from Team 3 expressed that they did not know about the scoring system until they arrived at the Festival. Player 1 from Team 3 reported having frequent conversations with coaches considering his effectiveness whilst carrying the ball into contact. He described these interactions as ones separate from the scoring system, where coaches instead focused solely on the technical and tactical feedback:

“So, instead of running directly into the player the aim was to get me to run into space so that’s been on my mind through the games so far. They showed it to me as a weakness.”

Our analysis of the interview data indicates that players from Team 1 were given complete information provided by the RFU regarding the modified scoring system but no opportunity to prepare. Conversely, players from Team 2 described being given multiple experiences of the scoring system in the lead-up to the festival. In addition to the RFU documentation, their players described learning within small sided and conditioned games; online review sessions; group discussions; and coaches use of specific feedback all in reference to the player scoring system. Finally, each player from Team 3 described that they had not received the documentation sent by the RFU and were not aware of the systems introduction until arriving at the festival.

3.1.2. Player Approach to Scoring System

Feelings toward the scoring system. Players from Team 1 described mixed feelings towards the scoring system. Player 3 indicated feelings of excitement as he felt that carrying was a strength of his, whilst others reported feelings of worry and nervousness before they played. Player 2 described negative feelings of confusion, as he did not understand the purpose of the scoring system. Players from Team 2 shared positive feelings towards the scoring system, expressing that they had feelings of confidence and focus heading into games. Players also gave reference to an awareness of how important the scoring system was for their player development. Players from Team 3 shared contrasting feelings towards the scoring system. Player 1 gave insight into how his coaches had identified his ball carrying ability as a factor that could prevent his future player development. In addition, he suggested that once he had arrived at the festival he developed feelings of worry, as his perceived weaknesses were now placed under increasing scrutiny. Conversely, Player 2 recalled that he had tried to push the scoring system from his mind completely, whereas Player 3 described positive feelings towards the scoring system, suggesting that his confidence had increased after noticing a clip of himself demonstrating an exemplar ‘4-point carry’ in the school café after Matchday 1.

Table 3: Player reflections on the introduction of a Player Scoring System at the 2019 Wellington Academy Rugby Festival.

Prescribed themes	Higher-order themes	Lower-order themes	Raw data examples
Regional Academy approach to scoring system			
Team 1	Learning experiences (8)	Online resource (RFU)	“We all got sent the video from the RFU and I watched it. I think I only watched it once.”
		Group discussion	“We talked about it once but didn’t actually go into any specifics about what it would look like. I don’t think we got any specific coaching or training before we came. I think it was maybe a tool to see how we adapt to it once we got here.”
		Playing in warm-up festival	“Before, our warmup festival – something like that. So we had that as a bit of a warm up. So we all knew what we had to do.”
		No preparation	“We didn’t prepare really, we just got sent this stuff on our online system, with the videos and PDF of what the scoring system would be from the RFU”
Team 2	Learning experiences (19)	Small-sided games	“We had in training some conditioned small-sided games, which obviously in training we had a point for each of the 4 f’s in little conditioned games.”
		Specific feedback by coaches	“The coaches gave plus and minus points in games which gave you a clear indication and knowledge that if you make a wrong decision you know the reason why.”
		Online resource (coach)	“Videos and scores were posted online so we could interact and comment on them. They had tagged little sections and clips where we had taken the right option in order to score highly.”
		Group discussion	“Started trying to implement it within games because we’d been talking through it in training about ‘what is it that makes a good example of that’. So, we’d developed a clear understanding of that over time then were able to implement it into the game.”
Team 3	Learning experiences (10)	No information provided	“They didn’t particularly prepare us for the scoring system particularly, I didn’t really know about it until I saw it on the screen once we got there.”
		Specific feedback by coaches	“It was bought up to me at the end of training and also when I was driving with them to a training session.”
		Group discussion	“Yep, I was trying to run into space and after went up to my coaches and we spoke about how effective it was”
		Online resources (player)	“Yes, erm I was definitely looking at footwork drills, and also watching loads of clips of positive examples both of myself and professional players”

