An Exploration of the Existence and Development of Shared Understanding between Football Dyads.

By

Michael Kevin Malone

School of Social and Health Sciences

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Declaration

I, Michael Malone, hereby certify that this thesis submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy (PhD), Abertay University, is wholly my own work unless otherwise referenced or acknowledged. This work has not been submitted for any other qualification at any other academic institution.

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Acknowledgements

Abstract

The purpose of this programme of research was to investigate the existence and development of shared understanding between football dyads through quantitative and qualitative research methods. Research has considered the importance of shared understanding between team members (Williamson and Cox 2014, Gershgoren et al. 2016) but rarely dyads within teams (i.e. Blickensderfer et al. 2010). *Study One* attempted to establish the existence of shared understanding between twenty football dyads. *Study Two* explored the levels of shared understanding displayed by forty-five defensive football dyads in game situations that had either a clear correct course of action or when there was no clear correct course of action. Through an interview-based approach, *Study Three* investigated potential factors that could contribute to the development of shared understanding between football dyads, based on the suggestions of twelve football players. Through these different methods, the three studies have provided evidence to support the existence and development of shared understanding between football dyads. The main findings of the thesis (a) shared understanding exists between dyads who have experience performing together, (b) when dyads are in a situation where there is a clear and correct option available, they are more likely to choose the same option based on their own individual experience, (c) when dyads are in a situation where there is no clear and correct option available, they are more likely to pick the same option based on their experience performing together, (d) experience performing together, having an efficient relationship with their partner, effective communication methods between one another and the role of the coach facilitated the development of shared understanding between dyads and (e) these factors facilitate an effective shared mental model between dyads.

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Chapter 1 – The Importance of Performing Specific Roles to Achieve an Effective Performance

This chapter will introduce the relevance of the chosen research field for this PhD. This section will investigate two examples of underdog successes in football. These were Greece winning the European Championships in 2004 and Leicester City winning the English Premier League in the 2015/2016 season. This chapter will consider the importance of team members performing their individual roles and having an understanding of other team members were able to achieve their unexpected success. It will focus on the importance of the team members being able to work together in own sub-teams based on their unique roles. In this chapter, there will be an evaluation of the importance of sub-teams with emphasis on a team's ability to have their sub-teams work together to achieve an effective overall team performance.

1.0 Underdog Success in Football

Many sports fans are fascinated by the idea of an underdog team being able to overcome expectations (Allison and Hensel 2012). There are various occasions where football teams - who did not have the most skilled team in a competition - have defied expectations and managed to be successful. The two examples of this feat are Greece winning the European Championships in 2004 and Leicester City winning the English Premier League in the 2015/2016 season. The two scenarios demonstrated that teams who do not perhaps have the best or most talented individuals, can still achieve success even though they are classed as an 'underdog.'

An underdog team can be described as a team who are at a disadvantage to their opponent and are widely expected to lose (Vandello, Goldschmied and Richards 2007). McGinnis and Gentry (2009) also theorise that even though a team is classed as an underdog, they can still achieve success against teams who are considered far superior. Therefore, it is worth examining some of the underlying factors that may have contributed to the success of the chosen two teams who managed to 'upset the odds' and achieved success in an unexpected way.

1.0.1 Greece – Euro 2004 Championship Winners

The Greek men's national football team managed to win the European Championships in 2004 (Carmichael and Thomas 2005) even though according to BBC Sport (2004) there were 'more talented' and higher ranked teams in the competition. Prior to winning the European Championships in 2004, Greece had only appeared in just two major tournaments, the 1980 UEFA European Championship and the 1994 FIFA World Cup, and failed to win a game in either (UEFA 2004a). This suggests that Greece were not regularly in the European Football Championships and had not been successful in the few tournaments that they took part in. Reimer, Park, and Hinsz (2006) state that Greece caused a huge upset with this victory even though they had never won an international soccer tournament before 2004.

Unlike the teams expected to perform well based on their high-achieving individual members, Greece's 2004 football team displayed expertise not as obviously attributable to each of the individual team members (Williamson and Cox 2014). For example, Greece outperformed previous European Championship winners and tournament regulars like Spain - who had qualified 9 times - (UEFA 2012a), Holland - who had qualified 6 times - (UEFA 2012b) and Italy - who had qualified 6 times (UEFA 2012c). Therefore, it was a monumental achievement for Greece to win this

tournament, especially considering some of the top teams that they played on their way to winning the European Championships in 2004 (UEFA 2004b) and based on their entire history in the tournament (UEFA 2004a).

For instance, Greece beat Portugal twice – once in the group stages and once in the final (UEFA 2004b). These were the only two defeats Portugal had in the entire tournament (UEFA 2004c) by a team who were ranked 30th – before the start of the tournament - in the FIFA World Rankings (FIFA 2017) and had the second lowest coefficient in the tournament (BBC Sport 2004). For Greece – who were the ranked as the second worst team in the European Championships (BBC Sport 2004) – to win the competition was an unbelievable achievement, especially considering the players which they had in their squad at the time.

Most of the Greek squad played in the Greek National League with a few players playing in the top leagues in Europe; most notably Stelios Giannakopoulos of Bolton Wanders (World Soccer 2004) who signed for them on a free transfer in 2003 (BBC Sport 2005). Williamson and Cox (2014) went as far to suggest that some of the Greek players were not even regular members of the starting team for their domestic teams. Whereas Portugal had individuals who were important players in some of the best teams in Europe at the time i.e. Luís Figo of Real Madrid – who cost Real £37.2 million in 2000 (Wilkinson 2017) - and Deco who was signing for Barcelona after the tournament from Porto (Sky Sports 2016a).

These transfer values suggest that Portugal should have performed far better than Greece in this competition, as they had a far superior set of individuals in their squad. However, Greece managed to win the competition even though they started the tournament as 80-1 outsiders (Szreter 2004). An important question to resolve is how

did Greece, who did not have the 'most talented' players in their squad manage to win the European Championships in 2004?

1.0.2 Leicester City - English Premier League 2015/2016

A more recent footballing example was Leicester City managing to win the English Premier League in the 2015/2016 season. At the beginning of the season, Leicester's odds of winning the league were 5000/1 and were one of the favourite teams to be relegated, never mind win the league (Angell, Bottomley and Doyle 2016). Similar to Greece in 2004, Leicester City did not have the most expensive or well-known players in their team. For example, four years ago Jamie Vardy, their top goal scorer, was playing for Fleetwood Town in the Vanarama National League (the 5th tier of English football); Riyad Mahrez – the player who managed the most assists for Leicester - was playing for Le Havre reserves, and Marc Albrighton – who played in every league match (Premier League 2016) - was deemed surplus to requirements at Aston Villa, the Premier League's worst side in the 2014-2015 season (Hill 2016).

However, these players became a crucial part of the team for Leicester City's title win last year in relation to scoring and creating many opportunities for scoring goals. For instance, top scorer Jamie Vardy scored 24 goals – the division's top scorer, Riyad Mahrez obtained 11 assists in the 2015-2016 season (Stanton and Jackson 2016) and Marc Albrighton started 34 games in the league and came on as a substitute in the other 4 Leicester City (Premier League 2016), meaning that he played in every one of Leicester's games that season. Gandy (2016) stresses the unlikelihood of this outcome by suggesting that the fact Leicester City were supposed to be in a relegation battle that season, not challenging for and winning the title. These statistics showed how these three players - who were not household names previously - managed to be crucial members of the Leicester City team. So how did a team who finished 15th in the English

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Premier League in the season before manage to overcome so many teams in the league who appeared to have better individuals in their squads?

So, what do these two examples seem to have in common, that allowed the underdog to triumph? One theory which would explain both team's achievement is that they did not rely on several highly talented but individualistic team members, each with their own egos' and motivation's but instead both Greece and Leicester City had members in their squad who despite being individually less talented, worked together effectively in order to achieve their success. Carmichael, Thomas and Ward (2000) state that if members of a team are able to work effectively together, the team will be able to produce an effective performance. This suggests that the players in these two teams combined their individual skills to create an effective performance rather than rely on talented individuals. Beal, Cohen, Burke and McLendon (2003) support this suggestion and propose that team members who work together effectively instead of relying on the individual skills of a few players is how teams are able to demonstrate an effective team performance.

For instance, the defenders in both teams had to be able to work with each other with their midfielders and attackers to stop the opposition scoring (i.e. all the players working together to provide defensive cover for each other). This would make both teams difficult to break down as in this situation; all the team's players were focused on stopping the opposition scoring and reducing the amount of space and chances that the opposition would have to score. The success of this is evident as Greece only conceded 4 goals in 6 games (UEFA 2004d) and Leicester City conceded 36 goals in 38 games (Sky Sports 2016b). These example demonstrates how the team members of both Greece and Leicester City worked together in order to achieve their own victory as

underdogs and as Sheard and Kakabadse (2004) state, it is crucial for team members to work together in order to achieve an effective performance.

1.1 The Importance of Working as a Team

McGinnis and Gentry (2009) propose that members of an underdog team are able to beat far superior sides if they all work effectively together. This suggests that teams whose members that can work together will be able to achieve success (Allison and Hensel 2012), regardless of how good the individuals of the opposition are. For instance, as suggested above Leicester City has players in their team who were deemed surplus to requirements to teams like Aston Villa. However, in summer prior to the start of the 2015-2016 season most of the teams who were expected to be challenging for the league spent vast sums of money in the transfer market. Chelsea spent £21.4 million on Pedro and £17.7 million on Abdul Rahman Baba, Manchester City purchased Kevin De Bruyne and Raheem Sterling for £54.5 million and £49 million, Liverpool bought Christian Benteke for £32.5 million and Roberto Firmino for £29 million and Manchester United had spent £36 million on Anthony Martial and £27.9 million on Mephis Depay (Sky Sports 2016c). These players were signed by these clubs to improve an already far superior team than the squad of players that Leicester possessed as they were challenging for the league title.

However, Leicester City's most expensive summer signings in 2015 were striker Leonardo Ulloa (£8 million) and midfielder N'Golo Kanté (£5.6 million) and were purchased to improve their squad from the previous season. Their most frequent team during the 2015/2016 season cost them around £22 million (Tanner 2016) which is less than what Chelsea spent on Pedro (Sky Sports 2016c) and at most Leicester City were only expected to stay in the division. The variance in spending between the teams at the

expected title challengers and Leicester City shows the different ambitions of the different teams, making Leicester's title win even more extraordinary in the 2015/2016 season. This suggests that even though Leicester did not possess the most expensive or talented individuals, they managed to overcome teams who were expected to be challenging for the league.

This example shows that if teams are able to work effectively together, they will be able to be more successful that teams who possess more expensive or more talented individual players. Salas and Fiore (2004) theorise that an effective team is expected to have members that perform together rather than relying on the sum of the individuals' performance. Eccles and Tenenbaum (2004) support this suggestion and propose that players who are able to work together effectively, and perform effectively together to be able to achieve team goals. This success was achieved even though teams like Greece in 2004 and Leicester City in the 2015/2016 season, did not have to have the 'most talented' teams i.e. Greece were ranked the fifteenth best team out of all the teams prior to the commencement of Euro 2004 (BBC Sport 2004) and Leicester City's most expensive signing in the summer transfer window of 2015 was Shinji Okazaki for £9.35 million (Tanner 2016). This showed that teams could achieve unexpected success with players who are perceived to be less talented against an opposition team with more talented individuals.

Blickensderfer, Reynolds, Salas and Cannon-Bowers (2010) suggest that this is possible for teams who have members that are able to work together are more likely to be able to produce a successful team performance. De Vries (1999) and Fiore, Salas, and Cannon-Bowers (2001) specify the importance of the interdependency between team members and suggest that this can facilitate a better team performance. Beauchamp, Bray, Eys and Carron (2002) defines interdependence as multiple people

having to work together to be able to complete a specific task. For instance, there were fifteen games where Leicester City did not concede a goal (clean sheets) in the year they won the English Premier League (Sky Sports 2016b) would not have been possible if their defenders were not able to work together and with the rest of their team to stop the opposition scoring goals. Therefore, it would be worthwhile to look at how this interdependency is possible.

Benson, Eys, and Irving (2016) theorise that teams who are able to perform their own role and work together are able to produce a better team performance. Beal et al. (2003) suggest that in professional sport, cooperation between team members as a whole rather than the individual technical skills of each single player is how teams are able to be successful. This supports the suggestions made in the previous section, lower quality teams who work more effectively together can be more successful than teams who are perceived to possess better quality players but who do not work together (McGinnis and Gentry 2009).

Mach, Dolan and Tzafrir (2010) suggest that the ability to work together is facilitated by the team member's ability to be able to work together and establish their interdependent roles. For instance, even though the Greek National team and Leicester City did not possess the best individuals, their ability to work effectively together facilitated their unexpected success. When considering the number of goals Leicester City scored in the 2015-2016 season – sixty-eight goals in thirty-eight English Premier League games (Sky Sports 2016d) - they managed to demonstrate this ability to work effectively together. For example, Leicester had two players in the top five goal scorers in the league (Eurosport 2016) and had four players in the top twenty players with most assists in the league (ESPN 2016). However, in order to achieve this, a number of players had to perform their own role effectively to make this happen. Gershgoren et al.

(2016) state that successful team performance is able to occur when all team members work together and carry out their specific role. For instance, Leicester City's defence and goalkeeper had to minimise the number of goals they conceded and give the ball to more attack minded players like Riyad Mahrez and Danny Drinkwater in order to create chances to score.

If the defenders did not work effectively with each other or more attacking players, they would not have been able to stop opposition teams from creating chances. In addition to this, they would have been unable to play the ball into more attacking players, meaning that Leicester City would have not had as many chances to score goals and win games. This would have resulted in them being in a much lower position at the end of the season due to players not working effectively together. Therefore, this example demonstrates the importance of team members working together effectively, performing specific roles in the team in order to be able to create a successful team performance.

1.1.1 Performing Specific Roles within a Team

Teams that have members that are able to work together are able to do so based on players having individual roles and utilising their own skills (Reimer et al. 2006). Ericsson, Charness, Feltovich and Hoffman (2006) state that in order to have the knowledge of how to perform a certain skill or role, they must have practice in order to perform correctly. For instance, within a football team each player has their own role to perform in order to ensure the appropriate functioning of that team. Carmichael et al. (2000) suggest that certain players in a team have a specific role within a team based on their abilities. For example, if a player is more accurate at shooting, they are more likely to play in a more attacking role within the team. This would be because in more attacking roles, they are more likely to be able to get opportunities to shoot. Benson at

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al. (2016) state that each team member's role within a team is crucial because if specific team members fail to perform their role effectively, team performance will suffer.

Below is a Diagram (Figure 1.0) and Table (Table 1.1) outlining one of the most common formations in football – according to Norris and Jones (1998), Vigne et al. (2010), Bradley et al. (2011) – and the roles and responsibilities for each player in a 4-4-2 formation and why they are important to the team. The 4-4-2 formation has a specific structure, individual roles and responsibilities of each player. Norris and Jones (1998), Hai-yu and Zhong-xin (2005), Marziali, Marziali and Mora (2002), Brillinger (2010), Dooley and Titz (2010), Vigne et al. (2010) bring these together in Figure 1.1 and Table (Table 1.1).

Figure 1.1 – A football team with a 4-4-2 formation.

4-4-2	Goalkeeper	Defenders	Midfielders	Attackers
No. of Players	1	4	4	2
Roles - Central Players	No. 1 – Goalkeeper. Directly stop opposition from scoring goals and give the ball to outfield players.	No. 4 and 5 - Centre Halves. Stop the opposition from scoring goals and to get the ball to more attacking players.	No. 7 and 8 - Central Midfielders – Provide cover for the defence, receive the ball from the defence and play the ball to attacking players or support the attackers.	No. 9 and 10 – Forwards. Receive the ball from the defence or midfield. Also, press the ball when opposition defence have possession.
Why?	Stop the opposition from scoring goals and to give outfield players the ball to start an attack.	Stop the opposition from scoring and to give their team members the possession of the ball to start an attack.	To stop the opposition team from scoring and give their team members the possession of the ball to further progress and attack. Also, to help their team score a goal.	To create chances to score goals. Also, force the opposition players to make a mistake to win back possession of the ball.
Roles - Wide Players	N/A	No 2 and 3 – Full Backs. To stop the opposition from scoring goals and to get the ball to more attacking players. Also, to provide	No 6 and 11 – Wide Midfielders. To receive the ball from the defence and to either play the ball to more attacking players or support the attackers.	N/A

		support midfielders and attackers.		
Why?	N/A	To stop the centre halves being exposed and without cover against the opposition's wide players. Also, to give their team members the possession of the ball to start an attack or support an attack themselves.	To stop the centre midfielders being exposed and without cover against the opposition's wide players. Also, to give their team members the possession of the ball to start an attack or support an attack themselves.	N/A

Table 1.1 – A summary of the structure, roles and responsibilities in a 4-4-2 formation in football.

For example, a defensive ('holding') midfielder's role within a football team in a 4-4-2 formation is to offer extra cover for the defensive line and to try to win possession of the ball in their area (See Table 1.1). If they win the ball, they pass it up to the attackers who try and score. However, if these holding midfielders do not perform their specific role the team and are caught too far forward, the team will be unbalanced and not perform as efficiently. Humphrey, Morgeson and Mannor (2009) also theorise that if there are team members who are not able to perform their role effectively, other team members will be unable to perform their own role as well and the level of team performance will decrease.

For instance, if the holding midfielders are too far forward, the defensive line will not have the cover that these holding midfielders would provide (See Table 1.1). This would result in the opposition having greater space in front of the defence, giving them more opportunities to score and will increase the chance of the opposition winning. This scenario would demonstrate players in the same team not working together and allow for a poor team performance. Benson et al. (2016) support this example by suggesting that team members who do not perform their roles effectively can help their opposition to perform better. Therefore, these examples explains the importance of team members being able to perform their role in order to facilitate team success.

Carmichael et al. (2000) state that both effective defending and attacking skills are required in order to achieve an efficient team performance. However, having team members who perform their role effectively is a characteristic that could attribute to the success of the team members of Greece and Leicester City. For example, both these teams had defenders who performed their roles to stop opposition attackers from scoring (i.e. Greece conceded four goals in six games (UEFA 2014) and Leicester City conceded 36 goals in 38 games (Sky Sports 2016d)). This showed that the defenders in

both teams worked together to win back and retain possession of the ball and give the ball to more attacking players to create chances to score goals.

This resulted in a goals scored per games ratio of 1.2:1 for Greece (UEFA 2014) and 1.8:1 for Leicester City (Sky Sports 2016d). This scenario meant that games could be won more easily as defenders in both teams were not conceding many goals and attackers were scoring goals (i.e. defenders and attackers were working together as a team by performing their own roles). However, this could also have been facilitated by members of these teams having an understanding of each other's roles in addition to their own as Marks, Sabella, Burke and Zaccaro (2002) theorise that this scenario facilitates team member's ability to be able to perform effectively together. For example, Greece's defenders would have to know that their attackers would be looking to get the ball from them once the win back possession from the opposition. This suggests that defenders and attackers in both these teams would had an understanding of each other's roles in order to work together.

1.1.2 Understanding Other Team Member's Roles

Reimer et al. (2006) propose that effective teams have members who have an understanding of each other's roles and this allows them to be able to work together more effectively as part of the team. Mathieu et al. (2000) suggest that it is possible for team members to use their knowledge of each other's roles to help them choose their actions. For example, two centre halves could use the knowledge of their fellow defender's roles in order to perform effectively together in a 4-4-2 formation. One of the centre halves would know that the right back is likely to go towards an attacker who is dribbling with the ball down their side (See Table 1.1). The centre half could use this knowledge to be positioned closer to the right back in case they are beaten by the opposition attacker to provide extra defensive cover. This would demonstrate an

appreciation of other team member's roles which Marks et al. (2002) states that this leads to a better team performance.

If the defender in this situation was not focused on working with their fellow defender, the attacker – if they got past the full back – would have an easier chance to shoot at goal as there would be more free space for them to run into as the centre half had not provided cover (See Table 1.1). Blickensderfer et al. (2010) supports the suggestion that team members should have an understanding of other team member's roles in order to facilitate a better team performance. This theory could also support the suggestion that these 'underdog teams' - Greece and Leicester City - had an understanding and appreciation of other team member's roles.

For example, Riyad Mahrez would have to know attacking players like Jamie Vardy's roles in the Leicester City team in order to provide them with 11 assists (Stanton and Jackson 2016) for scoring goals. However, in order to create chances, Mahrez would have had to know where to be in order to receive the ball from the team's defenders and that the defenders would stop the opposition scoring. Araújo and Davids (2016) stress the importance of team member's having an understanding of each other's roles as they are able to use their knowledge of the roles which their team members in order to work together effectively.

This could explain why both teams conceded so few goals and winning so many matches in in the European Championships in 2004 – conceded 4 goals in 6 games (UEFA 2014) - and the English Premier League 2015/2016 – conceded 36 goals in 38 games (Sky Sports 2016d). Both team's ability to perform their roles effectively and have an understanding of other team member's roles facilitated their effective team performance, demonstrating the importance of team members working together. For

example, since Greece only conceded four goals in six games (UEFA 2014), this shows that the defenders successfully performed their roles and stopped the opposition from scoring goals.

However, in order to win matches, the Greek attackers had to also score goals i.e. seven goals in six games (UEFA 2014) as well as conceding so few goals. This demonstrates that both attackers and defenders had their own roles to perform and work together to contribute to the overall success of the team. In order for the attackers to score goals for example, they needed to work with the defenders and have a knowledge of each other's roles in order to get possession of the ball (See Figure 1.1). In addition to this, these teams also had members that had focus for achieving the team's shared goals which Gully, Incalcaterra, Joshi and Beaubien (2002) suggest are achieved when team members work effectively together.

1.1.3 How a Shared Team Focus relates to the Team's Shared Goals

One of the most important characteristics of working as part of a successful team is that each member will have a similar focus on attempting to achieve team goals. Marks, Zaccaro and Mathieu (2000) suggest that teams require members who share a similar focus to be able to achieve shared goals. Mohammed and Dumville (2001) suggest this to be important because if individual team members have different focus, they will not be able to work together as effectively. For example, this could be seen in a team that is winning a match 2-1 and there are only a few minutes left. The attackers in the team could be trying to score an extra goal when the rest of the team were trying to retain possession of the ball and keep the lead. However, if the attackers keep trying to score they may lose possession of the ball and give the opposition the chance to score. If conflicting focus exists between the one team, the attackers will not be able to offer defensive cover and increases the chance that the opposition may score. Therefore,

Mohammed and Dumville (2001) stress the importance of team members sharing a similar focus in order to be able to perform successfully together. For instance, a football team's overall goal could be to win matches by scoring as many goals as possible. Barron (2003) and Van den Bossche, Gijselaers, Segers and Kirschner (2006) suggests that teams are required to have share similar thoughts in order to be able to work together. For example, team's members must share a similar focus of winning games to facilitate their ability to work together to be able to score more goals than the opposition.

DeChurch and Mesmer-Magnus (2010) further propose that if team members use their own individual skills together they are more likely to be able to achieve team goals. For instance, in order to score goals, strikers would have to work with other players. This could be seen at Leicester City when they won the Premier League last year. For example, Jamie Vardy Scored 24 goals in 38 games however, he would have not scored as many if it was not for players like Riyad Mahrez (11 assists) or Danny Drinkwater (7 assists) contributing with assisting goals (Stanton and Jackson 2016). This example demonstrates the importance of team members working together to achieve team goals. However, if the Leicester City defence did not perform their role and stop the opposition scoring, Vardy might not have received the ball as much and presumably would not have scored as many goals. Beauchamp, Bray, Eys and Carron (2003) stress that if team members do not understand or cannot perform their role, team performance will suffer. This suggests that all team members were required to share a similar focus and work towards achieve their team's shared goals. Therefore, whether team members are defenders or attackers they should perform their own specific roles and their focus should all be towards achieving their team's shared goals (i.e. winning matches). Gabbett (2006) suggests that a coach can influence the team member's ability

to work together however, Bradley and Hebert (1997) and Ericsson (2003) propose that team members themselves have the biggest influence on their ability to work together. Even though underdog teams like Greece in 2004 and last season with Leicester City have to have team members working all together in order to achieve team goals, these teams can be broken down into sub-teams within the team. Correia et al. (2011) suggest this because there are a variety of differing roles within a team, sub-teams are essential to allow the functioning of the team.

For instance, the role of the defenders in a team of are to stop attacker from scoring whereas this role is not as important for other players such as a striker (See Table 1.1). For the central defenders in this sub-team, this is their focus of their role however, the wider defenders – the fullbacks – are expected to defend and attack. This would suggest a sub-team within the defensive sub-team as both full backs would have to work together to attack and defend in addition to working with their centre halves i.e. one could push forward if the other one covered in order to not leave the defence exposed. Silva et al. (2013) support this suggestion and propose that sub-teams provide a crucial role within a team's ability to perform effectively together. These defensive sub-teams for example, would be performing their own specific roles and contribute to the defensive and attacking roles and overall functioning of the team (See Table 1.1).

1.2 Sub-Teams

1.2.1 What are Sub-Teams?

Correia et al. (2011) state that teams are made up of several different sub-teams based on team member's positions. This is because teams require members to perform a wide variety of roles in order to function effectively together (Reimer et al. 2006). For instance, in football there are a number of defensive and attacking roles which need to

be performed and since there are a number of players in the team, Cruickshank and Collins (2012) suggests that sub-teams are formed with the focus on a specific role e.g. an attacking sub-team trying to score goals and an attacking sub-team trying to stop the opposition from scoring. According to Vilar et al. (2013), members of a sub-team, belong to a team where there are clear objectives and membership, but they exhibit interdependence that is unique to the team.

For example, in a 4-4-2 formation, there are three sub-teams and they are the defence, midfield and attack with their own specific roles within them (See Table 1.1). As suggested above, the defensive sub-team can be split into two (i.e. the centre halves and the full backs). The centre halves are required to stop the opposition attackers from scoring in their defensive role and they have to get the ball to the full backs, midfielders or attackers. Whereas the full backs do have to stop the attackers from scoring and give the ball to more attacking players – like the centre halves – but their role also requires them to get possession of the ball and dribble forward into winder attacking areas. Silva et al. (2013) supports this suggestion by stating that players of similar positions (i.e. defenders like centre halves and full backs) sometimes are required to do different tasks based on their role in the team, even though they share specific roles like stopping the opposition from scoring.

1.2.2 How Sub-Teams Function

Sub-teams are important for an effective team performance because each role within a team contributes to a team's ability to be able to perform well together (Marsh, Richardson, Baron and Schmidt 2006; Duarte et al. 2012). Cruickshank and Collins (2012) suggest that in order to achieve an effective performance, sub-teams have to perform their specific roles. For example, two strikers can be classed as a sub-team in a 4-4-2 formation (See Figure 1.0) and if they want to be successful, they would benefit

from working together to perform their roles in order to facilitate a better team performance. One of the main requirements for these players is to create opportunities to score goals. However, to be able to do this, they would depend on other sub-teams within their team (i.e. central and wide midfielders). Bourbousson, Sève and McGarry (2010) theorised that different roles within a team depend on several sub-teams. In relation to the example of the two attackers, they would require several sub-teams within their team in order to be able to create opportunities to score goals. For instance, in order to score goals, the attackers must have support from their midfielders who would supply them with the ball in a 4-4-2 formation (See Table 1.1). However, the midfielders would not have possession of the ball if the defenders in the team did not stop the opposition from scoring. This example stresses the importance of separate sub-teams working together in order to facilitate team performance. According to Mumford, Van Iddekinge, Morgeson and Campion (2008), team members must have an understanding of each other's roles in order to perform effectively together.

The two strikers in this situation would have to be able to work together to score goals and Austin (2003) suggests that they would use their knowledge of the other striker in order to facilitate their ability to work together. For example, both strikers would have to know how their partner would react in situations in order to be able to work together effectively. Salas et al. (1999) also supports this by stating that team members who have an understanding of what each other will do should be able to perform better together. In this scenario, in order to perform effectively together, both strikers would need to know this information. For instance, they would need to know which player was more likely to go and challenge for a header and what attacker is quicker and better for running in behind the opposition defence.

This demonstrated that attacking sub-teams benefit from having an understanding of each other's roles. Blickensderfer, Cannon-Bowers, and Salas (2000) suggest that team members who have an understanding of others' roles are able to combine their skills to be able to perform effectively together. Having this knowledge is also important between multiple sub-teams to be able to create an effective team performance. For example, it would be important for the midfielders to know which striker is quicker so they would be play a pass over the opposition defence. Therefore, sub-teams are crucial parts of any team and if they understand each other's roles, each sub-team are able to perform their own role; resulting in an effective team performance. As suggested by Correia et al. (2011) and Silva et al. (2013) sub-teams are a crucial component of effective sporting teams and their individual roles are important to the team's ability to function. However, be would important to look at the characteristics of effective sporting teams in order to fully understand and evaluate the contribution that different sub-teams can make to an effective team performance.

1.3 Chapter Summary

Chapter 1 looked at the importance of performing specific roles to achieve an effective team performance. This chapter firstly explores two cases of underdog teams in recent football history – Greece winning the European Championships in 2004 and Leicester City winning the Premier League in the 2015/2016 season. These examples were used to evaluate the importance of team members working together to be able and performing their own specific roles and having an understanding of their team members to achieve their unexpected success. Finally, this section will assess the notion of sub-teams, why they are important and how they function within teams.

Chapter 2 summarises the field of literature in the relevant research areas. The differences between a group and a team were evaluated in order to establish what

characteristics that are required for successful and effective teams. Once this had been

decided, the importance of team cohesion and effective methods of communication to

team members being able to coordinate their performance. After this has been

examined, the importance of shared knowledge between team members and how crucial

shared understanding between team members is to effective team performance. This

chapter has explored how a shared mental model is able to facilitate shared

understanding between team members and the importance of team members possessing

an effective shared mental model.

Chapter 3 (Study 1) focuses on demonstrating the existence of shared

understanding between football dyads through an effective shared mental model.

Through a quantitative approach, this study explores the existence of shared

understanding displayed between dyads. Through percentage of similarity – using

Ickes's scale (2001) – it was possible to explore dyad's shared understanding. This

provided data where dyads were able to demonstrate their shared understanding in

relation to different factors. These included experience performing together (actual

dyads compared to randomly paired players), experience in the position played (players

in their typical position compared to their atypical position) and the amount of time to

make a decision (strict time limit compared to no time limit).

Chapter 4 (Study 2) is centred on the ability of dyads to make a coordinated

decision. Through a quantitative methodology, it was possible to explore the level of

shared understanding displayed by dyads of football defenders - through percentage of

similarity - based on their ability to pick a coordinated action. This approach allowed

for data to gathered for two different types of game situation; one in which there was a

clear correct course of action and ones where there was no clear correct course of

action. This method provided information of how dyads could analyse different

situations based on their shared understanding. It suggested there were different knowledge structures drawn upon in different situations. These were based on individual knowledge of the game (years performing in the sport) and the knowledge of the dyad working together (years playing in the sport together).