Player approach to scoring system				
Team 1	Feelings toward the scoring system (9)	Excitement	“Excited, knowing there was a score system for the carry that was a real positive thing for me as it’s a strong area of my game.”	
		Nervousness & worry	“With the added scoring systems, I was definitely nervous. Yeah I was pretty nervous”	
		Focussed	“Instead of overloading myself I just needed to focus on a few, by watching some videos of myself and watching what I do normally.”	
		Confusion	“I didn’t really know what it meant. I didn’t know if you’d win games through that, or you’d be registered, or if you’d be looked more favourably upon by England selectors etc.. If you did those things, I wasn’t really sure”	
Team 2	Feelings toward the scoring system (11)	Focussed	“I feel like it’s added a variety when we’re making decisions so, if you implement all those 4 F’s you’ve got a really strong basis to beat the defender and make decent amount of yards.”	
		Confident	“But I would use these skills already, but can polish off certain things where I can make more metres or more of an impact.”	
		Reflection on personal development	“You can absolutely tell why it makes a huge difference – as it leads to a direct linebreak. You can obviously see that it’s not just me or us – it benefits everyone.”	
Team 3	Feelings toward the scoring system (8)	Nervousness & Worry	“I felt like it’s been an existing problem, and I’ll be honest I haven’t really wanted to face it as the way I’ve done it has always worked.”	
		No feelings	“Erm, I didn’t really think to much about it if I’m completely honest. Pretty much just thought about playing normally to be honest.”	
		Reflection on personal development	“I think the point system is a really good way to develop players for the game. Because when you’re on the field, you know you’re being video and then you see yourself up on the video’s in the café and you want to see like have you got the four points, it shows what you did and the F’s you did and then the impact it had on the wider game.”	
Player decision-making				
Team 1	Knowledge of scoring system (3)	Full description	“So, fight, fend, footwork and forward leading to an offload/linebreak.”	
		Impact of scoring system (10)	Conscious processing	“It has changed how I feel I make decisions. As I’m not really looking to like smash or bump off, it’s more like playing into space and getting the ball away.”
			Reduced options	“I think I was never really looking for the offload, as I think if I was consciously looking for the offload, I would have made more mistakes probably”

	More reactive	“Yeah definitely, I wasn’t pre-planning as much, and was more playing what was in front of me.”		
	Ignorance	“I think I just ended up pushing it out of my mind.”		
	Worry	“Because I was worried that I wasn’t running hard enough. I had too many things on my mind at that time, so I couldn’t get myself into the right position to be effective.”		
Team 2	Knowledge of scoring system (9)	Full description	“Fight, fend, footwork & forward.”	
		Importance	“It’s all about when, where and why. So, it’s one point for footwork, so footwork gets you into space for a 2 vs 1 so this can create an opportunity for you. There’s fend and fight was situational as it would earn you an extra point like if it was the fend got you out of the tackle then that would get you an extra point on top of the one. Or the fight as well, if you were going to be jackalled or turned over then you roll and you would get another extra point for that.”	
	Impact of scoring system (10)	Conscious processing	“I always think when I’m making decisions but I think that in the decision I think the scores make you think more about the process and what you actually should do in certain situations to be successful.”	
		Staying relaxed	“But you do have to try and stay relaxed whilst making decisions as it’s just so fast.”	
		Plan of action	“Our preparation for the point scoring just highlights that if you use them we’ll score and play much better, it doesn’t over flood you because you already know how to do it, so you can plan for it.”	
		More reactive	“The ball was, their defence came up really quite quick, so I had to like think fast so all I thought was I had to take this in, didn’t have time to think.”	
		More options	“I think if someone says they’re going to run at the line, but then they’re equipped to say I’m going to run at the line put some footwork on, put the ball into my left hand and fend with my right. It’s just about how we do things.”	
	Team 3	Knowledge of scoring system (3)	Full description	“Footwork, fight, fend, forward.”
			Importance	“So really it’s just educating us on having better awareness to keep our eyes up and scan the field constantly for space to work to.”
		Impact of scoring system (10)	Conscious processing	“Obviously, it was always on my mind, but I don’t think that was a negative.”
Focussing on previous mistakes			“I’d say there’s a restriction in my head if I’m doing it again saying try not to mess it up as you did before.”	
Plan of action			“Yes footwork will have an influence on my go forward in future especially when I look back and reflect on my performance.”	

Note: Numbers in brackets denote number of times players from each team referred to the higher-order theme

In sum, player descriptions from Teams 1 and 3 indicate mixed feelings toward the player scoring system. Whilst players from Team 2, described feelings of confidence, focus and a clear understanding of why the scoring system was beneficial for their player development.

3.1.3. *Player Decision-making*

Knowledge of the scoring system. Irrespective of Team, all players could list the parameters of the player scoring system and recite what points would be awarded for. Players from Team 3 described that they had had to gain understanding of the scoring system by watching videos shown in the café that had been uploaded by the RFU. Instead, players from Team 2 built on their descriptions of the parameters of the scoring system and described why certain actions should be used depending on the game situation to receive a higher score.

Impact of the scoring system on decision-making. Seven out of the 9 players (2 Players from Team 1; 3 Players from Team 2; 2 Players from Team 3) described increases in conscious processing of task-specific information in relation to the scoring system. Players recalled moments of the game where they had consciously processed game information in relation to the scoring system which resulted in a positive outcome. For example, players identified how the language used in the scoring system triggered the conscious recall of an appropriate action. Furthermore, players identified examples where the scoring system influenced a change away from actions that had previously been deemed as ‘typical’ responses. Player 2 from Team 3 shared an example where increased conscious processing had resulted in a mistake by reference to the scoring system. He described feeling ‘restricted’ in future actions through worry of making similar mistakes. Whilst Player 2 from Team 1 recalled attempting to ignore the scoring system altogether.

All three players from Team 2 and Player 3 from Team 3 describe how they had used knowledge of the scoring system to shape plans of action that formed clear intentions for performance; for example, Player 2 (Team 2) recounted how he intended to use footwork before contact initially to create space. Players who described clear intentions for their performance recounted having

an increased number of options available to them as they carried the rugby ball, which they suggested allowed them to be more reactive. In addition, Player 2 from Team 2 highlights how the scoring system allowed him to stay relaxed in attempt to better respond to match information. However, Player 3 from Team 1 shared a contrasting experience. He highlighted that the scoring system exposed a weakness in his game, which then prevented him from attempting certain actions through worry of making mistakes.

In summary, all players had knowledge of the parameters of the scoring system, but only players from Team 2 expressed a deeper knowledge of why specific actions were more appropriate for certain game information. Seven of the nine players described increases in conscious processing of task-specific information in relation to the scoring system. Furthermore, players from Team 2 universally described that knowledge of the scoring system had led to the development of clear plans of action and an increase of options available to them whilst carrying the ball. However, increases in options did occasionally lead to negative outcomes when players had limited time to decide. The perceptions of players from Teams 1 and 3 regarding the impact of the scoring system on their decision-making were mixed, some described similar experiences to players from Team 2, whilst the remainder indicated that the scoring system increased focus on past mistakes or was ignored altogether.

3.2. *Quantitative Data Analysis*

Descriptive and statistical analysis of the performance analysis data are reported in Tables 4 and 5, respectively. Taken together the analyses of performance showed that Team 1 made significantly more total carries than Team 2, and marginally more total carries than Team 3. Total carries made by Team 2 were significantly less than those made by Team 3. Moreover, Team 1 had a higher total point score than both Team 2 and 3, who did not differ. The resultant points per carry for Team 1 were greater than for Team 3, but significantly less than for Team 2. Points per carry for Team 2 were also greater than those for Team 3.

Table 4: Performance analysis and Decision-Specific Reinvestment Scale data for the three participating teams (Mean represents average per player, per game).

	Team 1		Team 2		Team 3	
	Mean	SD	Mean	SD	Mean	SD
Total Carries	11.53	7.17	5.23	3.44	8.52	4.57
Total Points	24.73	19.94	12.19	8.13	11.16	5.52
Points Per Carry	1.86	.81	2.38	.70	1.37	.39
Reinvestment	12.97	4.11	16.23	2.39	15.74	3.43
Rumination	16.23	4.78	14.96	4.39	16.13	6.37

Table 5: Between-team comparisons of performance analysis and Decision-Specific Reinvestment Scale data.