Chapter 5 (Study 3) considered the opinions of football players on the development of shared understanding between football partnerships. Using an interview based approach; it investigates how the players felt that shared understanding developed between them and their partner throughout their relationship. Through using a qualitative methodology, potential factors for developing shared understanding between football dyads were gathered. Findings suggested that there are a number of potential factors that could contribute to the development of shared understanding between dyads. These included experience performing together, effective methods of communication and the coordination of performance.

Chapter 6 summarises the findings of the previous three studies. It discusses the results of the research and considers the importance of shared understanding between football dyads in relation to its existence as well as the suggestions of how it develops. Finally, it discusses future research directions that can be followed based on these three studies in order to provide a better understanding of this topic.

Chapter 2 – An Assessment of the Importance of Shared Understanding in Team Sport

This chapter will outline and evaluate the relevant literature in the chosen research field and provide justification for the following three studies by providing a knowledge base of the relevant information in the area. This section will consider the differences between a group and a team, team cohesion, effective methods of communication between team members, implicit coordination, shared understanding between team members and shared mental models.

2.0 The Differences between a Group and a Team

Groups are described by Beauchamp, Maclachlan and Lothian (2005) as highly complex entities within which members are able to contribute various psychological attributes based on their personality characteristics (i.e. how they work with others and their focus to completing a task and how they prefer to function). Brannick, Roach and Salas (1993) and Carron and Hausenblas (1998) suggest that a team can be a set of two or more individuals that work interdependently to achieve shared goals. According to Sheard and Kakabadse (2004) the terms group and team are often used interchangeably, however, while there are some overlapping characteristics between these terms there are notable differences which means that they quite distinct. Cohen and Bailey (1997) theorise that groups and teams share some similar qualities like individuals within both groups and teams can work together as part of a larger aggregation in order to achieve similar goals.

Stillman, Fletcher and Carr (2007) stressed that while there are overlapping traits shared between groups and teams, teams are more structured than groups. This

suggests that even though both teams have members that work together in specific roles (Lencioni 2002), teams have a greater dependence on being more structured and having specific members to perform certain roles (Humphrey, Morgeson and Mannor 2009). However, Varma-Nelson and Coppola (2005) suggest that in theory, groups are a gathering of people that can sometimes lack the commitment to one and other to be able to achieve shared goals but acknowledge that this is a characteristic that a team is required to have. Varma-Nelson and Coppola's (2005) finding does not support the theory of Blickensderfer, Reynolds, Salas and Cannon-Bowers (2010) who stated that groups can have goals that they can work towards. Lencioni (2002) suggests that this is because for groups to be able to achieve their goals, they can afford to have members who are not fully committed. Whereas within a team, according to Morgeson and Mannor (2009) each member has a specific role which they have to perform and the correct focus in order to achieve their shared goals. This demonstrates a lack of clarity between what a team is and what is a group due to the variety of different definitions of each term. Therefore, it would be important to consider the key differences between teams and groups to establish what specific characteristics of a team.

As described above by Sheard and Kakabadse (2004), there are a number similar characteristics which groups and teams both share including having a specific structure (Stillman et al. 2007) and roles (Cohen and Bailey 1997). However, there are many differences that makes a team different to a group (Lencioni 2002). Weinberg and Gould (2014) theorise that a team can be described as a special type of group that have specific characteristics beyond what is required for normal groups. In the following sections, five characteristics that teams possess will be evaluated to demonstrate the differences between groups and teams.

2.0.1 Task Orientation

One of the key differences between a group and a team is task orientation (Lencioni 2002). Task orientation can be defined as the amount of focus on the task at hand towards achieving a goal (Kavussanu and Ntoumanis, 2003). For example, football teams will be focused on task orientation during matches (i.e. trying to win the match). In this situation, the individuals in the team are more likely to be driven to achieving this shared goal. Ntoumanis (2001) specifies that task orientation facilitates the autonomy of behaviour, because when individuals are focused on the task, their motivation to perform a task is derived from its intrinsic properties. This suggests that for team members to demonstrate task orientation they would all concentrate on achieving the team's shared goals.

Varma-Nelson and Coppola (2005) theorise that teams have more focus on the task at hand compared to groups. Lencioni (2002) elaborate by theorising that in general, groups work together because they have to whereas team members in most situations cannot wait to work together as they enjoy performing with one and other. This then helps teams to have the correct focus on completing their task (Kavussanu and Ntoumanis, 2003), leading to team members to carry out specific roles Mach, Dolan and Tzafrir (2010).   For instance, within a football team centre halves are primarily focused on stopping opposition attackers from scoring (See Section 1.1.1, Table 1.1). This is a specific task that these players are required to do in order to help the team towards their objective.

2.0.2 Degree of Interdependence

A characteristic which teams are required to possess is the need for interdependency of their members (Reimer, Park, and Hinsz 2006), whereas this is not

so important in a group (Varma-Nelson and Coppola 2005). Beauchamp et al. (2002) suggest that interdependence is seen when multiple people need each other to complete a specific task. Eccles and Tenenbaum (2004) propose that errors in performance are more likely to be reduced if team members are able to demonstrate interdependence. For example, within a football team, strikers are dependent on other team members giving them the ball (See Section 1.1.1, Table 1.1). This example proposes that in a team, members must be able to work with one and other. Sheard and Kakabadse (2004) suggested that teams have a strong interdependence for each member to work together in order to achieve the team's shared goals.

Forsyth (1999) theorises that this interdependency is influenced by the thoughts and behaviours of team members. In relation to the example involving the strikers in the same football team, their ability to work together is impacted by what they think of each other, their opinions of their selves and how they see what each other react in certain situations. These factors are deemed by Sheard and Kakabadse (2004) to be a crucial part of being a member of a team where as within a group, there is much more focus on individual performance as well as self-praising.

2.0.3 Purpose

Another characteristic which teams are required to possess is purpose (Morgeson and Mannor 2009), whereas this is not as important in a group (Varma-Nelson and Coppola 2005). Campion, Medsker and Higgs (1993) theorise that this is important for teams because team members must know what the objectives are in order to achieve their overall goals. For example, defenders must know what purpose or role they have to perform in the team for the team to be able to function (See Section 1.1.1, Table 1.1). Saavedra, Early, and Van Dyne (1993) support this suggestion by proposing

that team members are required to share a similar focus in order to perform successfully together.

If this was not something which defenders had, they would be out of position regularly – they would not be able to perform their role in the team's chosen formation - as they did not know what their purpose was, leading to more opportunities for the opposition to score. Blickensderfer et al. (2010) further stress that the desire for success towards achieving shared goals is higher in teams when in comparison to groups. This supports the suggestions made by Hill, Stoeber, Brown and Appleton (2014) who state that these traits are crucial for teams to perform effectively together. For groups however, Hills (2001) and Lencioni (2002), Varma-Nelson and Coppola (2005) suggest that members do not all have to share the same focus in order to complete their task and can function with a focused leader. Whereas Campion et al. (1993) and Morgeson and Mannor (2009) argue that teams require focused members who have to perform a specific role to function. This suggests that groups and teams do have differences including their member's focus on completing a task.

2.0.4 Degree of Formal Structure

Having a specific and formal structure is suggested by Carmichael, Thomas and Ward (2000) to be important for a team where members have their own individual roles to perform. Varma-Nelson and Coppola (2005) suggests that this characteristic is not so important for groups. Lencioni (2002) also theorises that this is a characteristic that groups do not require. However, Lencioni (2002) state that this is a trait that groups can develop when transitioning from a group to a team. Within a football team who are in a 4-4-2 formation in football for example, members each have their own roles and positions (See Section 1.1.1, Table 1.1) and these players are instructed to do a specific

job in that team. For instance, defenders in a football team will have their own role to perform in the team, as will the midfielders and attackers (See Section 1.1.1, Table 1.1).

Each of the players in the different positions will have their own specific skills that they will perform in that role (Morgeson and Mannor 2009). Blickensderfer et al. (2010) suggest this, as a team will possess members that each have a crucial role to perform within the team (See Section 1.1.1, Table 1.1). This would suggest that within teams, members have a specific structure and roles to perform whereas according to Mach et al. (2010) this is not as important within groups. This is because Benson, Eys, and Irving (2016) state that having specific roles in a team is a fundamental part of an effective team. Therefore, since having a structure including specific roles for team members, the structure of a group is noticeably different to that of a team.

2.0.5 Familiarity amongst Members

One of the important differences between teams and groups are demonstrated with the familiarity between their members. For instance, Tohidi (2011) states that team members learn more about each other over time. Team members then use this knowledge to work together to achieve their overall goals (Stillman et al. 2007). For example, once team members know what the roles of others in their team involve, their familiarity of each other will allow them to work with each other. This is of similar importance in other sports such as basketball (Beauchamp and Bray 2001), rugby and football (Beauchamp, Bray, Eys and Carron 2002). Wageman (2001) and Beauchamp et al. (2002) state this to be necessary in teams due the requirement of interdependency between team members to be able to function efficiently together.

This theory suggests that having familiarity and understanding of each other's roles (Hackman and Wageman 2005) are crucial characteristics for teams. However,

Varma-Nelson and Coppola (2005) suggests that groups do not need as much familiarity between their members because are working together, as they must, rather than by choice. Sheard and Kakabadse (2004) propose that possessing similar thoughts is an important skill for teams to have between its members but not for those who are part of a group. Eccles and Tenenbaum (2004) and Blickensderfer et al. (2010) theorise that thinking similarly is an important factor in a team's ability to be able to work together as sharing similar thoughts results in a better team performance. Since this shared characteristic between teams and groups (Varma-Nelson and Coppola 2005), the difference between the two is the clear need for teams to share a familiarity between its members to be able to function.

This thesis considers the research which has looked at the similarities and differences between groups and teams in and outside of a sporting context (Varma-Nelson and Coppola 2005; Stillman et al. 2007). However, the current studies provide more empirical evidence to support the importance of sub-teams within team (See Section 1.2) based on their role within a team. This importance can help to advance research that has stated the need for team members preforming specific roles within a team (Blickensderfer et al. 2010; Silva et al. 2013), which was established as an important characteristic of a team. This thesis highlights the necessity for team members performing their own individual roles within a team sport (football) which has rarely been considered in research.

2.1 What is a Team?

To function effectively, teams must demonstrate the above five characteristics. After considering the suggestions of previous research, there are some noticeable differences between groups and teams and these traits have an influence of how

successful teams can be when working together. Therefore, a team can be defined as a formally structured, task orientated group of players, who work together towards a common goal (Nelson and Coppola 2005), who's performance is based on interdependent action (Sheard and Kakabadse 2004) and interpersonal familiarity of the other members in the team (Tohidi 2011). This thesis brings together these characteristics and focuses on the importance of sub-teams performing their own specific roles (See Section 1.2) and working together to be able produce an effective team performance. Since this classification of what a team is, it would be worthwhile exploring how these characteristics combine to make that team successful.

2.2 Qualities of a Successful Team

Beauchamp, Jackson, and Lavallee (2007) suggest there are a variety of factors that can influence how successful teams function. As stated in the previous section, the five characteristics – task orientation, degree of interdependence, purpose, degree of formal structure and familiarity between team members – are required for teams to be successful. Successful teams need to have members who share a common purpose and task orientation towards completing a shared goal (Ward and Eccles 2006). For example, in order for defenders to effectively perform an offside trap, each individual needs to concentrate on moving forward up the park so that the opposition player is played offside (i.e. each team member has to perform their own individual role). This would suggest that successful teams are required to be focused on the task that they are required to perform. If even one of the defenders in this situation were not focused on the task (i.e. performing an offside trap), the performance of all the defenders would not be successful.

Successful teams according to Marks, Mathieu and Zaccaro (2001) have to have members who perform interdependent acts that are directed toward organising task work to achieve collective goals. Evans, Eys, and Wolf (2013) support this suggestion and state that team members are able to demonstrate interdependence and if they are able to work together in this way, it can benefit their performance. For instance, if a full back went out to press an opposition player running down the line, they would need one of the centre halves to provide cover behind them in case the opposition player got past them (See Section 1.1.1, Table 1.1). If the centre half did not provide cover for their full back, the opposition player would have an easier route towards goal (i.e. increasing their chances of scoring). Whereas if the centre half was able to work with their full back they will make it more difficult for the opposition to score. Therefore, it is very important for team members to be interdependent and work together to produce an effective performance and achieve their team's goals.

Carron, Bray and Eys (2002) and Hill et al. (2014) theorise that for sporting teams to be successful, each of their members must be able to work together interdependently in order to achieve shared goals. Evans and Eys (2015) state that this interdependence is crucial for team members to be able to perform effectively together. Ward and Eccles (2006) suggest that team members are required to perform their individual own role for teams to perform efficiently together. In football for example, full backs in a 4-4-2 formation must be able to work with the wide midfielders in order to facilitate an efficient performance (See Section 1.1.1, Table 1.1). This is because the full backs in this type of formation and wide midfielders depend on each other to be able to perform their own role. For instance, both players need to understand in certain situations one of them will be able to push forward with the other providing defensive cover (See Section 1.1.1, Table 1.1). If this does not happen, this side of the team could

be exposed and the likelihood of a successful performance will decrease, as the shape of the team will not be correct.

Teams are also required to have a specific purpose in order to be classed as an effective team (Campion, Medsker and Higgs 1993). Williams (2013) argues that the psychological characteristics of individual team members have an influence on team success and the extent to which members work well together. For instance, one characteristic suggested by Eccles and Tenenbaum (2004) is having effective methods of communication between team members and this according to LaVoi (2007) this is crucial to a successful performance within team sport. Williams (2013) suggested that if teams failed to have effective methods of communication between team members their performance would not be successful, making it difficult to achieve shared performance outcomes. This suggests that factors such as effective communication between team members and their ability to work towards shared performance outcomes with each other can influence individual and team performance.

In order to perform effectively, teams are required to be structured and have members who perform certain roles (Reimer et al. 2006). For example, the centre half role in a football team is to defend the goal by stopping the opposition from scoring, whereas the role of the more attacking players is to try to score goals (See Section 1.1.1, Table 1.1). Hill et al. (2014) also state that the different roles which team members have to perform improves their ability to work together to produce an effective team performance. However, if for example the defenders in the team did not perform their role, the team would not be able to perform effectively together. This would be because if defenders did not perform their role, the opposition would likely have more opportunities to score goals. In addition, if the opposition had more chances to score, there would be fewer chances for their strikers to score. Therefore, successful teams are

required to have a certain structure with players perform certain roles in order to achieve an effective team performance.

Finally, teams should contain members who all have a familiarity with one and other (Carron and Brawley 2008). For instance, having experience performing together according to Eccles and Tenenbaum (2004) and allows team members to work better together. Gershgoren et al. (2016) suggest that team members who have experience performing together build up a trust of each other's abilities to perform in certain situations. This experience helps to create successful team performances, as experience performing together will progressively improve each team member's understanding of others (Blickensderfer et al. 2010). Possessing an understanding of team members is thought to improve the likelihood of a successful team performance (Tenenbaum, 2004). Arguably, this research shows that team members who work effectively together will have the qualities that will enable them to produce a better team performance.

These suggested characteristics are required to be fulfilled by teams in order for them to be classed as successful. However, it would be worthwhile to examine how these characteristics facilitate team member's ability work together to produce an efficient team performance. Dissimilar to previous research which considered some of these characteristics (Marks, Mathieu and Zaccaro 2001; Beauchamp, Jackson, and Lavallee 2007 and Hill et al. 2014), the current research brings together these five characteristics and suggests that these can facilitate an effective team performance. In addition to this, the current thesis takes this knowledge into a team sport (football) and proposes that these five characteristics are required for teams to be able to perform effectively together.

2.3 Team Cohesion

Carron et al. (2002) propose that for teams to achieve performance goals they must work together as part of a dynamic interpersonal process known as team cohesion. Team cohesion can be defined as a dynamic process that is reflected in the tendency of the team to stay united in the pursuit of team objectives (Davis, Lindsey and Lyons 2014). Nezhad and Keshtan (2010) state that team cohesion has an important influence on the chance for any team to be able to produce a successful team performance. Carron and Brawley (2008) proposed a theoretical model (Figure 2.1) describing and explaining the interpersonal characteristics of team cohesion. Heuzé, Raimbault and Fontayne (2006) and Medeiros Filho (2012) suggest that this model has been developed since the mid-1980s by Carron and colleagues and most researchers have considered this construct crucial to explaining the dimensions of team cohesion.

Paskevich, Estabrooks, Brawley and Carron (2001) state that the Conceptual Model of Group Cohesion for Sports is focused on three assumptions: (a) cohesion can be examined through the individual team member's perceptions, (b) social cognitions are an important inclusion for both the group and individual level of analysis, and (c) cohesion beliefs are both social and task related. The following sections will look in depth at each part of the model and explore each area to demonstrate how team cohesion can be achieved.
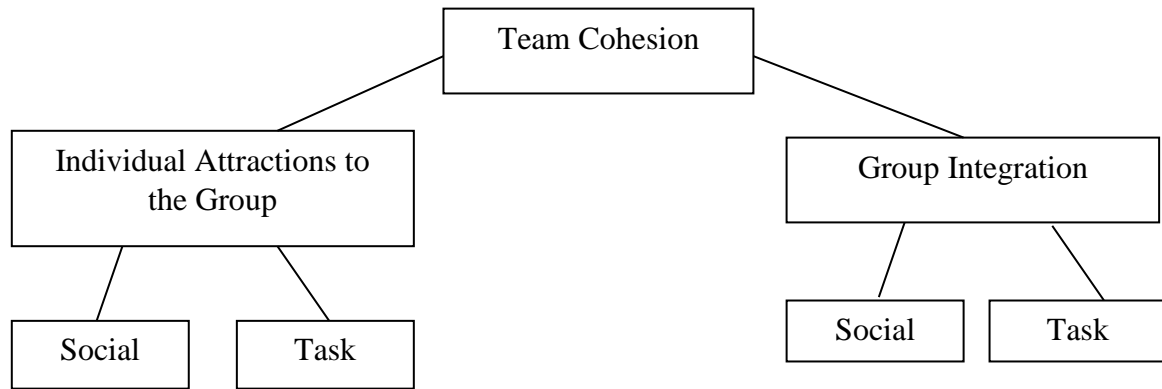
Figure 2.1 – Conceptual Model of Team Cohesion for Sports (Carron and Brawley 2008).

2.3.1 Individual Attractions to the Group and Group Integration

The first two sections the Model of Team Cohesion for Sports (Carron and Brawley 2008) which form team cohesion are described as individual attractions to the group and group integration. Individual attraction to the group (IAG) considers how much individuals want to a part of the team (Carron and Brawley 2008). There are several factors that can influence IAG, for example: performance of the team, perceived team status, perception of individual team members and wider social issues (i.e. monetary value). This is because success can be an important reason for individuals wanting to be a part of a team and this can influence the cohesion of the team (Casey-Campbell and Martens 2009). Totterdell (2000) further suggests that members who are happy to be a part of a team are likely to demonstrate positive emotions towards other team members and are more likely to work towards an effective team performance.

Group Integration refers to how individuals perceive the closeness, similarity or unification of the group. Carron et al. (2002) theorise that if team members get along with one and other, they are much more likely to work together to produce a successful team performance. Carron et al. (2002) further suggest that the team members who like

one another are able to perform much better as they are more likely to show more motivation to succeed. Carron and Brawley (2008) propose that team members who get on with each other, show better integration and are able to produce a better team performance.

2.3.2 Social Cohesion

Both of the above sections of The Model of Team Cohesion for Sports (Carron and Brawley 2008) are further subdivided into social and task cohesion. Gershgoren, Basevitch and Tenenbaum (2014) support this statement and state that task and social cohesion are the two sub-dimensions of overall team cohesion. Social cohesion is defined by Carron and Brawley (2008) and Pescosolido and Saavedra (2012) as the quality of the relationship between team members out of the sport. For example, if team members choose to spend some of their free time socialising together. Carron et al. (2002) and Marcos et al. (2010) suggest that social cohesion is linked to team members spending time together.

Bosselut, McLaren, Eys and Heuzé (2012) proposes that social cohesion between team members can have positive implications for team members including improvements to being able to work effectively together. However, Rovio et al. (2009) acknowledges that high social cohesion can be beneficial for team performance but this is not the case in every situation due to increased pressure to conform to what other team members think and feel. Pescosolido and Saavedra (2012) propose that a high level of social cohesion is not always desirable as this can lead to dysfunctional behavioural patterns. Carron and Brawley (2008) theorised that possessing team cohesion improves team members' understanding of each other through increased familiarity with the rest of their team.

As stated above (see Section 2.0.5), possessing a familiarity between team members is a key characteristic of a successful team. Silva et al. (2013) also theorise that over time, experience together in various forms as well as an individual's skills and abilities can influence team members' understanding of each other. It is through this experience together that social cohesion also improves, which according to Casey-Campbell and Martens (2009), is crucial for any successful team.

2.3.3 Task Cohesion

Task cohesion is defined as how efficiently team members function when performing tasks and whether they are able to complement each other's abilities (Carron and Brawley 2008). Eccles and Tenenbaum (2004) propose that successfully performing a task as part of a team is possible when team members have facilitated through experience performing together. Having experience performing together, also helps to reduce the amount of errors team members are likely to make as team members will know how to act in certain situations based on their knowledge of each other (Blickensderfer et al. 2010). This suggests that in order to have effective task cohesion with team members, it is crucial to have experience performing with these individuals in order to build up an understanding of what each person may do in certain situations. As suggested above, this a fundamental part of having a successful team. Within an effective team for instance, members are required to work together in order to complete their team's objectives (Araújo and Davids 2016).

Carron et al. (2002) state that if team members demonstrate effective team cohesion, they are likely to work together more efficiently and achieve an effective team performance. For example, a team who all work together to try to create opportunities to take shots on goal and increase their chance of scoring is demonstrating

task cohesion. This is because team members have their own specific roles to perform within the team, to be able to work effectively together. Benson et al. (2016) support this contention by suggesting that if team members all perform their roles correctly then their team will be able perform effectively together. Therefore, successful teams are able to demonstrate these characteristics of effective task cohesion in order to perform efficiently.

2.3.4 How Perception of Others Influences Team Cohesion

Aristotelis et al. (2013) states that cohesion between team members is a continually changing process that can be altered by individual members of the team. Terry et al. (2000) and Carron and Brawley (2008) propose that team cohesion can be influenced by individual team members' perceptions based on their perceptions of other members and how they feel they belong to the team. This suggests that if team members are not content performing with others, team cohesion can be affected in a negative way. Aristotelis et al. (2013) also theorised that team members' personal feelings about their own and others' abilities and how they seen their own position within a team can influence team cohesion. For example, this could be members of the team working together to reproduce a tactic that they had worked on during training successfully. Carron et al. (2002) suggest that having the experience performing together has a positive influence over team cohesion and the likelihood of a successfully team performance and Eccles and Tenenbaum (2004) theorise this can be facilitated by team members who have an understanding of each other's skills and abilities. This is because if team members have a knowledge of how one and other are likely to perform, according to Blickensderfer et al. (2010) their ability to work effectively together will be much higher.

If specific players do not believe that others have the ability to perform it successfully, team cohesion could be reduced and the likelihood of a successful performance decreases (Terry et al. 2000). Carron and Brawley (2008) and Aristotelis et al. (2013) emphasise the importance of individual team member's characteristics and their influence on team cohesion. Hill et al. (2014) proposed that members of a team all have differing perceptions of their team and its member's overall abilities, team cohesion can be negatively impacted and reduce the chance of an effective performance. This can be seen when a defender has an incorrect understanding of an attacker's strengths. For example, if a defender thinks one of the team's attackers is fast, they may be likely to pass the ball over the top of the opposition defence for that attacker to chase down and retain possession of the ball. In this situation however, the attacker is not fast and if this type of pass is played, the attacker will not be quick enough to win possession of the ball. This would mean the team would show poor team cohesion, as they are not working well together – due to incorrect perceptions – as they have lost the ball. This would also demonstrate an unsuccessful performance as these players have lost possession of the ball.

However, the perceptions will only be accurate if team members have experience performing together (Eccles and Tenenbaum 2004). Williamson and Cox (2014) suggest that having an understanding of each other through experience performing together can influence how effectively a team works together. This proposes that individual team members and their perceptions of their selves and other members can influence how the team performs. Therefore, individual team members have the ability to improve or reduce team cohesion based on how they feel about others and this can influence team performance.

2.3.5 Team Cohesion's Impact on Performance

Carron et al. (2002) examined the relationship between team cohesion and task success by looking at team sport in order to determine whether there was a relationship between team cohesion and overall task success. Their findings implied that in order to create a coordinated team performance, team members have to work together to be successful. For example, each team member is required to have an understanding of their fellow team members and their overall ability in addition to performing their own individual role effectively.

This is because team members use their knowledge of others in order to shape their own actions (Salas, Rozell, Mullen and Driskell 1999) and each team member has to perform their own role in order to facilitate an efficient team performance (Blickensderfer, Cannon-Bowers, and Salas, 2000). For example, strikers could use their knowledge of each other to decide which one of them is better at holding the ball up and which one is better at chasing a ball over the top over the opposition defence. Stein, Bloom and Sabiston, (2012) suggests that team members require instructions and feedback from their coach/manager to know what they should be doing. However, Salas et al. (1999) theorises that team members have to use their own ability and knowledge of other members to be able to work together effectively.

McEwan and Beauchamp (2014) suggest that since situations change in team sport, team members must be able to offer each other support and work together effectively. For instance, if the opposition defender continually wins the header, the strikers may have to use their knowledge of each other to be able to improve their chances of winning the ball. This situation shows that both players have their own roles to perform in the team and they can use their knowledge of each other to work together

to be able to perform effectively together. This scenario demonstrates how team members must perform their own roles in order to work together to facilitate a cohesive team performance.

According to Eccles (2010), a cohesive team performance can prove difficult in a team sport such as football, as different team members will have their own specific roles in order to complete the task. This is because sports teams have multiple members and it can be difficult to coordinate each individual's actions at the same time (Carron et al. 2002). However, Ericsson (2003) states that is only possible when team members have perfected their own role through experience. For example, defenders, midfielders and attackers both have different roles to perform that combine in order to create an efficient team performance (See Section 1.1.1, Table 1.1).

Firstly, the defenders in the team are required to stop the opposition from scoring and to be able to give possession of the ball to more attacking players (See Section 1.1.1, Table 1.1). Midfielders have to provide cover for the defence as well as get the ball from defenders to start an attack either to score themselves or to give the ball to the attackers (See Section 1.1.1, Table1.1). The role of the attackers perform is to score goals (See Section 1.1.1, Table 1.1). It is acknowledged that these roles are quite different but both are required to work together in order to facilitate a coordinated performance. Carron et al. (2002) and Leo et al. (2013) suggest that if a sports team does not have a high level of team cohesion, their performance will not be successful. For instance, if defenders stop the opposition from scoring, the team is likely to keep possession of the ball better (See Section 1.1.1, Table 1.1). This would mean that the midfielders would have more possession of the ball and be able to create more chances for the team to score. This will increase the chances of the attackers getting the ball and

improving their chances of getting opportunities to score goals. This demonstrates team members using their different roles to work together to be able to produce a cohesive team performance. This type of scenario is required in order to achieve the team's shared goal of winning a match i.e. conceding few goals, creating more opportunities and scoring more.

Considering previous research that has investigated cohesion in relation to team sport including studies by Carron et al. (2002), Eccles and Tenenbaum (2004) and Aristotelis et al. (2013), there are a number of factors that can influence cohesion amongst team members. This thesis has brought together a number of factors and proposes that if a team who are able to demonstrate the above five characteristics, the team can be classed as successful (See Section 2.2). This suggestion is for all team sports – not just for football – and produces a foundation for future research to consider these five characteristics and how sub-teams work together to create an effective team performance. For example, if team members have specific role to perform and work together (See Section 1.1.1, Table 1.1) - based on their own knowledge of each other - to achieve their shared team goals. However, in order to facilitate these five characteristics team members must be able to possess effective methods of communication. Salas, Cooke and Rosen (2008) and Smith et al. (2013) theorise that through possessing efficient methods of communication, the likelihood of a better team performance will improve. Therefore, it would be important to consider the role effective communication between team members has for individuals within teams to allow them to perform effectively together.

2.4 Effective Methods of Communication between Football Players

Sullivan and Gee (2007) define effective methods of team communication as interactions between teammates that result in enhanced team performance. Rico, Sánchez-Manzanares Gil and Gibson (2008) proposes than methods of communication can include intentional verbal commands. Sullivan and Feltz (2003) stress that effective methods of communication has been identified as an important aspect of intra-team interaction. For instance, effective methods of verbal and non-verbal methods of communication (Eccles and Tenenbaum 2004) can facilitate improvements to some of characteristics of successful teams. Lausic et al. (2009) and Onağ and Tepeci (2014) further stressed the importance of effective methods of communication and suggested that this is crucial for a successful performance. This can be demonstrated when a defensive line is trying to perform an offside trap as if defenders are trying to play the offside trap, effective communication methods will help improve the focus of each defender. For example, if the defenders are able to use specific shouts (verbal) or gesturing (non-verbal) to communicate that they should be moving forward Onağ and Tepeci (2014) proposes that their actions will be more efficient and be performed quickly. This example demonstrates the importance of effective communication methods to be able to facilitate an effective team performance.

Onağ and Tepeci (2014) theorise that effective communication does not just focus on the content of a message but also the effect the message has their team member receiving it. This would be because if the defenders are able to use effective methods of communication when they are moving towards the opposition goal, they will all understand when they should perform their own specific role effectively.

LeCouteur and Feo (2011) argue that effective methods of communication between team members can reduce mistakes that could occur during performance. However, if their methods of communication were not effective, they would not be able to perform efficiently together. This scenario would also show that team members would be able to work together in order to perform effectively together. Goodwin (2003) suggests that effective methods of communication can include instructions to one and other to give direction and suggestions of what they should be doing (i.e. gestures and position on the pitch).

If team members were able to use their effective methods of communication in order to perform an offside trap, this would show that these defenders would possess a familiarity between one and other and an ability to coordinate their performance. This would be because the defenders in this scenario would be able to understand what each other mean by specific shouts and they would be able to effectively perform an offside trap. Based on previous research, importance is placed on team members being able to have methods to communicate effectively during competitive performances. One attempt to look at how people communicate was created by Delia, O'Keefe and O'Keefe (1982).

2.4.1 The Constructivism Theory of Intrapersonal Communication

Delia et al.'s (1982) Constructivism Theory of Intrapersonal Communication proposes that people will have a greater ability to use complex communication if their individual perceptions of each other are accurate. If a striker is asking for the ball from a defender for example, if their perceptions are both accurate, the striker will receive the ball in the manner that suits them best (i.e. receiving the ball into their feet). Delia et al.'s (1982) theory suggests that there are multiple potential truths depending on both the abilities of the communicator and receiver in order to both create and understand

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complex messages. Delia et al. (1982) further theorises that the individual differences in the ability to be able to effectively communicate are based on the personal perceptions created through socialising with others. This theory of intrapersonal communication shares similar characteristics as a team that are described in the previous sections (See Section 2.0). Delia et al. (1982) theorise that spending time with people and getting to know them, builds perceptions of one another and can result in effective communication methods. Within a team, it was established that possessing a familiarity with team members is a crucial factor that contributes towards being able to function as an effective team (Carron and Brawley 2008). Mumford, Van Iddekinge, Morgeson and Campion (2008) stated that team members need to have an understanding of each other's roles and be able to work together. However, this is only possible if the perceptions of those involved in the relationship are accurate.

This scenario would also not be possible if team members' perceptions of one another were not accurate. For example, if two centre halves had only started to perform together, their understanding of each other would presumably be limited and they would not be able to work together effectively yet. This would also suggest that their perceptions of one another's abilities would also not always be correct. This suggestion is supported by Carron and Brawley (2008) who theorised that individual team members base their perceptions on working together with others in a sporting context as well as through socialising. For instance, over time performing together and spending time together without the sport, the two centre halves in this scenario will develop an understanding of each other's role, leading to accurate perceptions. Therefore, it would be worthwhile to examine Delia et al.'s (1982) Constructivism Theory of Intrapersonal Communication due to characteristics that are also required within a team. This would

allow for an exploration into the importance, which effective methods of communication have in an effective team.

Delia et al. (1982) suggest perceptions are dependent on a wide variety of factors including the athlete's age and their performance level in the sport. For instance, a younger athlete's perceptions of their relationship with their coach would be less complex than the perceptions of an older athlete that are likely to be more complex and are influenced by multiple factors based on their greater experience in the sport (.e. memories, past successes and failures). This is because an individual's opinions of others fluctuate over time based on their experience together (Casey-Campbell and Martens 2009).

Delia et al. (1982) suggest that these perceptions which influence methods of communication do not remain constant and can change over time. Therefore, the perceptions of those involved in the relationship are likely to fluctuate over time depending on experiences together and this means methods of communication will also change. For example, through experience performing together non-verbal communication methods can be used due to the understanding shared between partners. Eccles and Tenenbaum (2004) state that team members who have experience performing together and who understand what each other are likely to do before they carry out an action.

When considering Delia et al.'s Theory (1982) in relation to team sports like football, perceptions of team members have to be built up through socialisation. Carron et al. (2002) propose experience performing together can lead to the creation and development of perceptions between team members. For instance, over time team members will improve their understanding of each other, as their perceptions will

become more accurate. This could occur during training sessions or competitive experience performing together according to Eccles and Tenenbaum (2004), making methods of communication more effective and informative that leads to a more effective performance. For example, if a defensive line practice structure and establishing each player's roles during training sessions, they will get to know what each other mean by certain shouts (i.e. push up or drop deeper). Over time, team members will understand what others are communicating to each other and will be able to react quicker.

The conclusions made by Tziner, Nicola and Rizac (2003) suggest that individual perceptions of social cohesion can influence team performance. Casey-Campbell and Martens (2009) state that team cohesion can be influenced by experience together in a social setting. However, the current thesis proposes that the ability for team members to be able to work effectively together is facilitated by effective sub-teams. Only a few studies including Silva et al. (2013) and Vilar et al. (2013) have stated the importance of sub-teams in an effective team performance. The current studies can provide a foundation for future research looking into the importance of sub-teams within a number of different sport teams, not just football like this thesis focuses on. These findings of Casey-Campbell and Martens (2009) support the propositions of Delia et al.'s Theory (1982) that socialisation leads to more conclusive perceptions of each other and more effective communication methods. Sullivan and Feltz (2003) further suggest that more efficient communication methods can then lead to a better team performance. Blickensderfer et al. (2010) propose that methods of communication improve over time performing together, as team members develop an understanding of each other over time to facilitate a better team performance.

2.5 Communication between Team Members

Delia et al. (1982) theorise that communication is the tool that people and athletes use in order to form an understanding of others as well as the means by which perceptions of one and other are created. For instance, if one player gives their team mate encouragement after they make a mistake, that player will then think that this player is looking out for them and wants them to succeed. This suggests that communication between team members and their perceptions of one and other are linked. This means that if one of these changes, it is likely that the other will also change. For instance, if a player's perception of their team member changes, their method of communication would likely have to change.

Eccles and Tenenbaum (2004) theorise that if effective methods of communication between two people are used frequently, their knowledge of one and other increases which also improves their overall understanding of each other. Such knowledge improves team performance because the individuals can communicate more effectively with one another (Salas et al. 1999). Essentially, through effective communication, people are able to gain a better understanding of one another due to the increased access to information that they have about each other. However, the underpinning process suggests that this is not achieved instantly as effective methods of communication and knowledge of other people must be developed over an extended time.

2.5.1 Different Methods of Communication

Within teams, there are a range of communication methods that are adopted based on the individual members of the team and their own perceptions of situations. Onağ and Tepeci (2014) propose that there are two main different methods of

communication between team members; verbal and non-verbal. Verbal communication is when team members give vocal instructions to other team members to help them to choose their actions (LeCouteur and Feo 2011). This method of communication is used in a variety of situations within football. For instance, when a defensive line needs to move further forward, a couple of players would give other defenders a vocal shout to 'push up' as a direct instruction. This type of communication helps multiple players understand what each other are thinking during specific situations based on the verbal instructions of some players. This a common method of effective communication for team members and is used regularly to facilitate a coordinated team performance in netball teams (LeCouteur and Feo 2011).

Non-verbal communication methods can include finger pointing or gesturing to where a player thinks a team member should be or what action they should be performing. Cooke et al. (2007) suggest that expert teams develop an understanding between team members of key elements of their performance allowing them to operate effectively, without the need for overt communication. This method of communication is normally used by team members who have experience performing together and who have an understanding of each other's skills and likely moves (Eccles and Tenenbaum 2004). This is because this type of communication requires a base level of understanding before this method could be effective.

If players are unfamiliar with one and other as they have only just starting to perform together for instance, it is unlikely that they will know what each other mean if they see one of their team member gesturing towards them unless it was a gesture that is universally accepted. This action could mean move into a specific place into a more advanced area of the pitch or it could be a signal to another player to pass the ball the position they are currently in. Therefore, this confusion could lead to an inefficient

performance, as the player would not know exactly what they are being instructed to do. This example stresses the importance of having an understanding of team members in order to adopt this method of communication.

Non-verbal methods of communication are faster and therefore more desirable for performance (Onağ and Tepeci 2014). However, having an interpersonal knowledge between team members is crucial to facilitate this (Cooke et al. 2007). Eccles and Tenenbaum (2004) suggest that these types of methods of communication can be intentional or unintentional depending on where team members are positioned during a game. For example, if team members are too far apart to communicate via words, non-verbal communication methods can be adopted.

However, through experience together each player will understand what each other are trying to communicate to each other even if no words are passing between them. Cooke et al. (2007) suggest that to effectively use non-verbal communication methods, team members must have experience of performing together and an understanding of each other. As stated by Eccles and Tenenbaum (2004) different methods for effective communication are built on the mutual understanding between team members, developed through experience of performing together. This suggests that effective methods of communication are facilitated by accurate perceptions of team members as well as accurate understanding between all those involved. Since effective communication methods are attributed to improving the understanding between team members, it can be suggested that effective methods of communication can influence how the overall team performs.

2.5.2 The Importance of Experience Together

Eccles and Tenenbaum (2004) acknowledge that an environment which can facilitate effective methods of communication between its members requires time to develop. Blickensderfer et al. (2010) suggest that this is because it takes time to form accurate perceptions of one another and build relationships so it can be assumed that experience together is required for developing effective methods of communication. When a player joins a new team, they will have to perform together be able to build accurate perceptions of each other, facilitating effective methods communication. Eys, Carron, Beauchamp and Bray (2003) theorise that this can make team's struggle to perform as a unit as new players do not have experience with their new team where there are veterans of that team who already understand one and other. Experience performing together creates knowledge of those in the relationship and helps to form an understanding of each other, facilitating effective methods of communication between team members (Eccles and Tenenbaum 2004). This suggests that interpersonal knowledge facilitates efficient methods of communication between team members (i.e. the ability to choose the correct method in specific situations). However, Blickensderfer et al. (2010) state that to possess the ability to effectively communicate with team members, they must build a relationship with their fellow team members.

2.5.3 The Importance of Effective Relationships between Team Members

Aristotelis, Nektarios, Aristomenis and Maria (2014) theorise that team members develop social relationships with each other over time and this suggestion could be one of the reasons of why it may take time to develop effective methods of communication. This is because close relationships take time to develop closeness as well as trust (Jowett 2007). For example, if a new player comes into a team that has members that they have never performed with before, they will not have much of a

relationship with them. The new player would not feel close to their new team members or have much trust in them at the beginning of their relationship, as they did not know anyone at this point. This would also mean that they would be unsure of to which methods of communication would be best to adopt with their new team mates.

At the beginning of a relationship, people do not know much about one and other and require socialising with one and other to help build these perceptions according to Delia et al. (1982). Eccles and Tenenbaum (2004) suggest that effective methods of communication are based on interpersonal knowledge. However, in this situation a new player within a team would not have this knowledge and therefore might find it difficult to choose correct methods for effective communication. Therefore, close relationships require time in order to develop the interpersonal knowledge required in order to be able to choose effective methods of communication.

2.5.4 The Relationship between Experience Performing Together and an Effective Relationships of Team Members and Time

As suggested above, both having an effective relationship with fellow team members (Aristotelis et al. 2014) as well as having experience performing together (Eys et al. 2003) are two interdependent factors, which are crucial for developing efficient methods of communication within teams. This is because close relationships build trust and understanding between team members, but in order to reach this situation, they must have experience performing together first. For example, a youth player who has been called up to a first team will not be as familiar with the majority of the players as players who regularly train with the first team. Also, there will not be much of a relationship between the younger player and the rest of the team as this is the first time they have been called up to this squad, meaning that their methods of communication

will probably not be effective. In this situation, the youth player has to form relationships over time with the players they are going to be performing with. As this player gets more experience performing together with the team, closer relationships will form, resulting in a greater understanding of each other.

This allows this particular player to be a part of effective communication methods within the team. Eccles and Tenenbaum (2004) propose that effective methods of communication improves team member's ability to work efficiently together. However, without both of these factors, effective communication methods would not be possible. Therefore, for team members to have effective methods of communication between one and other, they must build a relationship with other team members over time (Stout et al. 1999). It is also important to develop an understanding of other team members in order for effective methods of communication to be chosen and develop. However, different team members and situations require various methods of communication (Cooke et al. 2007); suggesting that different methods of effective communication are required.

2.5.5 Advantages of Effective Methods of Communication

According to Rico et al. (2008) possessing effective methods of communication between team members is a crucial aspect of team sport, allowing the sharing of information. In addition to improving the understanding between team members, Sullivan and Feltz (2003) argue that effective methods of communication help team members to coordinate their movements by instructing others on where they should be during certain situations, helping the team to produce a more cohesive performance (Jonker, van Riemsdijk and Vermeulen 2010).

Eccles and Tenenbaum (2004) further theorise that effective methods of communication help to create a level of understanding of each team member's abilities. This is achieved through the exchanging of information with team members, allowing others to understand each other and can build up accurate perceptions of one another's abilities and typical behaviours. This suggests that the link between being able to use effective communication methods and successful team performances is based on using a mutual understanding between players regarding their abilities and behaviour to best coordinate their actions and reactions during play.

2.5.6 Disadvantages of Ineffective Methods of Communication

Teams whose members use ineffective methods of communication are likely to see a negative impact on team performance. Bradley and Hebert (1997) suggest that a team's ability to work effectively together can be impacted by poor intra-team communication methods as actions cannot be discussed and therefore these actions may be extremely disorganised and less cohesive. This can also result in poor team familiarity, as it will look like team members do not know what each other are going to do during specific situations. Eccles and Tenenbaum (2004) suggest that ineffective communication methods between team members has a negative influence create an understanding of each other's abilities. For example, if a defender decides that to shout an instruction to an attacker about the type of pass they are away to play to them but are not loud enough, there would be a breakdown in communication, a lack of understanding and a poor performance. Lausic et al. (2009) further suggest that ineffective methods of communication will lead to a poorer performance. If this defender is not loud enough, the attacker will not hear the instruction and they will not be able to go into the correct space to receive the pass. The two player's understanding of the situation would not match as the key information of what type of pass is going to

be delivered has not been hear. This ineffectual method of communication will likely result in the ball not reaching the attacker (i.e. a poor team performance).

Having effective communication methods are an important characteristic to have within a team as according to Blickensderfer et al. (2010) as possessing a shared understanding of team mate's abilities can help improve overall team cohesion and increase the team's overall performance. Therefore, in order to improve their understanding of each other, the methods of communication which players adopt must be fit the situation.

2.5.7 The Importance of Having Effective Methods of Communication

Effective methods of communication between team members are crucial to an effective team performance. Lausic et al. (2009) propose that verbal and non-verbal communication is a critical mediator of performance in team sports. However, if a team's communication is poor, their attempts to perform during a specific situation will look disjointed and it will reduce overall task cohesion. For instance, this can be seen if a left back tries to push the defensive line in order to play offside (See Section 1.1.1, Table 1.1) and their instruction is not loud enough. If they are not loud enough, the right back may not hear what they were instructing the other defenders to do, meaning they would be playing everyone onside and it is likely that the opposition would exploit this miscommunication and potentially score. This suggests that if instructions are not clearly given, each team member's understanding of the situation could be different, leading to an uncoordinated performance.

However, if team members use effective methods of communication - developed through experience performing together - then their understanding of each other will facilitate a better team performance. Mathieu et al. (2000) and Carron et al.

(2002) theorise if team members have a good level of understanding, they will be able to coordinate their actions. This can benefit members of a team as being able to coordinate the actions of multiple members increases their chances of being successful during competition. Blickensderfer et al. (2010) suggest that a team which has a high level of shared understanding between its members will have a higher level of cohesion, resulting in potentially more success for that team.

There have been numerous studies which have placed emphasis on successful teams having members who are able to effectively communication (Eccles and Tenenbaum 2004; Cooke et al. 2007; Rico et al. 2008 and Lausic et al. 2009). However, the importance of effective methods of communication between dyads (i.e. different sub-teams in football) are yet to be fully explored even though, there is some research that stressed the importance of sub-teams to the functioning of the overall team (Correia et al. 2011 and Cruickshank and Collins 2012). Following that theory, it would be important to consider methods of communication between dyads as they perform such a crucial role in an effective team performance (Duarte et al. 2012). Therefore, this thesis considers the importance of effective methods of communication between dyads (in football) and how they use communication as a tool to be able to perform effectively as a dyad and ultimately a team.

2.6 Implicit Coordination

According to Cannon-Bowers and Bowers (2006) implicit coordination can be defined as adaptive behaviour where team mates base their future movements on past experiences of similar tasks and knowledge about the rest of their team's reactions. Kleinman and Serfaty (1989) state that this type of coordinated functioning is possible even without extensive verbal communication methods. Mullen and Copper (1994)

have discussed why a collection of people who know each other, and have some familiarity executing tasks together, are more likely to display higher team cohesion compared with a collection of people who have no prior experience together. This theory highlights the importance of experience performing tasks together in order for team members to be able to consistently perform those tasks at a high level and ultimately work better together towards team performance goals. For instance, teams who perform a specific corner kick routine together will be able to perform the specific routine. In this situation, team members will not only be able to perfect their own individual role but they will see how their team mates perform too. This will allow the team to perform the corner kick routine effectively and this will give the best chance for one of the team members to score a goal.

Cannon-Bowers and Bowers (2006) suggest that teams are successful when members use their knowledge of each other to coordinate their actions. This process can be explained through Blickensderfer et al.'s (2010) hypothesised Model of Implicit Team Coordination in relation to tennis doubles.
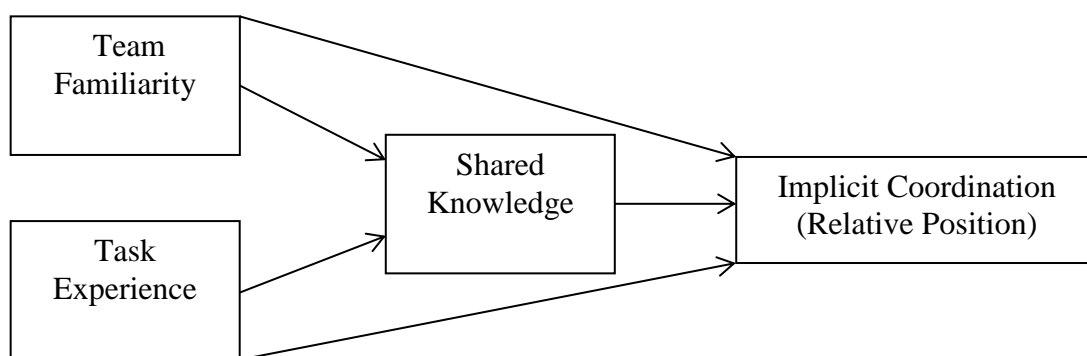
Figure 3.2 - Model of Implicit Team Coordination (Blickensderfer et al. 2010).

Blickensderfer et al.'s (2010) model (Figure 2.2) explains that three different variables contribute to implicit team coordination. These areas are team familiarity, task

experience and shared knowledge. It is theorised that all three factors interact in order to facilitate implicit coordination between team members within a team setting.

2.6.1 Team Familiarity

Team familiarity is concerned with how well a team know each other. Blickensderfer et al. (2010) describe this as an understanding of the other members of a team based on previous experience together. Team familiarity is developed through experience with team members in both competitive and social environments, facilitating an increase in interpersonal knowledge of team member's strengths and weaknesses. This is possible when team members perform together throughout a season, for example. At the beginning, team members may not have performed with each other previously resulting in a lack of familiarity. Over time however, they will experience more situations together and will develop their knowledge of one another over time. Mathieu et al. (2000) and Williamson and Cox (2014) suggest that if team members have an understanding of each other, they will be able to perform more efficiently as a team.

Through experience together, players obtain more knowledge of each other and develop an understanding of certain characteristics that individuals possess. For example, the greater time defenders of the same team spend working together in training or competitive football matches, the more they will develop a familiarity with each other. This is because each defender will be able to witness how other team members react in specific situations and this will improve their mutual understanding.

For instance, through training together each defender will over time know who is likely to control the back line, what actions each other are likely to perform and what they mean when an individual makes a specific shout. In this type of situation, it is crucial for team members to be familiar with each other in order to improve their

mutual understanding. However, Cannon-Bowers and Bowers (2006) argue that is not

sufficient to simply have an understanding of other team members and that task

experience is also a crucial part of the process of developing shared knowledge.

2.6.2 Task Experience

Task experience is the amount of time an individual has experience of

performing a set of specific actions or movements related to their sport (Blickensderfer

et al. 2010). For example, the length of time an attacker has been practicing shooting

towards goal. If a striker has practiced shooting towards goal from the edge of the box

over a long period, they will understand how much power and height to strike the ball

in order to score a successful goal. This knowledge will be based on numerous

successful and unsuccessful attempts during their time practicing this skill. This is

important because during game situations, athletes can think back to previously

practiced scenarios and use the actions they chose then (Silva et al. 2013). However, it

could be suggested that this is an unconscious reaction based on previous successful

attempts during training or even past competitive matches (McPherson 1999). For

instance, through experience practicing shooting during training, an attacker will have a

knowledge of what would be required to score during a game situation and will act

subconsciously based on previous success.

The greater the task experience that a group has, the greater their resource of

shared knowledge of what an individual's actions should be in certain scenarios, which

is in turn based on the success of past attempts to perform under the same conditions

(Blickensderfer et al. 2010). Without task experience, athletes cannot base actions on

previous practice and their performance will therefore lack the coordinated actions of a

practised drill and in turn may not be performed successfully. For instance, this could

be seen in a team who have players who had never performed together during their first

training session, while working on set pieces. Since these players have no experience performing together, coordination will be extremely difficult. This would be the scenario because players are unable to think back to previous situations with team members that they have no experience performing with before due to a lack of knowledge of each other. McPherson (1999) proposes that effective teams are required to relate back to previously similar situations in order to produce an efficient team performance.

Familiarity of other members of a team is intrinsically linked with task experience and is often developed through similar experiences and situations (Carron et al. 2002) particularly training drills. During possession-based drills within training for example, team members will be able to see first-hand who is comfortable with the ball under pressure or which players are competent at reading where a pass will go. This will build up an understanding between team members based on similar experiences together. Cannon-Bowers and Bowers (2006) support this suggestion and theorise that team members use their experience performing together to build and understanding of one and other. This knowledge will then improve each team member's knowledge of each other and help them to choose their actions (Reimer et al. 2006). For instance, through experience together in possession drills team members identify that one player is only comfortable getting the ball played to their feet rather than into space. Through this experience together, team members are able to see how this individual acts in certain situations and in order to get the best out of that player, they should be passing the ball to their feet rather than into space or in the air. This suggests than performing tasks together, is crucial for teams to be able to perform tasks together successfully. Stewart, Fulmer and Barrick (2005) support this theory and state that team familiarity

and experience performing together (Bunderson 2003) facilitates a shared knowledge between team members.

2.6.3 Team Familiarity and Task Experience Creating a Shared Knowledge

As theorised by Blickensderfer et al. (2010) team familiarity and task experience combine to create a shared knowledge between members of the same team. For instance, team members are required to have knowledge of one another as well as knowledge of how to perform the required task. These two factors would be crucial for teams who want to work more effectively together (i.e. develop effective set piece routines). Each team member would require having experience performing together in order to have an understanding of each other's skill level and likely actions. This experience would allow each individual to understand what their other team members are likely to do in specific situations. Stewart et al. (2005) stress the importance of team members understanding their roles and the role of their fellow team members, in order to be able to perform correctly. However, Bunderson (2003) propose that this is not possible unless those team members have experience performing together. In this situation, experience performing set pieces are also important. Through task experience, team members are able to see what actions are required to perform each set piece successfully and establish each individual's required role. Through performing the task together, expectations of how players think others will react will be possible. If the team has experience performing set pieces together, they will then possess a shared knowledge of each other during these situations, leading to a more efficient performance.

Blickensderfer et al. (2010) argue that task experience and team familiarity result in a shared knowledge between all team teams. This suggests that to be able to develop shared knowledge, team members need to have experience performing specific

tasks with team members (Cannon-Bowers and Bowers 2006). Blickensderfer et al. (2010) theorise that in order to have accurate shared knowledge, both team familiarity and task experience is essential. This means that having an understanding of other team members and experience performing the task are both interdependent. As suggested by Eccles and Tenenbaum (2004) both of these factors are crucial in order for team members to be able to understand one and other. Smith-Jentsch, Mathieu and Kraiger (2005) theorise that this shared understanding is then able to facilitate a coordinated performance between team members.

2.6.4 Shared Knowledge Leading to Implicit Coordination

Blickensderfer et al. (2010) state that shared knowledge between team members is a mediator between the two variables Team Familiarity and Task Experience, and the outcome of Implicit Coordination (See Figure 2.2). Rico et al. (2008) theorise that implicit coordination occurs when team members are able to predict the likely actions and behaviours of other team members in specific situations, such as field of play, and they can base their own actions on this knowledge to allow them to most effectively interact with those team members by fulfilling their own role within that situation. This philosophy supports Blickensderfer et al.'s (2010) hypothesised Model of Implicit Team Coordination that establishes the link between experience performing and developing a familiarity between team members leading to shared knowledge and implicit coordination. Poizat, Bourbousson, Saury and Sève (2009) also support this suggestion and propose that shared knowledge allows team members to be able to anticipate what each other are going to do at any one time and leads to coordinated actions. Williamson and Cox (2014) propose that through practicing skills together, an understanding of each other's skills is developed.

An example of this whole process can be seen when two strikers who have been signed by a club to be their striking partnership but they have not played together. Both players would first have to have to get to know each other, what their skill level is and what actions they are likely to perform. This is achieved through experience performing together in training and during competitive matches. Experience together and having a familiarity of each other will then lead to the two strikers having a shared knowledge of each other. This would be where each player knew the other and how they are likely to perform in certain situations. They would then be able to shape their actions based on what they thought the other one would do (i.e. produce a coordinated performance). Based on their knowledge of each other for instance, during an attacking phase of play one of the strikers would make a run across then behind one of the opposition defenders, as they knew that their striking partner was going to win a header and play them through. This action was decided on because of the knowledge that each player had about each other through having an understanding of one another through their experience performing together.

In summary, in order to gain the knowledge of team members, it is important to have the experience performing tasks together (Blickenderfer et al. 2010) and a familiarity of one another (Stillman et al. 2007), which leads to a coordinated team performance (Fiore and Salas 2006). Therefore, it is logical to state that having a shared knowledge of other team members is crucial to successful team performance. This thesis will consider these interdependent factors – which are necessary for implicit coordination - and bring them together to identify their importance and examine how they link into shared understanding between dyads and how they facilitate a more coordinated performance. This will be different to Fiore and Salas (2006) and Stillman et al.'s (2007) findings as this thesis will focus on the importance of dyadic

coordination – similar to Blickenderfer et al. (2010) – instead of team sports. This will support similar research into dyadic research (i.e. Blickenderfer et al. 2010 and Silva et al. 2013) but provides a new direction by looking at the link between experience together, task familiarity, shared knowledge and implicit coordination within a team sport instead of just dyadic sports (i.e. table tennis (Blickenderfer et al. 2010)). This approach will create a platform for further research that could look at the importance of shared knowledge on coordination between more team members than just dyads in the future.

2.7 Importance of Shared Knowledge

As stated by Fiore and Salas (2006), possessing a shared knowledge between team members is a crucial quality that teams use in order to produce a successful team performance. Blickenderfer et al.'s model (2010) shows that shared knowledge is a main causal factor for coordinated actions and therefore is likely to be a key variable in performance. Blickenderfer et al. (2010) further show that shared knowledge is a mediator between the interpersonal knowledge of team members, experiences of play, and coordinated action. Sève, Saury, Ria and Durand (2003) state that experience leads to an ability to build an understanding of a sport. This means that shared understanding is what allows experience gained during training to be translated to coordinated play and therefore competitive success. Fiore et al. (2003) support this suggestion and state that shared understanding between team members facilitates a more effective team performance.

With this in mind, it is vital to understand shared understanding as a potential mechanism for enabling an efficient team performance. In line with Blickensderfer et al.'s model (2010), Eccles and Tenenbaum (2004) argue that the relationships between

members of a team can influence their knowledge of each other and their ability to work together. This suggests that having a shared knowledge between team members improves their ability to function effectively together and increases the likelihood of a better team performance. Cannon-Bowers and Salas (2001) reported a link between having shared knowledge between team members and a successful performance. However, in order to be able to fully appreciate the importance of team members possessing a shared knowledge, we must first look at some characteristics that can influence the development of shared understanding between team members.

2.7.1 Shared Cognitive Focus

A crucial skill for successful teams to share is similar thinking between its members (Webber et al. 2000) and this environment can facilitate a more effective team performance (Kang, Yang, and Rowley 2006). Shared cognitive focus can be defined as the similarity in the psychological states of individuals regarding a specific situation (Lorimer and Jowett 2009a). Lorimer and Jowett (2009b) have argued that this is essential in allowing individuals to coordinate their actions and most appropriately respond to each other. In a team sport context, Rasker, Post and Schraagen (2000) suggest that this is because if team members share similar thoughts, it makes it easier for them to work together. For instance, if two central midfielders in a 4-4-2 formation (Figure 1.1) share similar thoughts about how they perform in certain situations, they are more likely to work well together as they will have an understanding of what each other will have to do at any one time. Therefore, in order to evaluate the importance of athlete's shared understanding, it is important to investigate shared cognitive focus. While not well examined in sport contexts, Lorimer and Jowett (2009b) investigated shared cognitive focus between coaches and athletes. They found that levels of shared cognitive focus were higher between coaches and athletes involved with individual

sports compared to team sports. This could be because it is more difficult for individuals to share an understanding with multiple people (such as seen between multiple team members and a coach) compared to a coach with a singular athlete.

It could be argued then that it would be difficult to for multiple individuals to possess a shared cognitive focus. Ward and Eccles (2006) support this theory and propose that individual team members are able to influence their whole team's shared thoughts. For instance, most football teams contain squads of twenty plus players and every single individual contributes either positively or negatively towards the team's shared cognitive focus. For example, a striker who starts to complain if they do not receive get given the ball enough could change the way some players pass the ball (i.e. they my start to pass the ball directly to the striker instead of through the midfield first). This can alter the way team members perceive each other and change their overall shared cognitive focus. This theory can help to explain why it can be difficult to have high levels of cognitive focus within team sport, as Silva et al. (2013) suggest that each individual can have their own influence over the shared cognitive focus of the team. However, a counter to this would be the concept that sporting teams – like football - contain multiple smaller units each with a different role and focus (e.g., strikers up front, or, defenders and the goalkeeper). Correia et al. (2011) suggest that these smaller teams are described as sub-teams and these teams are based on member's positions (See Section 1.2.1). It could therefore be said that these sub-teams find it easier to have a shared cognitive focus compared to the team as a whole. However, since there is a requirement for further research that has considered the importance of similar thinking within dyads it would be importance to provide further evidence to support this suggestion. The current thesis can support findings from Correia et al. (2011) and Silva et al. (2013) but can bring their suggestions into football, which has been rarely

considered even though it is one of the world's most richest and popular sports (Budd and Egea 2017). The current research can provide an extra dimension into this field and provide the platform for further studies looking at shared understanding within sub-teams in football.

2.8 Shared Understanding between Team Members

While it can be argued that shared cognitive focus could be an important aspect of team performance, it can also be argued that it is not enough simply to share similar cognitions regarding a situation. The concept of shared understanding can be classed as two or more people having similar thoughts on specific situations based on prior experience of those situations over a period of time working together (Blickensderfer et al. 2010). Where this differs from shared cognitive focus is that it implicitly includes the concept that in order for a team to be successful, its members are required to have shared knowledge of other's skills and abilities (Eccles and Tenenbaum 2004). For example, it would be crucial for a football team to possess a shared understanding between each member when trying to score a goal from an attacking corner kick. Each team member would require to not only have similar thoughts regarding the situation, but also an understanding of each other's abilities and capacities and the likely actions of others in the team.

It can therefore be argued that similarity in psychological states (e.g., interpreting a situation in the same way) is only partially related to performance; it is also vital that this similarity is based on accurate information. For example, not only would two football strikers 'read' a game situation in the same way and act in a coordinated manner, but they would also be selecting the optimal course of action based on an accurate understanding of each other's abilities. However, Blickensderfer et al.

(2010) states that shared understanding between team members is not instantaneous, this understanding requires experience performing together. Therefore, it would be important to consider what happens during this time and how understanding develops between team members.

2.8.1 Developing understanding of other individuals in a team

Blickensderfer et al. (2010) suggest that in order to develop shared understanding between team members they must have experience performing together. This could be through training or performing together in competitive situations. Through performing together shared understanding is developed between team members (Silva et al. 2013) as during these situations, players are able to see how each other act during specific situations. During shooting practice team members can see how their goalkeeper reacts to different shots towards their goal, for example. The goalkeeper could perform well against shots that are directed towards the top corner of the goal but could struggle to get down to save shots aimed towards their bottom corner. Through this type of practice and experience performing together, team members will know the goal goalkeeper's strengths and weaknesses and how they are likely to perform during competitive situations. This suggestion is supported by Williamson and Cox (2014) who stressed the importance of training together in order to develop an understanding of team member's skills and abilities. For instance, defenders would try to reduce the likelihood of opposition players taking low driven shots towards their own goal, as they know their goalkeeper does not deal well with them. This example stresses the importance of developing an understanding of other team member's strengths and weaknesses in order to be able to have expectations of how each other are going to react in specific situations.