	Team 1 vs Team 2		Team 2 vs Team 3		Team 1 vs Team 3	
	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>	<i>p</i>	<i>d</i>
Total Carries	.001*	1.12*	.003*	.81	.05	.50
Total Points	.004*	.83*	.58	.15	.001*	.93*
Points Per Carry	.013*	.69	.001*	1.79	.004*	.76*
Reinvestment	.001*	.97*	.53	.17	.006*	.73*
Rumination	.30	.28	.43	.20	.94	.02

Note: * Denotes significant differences ($p < .014$) and large effect sizes ($d > .80$)

Tables 4 and 5 also present the descriptive and statistical analysis of Decision Specific Reinvestment Scale data. Taken together the analyses showed that Team 1 had significantly lower Reinvestment scores than both Team 2 and 3, which did not significantly differ. No between-team differences were shown for the Rumination factor.

4. Discussion

Carefully engineered rule modifications that re-shape a sport can cause desirable changes in player behaviour (Arias, Argudo, & Alonso, 2011; Ashford et al., 2020; Burton, Gillham, & Hammermeister, 2011). The primary aim of this study was to monitor the impact of an engineered scoring system on cognitive, affective and behavioural outcomes by exploring player perceptions. This aim was underpinned by the consideration of three research objectives; (i) to consider player’s perceptions of their Regional Academies approach to the player scoring system; (ii) the player’s approach to the scoring system; and (iii) the impact of the scoring system on player decision-making. A triangulation of methods were employed in data collection, using qualitative measures to garner the perspective of the players, psychometrics to capture decision-making thought processes and descriptive measures to monitor the impact of the scoring system on player effectiveness.

4.1. Player Perceptions of Their Regional Academies Approach to the Scoring System

Themes from the analysis of interview data demonstrate that each Regional Academy approached the introduction of the player scoring system differently. Players from Team 1 indicated that no formal preparation occurred for the scoring system outside of the original resources released by the RFU. Furthermore, one player recalled being told by coaches that their performance in the carry were at an acceptable level to be scored highly throughout the festival without preparation. Alternatively, players from Team 3 described that their first introduction to the scoring system was on arrival at the Wellington Festival. Conversely, players from Team 2 indicated they were given substantial amounts of support and

preparation for the scoring system by their coaches. Players described receiving on-field learning experiences through small-sided and/or conditioned games, and off-field learning through online video review opportunities in the six weeks leading into the festival. Research exploring the adoption of small-sided games (Bennett et al., 2018; Burgess & Naughton, 2010; Caso & van der Kamp, 2020; Fenner, Iga, & Unnithan, 2016; Ortega-Toro et al., 2018; Silva et al., 2016; Unnithan et al., 2012) and conditioned games (Caso & van der Kamp, 2020; Davids et al., 2013; Silva et al., 2014a; Silva et al., 2014b) have demonstrated improvements in tactical awareness and technical development, if the games are designed appropriately. Players recalled how coaches created multiple feedback opportunities within games that aided their development of task-specific knowledge, their application of knowledge and their technical ability to score highly. These experiences suggest that players were aware that their coaches manipulated the rules of training games, so consequences would emerge from the parameters of the game itself (i.e., not using footwork before contact) and provide specific corrective feedback relative to the scoring system (Chow, 2013; Cushion et al., 2011; Passos et al., 2008).

The type, frequency, and specificity of feedback have been identified as clear characteristics of a coach’s effectiveness in generating appropriate learning environments for player development (Cote et al., 2009; Horn, 2008; Erickson & Cote, 2016). Researchers have also suggested that reflective forms of off-field learning can positively shape and influence player knowledge, behaviour, effectiveness and decision-making (Bar-Eli, Plessner & Raab, 2011; Richards, Collins, & Mascarenhas, 2017; 2012). Players from Team 2 provided multiple examples where they had received specific praise and corrective feedback (Cushion et al., 2011) in relation to the scoring system online. Players recalled accessing clips of training footage where coaches had deliberately offered positive and negative examples of carries and scores for them to interact with. It is possible, that players from Team 2 had developed a collective understanding, shaped through a well-constructed shared mental model of performance because of these learning opportunities (Richards et al., 2012; 2017). Therefore, it is likely that the different learning experiences provided, or not provided, by each Regional

Academy have resulted in contrasting levels of task-specific knowledge.

Our findings demonstrate evidence of the relationship between preparation, task-specific knowledge and performance (Johnstone & Morrison, 2016; Lex et al., 2015; Mulligan, McCracken, & Hodges, 2011). Reinvestment scores indicate that the probability of players using knowledge to consciously process information in relation to the scoring system, was significantly higher for Team 2 (and for Team 3) than Team 1 (Kinrade, Jackson, & Ashford, 2010; 2015). This is reflective of the learning experiences provided by each Regional Academy extracted from interviews. At the same time, performance analysis indicated that the Points Per Carry for Team 2 was greater than the other teams.

Interestingly, Team 1 had the highest number of Total Points and Total Carries. Given the apparent lack of focus on the player scoring system and confidence from the coaches that their players 'would score well' it is probable that carrying was a prominent feature of their game plan coming into the festival. Of greater note to us, therefore, were the PPC scores. The points system was introduced to bring a focus to important perceptual-cognitive-motor elements of this crucial part of the game (Capranica & Millard-Stafford, 2011; Fenner, Iga, & Unnithan, 2016; Unnithan et al., 2012). Within a TID setting at this level one would expect a focus on developing the finer points of game awareness and skill. This requires players to try new actions to hone their skills for the future game. A combination of both qualitative data here suggests only one team, in this circumstance, focused on this process. Interpretation of the Regional Academies approach to the scoring system suggests that coaches within TID environments should not only use on-field and off-field strategies to develop the actions and intentions of their players, but go further to consider how they develop their understanding and task-specific knowledge of why intentions and actions are appropriate in given match situations (Anderson, 1982; Ashford, Abraham, & Poolton, 2021; Bar-Eli, Plessner, & Raab, 2011; Richards, Collins, & Mascarenhas, 2012; 2017).

4.2. *Player Approach to the Scoring System – Affective Responses*

Player descriptions of feelings towards the scoring system were both positive and negative and seemed to be partially dependent on their experiences in preparation for and at the festival. Some players from Team 1 expressed feelings of worry, nervousness and confusion. Similarly, players from Team 3 described feeling a lack of confidence of scoring well against the system, alongside feelings of worry. The worry described by players may have reduced self-efficacious beliefs (Bandura, 1989), self-confidence (Vealey et al., 1998) and could have led some to instances of ruminative behaviour (Kinrade, Jackson, & Ashford, 2010; 2015). Although no differences were found between the teams' Rumination scores, interpretation of individual player recollections suggest that ruminative behaviour may have occurred on an individual basis. Furthermore, this is likely to have been as a result of preparation for the scoring system being left to the autonomy of the individual in both teams. Analysis of interview responses provide evidence that when coaches disregard preparation for technical and tactical solutions when

modified rules are introduced, players may develop negative perceptions towards it (Taylor & Collins, 2019).

That said, Player 3 from Team 3 expressed feelings of increased confidence toward the scoring system after one of his carries from the warm-up festival was uploaded onto the highlights reel in the café as an exemplar. Furthermore, Player 1 from Team 1 harboured excitement, as he perceived ball-carrying to be a strength of his. Such descriptions suggest that those who believed they would score highly had an increased efficacy towards the scoring system (Bandura, 1989).

Players from Team 2 recounted feelings of focus, confidence and increased understanding of why the scoring system was beneficial for their long-term player development. The commonalities in the feelings shared by Players from Team 2 may demonstrate the development of psychological skills in reference to the scoring system. The feelings expressed demonstrate the players' ability to focus, be self-aware and self-evaluate, which have been defined as key psychological characteristics and skills essential for talent development (Dohme et al., 2019; MacNamara, Button, & Collins, 2010a; 2010b). Collins and MacNamara (2017) have suggested that psychological characteristics are transferable across domains and contexts. Therefore, it is plausible that players may also operationalise these characteristics and skills in areas of the game external to the scoring system.

4.3. *Player Decision-making*

All players were able to recite the parameters of the scoring system and how they would be scored. However, only players from Team 2 built on this. They described how information driven by the game situation would dictate why a decision to act was more appropriate than others. Anderson (1982) suggests that people not only require the development of procedural knowledge to perform (i.e., what to do and how to do it), but must also develop declarative knowledge to better understand why it is important/appropriate given the situation (Anderson, 1982; Ashford, Abraham, & Poolton, 2021; Johnstone & Morrison, 2016). Themes extracted from player interviews and Reinvestment scores offer the suggestion that increased declarative understanding developed in training could develop player's likelihood to consciously process game information (Kinrade, Jackson, & Ashford, 2010; 2015; Poolton et al., 2004).