Gershgoren et al. (2016) suggest that this is where expectations are created between team members, where they see how each other will normally react in specific scenarios. For instance, during training a football team will work on several attacking situations with both attackers and defenders. During this type of training experience, team members are able to see the strengths and weaknesses of players in different circumstances (i.e. the full back is strong with the ball at their feet but does not cope well when the ball is up in the air). Possessing an understanding of their team member will help others to play to that player's strengths in order to help the team to be successful (i.e. if they are going to pass the ball to this right back, they are better to give it to their feet rather than play a higher pass in the air). Blickensderfer et al. (2010) suggest that once team members have an understanding of each other's skills and abilities, they will have an effective shared understanding and this can lead to a better team performance.

Through experience together, team members will be able to establish each individual role in the team and have knowledge of what certain players are likely to do during certain situations (Blickensderfer et al. 2010). This suggests that an overall understanding of each team member's role is crucial to the development of shared understanding between members of a team. For instance, if each member of a football team understands what each other is likely to do during a specific counter attack that has been worked on during training. This means each player is able to perform their role efficiently and correctly, leading to an efficient team performance. Gershgoren et al. (2016) theorises that an overall knowledge of what is expected in each role within a team is fundamental to the chances of a successful team performance. However, Eccles and Tenenbaum (2004) theorise that even if it is crucial for team members to share an

understanding of one another, players in specific positions are required to have specialised knowledge of how to perform that role in the team.

2.8.2 Developing an Understanding of Specific Tasks and Roles

Entin and Serfaty (1999) propose that the majority of players in a team will have an amount of general knowledge about others in their team but stress that more specific knowledge very likely to be shared between those of a similar position. This is because each position in a team requires different actions based on the situations that they are faced with during a competitive match (Correia et al. 2011). For example, during a set piece drill in a training session, attackers would be up against defenders to try to score a goal. This situation would give both types of players an understanding of what would be required to perform that role in order to decide what action they should perform. For instance, a defender would see how the attacker they were marking at a corner and shape their actions based on what the opposition was doing. However, the defender would then have an understanding of what actions an attacker in this situation would potentially choose, giving them a general knowledge of a different role to their own. This example demonstrates the findings of Gershgoren et al. (2016) who specify the importance of team members having a general understanding of other roles within a team in order to help shape their own actions.

Eccles and Tenenbaum (2004) suggest that certain specific knowledge between athletes does not have to be shared with all those in the same team and is dependent on the position of that athlete in the team. This could be because certain players may never experience certain situations so they may not have the same understanding as a player who performs during the same scenario on a regular basis. For example, a goalkeeper in football is very unlikely to experience the same situations in the middle of a pitch

compared to someone who is playing in a central midfield position (See Section 1.1.1, Table 1.1). However, it would still be important for the goalkeeper to understand some of the required actions of this role, (i.e. how to win a header from a high ball). This would be important because this knowledge would help the goalkeeper to choose the best type of kick to make in order to help their central midfielder to win a header and push their team further up the pitch. Therefore, like Entin and Serfaty, (1999) and Eccles and Tenenbaum (2004) suggest, players of a similar position are more likely to have a specific shared understanding compared with those who play in a different position.

According to Gershgoren et al. (2016), different team members are required to have a large general understanding of their team sport, but also need a deeper knowledge of the required actions of their position in the team. This suggests that players of a similar position within a team are theoretically more likely to show greater shared understanding of certain situations. Sharing specific knowledge amongst players of a similar position in a team will help them to combine with each other in order to provide a successful team performance (Eccles and Tenenbaum, 2004).

For example, a right midfielder and a right back in a 4-4-2 formation (See Figure 1.1) must share specific knowledge in order to be able to perform together, (i.e. where one player should be if the other is further forward towards the opposition goal). This situation is crucial because team members will all understand the role that they are required to perform in order to achieve a coordinated team performance (Entin and Serfaty 1999). This theory supports the research of Blickensderfer et al. (2010) as their model (Figure 2.2) suggests that the shared knowledge between athletes within a dyadic relationship is important to successful team performance.

2.8.3 The Importance of Shared Understanding between Team Members

Gershgoren et al. (2016) suggest that successful teams require experience performing with team members that provides individuals with a general sporting knowledge in addition to specific knowledge regarding these other players and specific knowledge about how to perform in a specific role. These factors are what allow the development of shared understanding between team members (Blickensderfer et al. 2010). For example, a right back in a football team in a 4-4-2 (Figure 1.1) would have the understanding of what they should be doing at any one time but they will have the knowledge of those around them and what these others will be doing at the same time. Blickensderfer et al. (2010) suggest that if team members have a well-developed shared understanding, they will in turn be able to predict the actions of other individuals and react appropriately, leading to effective coordinated actions and thus increasing the likelihood of a successful performance. For example, if a central midfielder in a 4-4-2 formation (Figure 1.1) knows that their centre back is likely to header a high ball back into the midfield, they would move into a position on the pitch where they think that the ball is likely to land. Silva et al. (2013) support this suggestion and state that this shared knowledge has to be obtained through experience of performing together with their team members. In this scenario, the central midfielder is using their knowledge of their team member to predict what they are likely to do in order to achieve a coordinated performance. This is possible when team members have an understanding of the likely actions of others as they are able to predict what other individuals in the team are probably going to do and can choose their own actions based on this (Gershgoren et al. 2016).

When considering research that has focused on the prominence of shared understanding between teams (Eccles and Tenenbaum 2004; Gershgoren et al. 2016) it

is necessary to establish if this the same within football. However, it would be important to provide further evidence of shared understanding between dyads (i.e. different sub-teams in football) and then scale up to the full team through similar methodologies to this thesis. This would help to advance research that has stated the importance of shared understanding between sub-teams (Blickensderfer et al. 2010; Silva et al. 2013), similar to those in football where there is a lack of evidence. This would provide more data to support the importance of shared understanding between team members as suggested by Blickensderfer et al. (2010) and Gershgoren et al. (2016). Therefore, this research looks to determine the importance of shared understanding between athletic dyads to provide a platform for future research projects that can build on the current study to evaluate the necessity of shared understanding in team sports like football.

2.9 Shared Mental Models

Shared understanding between team members is facilitated by a possessing a shared mental model (Mathieu et al. 2000). A shared mental model can be defined as a set of knowledge structures that are shared between two or more individuals (Marks, Zaccaro, and Mathieu 2000) which allow them to coordinate their actions (Cannon-Bowers, Salas and Converse 1993). Shared mental models can provide a description, explanation and the prediction of behaviours within a team setting (Jonker et al. 2010). An effective shared mental model can be likened to both individuals possessing the same roadmap. If they both follow the map correctly, they will reach the same destination. Additionally, by studying that map they can predict the route each other is most likely to take to reach that destination. For example, a successful team which includes members who are able to adopt this approach are more likely to be able to have an understanding of what each individual is likely to do in certain situations, and can

predict what they are going to do next. This suggests that having this mutual understanding within a sports team helps to facilitate the sharing of knowledge between team members and having an overall understanding of the required tasks (Bourbousson, Poizat, Saury and Sève 2011).

Jonker et al. (2010) and Williamson and Cox (2014) suggest that in order for a team to be classed as an expert team, they must possess a shared mental model in order to facilitate similarity in their thinking processes. This is because team members have an understanding of each other's ability and likely actions, leading to a coordinated performance (Mathieu et al. 2000). Having a shared mental model amongst a team can have several positive performance outcomes (Cannon-Bowers et al. 1993). Mathieu et al. (2000) and Johnson Lee and Lee (2007) further propose that a shared mental model allows the understanding and prediction of others' behaviour based on events which have occurred previously. Mathieu et al. (2000) however emphasise that there are multiple types of shared mental models and no 'correct one' for every situation.

2.9.1 Different Types of Shared Mental Model

Cannon-Bowers et al. (1993) and Mathieu et al. (2000) discuss several types of shared mental models. Certain knowledge structures may be required in different situations. For example, a team may be required to focus on completing a task that would tap into one type of shared mental model. However, a shared mental model which is more focused on how a team works together could be used by a team that has a number of new players in order to build their understanding. Jonker et al. (2010) suggests that within a team, a shared mental model develops naturally over time performing together. Over the course of a season for instance, team members will become more familiar with each other as their mutual understanding grows. This will

lead to a more efficient shared mental model between team members due to the improvement in understanding. Jonker et al. (2010) suggest two different types of shared mental models that are subconsciously used by teams depending on the situation that they are faced with; task work and team work. In order to fully understand these two mental models and how teams use them, it would be important to consider why these mental models are important, what type of situations these would be used in and could they be combined in order to produce a better team performance.

2.9.2 Task Work Mental Model

The task work shared mental model is linked to the task which the team needs to perform successfully, potential negative aspects of performing the task and the procedures that are required (Jonker et al. 2010). This type of shared mental model is focused on a team successfully performing a task. This approach would require team members to each perform a specific role that resulted in a successful performance. For instance, this type of mental model within a football team would be focused on scoring goals - centred on the task itself - rather than how it is achieved, (i.e. scoring goals rather than how the team works together in order to score). For example, this type of knowledge structure can be used when a football match only has minutes left and a team needs to score to win. In this situation, the team is solely focused on trying to score in order to win the game and not on how the team work together, only that they must score in any way possible.

How the team scores a goal is not considered important within this mental model, only that a goal is scored. In this instance, when the team is trying to score the winner in the last few minutes of a game, they may adopt a long ball approach. This could go against how their team normally perform, but they are more focused on trying

to score even though the negative aspects may help to achieve the team's goal of trying to score. One of these could be that increasing the number of long balls towards the striker in order to try to score a late goal increases the chance of an opposition defender clearing the ball. Even though there is now a higher chance of error when playing this type of pass, in order to score they would have to adopt the more direct approach regardless of risk. In this situation, this type of shared mental model places focus on the completion of the task itself and not what way the team usually works (Jonker et al. 2010).

2.9.3 Team Work Mental Model

A team work mental model is focused on how teams function and considers the individual team members' skills and preferences according to Jonker et al. (2010). This type of shared mental model emerges to help players understand each other's skills and abilities. For instance, this approach could be adopted when new players start to play for a team. During this situation, team members need to learn each other's abilities and how they choose to perform in certain scenarios. This will lead to a development of understanding between players and will help to facilitate a better performance long term. Therefore, the main focus of this type of mental model is on how team member's skills work together.

This type of shared mental model focuses on how the team works with one another and how their skills combine to produce a successful performance (Bourbousson et al. 2011). This approach suggests team members work together and combine all their own individual skills in order to create a successful performance. This approach can be seen when trying to develop set piece routines during training in preparation for a competitive match. For example, the team would have to have an

understanding of who was taking the set piece and where the ball was likely to land. In this situation, team members would then position themselves and choose their actions based on how they think their team member will deliver the ball in order to try to score. Since this type of shared mental model is based on understanding and incorporates team members working together (Mathieu et al. 2000), it could be used in numerous situations during a competitive match. Potentially however, this type of mental model could be used in conjunction with the task work model in order to create an efficient team performance (Jonker et al. 2010).

2.9.4 A Combination of Models

The use of these types of shared mental models proposes that members of a team may follow different shared mental models depending on the scenario that they are faced with. As suggested by Jonker et al. (2010) and Bourbousson et al. (2011) a mixture of these models can be classed as crucial in a sporting context forming a shared mental model which is focused on task work as well as team work. For example, a combination of these two shared mental models can be seen when a team is trying to score a goal during a match. The task work mental model is adopted by the team who outline their desire to score a goal. This would be where each individual is focused on winning the game and scoring a goal. However, through adopting a team work mental model this achievement is made easier. The team work mental model would be used to work towards scoring a goal, through team members working together. This would allow team members to work together and have an understanding of each other's abilities in order to score a goal. Therefore, a combination of these two knowledge structures would help to facilitate an efficient team performance.

A combination of both these shared mental models would help to facilitate a more efficient team performance. The goal of every team is to produce a successful performance (Williams 2013) and any method which can improve how a team works together is important. This efficient performance is possible if a team's members contribute and work together and if they are sharing similar thoughts, so that they will be able to work together better (Mathieu et al. 2000). However, it is also important that the mental model(s) that they choose to adopt are efficient and not based on an incorrect understanding of team members (Bourbousson et al. 2011). Therefore, it would be worthwhile examining the different characteristics that team members would have to possess in order for their team to be able to adopt an efficient shared mental model.

2.9.5 Development of an Effective Shared Mental Model

Kim (1997) states that experience performing together will improve team member's shared mental model. Bourbousson et al. (2011) theorise that having an effective shared mental model between members of a team is an ideal scenario for a successful team. For example, if team members do not have the correct understanding of a specific player, (i.e. they may think that they prefer the ball played into space for them to run into, rather than to feet, even though they do not have the speed for this type of pass, meaning that the team's performance will suffer). In this situation, the player who prefers the ball into their feet will not have the speed to run into the space to collect the ball and the team will lose possession. If an individual had an understanding of their own ability, but not of their team members, their choice of actions would not always be correct and would result in an uncoordinated team performance. This scenario suggests that having an efficient shared mental model(s) is crucial in order to be able to perform effectively as a team. This could be because individual members of a team have the potential to influence the shared mental model that their team possesses

in a positive and negative manner (Jonker et al. 2010). This can be seen for instance, if a new team member came into the team. This could disrupt the shared mental model of the team as members could be sure of what this player would do (i.e. team members' expectations of this player may not match how the team perform). Mathieu et al. (2000) states that team members are required to have an understanding of their team members in an effective shared mental model. However, through performing together over time their expectations of this player will match and facilitate an effective shared mental model.

Williamson and Cox (2014) stress that individuals must be aware of their own abilities as well as other team members as the skill requirements may depend on what member of the team they are playing with at any particular time. For instance, a centre back must understand their skills and the role that they are performing for the team (Figure 1.1). It would be an error if they start to dribble with the ball down the right-hand side trying to take on players – even though this may not be their strongest skill. Araújo and Davids (2016) stress the importance that team members are able to use their knowledge of the roles and abilities that their team members have to be able to work effectively together.

In the above situation, the players are not only not playing to their own strengths but also failing to perform their role in their team, resulting in an inefficient team performance. This would have a negative impact on the team's shared mental model as no one would understand or be able to predict what this centre back would do as this was not in line with what they expect that particular player to do. In this situation, the defender should realise what their skills are and what role in the team they are required to perform. Kermarrec and Bossard (2014) propose that when people need to make

complex decisions, they use previous experience of performing the required skills. This theory proposes that in order to be able to consistently make the correct decisions between team members, possessing an understanding of their team members' abilities as well as their own is crucial. Mathieu et al. (2000) suggest this is a vital characteristic of an effective shared mental model. However, Blickensderfer et al. (2010) suggest that the understanding between team members requires experience performing together. Therefore, it would be important to consider experience as a factor related to having an effective shared mental model between team members.

2.9.6 The Role of Experience

Mathieu et al. (2000) suggest that having an effective shared mental model will facilitate the performance of a team. According to Eccles and Tenenbaum (2004), this is because when athletes start training together, there is little understanding between team members. However, Williamson and Cox (2014) state that in order to create an effective shared mental model within a team, it takes a large amount of experience and time to refine their actions. For instance, if team members spend time together during training and matches, their understanding of each other will improve as they will experience similar situations. This will allow individuals to see each other's abilities in certain situations. This experience will improve their ability to work together and improve their team work mental model. For example, if team members perform attacking set pieces in training they will develop an understanding of each other's abilities and likely actions. This scenario will lead to team members being able to work together more effectively as they will know how each other are likely to act during these set piece routines.

Improvements will also be seen within the team's task work mental model as they gain more experience performing together. For instance, the more set pieces they perform together, their understanding of how each player's role contributes to a successful attacking set piece e.g. a goal, will improve. This will be based on the team's collective understanding of how these set pieces should be conducted in order to score a goal. This suggests that experience together creates shared understanding between team members over time and in turn producing an effective team work and task work mental model.

Williamson and Cox (2014) theorise training together provides an effective method of creating shared understanding between team members and allows perceptions to be built regarding the abilities of each member. Silva et al. (2013) postulate that while the time a team spends together can have an influence on a team's level of shared understanding, there is no evidence for a specific or optimal amount of time or number of experiences that will give team members an optimum level of shared understanding. However, Williamson and Cox (2014) theorise that the more team members train or play in competitive matches, the more likely it is to see a corresponding development in shared understanding. Stout et al. (1999) suggest that if a team is together for a longer period of time practicing routines, their level of shared knowledge of others in their team will increase. Silva et al. (2013) theorise that this is because practising routines can help athletes to memorise patterns in play and how certain team members react in specific situations. This would suggest a link between the amount of time teams train and work together and levels of shared understanding. For example, if team members practice set pieces together, each individual would know their role and what each other should be doing. This facilitates understanding between team members through experience together. Eccles and Tenenbaum (2004) suggest that

experience together is important for developing understanding and can facilitate more effective methods of communication.

2.9.7 Improvement of Communication Methods

Jonker et al. (2010) theorise that if those involved within a relationship follow a shared mental model, communication becomes more effective between those in this relationship allowing them to work better as a team. However, having effective communication can also improve a shared mental model (Mathieu et al. 2000). This suggests that these are reciprocal, e.g. as a shared mental model is developed, communication improves but as communication methods become more efficient the team's shared mental model also improves.

For instance, at the start of the season, a team may have signed a few new players over the summer and their understanding of each other has not had a chance to develop yet. At this stage, the methods of communication that the team use are not as effective as they could be. Over time performing together, their understanding of each other will improve, as will their methods of communication, based on experience performing together (Jonker et al. 2010). This also results in improvements to the team's shared mental model as communication methods become more efficient, understanding between team members develops.

Mathieu et al. (2000) suggest that the effectiveness of communication methods improves over time as a shared mental model develops. These improvements can be seen for a combination of both a team work and a task work shared mental model (Jonker et al. 2010). For instance, through experience performing together, methods of communication and shared understanding can facilitate improvements to a team work mental model between team members. This would be possible as through experience

performing together, methods of communication would be more streamlined and team member's ability to work together would improve (Cooke et al. 2007). For example, the more experience a defensive line practice an offside trap, the better understanding they will have of a centre half's shout to push up. This would result in a more comprehensive knowledge of what that player's instruction meant, meaning more efficiency with the communication methods which are chosen.

In addition, in this situation improvements to methods of communication would lead to a more efficient task work model. For instance, players in this defensive line would over time know how to perform their individual role within playing an offside trap. These players would recognise a shout from one of their team members and perform their required action. This would lead to a more efficient task work model as the defenders would be able to perform the task quicker and correctly as their understanding of the task improves, leading to better methods of communication to start the move off. Therefore, this scenario supports suggestions made by Eccles and Tenenbaum (2004) who propose that more understanding can lead to more effective methods of communication between team members and improvements to the team work and task work models with the more scenarios they perform together. However, the improvements to these mental models also lead to a better understanding and more efficient methods of communication (Mathieu et al. 2000).

Jonker et al. (2010) argue this is because individuals who understand each other better require less verbal communication in order to coordinate their actions, instead relying on interpersonal knowledge and past experiences. For example, if team members hear a shout from a specific player in the early stages of training together, they may not understand that in this situation a certain action is required. At this stage,

the team's shared mental model would not be entirely efficient as team members' understanding would not be sufficient to understand what each other mean with verbal instructions every single time.

Cooke et al. (2007) theorise that experience together this can lead to players understanding how to act in similar situations and non-verbal communication methods like gesturing in order to coordinate their actions. In this situation, the shared mental model will have become more efficient in addition to improvements to communication methods. This would mean team members would possess a greater understanding of each other and they would know what specific non-verbal communication methods meant i.e. pointing or simple head movements. Having efficient methods of verbal and non-verbal communication improves the team's shared mental model, but it is the understanding of each team member that facilitates more efficient methods of communication also.

However, there are various ways in which this type of environment can be created (Mathieu et al. 2000) and there is no set way to create one shared mental model that will work for every team and do so in the same amount of time. For example, when considering a shared mental model of two different football teams between their team members would facilitate shared understanding between team members and improve methods of communication between each other at different rates due to the individual members of each team. Therefore, possessing an effective shared mental model within a team can facilitate more effective methods of communication and coordinated performance (Mathieu et al. 2000). This framework aims to improve the sharing of information through communication between team members (Jonker et al. 2010) as well

as improving the likelihood of being able to predict the actions of other members (Cannon-Bowers et al.1993; Mathieu et al. 2000).

2.9.8 Coordination Leading to More Understanding

As stated by Mathieu et al. (2000), an effective shared mental model between team members will facilitate a coordinated team performance. Having this type of knowledge structure, team members have the ability to predict the actions of one and other. Mathieu et al. (2000) suggest that an efficient shared mental model can allow the understanding of scenarios for members of a team as well as being able to predict what actions others may take. For example, experience performing together can give two attackers a shared knowledge of each other's skill level and likely actions and if these two attackers have a good enough understanding of each other, they will be able to predict how each other will act in specific situations. Silva et al. (2013) theorises that experience performing together can lead to improvements in shared understanding and to the ability to predict the actions of other team members. For instance, one striker may prefer to challenge for a high ball. Their partner would use this understanding to predict that the attacker will choose action in certain situations, so they run in behind the defensive line in order to try to collect the ball, which is likely to be played by their partner. This example demonstrates team member's ability to use their knowledge of each other to predict the actions of each other and base their own actions on what they think their partner will do, (i.e. leading to a coordinated performance). This theory also links to Blickensderfer et al's Model of Implicit Coordination (2010) where they state that a shared understanding between team members facilitates the prediction of actions and leading to a coordinated team performance. This suggests that in addition to the predication of actions, having the knowledge of other member's actions helps to shape the actions of the rest of the team (Jonker et al. 2010). The ability to coordinate team

member's actions will also lead to further improvements to shared understanding. Blickensderfer et al. (2010) propose that this understanding can change over time, where the ability to coordinate actions is facilitated by the sustained development of shared understanding between team members. Subsequently, a team member's understanding of one another could potentially fluctuate over time depending on individual team members. For example, as players get older they may have to change how they react in certain situations, i.e. an individual may become slower over time. This means that the player would be able to change how they would act in certain situations, based team members performing together over time. This is important in order to have shared understanding of how this individual's likely actions have changed. This example suggests that team members are required to have a shared understanding of each other in order to perform well however, if certain characteristics or actions change, they must develop their understanding as well and one way for improvements to understanding is through more coordination.

As theorised by Correia et al. (2011) and Reimer et al. (2006) all teams are made up of many different sub-teams which are dyadic relationships (See Section 1.2). For example, teams are comprised of numerous sub-teams who have to be able to perform specific roles to be able to function effectively together (Mathieu et al. 2000). Based on some of the research that has considered shared understanding within relationships in sport, e.g. coach-athlete relationship (Jowett and Poczwardowski 2007) (see Section 2.10) an investigation into the existence of shared understanding between dyads within the same team and exploration of how this understanding develops would be worthwhile. This would help to see if there were similar factors that influenced shared understanding between athletic dyads and the coach-athlete relationship. Comparable factors in relation to the existence and development of shared

understanding between the coach-athlete relationship (Jowett and Poczwardowski 2007) could be drawn in addition to similar factors that have established in teams (Silva et al. 2013).

When considering research that looked at shared understanding between full teams (Smith-Jentsch et al. 2005), it would be important to identify similar factors between the existence and development of shared understanding between team members and between dyadic sub-teams within teams. Since shared understanding is suggested to be an important characteristic which is fundamental for team members to be able to coordinate their actions (Eccles and Tenenbaum 2004; Blickensderfer et al. 2010), an investigation which looks at shared understanding would be beneficial to the advancement in knowledge in this topic. This would help to establish the importance of shared understanding between dyads which Blickensderfer et al. (2010) state is crucial for dyads to be able to coordinate their actions. Therefore, this research looks to determine the importance of shared understanding between athletic dyads, prove its existence and aim to propose factors that contribute to the development of understanding between dyads.

2.10 The Importance of Coach-Athlete Relationship in Developing Shared Understanding between Football Players

As stated above, the existence and development of shared understanding between team members is fundamental to an effective team performance (Blickensderfer et al. 2010, Silva et al. 2013). However, another crucial factor can have a large influence on team members' ability to develop this shared understanding - the coach athlete relationship (Gabbett 2006). In order to be able to establish the

importance of shared understanding between team members, the importance of the coach-athlete relationship must be evaluated.

2.10.1 The Coach-Athlete Relationship

The coach-athlete relationship can be described as the interpersonal connections between an athlete and a coach (Cassidy 2009) and this relationship can have a significant effect on an athlete's performance (Jowett and Cockerill 2003; Jowett and Poczwardowski 2007). There has been research which has looked at how this coach-athlete relationship has such an impact on an athlete's actions and development (Côté and Gilbert 2009; Jowett, O'Broin and Palmer 2010). This relationship can be seen as comparable to the athlete-athlete relationship because there are a number of similarities which each relationship shares. For instance, both are a two-person relationship that share similar traits such as requiring to work towards achieving common goals. Therefore, in order to evaluate the importance of the coach in shared understanding between athletes the relationship between a coach and an athlete must be considered.

2.10.2 The 3 + 1 C Model

Jowett (2007) established the 3 + 1C's Model in order to explain the four key components of the coach-athlete relationship. The four factors that make up Jowett's model (2007) are labelled closeness, commitment, complementarity and co-orientation. Since there are a number of similarities between this relationship and athlete-athlete relationships (dyadic sub-teams), Jowett's model (2007) could be used to describe this relationship.

The first component of the model is called closeness and refers to the depth of the emotional attachment between the athlete and the coach and expressions of appreciation, trust and respect are taken into consideration. For example, this looks at

whether the coach and the athlete like each other and are willing to accept each other's judgments on certain aspects such as training schedules or focuses. The next component of Jowett's (2007) 3 + 1 C's model is categorised as the commitment section and Jowett and Ntoumanis (2004) define interpersonal commitment as the intention of a person to maintain a relationship over a long period of time. The third component is complementarity and this looks at how cooperative and effective the relationship actually is and how well both the coach and the athlete work together to achieve joint goals. For instance, this section of the 3 + 1 C's model (Jowett 2007) emphasises that the better the athlete and the coach get on together and cooperate, the easier these shared goals will be to achieve and this can be shaped by where the coach feels the power relation is within their relationship with their athlete. The final part of the 3 + 1 C's model (Jowett 2007) expresses that co-orientation is crucial to the success of the coach-athlete relationship. Co-orientation is the "+1" element, falling under the cognitive construct runs through the affective, cognitive, and behavioural elements (Rhind and Jowett 2010). This section of the 3 + 1 C's Model emphasises the importance of the coach being able to work effectively together to help the athlete to perform to their optimal level.

Jowett's 3 + 1 C's Model (2007) establishes the main components of the relationship between a coach and their athlete and states that this relationship has an influence over how the athlete performs. Considering this suggestion, if the relationship between a coach and an athlete can affect athletic performance, this relationship can have an influence on the level of shared understanding between team members. Therefore, it would be important to consider how the coach and this relationship can affect an athlete during training and competition, including their shared understanding between their fellow team members.

2.10.3 The Influence of a Coach on Developing Shared Understanding during Training and Competition

As stated above, the relationship between a coach and their athlete can influence how that athlete performs (Jowett, O'Broin and Palmer 2010). In addition to this relationship, the coach can play an important part in the development of shared understanding between athletes. For instance, a coach can help increase shared understanding between their athletes by simply pairing athletes together during training and in competitive matches. This would increase their experience performing together (See Section 2.5.2) which is a fundamental part of developing shared understanding between team members (Eccles and Tenenbaum 2004). For example, the type of drills that coaches choose during their training sessions (i.e. tactical shaping) can improve understanding between team members (Gabbett 2006). If a coach decided to use tactical shaping drills with their training sessions they would be able to give their players more experience performing together which Blickensderfer et al. (2010) state is crucial to developing an understanding between team members. This would allow players to build up an understanding of what their team members are likely to do in certain situations (Cannon-Bowers and Bowers 2006). This suggestion supports a section of the Model of Implicit Team Coordination (Blickensderfer et al. 2010) that emphasises the importance of task experience and team familiarity to developing an understanding between team members. Therefore, the coach plays an important role for developing shared understanding between team members by giving their athletes the experience of performing tasks together to be able to develop their understanding of one and other. However, what influence does a coach have over their athletes' ability to demonstrate this knowledge and facilitate an efficient team performance?

2.10.4 The Influence of a Coach on their Athletes' ability to Demonstrate Shared Understanding during Training and Competition

As suggested previously, the coach-athlete relationship has a central role in athletic development (Côté and Gilbert 2009; Jowett, O'Broin and Palmer 2010) and in the development of shared understanding between team members. However, when it comes to deciding how to act in certain situations team sports athletes depend on their previous experience with their team members on how to perform (Blickensderfer et al. 2010). Cardin, Bossard, Buche and Kermarrec (2013) stress the importance of football players being able to make quick and effective decisions when performing in order to achieve an efficient team performance.

Coaches play an important role in developing this understanding (Gabbett 2006) but when it comes to in game decision making, team members' understanding of one and other it is how they are able to perform effectively together (Fiore et al. 2003). Federico (1995) states that this is because effective decisions are made quickly and are based on pattern recognition (i.e. previously similar situations). For example, during training the coach can prepare for a game where they expect to be playing against a team with one quick wide left midfielder. The whole team would have developed an understanding of each other's roles (See Section 1.1.1) based on this assumption. However, after five minutes of the match the wide midfielder switches to the opposite side. Team members then have to adopt slightly different roles to be able to work effectively together. Each player will rely on their understanding of one and other's abilities (Gershgoren et al. 2016) and previously similar situations that they have experienced together (Blickensderfer et al. 2010) to be able to perform together. To be able to make this an effective decision, it has to be done quickly in order for the team to be able to have an efficient performance (Cardin et al. 2013). Therefore, this example

demonstrates the importance of the coach when developing shared understanding between team members (Gabbett 2006) however, when it comes to performing together team members rely on their shared understanding (Smith-Jentsch et al. 2005) based on their shared experiences (Williamson and Cox 2014) in order to make quick and effective decisions (Cardin et al. 2013).

2.11 Conclusion

2.11.1 Why is Shared Understanding between Dyads Important?

Shared understanding is when two or more people possess similar thoughts in specific situations, based on previous experience with each other (Blickensderfer et al. 2010). Eccles and Tenenbaum (2004) state that shared understanding is an important characteristic of successful teams. For example, if two strikers in a 4-4-2 formation (Figure 1.1) can develop a shared understanding through experience performing together, they will be able to use their knowledge of each other to be able to perform more efficiently together. Carron and Brawley (2008) propose that this would be possible because each player would know how each other would react in certain situations, making it easier for them to perform together. For instance, one of the strikers could use their knowledge of their partner to challenge for a header, as they knew that their partner would be able to run in behind the defence in order to get a shot on goal. This understanding would give their team the best chance to score a goal. However, this situation would not be possible without shared understanding between both players. Therefore, in order to achieve an efficient team performance, team members should have an accurate understanding of each other (Silva et al. 2013). This means that shared understanding is a crucial skill for dyads to possess, in order to have an effective shared understanding between one another.