Seven players described moments where conscious task-specific knowledge of the scoring system allowed them to retrieve effective memory representations during performance. A player from Team 2 recounted how terminology used within the scoring system triggered conscious processing of information when carrying the ball. Whilst taking contact he claimed to have realised that he was not making any ground, which stimulated a memory representation through the term 'fight'. This triggered a rapid selection of suitable actions to score effectively. Similarly, a player from Team 1 highlighted that before the festival he had always looked to use his size to 'bounce' defenders away whilst taking contact. Here, the player seems to recall the breaking of a well-established heuristic (Jackson et al., 2006; Raab & Laborde, 2011). Consequently, conscious processing of game information in reference to the scoring system may have allowed for a

diagnosis that resulted in the selection of an adaptive course of action of passing the ball to his teammate (Macquet, 2009; Macquet & Kragba, 2015). This indicates a relationship between improved task-specific knowledge of the game and the conscious processing of game information to make adaptive decisions (Ashford et al., 2021b; Collins, Collins, & Carson, 2021; Johnstone & Morrison, 2016).

Recent research has suggested that player learning capabilities and strategic thinking can be enhanced (Price et al., 2019; 2020). Player recollections from Team 2 frequently include instances of reflection and sense making of their decision-making process. These instances present evidence of deliberate strategic thinking, problem solving and metacognitive activity in reference to the scoring system, which are likely to have been a consequence of the learning experiences provided by their Regional Academy coaches (Price et al., 2019; 2020). Price and colleagues (2019; 2020) have suggested that coaching staff should aim to establish player development programmes that foster players' metacognitive ability. In this case study, the support provided by coaches in Team 2 may have promoted their players' metacognitive processes preceding, during and following performance.

Team 2's PPC scores and interview responses offers evidence that improved memory representations may facilitate their players to form suitable plans of action that enhanced their capability to effectively operate in dynamic game environments (Ashford et al., 2021b; McPherson & Vickers, 2004). McPherson and Vickers (2004) suggest that action-plan profiles support players to develop clear intentions for performance, such as intending to use footwork to find space between two defenders (Macquet & Fleurance, 2007). Furthermore, these players indicated that well-formed intentions created 'more options' for them to perceive before executing a ball carry. Subsequently, player descriptions imply that the scoring system has increased the landscape of information available for the player to act on (Ashford et al., 2020; Ashford, Abraham, & Poolton, 2021a).

Despite this, players from Team 2 also expressed that they became more reactive to game information whilst making decisions. Ashford, Abraham, and Poolton (2021b) suggested that Professional and University Rugby Union players are consistently required to make sense of in-game information in consultation with their knowledge of the game. So, if new information arises, such as an opposing player showing unexpected (or atypical) behaviour, their conscious knowledge will need to be updated (McPherson & Vickers, 2004). Using the communal language Ashford, Abraham and Poolton (2021a) recently developed for decision-making in team sports, players interviewed from Team 2 may be using knowledge of the game to update knowledge in the game where player's use game information to update memory representations to make effective decisions (Ashford et al., 2021b). However, players from Team 2 recounted both positive and negative experiences of this. Thematic analysis indicated that these experiences were dependent on the time available to process information with reference to the scoring system. When time was available, player's recall conscious processing of information resulting in successful outcomes. Whereas, when time was limited,

players describe attempts to consciously process information as impractical as the opportunity to decide had already passed.

Individual players from both Team 1 and 3 stated that they deliberately tried to remove the scoring system from their mind. Such an approach is common among humans making decisions in moments of uncertainty (Lipshitz & Strauss, 1997). However, when considered through the lens of TID, a tendency to suppress moments of uncertainty from consciousness may be a hindrance to a player's development. Evidence suggests that players being able to face uncertainty is essential in progressing along the rocky road to elite status (Collins & MacNamara, 2012; Taylor & Collins, 2019). Therefore, coaches should deliberately shape learning opportunities for players to face and develop appropriate responses to moments of uncertainty rather than an instinct to suppress.