2.11.2 Shared Understanding Created and Developed from Experience

Performing Together

Williamson and Cox (2014) state that it takes experience to refine actions in order to create understanding between athletes, allowing successful expectations and predictions of one another's actions. Blickensderfer et al. (2010) theorise experience together to be central to creating shared understanding between team members. For instance, through training together team members are able to build up knowledge of their team members over time. For example, through practicing defensive set pieces, defenders will develop a shared understanding between other team members of what each other are likely to do in these situations. This understanding will facilitate the development of an efficient team work mental model (Mathieu et al. 2000) between the defenders as they will learn how they need to work together in order to achieve an efficient performance.

Baker, Côté, and Abernethy (2003) acknowledge that the development of understanding between team members can take some time. This is because experience together allows team members to build up knowledge of each other but individual characteristics can alter how the team work mental model can develop. Stout et al. (1999) also suggest practicing together to be effective mechanism for increasing understanding between athletes, by allowing team members to see what each other do during specific situations. Silva et al. (2013) postulate that there is no specific number of experiences that gives team members optimal shared understanding. However, in order to develop a comprehensive understanding of other team members, team members need to have experience performing tasks. Therefore, in order to create shared understanding between dyads, they must have experience performing together in order to allow it to develop.

2.11.3 Shared Understanding and Positon Specific Knowledge

Experience is crucial for team members to be able to understand each other. However, specific knowledge based on what position individual members are playing is also important (Eccles and Tenenbaum, 2004). This is because players in a similar position such as defenders would require different knowledge of how to perform their role during a match compared to attackers, meaning these two positions would not require the same knowledge to perform. Berman, Down and Hill (2002) support this example by suggesting that certain players have specific knowledge related to tasks that they can perform which other team members cannot. For example, defenders would have to have a general understanding of how attackers play in certain situations in order to shape their own actions. However, they would have to possess a thorough knowledge of how to defend effectively in order to perform successfully.

In relation to the above example, defenders in the same team will develop their own knowledge of what their own role requires. Each of the defenders will use their knowledge of their own role in order to work towards achieving the team's defensive goals. However, this would not be possible unless each defender knew what was required of them in their own role. Entin and Serfaty (1999) stress that this allows each team member to understand their own role within a team and will allow for a successful team performance. This suggests that team members would benefit from having a robust knowledge of their own role in order to be able to achieve team goals. This supports an important theme of Blickensderfer et al's (2010) model where shared understanding is created through experience. Therefore, team members of similar positions not only have to have an understanding of each other but they also must share knowledge of their role within the team.

2.11.4 Shared Understanding and Methods of Communication

Sullivan and Feltz (2003) suggest that effective methods communication is one of the most important aspects of intra-team interaction. One such example of communication methods being linked to a positive team performance that is suggested by LeCouteur and Feo (2011) is that mistakes that occur can be reduced by having effective communication between members of a team. For example, if team members possess effective methods of communication it will prove easier to coordinate players when trying to defend a free kick. For instance, if some of the team's defenders give a shout to push the defensive line up towards the edge of the penalty box (Figure 1.1), this will reduce the chance of the free kick being played to one of the opposition, leading to an easier shot on goal. If methods of communication are not effective and some players do not understand what their team member is trying to say, this will lead to a poor defensive line. This will mean the likelihood of the ball going to an opposition attacker will increase, giving the opposition a better chance of scoring.

However, if team members have a mutual understanding of what certain players mean when they give certain instructions, their ability to defend the free kick is increased, making it more difficult for the opposition to score. Eccles and Tenenbaum (2004) suggest that effective methods of communication improves as team members gain more experience together and this can lead to better performance. This would be based on players seeing what specific instructions from individuals mean, facilitating a mutual understanding between players depending on what a specific player means (Onağ and Tepeci 2014). The above example suggests that effective methods of communication and experience performing together are interlinked and help to facilitate an effective mutual understanding between team members and if these are both effective, team members will be able to coordinate their actions. However, Eccles and

Tenenbaum (2004) state that possessing an effective understanding between team members is central to this. Therefore, shared understanding and methods of communication are interdependent and as one of these improves, the other will improve.

2.11.5 Shared Understanding's Role in Developing an Effective Shared Mental Model

A shared understanding of team members is crucial to a successful team performance (Eccles and Tenenbaum 2004) and the process that explains understanding between team members is called a shared mental model (Jonker et al. 2010). A shared mental model is defined as knowledge structures between people, allowing coordination of actions (Cannon-Bowers et al. 1993) providing description, explanation and prediction of behaviours within a team (Jonker et al. 2010). All sporting teams possess some form of shared mental model however; it is the quality of that model which is crucial (Bourbousson et al. 2011). In this situation, team members would all have an understanding of each other's skill levels and likely actions. For example, if a football team possessed an effective shared mental model, each team member would know the skill levels of each other and know how to perform best as a team in order to achieve an effective team performance. For instance, team members would know the best type of delivery of a pass to give their attackers to give them the best chance of scoring (i.e. an efficient team performance). This suggests that having this type of knowledge structure facilitates the sharing of knowledge between team members (Bourbousson et al. 2011) and this understanding can lead to predicting actions and to coordinated performance (Mathieu et al. 2000).

However, only a few researchers such as Blickensderfer et al. (2010) and Silva et al. (2013) have considered the importance of shared understanding between dyads within teams. Duarte et al. (2012) and Vilar et al. (2013) stress that sub-teams exist within teams and if they are able to work together, teams are able to perform more effectively together (See Section 1.2). Since shared understanding between team members has been stated to be crucial and how this can facilitate an effective performance (Blickensderfer et al. 2010), further evidence is required to support the suggestion that shared understanding between dyads is crucial. For example, Cruickshank and Collins (2012) sub-teams are fundamental to teams being able to perform effectively together. Therefore, if dyads are able demonstrate shared understanding, they will develop their own shared mental model to facilitate this knowledge. This will then give dyads the ability to be able to use their knowledge of one another - which has been developed through experience performing together - to be able to predict what each other are likely to do at any one time.

2.11.6 Shared Understanding Leading to Prediction and Coordination

Members who are part of a shared mental model would have an understanding of their own abilities as well as the skill level of their team members (Williamson and Cox 2014) and this understanding this makes the accurate prediction of actions easier (Mathieu et al. 2000). For example, if team members have the knowledge that their full backs are able to successfully switch the ball to their opposite midfielder consistently, (i.e. left back passing to right midfielder, they will expect those players to perform that pass in certain situations).

Klein (2008) theorised that these predictions can be made as individuals recall similar situations and expect their team member to perform again. This assumption is made based on general knowledge of what should be done in this situation as well as

the knowledge of what the player would usually do. Baker et al. (2003) and Poizat et al. (2009) state that if an athlete has a background in a sport, they will have a general knowledge of what should be done in specific situations. However, they require knowledge of team member's abilities to be able to predict their actions and produce a positive team performance (Eccles 2010). This proposes that a mixture of sporting understanding and of their team members is required to successfully predict the correct actions of others, allowing coordinated performances.

Jonker et al. (2010) state that the prediction of actions leads to a coordinated team performance, which Eccles and Tenenbaum (2004) stress is the ideal outcome in team sport. In relation to a centre half heading a ball back into the midfield, one of the centre midfielders would move towards where they expect the ball to land based on their prediction of what their centre half is going to do. This would allow the midfielder to have the best chance to receive the ball, resulting in these two players coordinating their actions. This type of situation is possible because each team member will have the knowledge of one another to be able to predict and shape each other's actions after experiencing situations together they can more accurately predict what they will do. For instance, other players would see the central midfielder going into the space where they expect the ball to land and choose their actions based on what they think is going to happen. However, if an individual only understands their ability but not of their team members, their actions would not always be correct; resulting in uncoordinated movements (Jonker et al. 2010). This theory proposes that in order to make accurate predictions of other's actions, an overall understanding of each other's ability is vital, making shared understanding crucial to the ability to predicting actions and coordinated team performance. This further demonstrates the importance of shared understanding between dyads to be able to improve their ability to work more effectively together.

2.12 The Current Research

Little is known about the about the existence and development of shared understanding in dyads. However, shared understanding has been suggested to be crucial for the effective functioning of players and teams and therefore understanding this area is important (Blickensderfer et al. 2010). For instance, Cruickshank and Collins (2012) state that sub-teams within teams have specific roles that they are required to perform in order to facilitate an effective team performance. This suggests that the role of sub-teams is fundamental to the functioning of the team. As suggested previously (Figure 1.1), there are a variety of different dyadic sub-teams within football. If similar factors which facilitate the development and shared understanding between full teams (Eccles and Tenenbaum 2004, Blickenderfer et al. 2010, and Silva et al. 2013), can be seen in dyadic sub-teams like centre halves and strikers in a 4-4-2 formation (Figure 1.0), our knowledge of dyads within sporting teams will be increased.

Reimer et al. (2006) and Vilar et al. (2013) stress the importance of sub-teams within teams and suggest that they can have a large influence on how the overall team could perform based on the roles that they perform. Therefore, if the knowledge of these dyadic relationships in football can be discovered, we will learn more about this fundamental part of sport teams and how crucial the shared understanding between partners is.

This body of work will contribute new knowledge to the area by addressing gaps in understanding highlighted by previous literature. The current research follows three questions in order to evaluate the importance of shared understanding between football dyads and how shared understanding facilitates the ability of dyads to work more effectively together.

2.12.1 Question 1 - Does shared understanding exist between experienced football dyads?

The first area that needs to be addressed is whether shared understanding exists between athletic dyads in the same team. Blickensderfer et al. (2010) theorises that shared understanding is when two individuals have a mutual understanding of one another's skills and abilities. It would be important to first establish the existence of shared understanding in dyads before speculating on how it may develop within dyads and what it could possibly lead to. Eccles and Tenenbaum (2004) also suggested that shared understanding does exist between team members and this interpersonal knowledge can have a number of benefits to team sport. Even though Blickensderfer et al. (2010) demonstrated the existence of shared understanding between tennis doubles however, would similar factors that were able to combine to create shared understanding within dyads in a team sport like football? Therefore, before anything else it would be fundamental to the current study to be able to demonstrate the existence of shared understanding between dyads.

In addition, if shared understanding is able to be proven to exist within football dyads, it would be worthwhile investigating if levels of shared understanding vary based on the individuals' experience together. As suggested by Williamson and Cox (2014), understanding between team members is dependent on experience of players performing together. This is because shared understanding takes time to develop (Cannon-Bowers and Bowers 2006) so it would be important to investigate whether the amount of experience has an influence on shared understanding between football dyads. For instance, are the number of training sessions as important as the number of months or years? Since these factors are prevalent within team sport, it would be reasonable to

see if dyad's experience also affected their level of shared understanding if its existence could be proven.

In addition to the amount of dyadic experience the individuals had together, it would be important to see if the type of experience has an effect on levels of shared understanding. Gershgoren et al. (2016) theorise that that it is important for team members to have a general understanding of different roles within the team. For instance, would a dyad's understanding of each other vary if they were to perform a task that is not suited to their position (i.e. two defenders playing up front together and trying to score a goal)? Are dyads able to demonstrate the same level of understanding when they are both performing in a role they are unfamiliar with?

Eccles and Tenenbaum (2004) propose that having an understanding of other roles within the team can help team members to perform their own role better. For example, if a defender has a rough understanding of what an attacker does when running with the ball; they can use this knowledge to perform their own role better. This suggests that having an understanding of a player's atypical position may be beneficial to their performance. However, would a dyad's understanding of their atypical positions actually be similar or very different to their typical position? Therefore, it would be important to investigate this theory.

The final part of the first question would be to consider time as a factor when dyads demonstrate shared understanding. For instance, will dyads be able to make similar choices when they have a time restriction or when they have as much time as they want to make a decision. Macquet (2009) proposes that having the correct knowledge of how to perform in certain situations can help facilitate the decision making process.

Eccles and Tenenbaum (2004) support this suggestion and state that team members who have to make a choice of action base their decision on previous experiences of similar situations with their part. Therefore, that would suggest that dyads would not need a longer period of time to decide how to act, they would subconsciously think back to how successful each individual was during previously similar situations in order to choose a correct action. Gershgoren et al. (2016) however theorises that if the team member's understanding of each other is incorrect, they would not be able to make accurate assumptions if how each other will then act. Therefore, it would be worthwhile to see if shared understanding improved coordination in time restricted situations or not.

2.12.2 Question 2 - Are experienced football dyads more likely to make a coordinated decision if there is a clear and correct course of action?

The second question that should be addressed is that are experienced football dyads more likely to make a coordinated decision if there is a clear and correct course of action. For instance, if a dyad had two individuals who had a high level of shared understanding between each other, would they be more coordinated that a dyad with much less shared understanding? Blickensderfer et al. (2010) suggest that team members who are able to demonstrate shared understanding, the likelihood of being able to coordinate their actions also increases. If shared understanding could be demonstrated, it would be wise to investigate whether dyads could use their knowledge of each other to be able to make a coordinated decision. Jonker et al. (2010) argues that those who understand each other, are able to make a coordinated decision. So, would shared understanding between football dyads allow both individuals to make a more coordinated decision? Therefore, it would be useful to demonstrate if shared understanding improves the chance of dyads performing coordinated actions.

In addition, are there situations where dyads are able to be more coordinated than others? For example, if there was a clear and correct course of action, would dyads be able to be more coordinated in these situations when compared to situations where there is no correct course of action to take. As suggested by Eccles and Tannenbaum (2004) those who are able to make a coordinated decision, are able to do so based on their mutual knowledge of each other. So, are dyads able to use their knowledge of each other to make a correct decision? Therefore, it would be wise to see if dyads are more likely to use their shared understanding to make a coordinated decision if there was a right answer available to them.

The final part of the second question would be to investigate whether dyads use different knowledge structures in these situations. Mathieu et al. (2000) propose that team members do use their own experiences in order to make a correct decision. For instance, when there is a correct decision available to dyads, would they rely on either their own individual knowledge based on their individual experience or their shared understanding? This would suggest that dyads would fall back on their own knowledge and experiences if there was a correct answer available. However, would they be more likely to use their dyadic experience when there was no obvious answer available? During this situation, would each individual in the dyad use their experience with each other to make a decision of how best to act thus demonstrating their shared understanding? Therefore, a comparison between these two scenarios would be beneficial to see if dyads rely on different knowledge structures in different situations.

2.12.3 Question 3 - How does shared understanding develop between football dyads?

If the first two questions are answered, we will know if shared understanding exists within athletic dyads and whether they can make a coordinated decision based on their understanding of each other. The third and final question is how shared understanding develops within dyads. For instance, does shared understanding naturally over time solely based on experience performing together. Blickensderfer et al. (2010) suggest shared understanding requires experience performing together in order to develop. This is important for dyads as through experience together they get to know one another, leading to the development of understanding (Eccles and Tannenbaum 2004). Alternatively, are there any other factors that facilitate the development of shared understanding between dyads?

If we are able to establish any factors which can facilitate shared understanding, we would not only get a better understanding of the research topic, but this could help to expand our understanding of how dyadic relationships function. This could be a crucial starting block for gaining the knowledge of the role of how important shared understanding can potentially be within not only dyadic relationships but also within full teams. Therefore, if the three research questions can be answered, we will have a crucial improvement of knowledge of shared understanding between football dyads.

In summary, the current research project has considered and addressed the following questions:

a) Does shared understanding exist between experienced football dyads?

b) Are experienced football dyads more likely to make a coordinated decision if there is a clear and correct course of action?

c) How does shared understanding develop between football dyads?

Chapter 3 – The Existence of Shared Understanding within Football Dyads.

3.0 Introduction

3.0.1 Shared Understanding between Team Members

Smith-Jentsch, Mathieu and Kraiger (2005) propose that in order for teams to achieve a successful team performance, shared understanding between team members is essential. Blickensderfer et al. (2010) state that team members possessing a shared knowledge between one another is central to being able to coordinate their actions. Eccles and Tenenbaum (2004) argue that the relationships between members of a team can influence their knowledge of each other as well as their ability to work together. This suggests the importance of team members being able to understand each other in order to facilitate a better team performance.

Blickensderfer et al. (2010) also theorise that shared knowledge acts as a mediator between the interpersonal knowledge of team members, experiences of play, and coordinated action. Experience between team members in either a training or competitive setting, facilitates shared understanding and thus improves coordination of team member's actions. Kermarrec and Bossard (2014) and Gershgoren et al. (2016) suggests that experience performing together is a crucial factor in being able to develop shared understanding between team members. Therefore, it would be important to have an understanding of the concept of shared understanding as a potential mechanism for the facilitation of a coordinated team performance. However, in order to be able to fully understand the importance of team members possessing a shared knowledge, we must

first look at some characteristics that can influence the development of shared understanding between team members. For instance, it would be important to look at the perspectives that team members have of their partners and how they are able to think similarly. Mathieu et al. (2000) suggest that this is possible when team members establish an effective shared mental model between one and other.

3.0.2 The Importance of an Effective Shared Mental Model

Possessing a shared understanding of team members is crucial to a successful team performance according to Eccles and Tenenbaum (2004) and the process that explains understanding between team members is called a shared mental model (Jonker, van Riemsdijk and Vermeulen, 2010). A shared mental model is defined as knowledge structures between people, allowing coordination of actions (Cannon-Bowers, Salas and Converse 1993) providing description, explanation and prediction of behaviours within a team (Jonker et al. 2010). However, according to Bourbousson, Poizat, Saury and Sève (2011) all sporting teams possess some form of shared mental model but it is the quality of that model which is crucial. In this situation, team members would all have an understanding of each other's skill levels and likely actions. For example, if a football team possessed an effective shared mental model, each team member would have an understanding of the skill levels of each other and know how to perform best as a team in order to achieve an effective team performance.

Bourbousson et al. (2011) supports this suggestion and state that an effective shared mental model helps to develop a mutual understanding between team members. For instance, team members would know the best type of delivery of a pass to give their attackers in order to give them the best chance of scoring (i.e. an efficient team performance). This suggests that having this type of knowledge structure facilitates the sharing of knowledge between team members (Bourbousson et al. 2011) and this

understanding can lead to predicting actions and to coordinated performance (Mathieu et al. 2000).

3.0.3 Prediction Leading to Coordination

Members who are part of a shared mental model would have an understanding of their own abilities as well as the skill level of their team members (Williamson and Cox 2014) and this understanding facilitates accurate prediction of future actions (Mathieu et al. 2000). For example, if team members in a 4-4-2 formation (Figure 1.1) have the knowledge that their full backs are able to successfully switch the ball to their opposite midfielder consistently (i.e. left back passing to right midfielder or vice versa), they will expect those players to perform that pass in certain situations. Eccles and Tenenbaum (2004) and Gershgoren et al. (2016) theorise that these predictions can be made as individuals recall similar situations and expect their team member to perform again. This assumption is made based on general knowledge of what should be done in this situation as well as the knowledge of what that particular player would usually do. Baker, Côté, and Abernethy (2003) state that if an athlete has a background in a sport, they will have a general knowledge of what should be done in specific situations, but they require knowledge of their team member's abilities in order to be able to predict their actions and produce a positive team performance (Eccles 2010). This suggests that a mixture of sporting understanding and an understanding of their team members is required to be able to successfully predict the correct actions of others, allowing coordinated performances.

Williamson and Cox (2014) state that the prediction of actions leads to a coordinated team performance, which Fiore and Salas (2006) stress is the ideal outcome in team sport. Evans and Eys (2015) further stress that team members who are able to work interdependently together are more likely to produce a more effective team

performance. In relation to a centre half heading a ball back into the midfield, one of the centre midfielders would move towards where they expect the ball to land based on their prediction of what their centre half is going to do (Figure 1.1). This would allow the midfielder to have the best chance to receive the ball, resulting in these two players coordinating their actions. Williamson and Cox (2014) support this theory and propose that being able to predict the actions of team members is a crucial skill that facilitates a coordinated team performance. This type of situation is possible because each team member will have the knowledge of one another to allow them to be able to predict and shape each other's actions, gained after experiencing situations together thus allowing them to more accurately predict what they will do. For instance, other players would see the central midfielder in a 4-4-2 formation going into the space where they expect the ball to land and choose their actions based on what they think is going to happen (Figure 1.1). However, if an individual only understands their ability but not of their team members, their actions would not always be correct; resulting in a poor team performance (Morgeson and Mannor, 2009). This suggests that in order to make accurate predictions of other's actions, an overall understanding of each other's ability is vital, making shared understanding crucial to the ability to predicting actions and coordinated team performance. It would therefore be worth investigating how coordination is possible in different situations through different types of shared mental models.

3.0.4 Different types of Shared Mental Models

Cannon-Bowers, Salas and Converse (1993) and Mathieu et al. (2000) discuss several types of shared mental models that are accessed in different situations. For example, a team may be required to focus on completing a task would tap into one type of shared mental model. However, a shared mental model that is more focused on how

a team works together could be accessed by a team that has a number of new players in order to build their understanding. However, an effective shared mental model requires experience in order to be efficient. Mathieu et al. (2000) state that within a team, a shared mental model develops naturally over time performing together. Jonker et al. (2010) suggest two different types of shared mental models that are subconsciously used by teams depending on the situation that they are faced with: task work and team work.

3.1 Task Work Mental Model

The task work mental model is solely focused on the successful completion of a specific task by a team (Jonker et al. 2010). This knowledge structure however does not place emphasis on how the team works together to complete a task. This approach requires team members to perform a specific role to achieve task completion. For example, this type of knowledge structure can be used in the last few minutes of a football match a team needs to score or they lose the game. In this situation, the team is solely focused on trying to score – the team's task - in order to not lose the game; the team must score in any way possible. In this environment, there is no concern of how the team works together, only that the team scores a goal thus all the emphasis is on the successful completion of the task.

3.2 Team Work Mental Model

The team work mental model is completely focused on how a team functions and how their individual skills work together (Jonker et al. 2010). This type of shared mental model emerges in order to facilitate understanding of team members' skills, preferences and abilities. For instance, this approach could be adopted when a team signs a few new players during preseason. During this situation, team members have to

learn each other's abilities from scratch, as they do not know how each other will choose to perform in certain scenarios. Mathieu et al. (2000) suggest that at the beginning of the relationship, team members do not have much understanding of each other and require experience performing together. This will lead to a development of understanding between players and will help to facilitate team member's being able to work together more efficiently. However, there is no emphasis placed on achieving team performance goals, just that the team members all work well together. Therefore, the main focus of this type of mental model is on how team members' skills work together.

3.2.1 Having a Combination of Mental Models

When considering these two shared mental models, it would be beneficial for teams to possess a mixture of different efficient models, such as the task and team work models. Mathieu et al. (2000) theorise that team members are required to use different mental models depending on the situation that they are faced with. This is because this approach will allow team members to work together effectively and achieve a team's overall shared goal. For example, a combination of these two shared mental models can be seen when a team is trying to score a goal during a match. The task work mental model is used by team members who outline their desire to score a goal. In this situation, each individual team member is focused on scoring a goal – the task that the team wants to achieve.

However, through also using a team work mental model as well, this process is made easier. In relation to the above example, the team work mental model would be used to improve the team's chances of scoring a goal, through improving member's ability to work together. This will be facilitated by team members using their

understanding of each other's abilities in order to score a goal. Therefore, a combination of both of these knowledge structures are required to facilitate a coordinated team performance. However, it can take time to develop an efficient shared mental model between team members (Jonker et al. 2010) and in order for an effective mental model to emerge, it requires experience performing together in order to develop.

3.2.2 Experience Together

Blickensderfer et al. (2010) consider experience together to be central to creating shared understanding between team members. Through experience together, team members will be able to develop their own team work mental model (Mathieu et al. 2000). Williamson and Cox (2014) state that it takes experience to refine actions and create understanding between athletes, allowing successful expectations and predictions regarding each other's actions. For instance, through training together team members are able to build up knowledge of their team members over time and developing their team work mental model.

Baker et al. (2003) acknowledge that the development of understanding between team members can take some time. This is because experience together allows team members to build up knowledge of each other but individual characteristics can alter how the team work mental model develops. For example, through practicing defensive set pieces, defenders will develop a shared understanding between other team members of what each other are likely to do in these situations. This understanding will facilitate the development of an efficient team work mental model between the defenders as they will learn how they need to work together in order to achieve an efficient performance.

Stout, Cannon-Bowers, Salas and Milanovich (1999) also suggest practicing together to be effective for increasing understanding between athletes by allowing team

members to see what each other do during specific situations. Silva et al. (2013) postulate that there is no specific number of experiences that gives team members optimal shared understanding. This suggests the building of shared understanding between team members depends on the individuals themselves and all team members are able to influence their team work mental model. This is because each team member has their own role to perform in the team, therefore in order to have an efficient shared understanding and team work mental model they must have experience performing together. However, in order to develop a comprehensive understanding of other team members and an efficient shared mental model, team members need to have experience performing tasks.

3.2.3 Position Specific Knowledge

Experience is crucial for team members to be able to understand each other, but specific knowledge based on what position individual members are playing is also important (Gershgoren et al. 2016). This is because players in a similar position e.g. defenders would require different knowledge of how to perform their role during a match compared to attackers, meaning these two positions would not require the same knowledge to perform. For example, defenders in a 4-4-2 formation (Figure 1.0) would have to have a general understanding of how attackers play in certain situations in order to shape their own actions. However, they would have to possess a thorough knowledge of how to defend effectively in order to perform successfully. This specific knowledge helps to develop a task work mental model (Jonker et al. 2010).

In relation to the above example, defenders in the same team will develop their own knowledge of what their own role requires. Each of the defenders will use their knowledge of their own role in order to work towards achieving the team's defensive goals. However, this would not be possible unless each defender knew what was

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required of them in their own role. Entin and Serfaty (1999) stress that this allows each team member to understand their own role within a team and will allow for a successful team performance. This suggests that team members would benefit from having a robust knowledge of their own role in order to be able to achieve team goals. This supports an important element of Blickensderfer et al.'s model (2010) where shared understanding is created through experience. This understanding then allows for the development of an efficient shared mental model for team members.

3.3 The Current Chapter

The purpose of the study was to examine the existence of shared understanding within football dyads through an effective shared mental model. As suggested in the previous chapter (See Section 2.8), little is known about the about the existence shared understanding between sporting dyads. However, teams require sub-teams (See Section 1.2) to be able perform specific roles for the benefit of the team (Reimer, Park, and Hinsz 2006; Vilar et al. 2013) as there are a variety of different dyadic sub-teams within a football team (Figure 1.1). Mathieu et al. (2000) and Jonker et al. (2010) theorise that shared understanding between team members is facilitated by an effective shared mental model. Since shared understanding between team members is crucial for the effective functioning of players and teams (Blickensderfer et al. 2010), understanding the role of sub-teams and their shared understand each other is fundamental. Therefore, the existence of shared understanding within football dyads through an effective shared mental model has been explored.

Twenty-four dyadic football partnerships were asked to give information regarding their thoughts, feelings and actions relating to what they would do in specific situations based on scenarios on tactical sheets (See Figure 3.1) and video clips.

Partner's answers were compared to assess similarity between players, demonstrating their shared understanding and the effectiveness of their shared mental model. Research suggests that having an effective shared mental model amongst members of team creates understanding between players (Bourbousson et al. 2011), leading to predicting actions (Mathieu et al. 2000) and coordinated performance (Jonker et al. 2010).

Based on research that has looked at shared mental models within teams (See Section 2.7), this chapter considers factors such as length of time performing together, frequency of training sessions and performance levels to determine their influence on partnership's shared mental model and how this demonstrates the existence of shared understanding. Therefore, it was hypothesised that dyads that have experience playing together would produce higher percentages of similarity in both the sheets and videos compared dyads, which are random partnerships whom have no prior experience together. It was also expected that dyads would produce higher percentages of similarity for their typical positions compared to their atypical positions e.g. attackers would produce better scores in attacking situations. It was presumed that if there is more time available for dyads to give information during the sheets, their answers will be more detailed and varied compared to information given for their interpretations of the videos.

3.4 Methodology

3.4.1 Participants

Twenty-four football dyads of players who were all over the age of sixteen years old (M_{age} = 19 +/- 3 years) from youth ($n=10$), amateur ($n=3$) and junior levels ($n=11$) from within the Tayside area were recruited. Each of the dyads consisted of either two

defenders or two attackers (i.e. a defender or an attacker dyad) that play football together regularly with the average time together of each dyad being 31 (+/- 43.02) months. There were eleven attacker dyads and thirteen defender dyads. The number of dyads in this study was comparable to research that looked at similar dyadic sporting relationships including Fisher, Mancini, Hirsch, Proulx, and Staurowsky (1982) and Jackson and Beauchamp (2010a) who both had fifty athletes.

3.4.2 Materials

Video Footage

Video footage was taken during a Dundee Football Club league match in the 2013/2014 season. Video footage was recorded during the first half of the match by the team Performance Analyst using the video capturing software on a Samsung Galaxy Tab Two tablet. Scenarios of open play, or a set piece where several potential outcomes of open play where possible were identified by the primary researcher. This type of scenario was chosen due to the vast number of possible future outcomes. Closed scenarios, such as a penalty kick, where there are much fewer potential options available were excluded. Scenarios were also excluded if players or the ball could not be clearly seen throughout the video. A total of four scenarios were selected. Two scenarios showed attacking situations and two scenarios showed defensive situations.

Each of the four video clips were then divided into four segments depicting the flow of play. Each segment lasted for a maximum of ten seconds. The final video consisted of the start of the scenario were one player was highlighted with a red circle to show participants who to focus upon. The first segment of play was then displayed. This was followed by a break of thirty seconds during which a black screen was displayed. A message was displayed five seconds before the end of each black screen to

state that the next section of video was about to begin. The video would return to the

beginning and play the first and second segments followed by another thirty second

break. This continued adding another segment each time until the last part of the video

displayed all four segments continuously.

Tactical Sheets

The scenarios depicted in the video footage were also replicated as a set of

tactical sheets (See Figure 3.1). These sheets were a simple design; top-down depiction

of a football pitch that included the players of two teams represented as a series of

coloured dots. The tactical sheets were the same as the tactical boards that each of the

participant's teams would have in their own dressing rooms of their own clubs on a

weekly basis. The four scenarios were designed to be exact copies of those depicted in

the videos that were used for the first part of the data collection process. In order to

match how the scenario is revealed to participants in the video clips, the four scenarios

were each split into four different tactical sheets depicting the flow of play. This was

the same number as Blickensderfer et al. (2010) who also used twelve sheets in total in

their research. As with the videos, one player was circled on each tactical sheet, which

allowed participants to identify the specific player that they were to focus on.
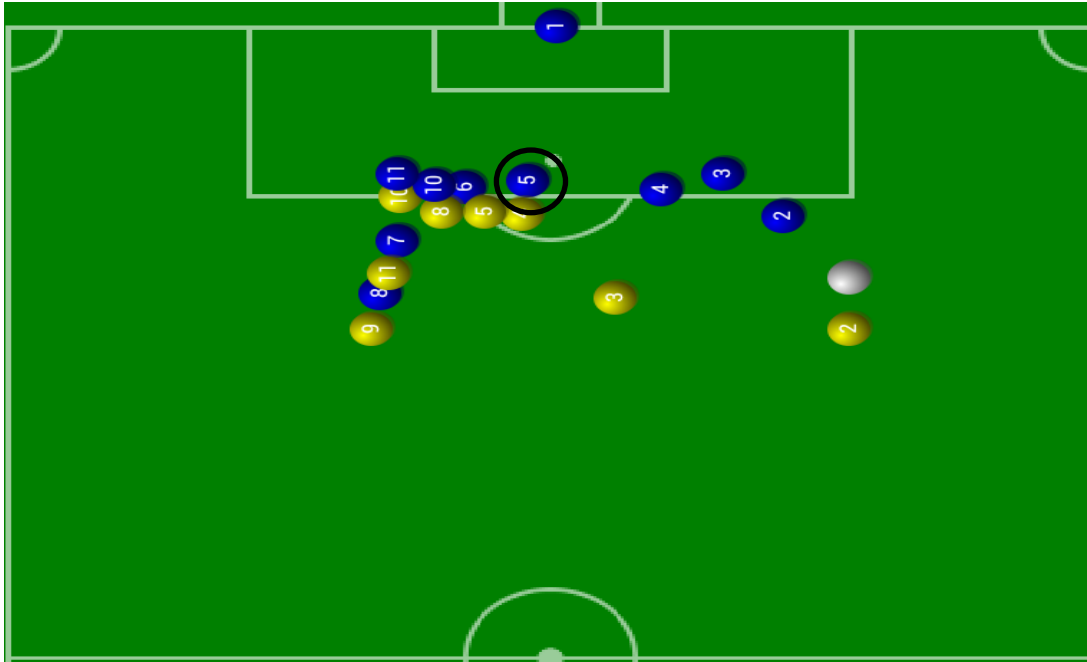
Thoughts:	
Feelings:	
Actions:	

Figure 3.1 – Example Tactical Sheet.

3.4.3 Procedure

Before the study could start, ethical approval had to be given by the Abertay

University Ethics committee (Appendix One). Once ethical approval was given,

participants were contacted and invited to take part in the study (Appendix Two). After

the aims, background, procedure and the participant's role had been outlined, they were

able to ask any questions which they had about their inclusion in this study. Participants

were asked to choose a suitable location for where the data collection could take place.

This had to be a safe and secure environment where the participant felt comfortable to

complete the study and was generally in a sport centre or training facility. This allowed

data collection to take place in a private place but still with people nearby for safety reasons in case something went wrong.

After the location had been established, the data collection was able to begin. Participants were asked to fill in an Informed Consent Form (Appendix Three), allowing the following schedule to commence. Once the Informed Consent Form had been signed, participants filled out a small demographic questionnaire (Appendix Four) where they had to state how long they had played football; at what level of performance and how much experience they have had with their partner. In order to attempt to remove a learning effect, some of the participants filled in the tactical sheets first before watching the videos, whereas the rest watched the videos then filled out the tactical sheets.

Data collection using the video footage was similar to Ickes's (2001) empathic accuracy paradigm, a data collection method used to gather individuals' perceptions of the thoughts, feelings and actions of others. Each participant individually watched each scenario in turn. During the thirty second break between each segment of the scenario, participants were asked to write down what thoughts and feelings they would have if they were the designated player in the situation and what actions they expect the player to make based on what they would do in this scenario. Participants recorded this using an answer sheet (Appendix Five) which had four separate tables for each video with space for participants to write down the required information.

Participants were asked to repeat the exercise, but this time using the tactical sheets as a prompt for the scenario. The order of the scenarios was the same for both videos and tactical sheets. Both approaches were used to allow for a comparison between limited time and no time limit. Participants had to look at each indicated player

on the tactical sheet, assess their situation and write down what thoughts and feelings they would have if they were in that situation themselves and the future actions of the indicated player by either writing down the actions or by drawing arrows on the tactical sheets. Unlike the video footage, where participants had thirty seconds to record their inferences, participants had as long as they required to write down the information on the tactical sheet and were encouraged to consider their responses carefully. Participants were not specifically instructed that the scenarios for the tactical sheets and videos were the same. This information was recorded underneath each scenario (Appendix Six). This design was similar to the format suggested by Ickes (2001) that was to record inferences about the video footage. After completing both the videos and sheets participants were told not to share any information with their partner in order to not influence the results of the study.

3.4.4 Data Analysis

Calculating Percentages of Similarity

Shared understanding was represented by calculating the similarity in the inferences made by dyad partners. This was done using a method proposed by Ickes (2001) for assessing empathic accuracy in social contexts (See Ickes 2001) that has since seen wide use for calculating similarity in social psychology (Thomas and Fletcher 2003) and sport psychology contexts (e.g., Lorimer and Jowett, 2011). Similarity was calculated by comparing dyad partners' inferences about the players in the video/tactical sheet scenarios.

With four scenarios, each with four sections, there were 16 points of comparison each for the videos and tactics sheets, resulting in 32 comparisons in total. For each comparison, two raters – the primary research and a trusted external party -

independently assessed the similarity of each pairing using a three-point scale: 0 – *essentially different*, 1 – *similar, but not the same*, and 2 – *essentially the same* (Ickes 2001). An interrater reliability of a=>0.8 was agreed as an acceptable threshold. This percentage was decided on based on the research of Fletcher, Simpson, Thomas and Giles (1999) and Ickes (2001) who proposed this to be a sufficient percentage of agreement for interrater reliability. The similarity scores given for each pairing were then used to calculate an overall aggregated score. Ickes (2001) state that this was done by summing the scores and dividing by the total number of comparisons, giving a value ranging from 0 to 2, this was then multiplied by 50 to produce a percentage score describing the degree of similarity between the dyad partners: 0% describing total inaccuracy and 100% describing perfect accuracy.

Different similarity scores

A range of aggregated scores were calculated, for both attacker and defender dyads, for the four video scenarios and the four tactical sheet scenarios (i.e. Attacking dyad's score for video scenarios). To explore the influence of playing-position specific knowledge these scores were further subdivided into Typical (i.e. Attacking dyad's score for videos showing attacking scenarios only) and Atypical (i.e. Attacking dyad's score for videos showing defending scenarios only). In addition to these scores that represent the similarity between dyad members who had experience performing together (i.e. Actual Dyads), the influence of experience was explored by randomly pairing participants. This involved one member of an actual dyad paired with a player in a separate dyad with only having playing position in common - and calculating similarity to represent dyads with no experience playing together (i.e. Random Dyads).

3.5 Results

Table 2.1 *– Mean and standard deviation values for Actual and Random Dyads.*

Actual/Random Dyads	Mean	Standard Deviation
Actual Attacking Sheets	42.81	14.80
Actual Defending Sheets	45.83	17.27
Actual Attacking Videos	45.24	18.00
Actual Defending Videos	45.96	18.54
Random Attacking Sheets	30.10	14.15
Random Defending Sheets	29.48	9.78
Random Attacking Videos	25.78	10.13
Random Defending Videos	27.81	11.47

Table 3.1 shows the mean and standard deviations for all of the aggregated similarity scores. A clear 10-15% difference is evident between the scores for dyads that actually played together compared to those dyads created with random pairings of players. To explore this further a Mann-Whitney U test – through SPSS - was used to compare the similarity scores of the actual dyads with the random dyads, as the data did not have normal distribution.

Table 3.2 *– Mean and standard deviation values for Typical and Atypical Dyads.*

Typical/Atypical	Mean	Standard Deviation
Typical Attacking Sheets	43.75	16.70
Atypical Attacking Sheets	41.15	13.45
Typical Defending Sheets	50.52	11.45
Atypical Defending Sheets	40.97	22.77
Typical Attacking Videos	42.12	12.64
Atypical Attacking Videos	45.13	19.14
Typical Defending Videos	53.07	23.19
Atypical Defending Videos	42.75	12.88

Table 3.2 shows the mean and standard deviations for all of the aggregated similarity score for dyads in relation to their typical and atypical position. In three of the four factors, players scored higher in their typical position compared to their atypical position. The fourth factor – attacking videos – showed a higher mean value for defenders compared to attackers even though this was their atypical position. To explore this further a Mann-Whitney U test – through SPSS - was used to compare the similarity scores of the actual dyads with the random dyads, as the data did not have normal distribution.

The Existence of Shared Understanding in Experienced Dyads

Table 4.3 – *Comparisons of Actual to Random Dyads*

Actual vs Random Dyads			
Factor	**Significance**	**U**	**Effect Size**
Attacking Sheets	0.00	84.50	0.40
Defending Sheets	0.00	102.50	0.55
Attacking Videos	0.08	128.00	0.55
Defending Videos	0.00	93.00	0.51
Typical Position Sheets	0.00	58.50	0.59
Atypical Position Sheets	0.01	143.00	0.31
Typical Position Videos	0.00	80.50	0.57
Atypical Position Videos	0.00	125.50	0.50

Table 3.3 shows dyads with actual experience together have a significantly higher similarity than randomly paired dyads ($p < .05$). The only exception was Attacking Videos which showed a trend towards significance ($p=.08$). There were also some medium – over 0.3 (Cohen 1988) - to large effects - over 0.5 (Cohen 1988) - sizes discovered between all comparisons ($d < 0.31$).

Table 5.4 – *Comparison between Actual and Random Attackers*

Actual vs Random Attacking Dyads			
Factor	**Significance**	**U**	**Effect Size**
Attacking Sheets	0.05	8.50	0.47
Defending Sheets	0.10	31.50	0.32
Attacking Videos	0.00	17.00	0.71
Defending Videos	0.16	20.50	0.61

Table 3.4 shows the comparisons between actual and random attackers. A Mann-Whitney U test was used to compare actual attacking dyads with randomly paired dyads. The results showed significance values between actual and random attacking dyads in comparisons linked to Attacking Sheets and Videos ($p \leq 0.05$) and one value which showed a trend towards significance ($p = 0.10$) in relation to Defending Sheets. The comparison for Defending Videos was found to be non-significant ($p = 0.16$). There were also four medium to large effect sizes - ($0.32 < d > 0.71$) - (Cohen 1988) found between Actual and Random Attackers. Effect sizes are used to quantify the difference between two groups by emphasising the size of the difference rather than confounding this with sample size (Fritz et al. 2012).

Table 6.5 *– The comparisons between Actual and Random Defenders*

Actual Defenders Vs Random Defenders			
Factor	**Significance**	**U**	**Effect Size**
Attacking Sheets	0.04	39.50	0.44
Defending Sheets	0.00	16.50	0.61
Attacking Videos	0.06	48.50	0.42
Defending Videos	0.00	22.00	0.40

Table 3.5 shows the comparisons between actual and random defenders. A Mann-Whitney U test was used to compare actual dyads with random defenders. The results show three significant values in comparisons linked to Attacking and Defending Sheets as well as Defending Videos ($p < 0.05$). One value which showed a trend towards significance (p=0.06) was Attacking Videos. Four medium to large effect sizes (d> 0.40) were discovered in relation to both Defending and Attacking Sheets and Videos.

Position Specific Knowledge

Table 7.6 *– Comparisons of Attacker and Defender Dyads*

Actual Attackers Vs Actual Defenders			
Factor	**Significance**	**U**	**Effect Size**
Typical Position Sheets	0.08	26.00	0.23
Atypical Position Sheets	0.65	48.50	0.00
Typical Position Videos	0.07	40.00	0.28
Atypical Position Videos	0.73	65.00	0.07
Attacking Sheets	0.30	35.50	0.09
Defending Sheets	0.11	32.50	0.26
Attacking Videos	0.87	68.50	0.09
Defending Videos	0.08	37.50	0.27

Table 3.6 shows the comparisons between actual attackers and defenders. A Mann-Whitney U test was used to compare actual attackers with actual defenders. It was expected dyads with actual experience together would have a higher similarity than dyads randomly paired. The results show no significant results, but show some of the comparisons that show trends towards significance ($0.07 > p < 0.11$). Four comparisons produced a small effect size ($d > 0.26$). However, the other four comparisons showed small effect sizes ($d < 0.09$).

Influence of Time-Demands of the Percentage of Similarity

Table 8.7 – *Comparisons between Attackers and the Defenders Internally*

Factor	Significance	Z Value	R Value
Actual Attacker Dyads			
Defending Videos – Attacking Videos	0.31	-1.02	0.31
Attacking Sheets – Attacking Videos	0.41	-0.83	0.28
Defending Sheets – Defending Videos	0.77	-0.30	0.09
Defending Sheets – Attacking Sheets	0.11	-1.62	0.54
Actual Defender Dyads			
Defending Videos – Attacking Videos	0.69	-0.40	0.12
Attacking Sheets – Attacking Videos	0.45	-0.76	0.23
Defending Sheets – Defending Videos	0.72	-0.36	0.11
Defending Sheets – Attacking Sheets	0.02	-2.25	0.68

Table 3.7 shows comparisons between attackers and the defenders internally. A Non-Parametric Two related samples Wilcoxon Test – through SPSS - was used to compare attackers and defenders internally. This statistical test was chosen because the data did not have normal distribution. It was expected dyads with actual experience together would have a higher similarity than dyads randomly paired. The results produced one significant figure (p = 0.02) during this comparison and that was the percentage of similarity for Actual Defenders between Defending and Attacking Sheets. In relation to the Actual attacker's percentage of similarity between Defending and Attacking Sheets, trends towards significance was found (p = 0.11). Both Actual Attackers and Actual

Defender's comparisons for Defending and Attacking Sheets did produce large R Values (Kampenes et al. 2007) (R> 0.54). Two medium R values (0.28 > R < 0.31) and one low R value (0.09) (Kampenes et al. 2007) was also found when looking at comparing Actual Attacker's percentages of similarity together. One medium R value (R = 0.23) and two low R values (0.11 > R < 0.12) (Kampenes et al. 2007) were also found when looking at the comparisons of the Actual Defender's percentages of similarity.

3.6 Discussion

3.6.1 Main Findings

The aim of this study was to explore the potential existence of shared understanding within a sample of football dyads. The study also examined the influence of dyad experience, playing-position specific knowledge and time restraints on the existence of shared understanding.

It was hypothesised that dyads who have experience playing together would be able to produce higher percentages of similarity in both the sheets and videos compared dyads of randomly paired partnerships who have no prior experience together. The results showed significant differences (p<0.01) were found between the dyads who had experience performing together compared to dyads who were randomly paired up and that had no experience together. The only characteristic which random partners had in common with one and other was that they both perform in the same position e.g. defenders paired with defenders. Only one comparison – attacking videos – was found to be non-significant (p<0.08). However, this factor showed trends towards significance. The results of the current study support the hypothesis that experienced

dyads were able to produce higher percentages of similarity compared to dyads that have no experience performing together.

It was also expected that dyads would produce higher percentages of similarity for their typical positions compared to their atypical positions (i.e. attackers would produce better scores in attacking situations, and defenders in defensive situations). The results showed that dyads produced higher percentages of similarity in scenarios focused on their typical position compared to their atypical position. These comparisons displayed higher mean values for the typical positions compared to the dyads atypical positions for three factors e.g. defenders scored better on average for defensive scenarios compared to attacking situations. However, one of the factors – attacking videos – did not follow this pattern as defenders scored better than attackers, even though this was their atypical position. The findings of the current study somewhat support the hypothesis that players would score higher percentages of similarity for scenarios focused on their typical position.

A further hypothesis of the current study was that if there is more time available for dyads to give information during the sheets, their answers will be more detailed and varied compared to information given for their interpretations of the videos. The results also showed little difference between the percentages of similarity between the video sections where there was little time available compared to filling in the sheets which participants had an unlimited amount of time to complete. However, there was no difference found between the percentage of similarity and available time regardless of whether participants filled in the sheets or watched the videos first.

3.6.2 Experienced Dyads Vs Randomly Paired Dyads

It was hypothesised that dyads that have experience playing together would be able to produce higher percentages of similarity in both the sheets and videos compared dyads of randomly paired partnerships who have no prior experience together. The results showed significant differences ($p<0.01$) were found between the dyads who had experience performing together compared to dyads who were randomly paired up and that had no experience together. The only characteristic that random partners had in common with one and other was that they both perform in the same position (i.e. defenders paired with defenders). Only one comparison – attacking videos – was found to not be significant ($p<0.08$) however, this area was showing trends towards significance.

The results of the current study support the hypothesis that dyads who had experience performing together were able to produce higher percentages of similarity compared to random dyads who had no experience performing together. This finding demonstrates the existence of shared understanding between team members who do have experience performing together which proposes the existence of a more efficient shared mental model between experienced dyads compared to randomly paired dyads. This result was confirmed based on the significant higher percentages of similarity for experienced dyads compared to randomly paired dyads.

Shared Understanding Based on Experience Performing Together

Stout et al. (1999) stress that task experience is central to creating shared understanding between members of the same team. The results of the current study show that through having experience performing together, dyads are more likely to understand each other through possessing a more efficient shared mental model

between both players. Mohammed and Dumville (2001) investigated one method which shared understanding is facilitated between members in sporting teams –through a shared mental model- and how this type of knowledge structure could be built up over time and how this can affect team performance. Mohammed and Dumville (2001) theorise that having an effective shared mental model can facilitate the sharing of information between team members and build understanding of each other's skill level and abilities for reference during future competitive situations. This theory could help to explain the results of the current study as the actual dyads may have analysed the scenarios based on their previous experience with their partner. Since randomly paired dyads had no experience performing together, they could not rely on the knowledge that actual dyads had, resulting in significantly lower percentages of similarity.

One method that helps to facilitate shared understanding according to Gabbett (2006) is the influence of the team's coach. As stated previously (See Section 2.10), the coach can play a crucial role in the development of shared understanding between team members. For example, the type of training which the coach choses (Gabbett 2006, Jowett 2007) as well as giving team members the experience of performing together (Cannon-Bowers and Bowers 2006) can improve shared understanding between team members. This suggestion can also support some of the findings of the current study based on the difference in percentages of similarity between actual and random dyads.

Experience performing together is stated to be a crucial factor for the existence of shared understanding between dyads (Silva et al. 2013, Williamson and Cox (2014) and this was the difference between the actual dyads (experience performing together) and random dyads (no experience performing together). Random dyads would not have the influence of the same coach as well as their random partner, whereas actual dyads have experienced similar training methods from the same coach. This joint experience

of working with the same coach through the same shaping drills for example, builds up an accurate understanding of how each other perform in certain situations (Blickensderfer et al. 2010). The randomly paired dyads lack this important experience – supplied by the coach – which makes it difficult for these pairings to be able to demonstrate shared understanding, as they do not have the shared experience which Stout et al. (1999) state is so important to having shared understanding between team members. Therefore, the influence of the same coach and the specific drills that they choose to use will give the actual dyads shared experiences, leading to shared understanding and in the context of the current study higher percentages of similarity.

The findings of the current study in addition to Mohammed and Dumville's (2001) research suggests that shared understanding between team members can result in a better performance. However, experience together is crucial for this understanding to be developed. Blickensderfer et al. (2010) emphasise that task experience is a crucial element for being able to create a coordinated performance and has a direct impact on shared understanding between athletic dyads. This was suggested to allow dyads to read situations in a similar way and to be able to make similar choices based on similar thinking through an effective shared mental model. These findings support the conclusions of Cannon-Bowers and Bowers (2006) who theorise that if partners have experience together during training sessions or competitive matches, they are more likely to have an understanding of each other. This understanding was also suggested to lead to knowledge of how their partner is going to perform in certain scenarios, based on experience performing together and through the development of an effective mental model.

Practicing situations together could explain the results of the current study as actual partners would have practiced similar situations previous during training and

competitive games, giving them the knowledge of what their partner may do in these scenarios. This suggestion could help to explain the results of the current study as two of the four videos were from free kicks and two were from a common piece of open play. Since these scenarios occur regularly in the majority of football games, the participants were able to potentially recall the actions that they undertook in the past as well as the movements of their partner as well. Mohammed and Dumville (2001), Silva et al. (2013), Hill, Stoeber, Brown and Appleton (2014), and Williamson and Cox (2014) support this suggestion who state that experience together can help team members choose actions based on the success they had during similar situations in the past. This emphasises the significantly higher similarity scores for the natural pairings compared to the random pairings based on the experience that they have together. Silva et al. (2013) also state that through experience together, team members will have the knowledge and information of other members in their each and an understanding of everyone's role in the team.

Jonker et al. (2010) further proposed that practicing scenarios together during training, facilitates understanding between team members and can help to develop an effective shared mental model. These findings support the results of the current study and provide further evidence for why actual dyads scored higher than randomly paired dyads – their shared mental model was much more efficient, leading to better shared understanding. Each of the partners within the random pairing had no experience together. Consequently, they would possess no familiarity making it impossible for a decent level of shared understanding between the partners.

Eccles and Tenenbaum (2004) stress that through practicing with team members can improve overall understanding of each other and facilitates the likelihood of a more efficient team performance. These suggestions reinforce the findings of the current

study as the dyads who had experience performing together produced a significantly higher percentage of similarity compared to randomly paired dyads. This finding was based on the actual dyads' understanding of each other from experience performing together and through the development of their shared mental model. For example, if the defenders in the same team practiced defending corner kicks during training sessions, their understanding of the situation and their other team members would improve and their shared mental model would improve. This would be possible because through practicing these defensive situations, team members will see how each other react in these scenarios. Mathieu et al. (2000) suggested that performing skills can create the opportunity to recall them in the future to help athletes to decide how to act during similar situations. This will presumably lead to improvements to their shared mental model and - at the same time - their shared understanding of each other, as they will be sharing experiences together.

Cannon-Bowers and Bowers (2006) further state that player's experience performing together has positive effect on shared understanding between team members. This suggestion helps to explain why the results of the current study showed significantly higher percentage of similarity for the experienced partnerships than the randomly paired dyads. It is further suggested by Bourbousson, Poizat, Saury and Sève (2012) that the sharing of information amongst team members is crucial for effective performance and one method that facilitates this is through experiencing competitive situations with one and other. This could be because the experienced partnerships have performed together in similar situations to the above example, and have developed an efficient shared mental model between each other and as a result, they have a comprehensive understanding of each other. The conclusions of Blickensderfer et al. (2010) support this suggestion by stating that prior task experience together facilitates

the development of shared understanding between team members. Whereas the randomly paired dyads that have had no experience together so have not had the opportunity to develop their own shared mental model, meaning it is extremely improbable that they would be able to demonstrate shared understanding. This would be because dyads who had not performed together could not rely on past shared experiences to provide their answers.

3.6.3 Typical Position Vs Atypical Position

It was also expected that dyads would produce higher percentages of similarity for their typical positions compared to their atypical positions. The results showed that dyads produced higher percentages of similarity in scenarios focused on their typical position compared to their atypical position. These comparisons displayed significantly higher mean values for the typical positions compared to the dyads atypical positions for three factors (i.e. defenders scored better on average for defensive scenarios compared to attacking situations). However, one of the factors – attacking videos – did not follow this pattern as defenders scored better than attackers, even though this was their atypical position.

This result proposes that defenders may need to have some knowledge of the roles of attackers to accurately predict what their opponent will do next and perform their own role effectively. This also could suggest a shared knowledge between team members of the same team is required for the whole team to be able to work effectively together. The findings of the current study somewhat support the hypothesis that players would score higher percentages of similarity for scenarios focused on their typical position. This result advocates the importance of players possessing position specific knowledge in order to perform their role. This finding was based on dyads'

ability to score higher percentages of similarity in their typical position. However, the attacker's percentage of similarity for attacking videos went against this theory. This could suggest that in some scenarios, defenders may require an understanding of attackers to be able to perform their own role effectively.

The Importance of Having General and Position Specific Knowledge

Entin and Serfaty (1999) suggested that team members require a general knowledge of different positions in the team however; more specialised and detailed knowledge is required for each individual role. Entin and Serfaty's (1999) theory would suggest that an effective shared mental model was required to facilitate understanding between team members of different positions. This was a theory that the current study followed but the results appear to challenge this concept. The results of this study showed that defenders produced a higher percentage of similarity for their Typical Position (sheets = 50.52 and videos = 53.07) compared to attackers (sheets = 43.75 and videos = 42.12). Bourbousson et al. (2012) advise that it is crucial for team members have an understanding of how players in other roles will react in certain situations in basketball, for example in order for an effective team performance. These findings also support the suggestions made by Entin and Serfaty (1999) who stressed the importance of team members having an understanding of one and other. This suggests that team members need to work together effectively, through having an understanding of each other's different roles in order to perform well together.

This understanding can be seen between a full back and a wide midfielder in a 4-4-2 formation (Figure 1.0) for example. Even though these roles have different focuses (Figure 1.1), there must be an understanding between both players for them both to be able to work together efficiently. Benson, Eys, and Irving (2016) support this suggestion and state that having an understanding of other players' roles as well as their

own can improve their ability to work together. Both players would need to know each other's characteristics, overall ability and likely actions in order to shape their own actions (Araújo and Davids 2016). Bourbousson et al. (2012) propose that this understanding allows team members to work in synchronisation with each other, as they are able to anticipate one another's actions during specific situations. In this situation, the wide midfielder would need to know when the full back is pushing further up the park with the ball, they would need to provide them with cover and sit deeper or if the full back was sitting deeper, they can move forward. This example suggests that even though these roles have different focuses, they must possess a general understanding of each other's required and likely actions. This also proposes that team members must possess an effective shared mental model in order to share an understanding of each other's roles and responsibilities.

Entin and Serfaty (1999) and Araújo and Davids (2016) recommend that in football, players must have an understanding of each of their team mates in order to produce a cohesive team performance. The findings of Entin and Serfaty (1999) and Bourbousson et al. (2012) can provide an explanation for the results of the current study as the current study produced higher percentages of similarity between dyads that were part of the same team and of similar positions too. This further suggests that experience together is crucial for developing shared understanding and can have an influence on how team members can perform together. These assumptions could support the results of the current study which found that percentages of similarity between partnerships when players were looking at scenarios of their typical position compared to position they were not familiar with. However, for attacking videos the defensive dyads scored higher than attackers did. This could be due to defensive dyads possessing some of the

knowledge required to perform in different roles in order to be able to perform their own role effectively.

As suggested above, defenders not only produced better similarity scores in their own areas, but in fact they also produced higher percentage of similarity than attackers in relation to attacking videos (defenders = 45.13, attackers = 42.12). These findings suggest that there may be some overlapping information that defenders and attackers both have to share in addition to their own specific positional knowledge. The results also suggest that team members use position specific knowledge through an efficient shared mental model that has been developed between one another. Eccles and Tenenbaum (2004) state that domain or position specific knowledge is crucial for an effective team performance. Gréhaigne and Godbout (1995) suggest that this knowledge allows defenders to have the knowledge of their opponent's roles to be able to predict what they may do next. For example, if a full back in a 4-4-2 (Figure 1.0) understood the role of the opposition wide player (Figure 1.1) they would be able to predict what the wide player could do and choose their own action accordingly.

Marziali, Marziali and Mora (2002) and Vigne et al. (2010) further emphasise the importance of defenders having an understanding of the opposition attackers in order to be able to perform their own role effectively. This suggests that if players understand what is required to perform their role effectively in their team they will know how they should react in specific situations. These findings support the results of the current study in relation to defenders possibly needing to have some shared knowledge of attacking players as well as the knowledge about their own position. The results of the current study could suggest that in order to perform their role, defenders may require more knowledge of the attacker's role against them if they are to execute their actions effectively. For example, a defender may be required to have knowledge of

how the opposition attacker performs in order for them to perform their role effectively and this could change from game to game. For instance, one match a defender may be up against a striker that they knew was very fast. In this situation they may decide it would be best to give themselves a few extra yards between themselves and the attacker to be able to cope with their pace for running in behind the defensive line. However, later on in the game this attacker may be substituted for a striker who is not nearly as quick. This would allow the defender to mark this attacker more closely in order to perform effectively. This example shows the different situations which defenders could be faced with during even a singular match. This could be because defenders are required to have a general understanding of the attacker's role within a team, as this is the player they are facing (Wilson 2002). This could explain the results of the current study that showed in some attacking situations – attacking videos – where defensive dyads produced higher percentages of similarity.

Carron, Bray and Eys (2002) propose that each individual member requires an understanding of their own role to be able to facilitate an effective team performance. For example, defenders should possess an efficient mental model with shared knowledge about how to perform their role (i.e. when to have a deeper defensive line or when to push further forward depending on where the opposition team have possession of the ball). However, this would be different to the information an attacker would have about their role. In this situation, attackers would need to be roughly aware of where the opposition's defensive line is – showing a general understanding of the role – but their focus is on what they need to do. This suggests that attackers are more responsive to opportunities and potential mistakes by the opposition defenders to try to win back possession of the ball. For instance, if the opposition defence has the ball, they need to focus on pressing the ball and working with fellow attackers to get the ball back by

trying to force the opposition to make a mistake. They do not need to know exactly what the defenders are doing specifically, only a general understanding of what they are doing. This example suggests that team members require knowledge specific to their role in the team in order to perform effectively but they also require a general understanding of other roles within a team. This is because alternate tasks are required for different roles in the team, so in order to try to outperform their opponent; they should have a general understanding of what that role involves.

The findings of Silva et al. (2013) support the theories of Cannon-Bowers and Salas (2001) who propose that effective team performance is facilitated by team members possessing an understanding of what each other are likely to do in specific situations. As found in the current study, in order to perform effectively together, team members should have a mixture of general knowledge about other positions in addition more specific knowledge based on their own role within the team. This would demonstrate an efficient shared mental model within the team as there would be a general shared knowledge between all team members as well as position specific knowledge shared between team members of similar roles i.e. two centre halves or two attackers. For instance, a goalkeeper would have to possess a general knowledge about the wide midfielder in the team including an idea of what their preferred actions are and what they are likely to do in specific situations (Figure 1.1). If this did not happen, there would likely be a break down in performance.

Even though these positions require very different actions, they need to have an understanding of each other. For example, the goalkeeper needs to know that if the wide midfielder is dropping deeper and asking for the ball, they want the ball from the goalkeeper (Figure 1.1). Therefore, the goalkeeper must use their knowledge of the wide midfielder to whether they give them a ball to their feet or to flick on with their

head. This would demonstrate a general understanding between the goalkeeper and the wide midfielder. However, the goalkeeper would need to use their own knowledge of their position in order to make this happen (i.e. what position they should take in their own box and what power they needed to put into their throw or kick in order for the ball to reach its destination). If the goalkeeper did not have an understanding of the wide midfielder's role, the chances of them giving possession away would increase, resulting in a poor performance. This example shows how both a general knowledge or other roles and a position specific knowledge is required for teams to function well through an efficient shared mental model.

3.6.4 Unlimited Time vs Limited Time

A further hypothesis of the current study was that if there is more time available for dyads to give information during the sheets, their answers will be more detailed and varied compared to information given for their interpretations of the videos. The results also showed little difference between the percentages of similarity between the video sections where there was little time available compared to filling in the sheets which participants had an unlimited amount of time to complete. These findings suggest that no matter how long the dyads had to make a decision and regardless of whether participants filled in the sheets or watched the videos first, their percentages of similarity were very similar. Therefore, the mechanism that dyads use in order to make a decision is similar in both instances.