5. Practical Implications and Conclusions

Our results suggest that the introduction of the player scoring system influenced player behaviour with regards to decision-making and actions, and the effectiveness of both whilst carrying the rugby ball into contact. However, the extent of the scoring system's impact appeared to be shaped by players perceptions of their Regional Academy's approach to its introduction to the 2019 Wellington Academy Rugby Festival. The triangulation of inductive and deductive thematic analysis alongside performance analysis measures suggest that the players' learning experiences shaped their decision-making and effectiveness whilst carrying the ball. According to the players interviewed from Team 2, they received substantial on-field and off-field support from their coaches, which seemed to affect their confidence and focus on the scoring system. Our interpretation of interview data is that these players developed their task-specific declarative knowledge (Anderson, 1982; Johnstone & Morrison, 2016); their capability to develop action-plan and current-event profiles, before and during performance (Ashford et al., 2021a; McPherson & Vickers, 2004), and showed an increased conscious awareness of the scoring system during performance (Macquet & Kragba, 2015; Raab, 2003). In contrast, players from the other two teams apparently received limited coaching support in relation to the scoring system. This seemed to manifest feelings of worry, concern, nervousness and confusion, which may have transcended into the performance of carrying the ball into contact (Kinrade, Jackson, & Ashford, 2010; Kinrade, Jackson, & Ashford, 2015; Kinrade et al., 2010) in some, but not all, of the players in these teams.

The findings highlight the role of the coach in supporting talented players to navigate rule modifications designed to influence learning and performance. This seems to be effective when coaches support players' understanding of the key performance indicators and why they have been developed. Furthermore, and building on this understanding, coaches should support players' development of declarative knowledge about what the requisite skills look and feel like in action, within an environment that offers opportunity for experimentation (Price et al., 2019; 2020). If players understand why specific actions are appropriate given a game situation it is likely to improve the

relationship between game information and their selection of an action (Anderson, 1982). Finally, interpretation of the findings imply that this understanding in such an environment seems to have helped players avoid feelings of worry, confusion, decision-rumination and task avoidance. In light of this, the findings of this study offer support for those presented in Ashford et al.'s (2021b) study exploring players decision making behaviour, as on multiple occasions players described the conscious processing of information for decision-making and shared examples of memory representations (Johnstone & Morrison, 2016; McMahon & McPherson, 2009). Additionally, players recognised that when time was limited, conscious processing of information led to undesirable results.

Some of the players in this study recalled deliberate attempts to suppress the uncertain proposition of the scoring system, and thereby, avoided adapting their behaviour accordingly. From a psychological point of view, players are confronted with feelings of uncertainty on a frequent basis in TID environments (Collins & MacNamara, 2012; Taylor & Collins, 2019). This would suggest they have not had the opportunity to develop skills, in this instance, in an environment that promoted experimentation with the rule changes. The sort of environment we are advocating here supports players to first acknowledge and then navigate their way through moments of uncertainty (Lipshitz & Strauss, 1997). Coaches can deliberately plan to coordinate moments of uncertainty for players in training, for instance, asking a defending team in a conditioned game to behave in a way that would be deemed atypical by the attacking players. Specific coach behaviours (e.g., instruction, questioning, feedback) could then be actioned to assist the player's acknowledgment of uncertainty and support the generation of an effective technical and tactical solution (Cushion et al., 2011; Muir et al., 2011).

This study was a first attempt to provide broad coverage of the impact of rule modifications on team player behaviour through a competition within TID environments (Tracey & Hinrichs, 2017). In exploring player perceptions, by use of interviews and psychometrics, alongside performance analysis measures, the approach taken in this study enabled the triangulation of descriptive and qualitative findings and deeper understanding of the subject (Clarke, Cushion, & Harwood, 2018; Messner & Musto, 2014; Piggott, 2010; Pitchford et al., 2004; Weissensteiner, 2015). Giving players a 'voice' (Piggott, 2010; Weissensteiner, 2015) exposed talent development academies influence on the cognitive, affective and behavioural outcomes realised by a player scoring system. Specifically, the learning experiences provided appeared to effect how prepared players felt to perform (affective); the acquisition and use of task-specific declarative knowledge (cognitive); and the effectiveness of players carrying the ball into contact (behavioural). That being said, the study did not give the players' coaches a 'voice' to explain their approach to preparing players for the rule modification specifically, and player decision-making in general. The study of how coaches coach decision-making in talent development environments may form part of a more holistic study of team player decision-making, which might also consider the influence of the variables of decision time and complexity (Gleeson & Kelly, 2019; Macquet & Kragba, 2015).

Conflict of Interest

Each author should reveal any conflict of interest. If there are no conflict of interests please state, "The authors declare no conflict of interests".

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