MacMahon and Mildenhall (2012) looked at different influences on referees' ability to make a decision during a game of football with one of the main influences over decision making being time pressure. Since there are a number of different factors that influence members of a football team's decision as well as referees decisions, the

suggestions of MacMahon and Mildenhall (2012) could explain the results of the current study. However, as theorised by Croft, Button and Dicks (2009) suggest that spontaneous decision-making does occur during sporting situations particularly in team sports. This suggests a difference between the mechanisms of how team sport athletes and referees make decisions. The amount of time which referees had to make a decision was suggested to have an influence on the accuracy of refereeing decisions as well as the ability to make the correct decision MacMahon and Mildenhall (2012).

However, this is not supported by the current study as dyads ability to produce a percentage of similarity was unaffected by time pressure. This could possibly be because there are so many factors, which a referee has to consider before making a decision that is more difficult to replicate compared to participants of this study who can work together to practice performing in situations that are likely to occur on a regular basis. For example, attackers have the opportunity to practice set pieces together in training and can learn how each other react in certain situations. However, it is more likely that team members require an understanding of each other's abilities, likely actions and roles (Mathieu et al. 2000).

This is because team members use their knowledge of each other to make decisions – through an effective shared mental model and a shared understanding of what each other are likely to do accurately. Whereas referees have to make decisions by themselves or with the help of other officials which will change game to game. This environment for referees means that they have to rely on their own opinions in the moment and based on their own experience in similar situations. However, team members are able to rely on previous experience performing together before making their decision. MacMahon and Mildenhall (2012) acknowledge that practice through training to look back at previously successful decisions help a referee to decide their

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future actions during a game. This example suggests that both team members and referees can use previous experience to assist their decision making process but referees are unable to rely on shared understanding between others to help them. Therefore, even though there are similarities between decision making between team members and referees, their process of making a decisions are different. The results of the current study showed very little difference between decisions made under time pressure and during a relaxed setting with no time pressures. This suggests that team members are able to rely in their shared mental model between one and other in order to make decisions based on their shared understanding, which has developed though experience performing together.

Eccles and Tenenbaum (2004) stress the importance of practicing in situations can help team members to make accurate and correct decisions. However, the scenarios that a football team is faced with are likely to be more similar to previous experience rather than referee's experiences. MacMahon and Mildenhall (2012) suggest that this could be because there are many contributing factors that can affect a referee's decision, which may not be the same in each scenario. Consequently, referees may have to base decisions in the heat of the moment as well as based on some previous experience. Those involved in team sports like football are able to look back to previously practiced scenarios such as free kicks and corners that contain less contributing factors that make them more easily replicated.

In addition, team members are practicing with the same players regularly and they can rely on their mutual understanding of each other, which is facilitated by their shared mental model. As stated previously, this is not a framework that referees can rely on as they work either on their own or with different officials in order to make a decision. This could help to explain why there was little difference between the

percentage scores of both attackers and defenders in relation to the tactical sheets and videos. This could be because dyads within the current study relied on their shared mental model and used their shared understanding to make a decision regardless of the available time in order to achieve close percentages of similarity.

Harrison et al. (2003) further theorise that having a level of familiarity between team members allows an easier and faster exchange of information. MacMahon and Mildenhall (2012) suggest that the ability to make a quicker decision of which action to take in situations comes from practicing in similar scenarios. These propositions emphasise that through experience, athletes build up knowledge of how to react in certain situations that will help to accelerate the decision making process and resulting in actions being performed quicker. This improvement to the exchange of information creates an environment where members understand each other and are able to understand what others will be doing during specific situations. This helps to facilitate the ability to make decisions quicker as team members have expectations of how others will react, meaning they can choose their actions quicker. One method that is suggested by Harrison et al. (2003) to allow this situation is practicing actions that will be used during competitive matches. This can permit team members to recall previous actions faster that have been carried out during training and know how they need to perform as well as those around them.

Baker et al. (2003) elaborate and suggest that members of a team are highly likely to fall back on previous experience when making a decision during competitive scenarios. For instance, if a defender is faced by an attacker running towards them in the first few minutes of a game, their choice of actions will be based on what they found successful in the past. The rest of the defenders will also recall previously similar situations in training where they have seen how this defender reacts and will choose

their own actions based on what they have seen the player do in the past. This demonstrates that team members fall back on their own shared mental model and their mutual understanding of their team members in order to make a decision.

Helsen, Hodges, Winckel and Starkes (2000) also looked into the use of practicing skills regularly in football and suggested that this knowledge can be used at a later date. This could provide an explanation to why participants of the current study's data were similar regardless of the time constraints as they managed to recall previous scenarios that they have practiced many times before. Since participants had a wealth of previous experience together during similar situations within football, theoretically they were able to recall these scenarios and provide data on actions they undertook. The time restrictions did not come into consideration as participants may have based their information on previous scenarios regardless of how much time they had available to them.

3.7 Practical Implications

There were three main findings from study one of this thesis. These results can provide valuable and practical information for coaches to help them to plan and prepare their training programmes to help their players to perform effectively together.

Firstly, dyads who had experience performing together had higher percentages of similarity those dyads with no experience. This suggests that dyads with more experience performing together are able to demonstrate their shared understanding. These results can provide football coaches with a recommendation that if they want players to be able to demonstrate shared understanding and produce a more efficient team performance, it would be beneficial to give them experience performing together. This could help coaches to plan their training sessions and long-term programmes to

build shared understanding between players who will be playing with (i.e. two centre halves).

Secondly, it was found that defensive dyads had higher percentages of similarity in their typical position (both defensive situations) and one of their atypical position (attacking videos). This finding suggests that defenders may benefit from having an understanding of the role of attacking players in order to be able to be able to perform more effectively. This information can provide coaches with justification for using specific attack vs defence training within their training programme. This would give defensive players the chance to learn more about the role of an attacker plus what actions they would be required to do in order to stop them and perform their own role effectively.

Thirdly, there was very little difference of percentages of similarity in situations where there was a time limit (videos) and no time limit (tactical sheets). However, the lowest amount of time which dyads in this study to make their decision was thirty seconds. This timeframe is not an accurate representative of making a decision during a match however, the technology was not available to allow this to happen. This result could further emphasise the importance of accurate decision making under time pressure. Based on this finding, coaches can then plan training sessions to facilitate accurate and split second decision making between team members.

3.8 Limitations

A limitation, which could have been taking into consideration during this study, would have been to find out why participants made the choices they did and whether these were the right or wrong options. MacMahon and Mildenhall (2012) suggest that there are a number of factors that could influence the ability to choose how to react in

certain situations. This could have led to an explanation for why participants chose the actions they did rather than just looking at the actions that participants took. Another improvement, which could have been made to the design of this study, was the number of data collection materials that were used. Four overall scenarios (sixteen individual) were used during the study for both the tactical sheets and videos. This was decided, as sixteen sheets was a reasonable number to have as Blickenderfer et al. (2010) used twelve similar scenarios within their research. However, it would have been good to include more in order to allow for more comparable data and produced more information.

Another factor that was found to be difficult was participant availability and managing data collection sessions. Problems with trying to get participants to take part in data collection sessions seemed to be the case due to players being busy with other commitments such as work and family life. This resulted in multiple data collection sessions with one team that became very time consuming and meant data collection lasted a lot longer initially anticipated. Participants could have been asked to provide their opinions of how similar they felt their answers would be to would have given context to their choice of decisions. This addition could have allowed the comparison of how well each partner within a dyad felt that their partner would score similarly to them against their actual scores. This may also have allowed participants to discuss how they felt shared understanding had developed between themselves and their partner. As suggested by Eccles and Tenenbaum (2004), shared understanding between team members develops over time due to a number of factors. If this study considered investigating these potential factors, this could have allowed the study to find the reasoning behind how partnerships develop over time, leading them to make coordinated decisions.

3.9 Future Research

This research study has looked to demonstrate the existence of shared understanding within football dyads using a similarity scale. Partnerships that had experience performing together demonstrated higher similarity scores than random pairings regardless of their position. It was also found when split into their position, actual dyads produced higher similarity scores in relation to their natural position when compared to their unnatural position. Future research can build on the findings of this study and further investigate shared understanding within dyadic relationships in football or other team sports. Comparable data collection methods can also be used but tailored to a variety of different team sports. Similar patterns could be investigated to include more than two players within a team as well (i.e. a back four in football to see if shared understanding exists between more than two team members based on their experiences performing together). It would be important to consider if partners are able to make a coordinated decision as according to Macquet (2009) this is the ideal function of team members. Therefore, it would be interesting to use similar data collection methods to identify if dyads who have experience performing together are able to make a coordinated decision if there was a correct option available to them or not.

The perceptions of the members of the football dyad could also be gathered to give more knowledge and description of how participants' understanding of their partner's functions. These views could be recorded through semi-structured interviews and give more information about player's perceptions of shared understanding in addition to similarity scores. This could also lead to a better understanding of how shared understanding develops between football dyads. This could lead to the creation of a training program aiming to increase understanding between dyads over a shorter period of time, resulting in a reduction in 'gelling time.'

3.10 Conclusion

The aim of this study was to establish the existence of shared understanding between football dyads. Since shared understanding between team members in football can affect overall team performance (Fiore, Salas, Cuevas and Bowers 2003; Blickensderfer et al. 2010), the data collected provides an insight into how shared understanding can help players to work more effectively together. The data showed that the dyads that have experience performing together, have a shared understanding and read situations in a similar way through their shared mental model to achieve higher percentages of similarity compared to dyads that had no experience together. The findings of the current study could have been due to experienced partners being able to rely on their developed shared mental to recall previously similar situations which they have participated in before and base their answers on these experiences. This demonstrates the existence of shared understanding between team members who had performed together previously.

The results illustrated that defenders produced higher percentages of similarity for their Typical Position compared to attackers and for attacking videos. Entin and Serfaty (1999) propose that team members must have a general knowledge of other team members' roles but must have knowledge specific to their position in the team. This finding can support the findings of the current study. These results showed that defensive dyads scored higher in three out of four categories in comparison to attackers that were not expected.

It was hypothesised that dyads would score higher for their Typical Position and lower than in their Atypical Position. However, this was not the case for all categories and these results suggest that defenders also need to have knowledge of what attackers

are going to do at any one time as well as knowing what actions they should be performing. The results could have been achieved due to defenders requiring an understanding of their opposition in order to perform their own role (i.e. they would need different actions to play against quick and slow players). This could further support the suggestions made by Entin and Serfaty (1999) of team members needing to understand other team member's roles as well as a knowledge of their own position. Therefore, in order to perform effectively, team members are required to have a mixture of general knowledge of other roles in the team in addition to a more specific knowledge of their own individual role.

It was anticipated that the more time participants had to answer each section, the more varied their answers would be. The amount of time given to analyse each scenario and write down what information they wanted to state was insignificant according to the results of the study. This was because there was no significant difference between the tactical sheets and video sections of the data collection. This could be due to participants relating back to previous experience with their partner in both situations in order to write an answer based on their analysis of each situation rather than relying on the amount of time allotted for each answer. This would suggest in order to make their decision; dyads were using their own shared mental model (a mixture of a task and team work mental model) and demonstrated their mutual knowledge to make a decision.

This finding does not support the conclusions made by MacMahon and Mildenhall (2012) who suggest that time pressure to make a decision is crucial. However, MacMahon and Mildenhall (2012) looked at decision making in referees whereas the current study considered decision making in football dyads. Within football, there is rarely the same situation with all players unlike referees (i.e. it is

unlikely that each player will be in the same position in different scenarios), therefore participants of the current study could be relating back to previous experience regardless of the time they have to make a decision. Therefore, dyads who have experience performing together demonstrate an efficient shared mental model, which facilitates shared understanding between team members. This allows dyads to read situations in a similar way to their partner and can pick similar actions of what they feel should happen in specific scenarios based on their experience performing together.

Chapter 4 - The Impact of Shared Understanding within Football Dyads on the Ability to Make a Correct Decision.

4.0 Introduction

4.0.1 Shared Understanding

Shared understanding is when two or more people possess similar thoughts in certain scenarios that are based on previously similar situations with each other (Blickensderfer, Reynolds, Salas and Cannon-Bowers 2010). Fiore, Salas, Cuevas and Bowers (2003) stress the importance of shared understanding and suggest that this is a characteristic that is held by successful teams. For instance, it would be important for two central midfielders to have an understanding of each other's abilities if they are going to be playing together regularly in the same team (Figure 1.1). This understanding would be beneficial for both players, as each central midfielder would know how each other would react in certain situations, making it easier for them to perform together.

Giske, Rodahl and Høigaard (2015) suggest that team members are able to use their understanding of each other's likely actions to be able to perform more effectively together. For example, if both central midfielders in a 4-4-2 formation (Figure 1.0) understood which player was more comfortable at passing the ball into their striker's feet, they would know which one of them to give the ball to in order to pass the ball up to the striker. This understanding would give their team's striker the best chance to

score a goal but this situation would not be possible without the mutual understanding between both players.

Williamson and Cox (2014) emphasise that achieving this level of shared understanding can facilitate an overall understanding between team members of everyone's role in the team; helping to coordinate actions. In relation to the above example, both midfielders – through possessing a mutual understanding of each other's abilities - are able to achieve a coordinated performance. Therefore, possessing an understanding of fellow team members is important in order to allow teams to be able to produce a coordinated performance. However, it would be worthwhile investigating how shared understanding is established between members of the same team and how this develops. Mathieu et al. (2000) suggest that this is possible in a sports team, through a shared mental model between team members. It would make sense to explore the construct of a shared mental model within a sports team to examine how shared understanding is established between team members and how it is able to develop.

4.0.2 Shared Mental Model between Team Members

A shared mental model is defined a knowledge structures between people, allowing sharing of information and the coordination of actions (Cannon-Bowers, Salas and Converse, 1993). Smith-Jentsch, Mathieu and Kraiger (2005) propose that shared knowledge between team members is essential for an effective team performance and states that this is facilitated by having an effective shared mental model. Mathieu et al. (2000) state that team members who have this psychological construct can influence their mutual knowledge and their ability to work together. For example, if a right back and right midfielder have a shared mental model between one another, they will have an understanding of how the other individual is likely to perform in certain situations.

These players are then are able to use their knowledge of each other to work effectively together. For instance, if both players in this scenario know that the right back likes to play a pass to the wide midfielder's feet, the right midfielder will then expect the right back to pass the ball to them in this manner (Figure 1.1). This means that there would not be a breakdown in performance with differing expectations of how the right back would pass the ball, facilitating a more effective performance. This scenario demonstrates an effective shared mental model between team members. Silva et al. (2013) also suggest that shared knowledge – which is facilitated by an effective shared mental model - is a crucial skill for team members allowing them to be able to coordinate their actions. It suggests the importance of team members being able to understand each other in order to facilitate a better team performance.

Blickenderfer et al. (2010) also theorise that shared knowledge as a mediator between the interpersonal knowledge of team members, experiences of play, and coordinated action. This suggestion supports the findings of Mathieu et al. (2010) who stress that improvements to these characteristics are possible based on an effective shared mental model existing between team members. However, in order to be able to fully understand the importance of team members possessing a shared knowledge, we must first look at how experience performing together can influence, create, and improve, shared understanding between team members. This is important as Baker, Côté, and Abernethy (2003) suggest shared understanding has to be developed over time and is not instantaneous. Therefore, it would be wise to investigate the role of experience of performing together has, when considering the importance of shared understanding between team members.

4.0.3 Experience Performing Together

Blickensderfer et al. (2010) suggest that experience of performing together is central to creating and developing shared understanding between team members. Through experience together, team members will be able to develop their own efficient mental model (Jonker, van Riemsdijk and Vermeulen, 2010), resulting in shared understanding between each other. Baker et al. (2003) acknowledge that understanding between team members can take some time to develop. Williamson and Cox (2014) suggest that this is because experience refining actions allows successful expectations to develop and result in shared understanding between team members. During crossing and finishing drills at training for example, team members will be able to see how different players cross the ball into the box for strikers and how certain players shoot on goal. Stout, Cannon-Bowers, Salas and Milanovich (1999) also suggest practicing together to be effective for increasing understanding between athletes by allowing team members to see what each other do during specific situations. Through this type of experience, players will develop an understanding of how their fellow team members react in certain situations, leading to shared understanding. This understanding will create certain expectations of how players will perform in certain situations (i.e. where the ball will likely land when a certain player crosses the ball into the box), facilitating the development of an efficient shared mental model between team members. This is because team members will learn how they need to work together in order to achieve an efficient performance.

Silva et al. (2013) state that there is not a certain number or type of experiences that gives team members the best shared understanding, suggesting that the building of shared understanding between team members depends on the individuals within the team. This is because each team member has their own role to perform in the team

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(Benson, Eys and Irving 2016) and in order to have an efficient shared understanding (through an effective shared mental model) team members must have experience performing together. However, in order to develop a comprehensive understanding of other team members and an efficient shared mental model, team members need to have a general understanding of what is required in each other's roles within the team (i.e. a general sporting knowledge).

4.0.4 The Importance of General Sporting Knowledge

Entin and Serfaty (1999) propose that the majority of players in a team will have an amount of general knowledge about others in their team. This is because certain positions in a team requires different actions based on the situations that they are faced with during a competitive match. For example, a goalkeeper in football is very unlikely to experience the same situations in the middle of a pitch compared to someone who is playing in a central midfield position (Figure 1.1). However, it would still be important for the goalkeeper to understand some of the required actions of this role, such as how to win a header from a high ball. This is important because this knowledge would help the goalkeeper to choose the best type of kick to make in order to help their central midfielder to win a header and push their team further up the pitch.

However, Gershgoren et al. (2016) suggest that different team members are required to have an extensive general understanding of their team sport, but also need a deeper and more knowledge of the required actions of their position in the team. For example, a goalkeeper would be required to have an extensive knowledge of his own role within the team in order to perform there on a regular basis (Figure 1.1). It is acknowledged that players do require a general knowledge of what should be done in certain situations, it is crucial for effective teams to have members whom have more specific knowledge based on their position in that team.

4.0.5 Position Specific Knowledge

Sharing specific knowledge between players of a similar position in a team will help to provide a successful team performance according to Entin and Serfaty (1999). For example, four defenders must share a general knowledge of each other's roles in order to be able to perform together i.e. (where each player should be positioned if they have to move further up the park as their team are on the attack). This situation is crucial because team members will then understand their role in order to achieve a coordinated team performance (Marks, Sabella, Burke and Zaccaro 2002). This is because players in a similar position (i.e. the defenders would require different knowledge of how to perform their role during a match compared to attackers), meaning these two positions would not require the same knowledge to perform. For example, defenders would need to have a general understanding of how attackers play in certain situations in order to shape their own actions but they would have to possess a thorough knowledge of how to defend effectively in order to perform successfully.

In relation to the above example, defenders in the same team will develop their own knowledge of what their role requires. Each of the defenders will use their knowledge of their own role in order to work towards achieving the team's defensive goals. However, this would not be possible unless each defender knew what was required of them in their own role. Reimer, Park, and Hinsz (2006) stress that this allows each team member to understand their own role within a team and will allow for a successful team performance. This suggests that team members would benefit from having a robust knowledge of their own role in order to be able to achieve team goals. Blickensderfer et al. (2010) also state where shared understanding is created through team members having experience performing together. This understanding then

facilitates the development of an efficient shared mental model for team members and facilitates effective decision making.

4.0.6 Shared Understanding Leading to a Coordinated Decision

Blickensderfer et al. (2010) suggest that having a mutual understanding can facilitate team members' abilities to make a coordinated decision. For example, two strikers in a 4-4-2 formation (Figure 1.0) will use their understanding of one and other's abilities and likely actions in order to perform together efficiently. In order to perform efficiently together, both of these players must use their knowledge of each other in addition to their knowledge of their role within the team (Benson et al. 2016). Firstly, both of these attackers would have an understanding of what a player in this role should do. Marks et al. (2002) suggest that team members use their own understanding of how to perform in a certain position when making assumptions of how fellow team members will perform. For instance, these two players will have an understanding of what would be required of two attackers that will perform together e.g. when one player should receive the ball and when the other attacker should make a run into space (Figure 1.1).

In addition to the knowledge of the specific role, in order to make a successful decision Gershgoren et al. (2016) state that team members must also have an understanding of other players in their team and actions that they are likely to take. In the above example involving the two attackers, both of these players are required to have an understanding of how each other react in certain situations in order for them to make coordinated decisions and be able work together efficiently. For instance, if both attackers in a 4-4-2 formation know that one striker is better at challenging in the air for the ball and the other is quicker at running in behind the opposition defence, they can both make a coordinated decision based on their knowledge of each other. Their shared understanding as well as their understanding of what should be done in this situation is

used to make their coordinated decision. Therefore, it would important to consider the different mechanisms that dyads use in certain situations in order to make coordinated decisions.

4.0.7 The Current Study

This study builds on the findings of Study One that found that shared understanding exists between football dyads (See Section 3.3.0). This study takes this information and investigates whether defensive dyads can use their shared understanding to be able to make similar decisions. Defensive dyads were chosen partially due to defensive dyads scoring better in the typical positions as well in some atypical position situations (See Section 3.3.2), and due to defenders having less varied roles within a 4-4-2 formation (Figure 1.0). The aim of this study was to explore the level of shared understanding displayed by dyads of football defenders in hypothetical game situations that had either a clear correct course of action or where there was no clear correct course of action.

Forty football defensive dyads had to rank three future options for the next movements of one player to see if dyads could make a correct and coordinated choice if there was a clear and correct answer available. These scenarios were similar to the tactical sheets that were used in Study One (See Section 3.1.1). However, instead of blank boxes, three options of potential actions were given to the participants to choose from. Since the results of Study One (See Section 3.4.1) showed little difference for similarity between dyads for both tactical sheets and videos, only the adapted tactical sheets were used in this study. Like Study One (See Section 3.1.2), both members of the dyad made their choices of actions separately in order for their data to be compared for similarity. Research suggests that team members use both a general sporting understanding and position specific knowledge to be able to make a coordinated

decision (Gershgoren et al. 2016). Based on research that has looked at the importance of a shared mental model and how this facilitates coordinated decisions within teams, this project considers factors such as length of time performing together and what type of knowledge partners will rely on based on the given scenario.

Scenarios with a Correct Answer

It was hypothesised that there would be a difference between the percentage of similarity displayed within dyads in game situations that had a clear correct course of action. Dyads were expected to be similar and select the correct course of action, rather than be similar and have not selected the correct course of action. It was also hypothesised that in situations which had a clear correct course of action, players would be more likely to gravitate towards the correct answer by drawing upon their own individual player experience and related knowledge of football.

Scenarios with no Clear Correct Answer

Conversely, it was expected that in situations that had no clear correct course of action, players who display similarity in their dyads must be thinking in a similar way to each other, which in turn would be related to their experience of working together. If the hypothesis that individual experience was more important in game situations with a correct course of action and dyad experience was more important when there was no correct course of action was accurate, then the difference in percentage of similarity between actual and random dyads would be greater in situations with no correct action than in those where there was a correct course of action that could be taken.

4.1 Methodology

4.1.1 Participants

Forty-five male football dyads (partnerships) over the age of sixteen years old (M_{age} = 19 +/- 3 years) from recreational (n=1), youth (n=6), professional youth (n=10), amateur (n=16) and semi-professional (n=12) and from within the Tayside area were recruited. Each of the dyads consisted of two defenders that play football together on a regular basis with the average time together of 31.65 months. The number of dyads in this study was comparable to research which looked at similar dyadic sporting relationships including Lorimer and Jowett (2009b) (40 dyads) and Jackson and Beauchamp (2010a) (50 dyads).

4.1.2 Materials

Scenarios

The twenty scenarios -two scenarios per sheet - were a simple design of a football pitch that included a variety of players from two football teams (See Figures 4.1 and 4.2) displaying different series of common defensive play. This was more than the number of scenarios which Blickensderfer et al. (2010) also used (twelve sheets) in their research. Each scenario was designed by the primary researcher and were based each one on common defensive situations that occur during football matches. The scenarios were based on the primary researcher's experience watching and playing football. In addition to this, each scenario was discussed with two other football coaches who had experience within football to make sure they were a fair an unbiased reflection of typical defensive scenarios. These were chosen, as the participants would

recognise these, as they are the same design as the tactical boards, which are commonly used by football teams.

A single player was indicated in each scenario to identify to participants which player they were choosing the next actions for. In addition to this, there was a small description above each scenario giving participants the information about what was happening in each scenario. Each description was decided by the primary researcher – based on their understanding of the situation – and the two experienced coaches who helped with the design of each scenario. Each scenario had three possible actions for the player to perform next, and the task was for participants to rank these options in regards to their first, second and third choice of actions, based how they themselves would react in that situation.

Establishing the Correct Option

The decision of which option was the correct action was decided by seven experienced football coaches with an average experience of 14.29 years (+/- 4.72) years. Each of the coaches were invited to take part via email (Appendix Seven) and were asked to participate to use their expertise to rank the choices in each of the twenty scenarios from 1st to 3rd. Their first choice answers for each scenario were examined for similarity and established whether the scenario had a right answer or not if a percentage of agreement between all the coaches was above 75%. Eleven scenarios had a correct answer (See Figure 4.1) and nine had no correct answer (See Figure 4.2). The inclusion of the expert coaches' similarity scores removed any bias from the primary researcher as the correct answer for each scenario was be based on their collective decisions.

The ball is coming high in the air towards **Orange no. 4** straight from **opposition No. 1's** drop kick.

Your Player – Orange No. 4	Rating 1st, 2nd or 3rd	Your Partner – Orange No. 5	Rating 1st, 2nd or 3rd
・ You header the ball to No. 9.		・ Keep an eye on opposition No. 9, step closer to No. 4 to provide cover.	
・ Play ball to No. 2 then up to No. 9.		・ Stand your ground and wait for No. 1 to collect the ball.	
・ Let No. 1 collect the ball.		・ Keep an eye on opposition No. 9, maintain shape and push up as a unit.	

Figure 4.1 – *Tactical Sheet with a Correct Answer Available for both Players.*

Orange No. 2 has the ball under their full control on the ground after a pass from **Orange No. 1.**

Your Player – Orange No. 2	Rating 1st, 2nd or 3rd	Your Partner – Orange No. 4	Rating 1st, 2nd or 3rd
· Play a quick one-two with No. 6 then a pass to No. 9.		· Get closer to No. 2 in order to provide cover.	
· Play a direct ball to No. 9.		· Drop off to receive the ball from No. 2.	
· Pass to No. 4, then the ball goes wide to No. 3.		· Push up a few yards while keeping an eye on opposition No. 10.	

Figure 5.2 *Tactical Sheet without a Correct Answer Available for both Players.*

4.1.3 Procedure

Before the project was able to begin, the Abertay University Ethics Committee (Appendix Eight) gave ethical approval. Once ethical approval was given, participants were then contacted and invited to take part in the project (Appendix Nine). After the aims, background, procedure and the participants' role had been outlined, they were able to ask any questions which they may have had about their inclusion in this research project. Firstly, participants were asked to choose a suitable location for where the data collection could take place. This had to be a safe and secure environment where the participant felt comfortable to complete the project such as a sport centre or training facility.

Once the location had been established, the data collection was able to begin. After they were comfortable with the research project and location and fully aware of their own role, participants were asked to fill in an Informed Consent Form (Appendix Ten), allowing the following schedule to commence. Once the Informed Consent Form had been signed, participants were asked to fill out a small demographic questionnaire (Appendix Eleven) where they had to state how long they had played football; at what level of performance and how much experience they have had with their partner. The researcher then gave a brief introduction to every participant, in order to state that each scenario is in fair weather, low wind and on a flat pitch with no bumps. This was stated so that participants had as much information about each scenario before they made their choice. They were also informed that participants should go with their instinctive decision instead of taking a large amount of time as overthinking situations may influence their judgements.

Participants had to rank three future options of the next movements of one player based on one hypothetical scenario (Appendix Twelve) to see if dyads could make a correct and coordinated choice if there was a clear and correct answer available to them. Both members of the dyad made their choice of actions separately in order for their data to be compared for similarity. The same twenty scenarios were used – in the same order each time - with all participants and the whole procedure lasted approximately fifteen minutes each.

4.1.4 Data Analysis

Calculating Similarity Score Percentages

A maximum of twenty comparisons were used for each of the forty dyads. These were split between whether there was an acceptable agreement of over 75% between the expert coaches to determine a correct answer and whether there was no acceptable agreement between the expert coaches. Eleven of these scenarios had a percentage agreement of over 75% meaning these scenarios had a clear and correct answer. This left nine scenarios where there was no clear and correct answer. This meant the highest score that any dyad could have for each of the two categories was eleven and nine respectively.

The researcher looked through each dyad members' data to look for similarity. Similarity occurred between partners if partners put the same option for one specific scenario, (i.e. if they both chose option 3 their answer was coordinated). Once all of the scenarios had been analysed for similarity, three percentages of similarity for each dyad was calculated. Two of these percentages were for the scenarios where there was a clear and correct answer and a further one percentage of similarity was for when there was no clear and correct answer. The number of coordinated responses that each actual and

random dyad made was divided by the total number of scenarios (either eleven or nine) and then multiplied by one hundred to calculate each percentage of similarity. This process was used to generate similarity percentages of actual dyads as well as randomly paired dyads whom had zero experience performing together.

4. 2 Results

4.2.1 Actual and Random Dyads

Actual dyads are the dyads that have had the experience of performing together. Random dyads were artificially chosen from the actual dyads, where each member of an actual dyad was paired with different player who they had never any experience performing together. Each member of the dyad had either a number one or two written on the top of their finished sheets by the primary researcher based on who handed their sheets first or second. The artificial dyads were created by randomly pairing players with a one and a two together that were not already their partner or from their own team.

4.2.2 Factor 1- Coordinated and Correct

Factor 1 is described as Coordinated and Correct. This factor considers 11 of the 20 scenarios which there was an acceptable agreement between the expert coaches of 75% or above. Out of the 11 scenarios, this factor is concerned with the percentage that dyads got the same as their partner and agreed with what the expert coaches stated.

4.2.3 Factor 2 – Coordinated but Wrong

Factor 2 is described as Coordinated but Wrong. This factor considers 11 of the 20 scenarios that there was an acceptable agreement between the expert coaches. Out of

the 11 scenarios, this factor is concerned with the percentage that dyads got the same as their partner but they did not agree with what the expert coaches stated.

4.2.4 Factor 3 – Coordinated

Factor 3 is described as Coordinated. This factor considers the other 9 of the 20 scenarios that there was no acceptable agreement between the expert coaches. Out of these 9 scenarios, this factor is concerned with the percentage where dyads got the same as their partner even though there was no acceptable agreement between the expert coaches.

Table 4.9 – *The mean and standard deviation percentage values for both Actual and Random Dyads.*

Actual/Random	Mean	Standard Deviation
Actual Coordinated and Correct	44.04	15.38
Actual Coordinated but Wrong	13.33	8.80
Actual Coordinated	46.91	20.23
Random Coordinated and Correct	39.39	15.98
Random Coordinated but Wrong	10.50	7.74
Random Coordinated	29.87	17.22

Table 4.1 shows the mean and standard deviations for all of the percentages of similarity. A clear 15-28% higher percentage difference is evident between the scores for dyads that actually played together compared to those dyads created with random pairings of players.

Table 4.10 – *The Actual Dyads significance and effect size comparisons.*

Actual Dyads				
Factor	**Significance**	**Z**	**Cohen's d**	**r**
Coordinated and Correct Vs Coordinated but Wrong	0.00	-5.6	2.45	0.77
Coordinated and Correct Vs Coordinated	0.43	-0.80	-0.16	-0.08

Table 4.2 shows the results of a Wilcoxon Signed Ranks Test for the comparisons between Actual Dyads for Coordinated and Correct Vs Coordinated but Wrong and Coordinated and Correct Vs Coordinated. An effect size calculator was chosen to find the effect size values between each of the factors. As expected, in situations where there was a correct course of action dyads had significantly higher similarity when picking that correct action rather than an incorrect action (p=0.00). Large Z values (Z = 5.6), Cohen's d (d = 2.45) and effect size (r = 0.77) were all found for this comparison. However, dyads were not more likely to pick a coordinated action if there was a correct action available in comparison to when there was no correct action to choose (p=0.43) – which was not hypothesised. A small Z value (Z = - 0.80), Cohen's d (d = - 0.16) and effect size (r = - 0.08) were all found for this comparison.

***Table 4.11** – Actual Dyad comparison between individual and combined experience.*

	Player 1 Experience		Player 2 Experience		Dyad Experience	
Actual Dyads Vs Experience						
	Significance	**R**	**Significance**	**r**	**Significance**	**r**
Coordinated and Correct	0.63	0.08	0.40	0.13	0.70	0.05
Coordinated	0.64	0.07	0.80	0.03	0.88	0.02

Table 4.3 shows the Significance and correlation coefficient between both forms of experience between each factor was calculated through a Spearman's correlation. The results show no significance between Player 1, Player 2 of Dyad Experience and Coordinated and Right. There was no significance found between Player 1, Player 2 of Dyad Experience and Coordinated. There were also no correlation (r<0.13) there was a correlation between both individual player experience and Dyad experience for both Coordinated and Correct and Coordinated.

***Table 12.4** – Actual vs Random dyad comparisons*

Actual v Random Dyads			
Factor	**Significance**	**U**	**Cohen's d**
Coordinated and Correct	0.15	836.00	0.22
Coordinated	0.00	508.50	0.62

Table 4.4 shows a non-parametric two independent samples Mann-Whitney U Test was used to find the Actual Vs Random comparisons. The results showed a significance value of less than 0.05 when comparing Actual Vs Random pairings for Coordinated (p=0.00). Actual vs Random Coordinated and Correct was found not to be significant but showed trends towards significance (p=0.15). These comparisons showed small (d = 0.22) and medium (d = 0.62) Cohen's d values.

4.3 Discussion

4.3.1 Main Findings

The aim of this study was to explore the level of shared understanding displayed by dyads of football defenders in game situations that had either a clear correct course of action or where there was no clear correct course of action. This study also examined how this shared understanding was influenced by both individual player experience (years performing in the sport) and the experience of the dyad working together (years playing the sport together).

It was hypothesised that there would be a significant difference between the percentage of similarity displayed within dyads in game situations that had a clear correct course of action. This was expected as dyads would be more likely to be similar and select the correct course of action, than be similar and have not selected the correct course of action. This was supported by the results ($p < 0.00$, $d = 2.45$) and it was suggested that the increase in percentage of similarity was the outcome of individual players being able to identify the correct course of action as opposed to similarity of thought processes within a dyad itself.

To investigate this, percentage of similarity in game situations that had a clear correct course of action was compared to percentage of similarity in situations where there was no clear correct course of action. It was hypothesised that if players were more likely to pick the correct course of action than a wrong one; they would be more likely to be similar in situations with a correct course of action than in one where there were many different but suitable actions that could be taken. However, this was not supported by the results ($p > 0.05$, $d = 0.16$).

Even though there was no significant difference between game situations that had a clear correct course of action and those with no clear correct course of action, it does not mean that the mechanism underpinning percentage of similarity displayed by the dyads was the same in both situations. It was hypothesised that in game situations that had a clear correct course of action, players were more likely to gravitate towards the correct answer by drawing upon their own individual player experience and related knowledge of football. Conversely, in game situations that had no clear correct course of action, players who display similarity in their dyads must be thinking in a similar way to each other which in turn would be related to their experience of working together. However, individual player experience was not consistently correlated with percentage of similarity in game situations that had a clear correct course, nor was dyad experience correlated with percentage of similarity in game situations that had no clear correct course of action.

As years played is a relatively crude measure of experience, the links between experience and percentage of similarity were further investigated by comparing dyads made of players who had actually played together to dyads made up of randomised players. If the hypothesis that individual experience was more important in game situations with a correct course of action and dyad experience was more important when there was no correct course of action was accurate, then the difference in percentage of similarity between actual and random dyads would be greater in situations with no correct action than in those where there was a correct course of action that could be taken. This would have been the case because Blickensderfer et al. (2010) and Gershgoren et al. (2016) suggest that team members use their shared understanding to be able to make a coordinated performance. However, if dyads had no experience performing together (i.e. the randomly paired dyads, their percentages of similarity

would not be as high as the actual dyads). This would be due to experience performing together being essential for shared understanding between sub-teams (Correia et al. 2011) like dyads. This was supported by the results; there was no significant difference between actual and random dyads in situations with a correct course of actions, but actual dyads had a significantly higher percentage of similarity than random dyads in situations where there was no clear course of action.

4.3.2 Coordination When There Is a Clear and Correct Choice

The results of the study showed significant differences ($p < 0.00$, $d = 2.45$) between the percentage of similarity displayed within dyads in game situations when there was a clear correct answer when participants chose the correct course of action and when participants chose an incorrect option. These findings demonstrated a significant difference when there is a clear correct option. In this instance, dyads were more similar and selected a correct course of action rather than be similar and have not selected the correct course of action. This suggested that dyads are more likely to pick the same correct decision rather a coordinated and wrong choice.

The results also show that dyads were not more likely to be similar in situations where there was a clear and correct answer than where there were scenarios where there are several potential outcomes ($p > 0.05$, $d = 0.16$). This suggests that dyads are not only relying on their own experience within the sport, they also possess shared understanding between each partner in the dyad. These findings support research which has looked at the link between sporting experience and shared understanding between team members where the importance of these forms of experience in being able to produce a coordinated performance has been highlighted.

Experience Leading to Shared Understanding

The findings of the current project state that when there is a clear and correct answer, dyads are more likely to select a correct course of action rather than be similar and have not selected the correct course of action. It could also be argued that in order to produce this result, dyads are able to rely on their own experiences within the sport. Silva et al. (2013) suggest that athletes regularly think back to previously similar situations in order to be able to choose how best to act. This could be the case for these scenarios as since there is a clear and correct answer; participants were able to use their own experiences of when they were in similar situations themselves.

These results support suggestions made by Blickensderfer et al. (2010) who state that team members' own task experience will give them an understanding of how to act successfully in certain situations. This would be because if they know a certain action works in a specific situation, they are going to try it again. For example, some (eleven) of the scenarios in this project had correct option available to dyads (See Figure 4.1). In this tactical sheet (Figure 4.1), the ball is coming high in the air towards Orange no. 4 straight from opposition No. 1's drop kick. Since this is common scenario for a defender to face within a football match and there was a correct answer available to participants, they could have used their own individual knowledge and experience to select what they though was the best option. This finding support the suggestions made by Silva et al. (2013) and Blickensderfer et al. (2010) who state that individual experience can give team members the information of how to act in similar situations. Therefore, dyads in the current study had the ability to refer back to previously similar and successful situations that thy faced when there is a clear and correct course of action. This suggestion would also explain participants gravitating towards the correct answer, as there may only be one certain way to act in this situation. For example, in a situation where a defender is in possession of the ball and there is only one player to

possibly pass to as their team members are all marked by an opposition player, this may be the only logical choice of action. However, the player could also think back to similar situations when they were faced with this same dilemma. MacMahon and Mildenhall's (2012) findings support this suggestion as they theorise that in order to make consistently successful decisions, an individual must refer back to similar situations when they acted successfully. This is important for team members to do as this process facilitates better decision making by improving the chance of being able to make a successful decision.

For instance, in training they were in the same situation during a specific defensive shaping drill. The first time the drill was ran, they tried to play a longer ball and switched the play to the other side of the pitch (i.e. the wrong option). The opposition gained possession and scored against the defence. McPherson (1999) and Silva et al. (2013) state that team members are able to refer back to previous experiences performing similar scenarios to be able choose actions during training and competitive matches. The next time, the defender chose the simple pass to the only player that was free. This time the defensive team kept possession of the ball and were able to work the ball forward. This suggestion supports Blickensderfer et al.'s (2010) conclusion that as team members become more experienced at certain tasks, their ability to produce an effective team performance increases. Therefore, the defender in this example would use their experience of similar situations to make a successful choice of action. Carron, Bray and Eys, (2002) proposes that this is because through experience, team members are able to performing task quicker and more accurately – based on their previous experiences. Therefore, players in this situation would quickly decide that this option is best, based on their understanding of football and their own individual experience performing in the sport. However, in order to make this decision, players must have

experience performing in similar situations – as suggested by Mathieu et al. (2000), Eccles and Tenenbaum (2004), Macquet (2009) and Kermarrec and Bossard (2014).

The results also show that dyads were not more likely to be similar in situations where there was a clear and correct answer than where there were scenarios where there are several potential outcomes. This finding suggests that dyads are not only relying on their own experience within the sport, they also possess an effective shared mental model and can rely on their shared understanding to make a decision. This result also shows that dyads who have experience performing together are able to make a correct and coordinated decision if there is a clear and correct option available; thus demonstrating the shared understanding between them. These results support the conclusions of Eccles and Tenenbaum (2004) who stress that experience together is crucial to developing shared understanding between team members and according to Cannon-Bowers and Bowers (2006) one of the ways which team members demonstrate this type of understanding is by making a coordinated decision. For example, if two defenders have practiced how to successful deal with long passes from the opposition, they can use this experience when the have to choose how to act. For instance, if these two players have seen in training that one player is more likely to challenge in the air with the other defender able to provide cover in case they are unsuccessful, they are likely to choose these options in the future if this has been successful in previously similar situations. This would demonstrate an efficient shared mental model between the two defenders as they were using their shared understanding to make a coordinated decision. Therefore, in order to achieve the percentages of similarity, the defensive dyads in the current study relied on their own shared mental model to use their mutual understanding to be able to make the same decisions in scenarios where there was no correct option to take.

Eccles and Tenenbaum (2004) and Silva et al. (2013) proposed that having experience with their partner performing together allows each member of the dyad to base their actions on times they performed well together. This suggestion supports the findings of the current study in relation to percentage of similarity for Coordinated and Correct as dyads would have experienced similar situations together and during this study, based their answers on times where they performed successfully. As there was no correct answer available to them, they had to think back to previously similar situations with their partner in order to make their choice. Johnson Lee and Lee (2007) also stated that to perform action successfully, athletes base their actions on actions that have been successfully executed previously, but Mathieu et al. (2000) suggest that this can only occur if there is sufficient understanding between team members. The findings of Mathieu et al. (2000), Eccles and Tenenbaum (2004) and Johnson Lee and Lee (2007) support the results of the current study and provide an explanation for why dyads were able to make a correct and coordinated decision based on previously successful performances.

The findings of the current study could be facilitated by dyads experiencing similar situations together in the past and using their knowledge of each other of what worked successfully for them. For example, two defenders could use their experience of performing together in defensive shaping drills to be able to decide what a specific defender should do in similar situations. Harrison et al. (2003) and Cannon-Bowers and Bowers (2006) propose that there are different ways such as training together, which partners are able to build experience together, facilitating the development of shared understanding between team members. According to Mohammed and Dumville (2001) and Hill, Stoeber, Brown and Appleton (2014) this environment gives partnerships the experience together for developing an understanding of each other's skills and abilities.

Having experience performing together also facilitates the development of an efficient shared mental model between team members (Kim 1997). This situation facilitates the mutual understanding between team members, which helps them to make a coordinated decision when there is no clear and correct option available to them.

The findings of Harrison et al. (2003), Cannon-Bowers and Bowers (2006) and Silva et al. (2013) support the conclusions of this project which found that partners who had experience together were able to demonstrate shared understanding by choosing a coordinated decision regardless of whether there was a right decision or not. The results of the current study stated that partners who had experience together were able to produce higher percentage of similarity when there was no correct decision. This could be because when there is no correct answer; partnerships could base their answers for this part of the study on their own experience together and their understanding of each other. Blickensderfer et al. (2010) further propose through experience, team members are able to gain an understanding of each other's skills and abilities and Poizat, Bourbousson, Saury and Sève (2009) suggest that this method of understanding allows partnerships to coordinate their actions.

4.3.3 Individual Experience Vs Combined Dyad Experience

Individual player experience was found not to be consistently correlated with percentage of similarity in game situations that had a clear correct course of action, nor was dyad experience correlated with percentage of similarity in game situations that had no clear correct course of action. These results illustrate that neither individual experience nor dyad experience is more important form of experience, suggesting that in order to make a coordinated decision; players must have sport specific knowledge as well as experience performing with their partner. This finding is supported by some of

the research, which emphasises the importance of a combination of these forms of experience in being able to produce a coordinated performance.

Sport Specific Knowledge and Dyad Experience Effect on Decision Making

Individual player experience was not found to be consistently correlated with the percentage of similarity in game situations that had a clear correct course of action. Blickensderfer et al. (2010) suggest that experience performing in a sport helps to give an individual an overall knowledge of what is required to perform in that team. In order to develop a general understanding of a sport, each athlete must obtain the knowledge through participation. For example, a right back would benefit from having a general understanding of different player roles within their team in order to perform efficiently together (Figure 1.1). An understanding of a right midfielder's role would assist the right back's ability to perform well within the team.

For instance, if the right back knew the defensive capabilities of the right midfielder in a 4-4-2 (Figure 1.1), they would be able to judge when was the correct time for them to get forward if they knew that their right midfielder would cover them. This would not be enough knowledge for the right back to effectively perform this role themselves but they would have enough knowledge to be able to perform together. This would be the case if this type of knowledge was also held by the right midfielder. This situation would demonstrate an effective shared mental model between the two players and they would be able to use their shared understanding of each other to perform effectively together.

Entin and Serfaty (1999) stress that team members are required to have a general understanding of the sport and other team members' roles in order to produce a coordinated team performance. This suggested that when partnerships chose their

actions during the current study as it was expected that their knowledge of the sport would help them to pick the 'correct' choices. It was anticipated that if players had more time performing in the sport, their general knowledge would be greater and they were more likely to be able to pick a 'correct' decision if there was a clear right answer available to them.

However, no significant difference was seen between individual player amount of experience and their ability to make a correct decision. These findings do not support the results of Baker et al. (2003) who suggest that experience of individual team members can help the decision making of others. This proposes that each team member possesses key information about their own individual role and an understanding of what their team member's roles were also. However, since the results of the current showed no relationship between individual partner's experience and the ability to make a coordinated decision, overall dyad experience was examined.

Individual player experience is important for building an understanding of a team sport however, Blickensderfer et al. (2010) suggest that the combined experience of each team member is crucial for team success. For example, two centre halves would benefit from performing regularly in order to build an understanding between each other to see how the other behaves in certain situations, leading to an improvement in their shared mental model. However, the results of the current study suggested that dyad experience was also not correlated with percentage of similarity in game situations that had no clear correct course of action. These findings indicate that dyadic experience was not enough for partners to be able to make a coordinated decision and produce a higher percentage of similarity. However, Silva et al. (2013) stress that if partners have experience performing together; they are more likely to have an

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understanding of what each other are likely to do at any one time and can facilitate a successful team performance.

Even though the results of the current study suggest that individual player experience was not found to be consistently correlated with the percentage of similarity in game situations that had a clear correct course of action and dyad experience was also not correlated with percentage of similarity in game situations that had no clear correct course of action, they suggest that there was a link between individual and combined dyad experience and the ability to make a coordinated decision, rather than just experience together. This could perhaps be due to the participants of this study having a combination of experience individually in the sport as well as time performing together as a dyad. The findings of Blickensderfer et al. (2010) support the results of the current study which state that through experience performing in the sport as well as experience together during training or competitive settings, can help to improve their ability to make a coordinated a decision. This is because the more experience partners have together, the more scenarios they will have the chance to perform in and they will be able see how each other react.

As suggested above, the results of the current study propose that the combination of both of these types of experience are crucial to developing shared understanding between team members. Silva et al. (2013) also found that both of these factors are crucial to developing shared understanding between team members. Blickensderfer et al. (2010) further propose that sporting experience is not enough for developing shared understanding, as experience performing together is a fundamental part of any sporting relationship. This because through experience together and experience in the sport facilitates the understanding between team members (Eccles and Tenenbaum 2004).

Cannon-Bowers and Bowers (2006) suggest that experience performing in a sport is required to build up an understanding of how to react it certain situations. This is useful for athletes deciding which actions to take in specific situations, but without the knowledge of how their partner will react can lead to an uncoordinated team performance. This would be an unsuccessful and uncoordinated performance between two players. If players had experience performing together however, both players would know what each other's roles have been previously during similar situations (Blickensderfer et al. 2010). For instance, if players have experience performing together one partner will challenge for the header while one player provides covers and this would be a successful team performance. Therefore, having sporting experience and experience performing with their partner will facilitate a coordinate performance.

Shared understanding between team members facilitates their ability to make a prediction of what each other are going to do at any one time and coordinate their own actions (Eccles and Tenenbaum 2004). The findings of Blickensderfer et al. (2010) further suggest that once partners have built up this mutual understanding between each other, they are able to predict each other's actions and make a coordinated decision. The findings propose that individual player experience was found not to be consistently correlated with percentage of similarity that had a clear correct course of action and dyad experience not being correlated with percentage of similarity when there no clear correct course of action. This suggestion indicates that a possible combination of these are crucial to developing shared understanding between team members facilitating the predication of others. These findings are supported Rico, Sánchez-Manzanares, Gil and Gibson (2008) who also suggest that shared understanding between team members allows each other to predict what each other will do at any one time. This is because

through experience, partners are able to build up an understanding of each other and how they will react in certain scenarios.

For example, some (nine) of the scenarios in this project had no correct option available to dyads (See Figure 4.2). In this tactical sheet (Figure 4.2), Orange No. 2 – the right back - has the ball under their full control on the ground after a pass from Orange No. 1. Through experience performing together – as suggested by Carron et al. (2002), Blickensderfer et al. (2010) and Gershgoren et al. (2016) – team members will have an understanding of what each other are likely to do in certain situations. In scenarios which had no right answer, dyads could have used their experience of performing together and their shared understanding of each other to be able to choose what action to take in the scenarios which had no correct option available to them. This would reinforce the findings of Blickensderfer et al. (2010) and Gershgoren et al. (2016) that in order for team members to be able to work together, they would benefit from having shared understanding of one and other, leading to the ability to predict what each other will do in certain situations (Mathieu et al. 2000).

Mathieu et al. (2000) state that prediction of actions derives from experiencing situations with their partner as this builds a knowledge of what athletes are likely to do in the future. Suggestions made Mathieu et al. (2000) and Jonker et al. (2010) as well as the suggestions made by the current study, the prediction of actions comes from the development of shared understanding through experience in the sport and performing with their partner. However, the practical implications of having the ability to successfully predict the actions of team members is that the chances of being able to produce a coordinated team performance.

The findings of Blickensderfer et al. (2010) suggest that prediction leads to coordination between team members, leading to a better team performance. This is because once team members have an understanding of each other, they have the knowledge of how their partner will react in certain situations and they can base their actions on how they know their team member will react as well (Jonker et al. 2010). For example, when two central defenders are faced with a ball coming towards them in the air, through experience together they will have an understanding which player is better at challenging for the ball in the air. This understanding leads to predicting what each other will do (Mathieu et al. 2000) and during this situation, one player will challenge for a header and the other player will provide cover in case they are not successful – leading to a coordinated team performance.

Blickensderfer et al. (2010) state that a coordinated team performance is the ideal outcome for any sports team that wants to be successful and this is only achieved through developing shared understanding between team members, leading to the ability to predict one another's actions. The recommendations made by Blickensderfer et al. (2010) and Jonker et al. (2010) support the suggestions made by this study which are that experience together and within the sport works together to facilitate team member's ability to predict what each other are going to do at any one time, leading to a coordinated team performance. Therefore, a combination of individual player experience and combined dyadic experience is crucial for developing an efficient shared mental model between team members to facilitate shared understanding to allow players to make a coordinated decision.

4.3.4 Actual vs Random Pairings

The results state that there was no significant difference between actual and random dyads in situations with a correct course of actions, but actual dyads had a significantly higher percentage of similarity than random dyads in situations where there was no clear course of action. The lack of a significant difference between the two groups could be due to participants referring back to their experience within the sport as there is a clear correct answer and they understand what the 'correct' course of action was to take. It would be right to assume that when there is no clear and correct action to take; dyads were relying on their shared understanding of the other member in the dyad in order to make a coordinated decision. These results support some of the research (Silva et al. 2013 and Gershgoren et al. 2016) which has considered understanding between team members in order to make a coordinated decision.

The Role of Experience in Developing an Efficient Shared Mental Model

As stated previously by Blickensderfer et al. (2010), sporting experience as well as experience with their partner leads to shared understanding within the dyad, which facilitates the ability to predict one another's actions, leading to a coordinated team performance. The results of the current study show experience together as crucial to partners being able make a coordinated decision when there was no clear and correct action available the actual dyads were much more likely to be able to make a coordinated decision in this situation compared to those who had never performed together. For example, defenders were who had experience performing together in this study were able to use their experience of performing together in similar situations to be able to decide which was the best course of action to take.

One of the ways that team members are able to get experience performing together is down to their coach. For instance, the role of the coach is to attempt to get the best out of their team members (Vella, Oades and Crowe 2011) and one method which coaches are able to do this is during training. This could help to explain why actual dyads were able to obtain a higher percentage of similarity in situations where there was no clear course of action than randomly paired dyads. For instance, if in training team members are allowed to work together regularly they will become familiar with each other's roles and abilities (Reimer et al. 2006). This decision is based on what the coach thinks is their best team (Gilbert and Trudel 2004) and whom they feel performs the role most effectively. This suggests that the coach has a role in who has experience performing together or not meaning that they can influence shared understanding between dyads. Since randomly paired dyads were from different teams, they would not have had the same coaches and ultimately not the same shared experiences – chosen by the coach during training. This would mean that the randomly paired dyads would not have had the shared experiences during training sessions to be able to build up a shared understanding. However, actual dyads have this experience and according to (Silva et al. 2013, Gershgoren et al. 2016) are able to use their shared experiences to develop a shared understanding and be able to think similarly in situations that have no right answer. This suggestion can help to explain the higher percentages of similarity achieved by actual dyads compared to random dyads in situations where there was no clear course of action.

Experience performing together was also stated by Williamson and Cox (2014) to facilitate the shared understanding between team members that is necessary to create a coordinated team performance. It is suggested by Cannon-Bowers and Bowers (2006) that in order to have team members who have a mutual understanding of each other,

they must have experience performing together during training and competition. For example, defenders who practice defensive set pieces together will be able to develop their shared mental model over time. Bourbousson, Poizat, Saury and Sève (2011) hypothesised that this shared understanding between team members is facilitated within a sports team through an effective shared mental model. As stated by Gershgoren et al. (2016) the method of which shared understanding facilitated within a sports team is through a shared mental model. A shared mental model - described by Jonker et al. (2010) - is as a knowledge structure shared between team members to allow them to coordinate their actions, based on prediction. Giske et al. (2015) suggest that this approach facilitates the exchange of knowledge between team members.

This is because if each team member has an understanding of one and other, they will know what actions their role requires based on what they already know about team members. This understanding facilitates the prediction what each other will do at any one time (Mathieu et al. 2000). Therefore, when the defenders in the above example are able to accurately predict the actions of their fellow team members, they will be able to coordinate their performance. However, the efficiency of their shared mental model and their mutual understanding of each other is crucial to being able to coordination of actions.

The theories suggested by Jonker et al. (2010) and Gershgoren et al. (2016) could help to explain the results of the current research project which found higher scores for partnerships which had experience together when there was no clear and correct action available compared to dyads who had not performed together. However, trends towards significance were seen when there when there was a clear and correct action available. Giske et al. (2015) suggest that experienced dyads have an effective shared mental model and this may be why they were more likely to make coordinated choice of

actions when there was no clear and correct action available. This could be because through experience together, actual dyads possess this knowledge structure which facilitates the subconscious sharing of information to be able produce similar thinking and which the randomly paired dyads do not have.

The findings of the current study support the suggestions made by Mathieu et al. (2000) and Jonker et al. (2010) who state that using a shared mental model between team members through experience together is crucial to making a coordinated decision. According to Gershgoren et al. (2016), this is suggested to facilitate the ability of team members to be able to predict one another's actions that will in turn lead them to coordinate their actions. This finding supports the results of the current study where experienced dyads produced higher similarity scores compared to random partners. Experienced partners within the current study have presumably developed an efficient shared mental model and are able to predict what each other are going to do when there was no clear and correct action available based on what they know about each other. Being able to make a coordinated decision between team members is facilitated by a shared mental model according to Bolstad and Endsley (1999). However, the key function that allows this coordination is the exchange of information leading to a mutual understanding between partners.

Jonker et al. (2010) propose that an efficient shared mental model exists between members of a sports team enables an exchange of information between one another and allows team members to understand and predict other's actions. This is because having this type of environment within a sports team helps to facilitate the sharing of knowledge between team members and having an overall understanding of the required tasks (Bourbousson et al. 2011). For example, if a team possesses and effective shared mental model, their understanding of each other's likely actions and abilities, they will

be able to predict how one another act in certain situations. Each team members' knowledge of this will be based on previous experience performing together in order to develop an efficient shared mental model.

These conclusions could provide supporting evidence for the findings of the current study by explaining why dyads that had performed together were able to demonstrate coordinated action. The results of the current project showed a significantly higher percentage of similarity for actual partners when there was no clear and correct action available compared to randomly paired dyads and trends towards significance when there was a clear and correction action available. According to Blickensderfer et al. (2010), this could be because of the mutual knowledge shared between experienced dyads. Jonker et al's (2010) findings support the conclusions of the current study by suggesting that through experience performing together, an effective shared mental model may develop between team members, which can then facilitate the sharing of information. The ideas proposed by Blickensderfer et al. (2010) and Jonker et al. (2010) could help to describe why the experienced partners of this study were able to produce a higher percentage of similarity for actual partners when there was no clear and correct action available.

Jonker et al. (2010) suggested that there is no single shared mental model, which works in every situation for all teams. The results of Mathieu et al. (2000) theorised that the type of shared mental model, which team members choose to engage, is dependent on the situation with which they are faced with. Bourbousson et al. (2011) propose two different shared mental models, which include the Team Work and Task Work Model. The conclusions made by Jonker et al. (2010) suggest that the Team Work Model is focused on how a team works together and the Task Work Model is centred on the task at hand.

The use of both models could suggest that dyads of the current study were subconsciously choosing a combination of the Team Work and the Task Work Model. This would be due to both team members focusing their knowledge of which they have about their partner's skills and likely actions and choosing a coordinated action when there was no clear and correct action available. For instance, both experienced dyad members in the current study are able to understand what the task is and how to complete it successfully based on what they know of their partner through experience together. An example of the combination of these two mental models can be seen when two centre halves need to clear the ball away from their own box. The Task Work model would be followed by the players, as their focus would be to complete the task (e.g. get the ball away from their own goal). The players would also follow a Team Work mental model to help both centre halves to work together in order. A combination of both of these mental models will facilitate the defenders to work together in order to complete their objective of clearing the ball out of their defensive area. In this situation, both defenders will use their knowledge of each other to choose what role they need to take in order to get the ball clear. One defender who is better in the air could challenge for the ball while the other player will hold this expectation of their partner to provide cover in case the ball goes over their head. This example, demonstrates the use of these mental subconsciously by both players in a very short space of time in order to coordinate their performance. These suggestions propose that through the combination of these two different shared mental models, information is freely exchanged and this environment can facilitate a positive and coordinated team performance.

As suggested by Bourbousson et al. (2011) the combination of two different types of shared mental model can help facilitate understanding and improve the success of how team members perform together. In the above example with both defenders,

through using these two knowledge structures they were able to predict what each other were going to do – based on their understanding of each other – in order to work together to achieve a coordinated performance. This could suggest why the experienced dyads who participated within this study were able to demonstrate a coordinated performance and chose a coordinated action when there was no clear and correct action available.

Gershgoren et al. (2016) further suggests that this level of understanding is only possible through experience performing together and this suggestion could explain that the experience which actual dyads had together during the current study. For instance, this allowed for the combination of these two shared mental models to develop effectively, facilitating partners to read situations similarly, predict what each other would do in specific situations and be able to make a coordinated decision even when there was no clear and correct action available. Whereas the randomly paired dyads had not developed this mutual understanding of each other and are unable to make a coordinated decision. Therefore, as suggested by Jonker et al. (2010), possessing the mixture of shared mental models is crucial for team members to think similarly as well as being able to coordinated decision, leading to a coordinated performance between those involved. However, in order for the shared mental model to develop, experience performing together is crucial to build a mutual understanding between players and this environment facilitates a coordinated performance.

4.4 Practical Implications

There were four main findings from study of this thesis. These results can provide valuable and practical information for coaches to facilitate a more effective team performance.

Firstly, when dyads were faced with a situation that had a clear and correct answer, they were more likely to pick the same correct action than the same wrong action. This gives coaches the rationale to have situations during training sessions that are designed to have a clear and correct and expect their players (in the majority of these situations) to be able to pick the correct action. This can help coaches to use drills during training sessions to see if their dyads are thinking similarly and are able to perform effectively together.

Secondly, dyads were just as likely to pick a coordinated action whether or not there was a correct answer available to them. This finding gives coaches the ability to see whether their players can demonstrate shared understanding during more game related practices. This is an important implication because within football, there are only few situations that have a correct option. (Croft, Button and Dicks 2009). Therefore, coaches would be able to see which players are demonstrating shared understanding if they are reading situations in the same way, as they will be performing effectively together.

Thirdly, the results suggest that a mixture of individual playing experience in addition combined dyad experience is required for dyads to be able to make a coordinated decision. This could provide coaches to demonstrate the importance of individual experience (experience performing in the sport) in addition to joint dyad experience (experience performing together). This finding emphasises the importance of a mixture of different types of experience for players. Coaches could use these results to plan and develop their coaching programme to give their players the best possible chance to demonstrate their shared understanding.

Fourthly, the findings of study two are similar to study one (See Section 3.6) as dyads who had experience performing together were more likely to be similar than dyads who had no experience performing together. This strengthens the evidence for players to have experience performing together in order to be able demonstrate shared understanding. For instance, coaches can use this finding to help them to prepare training sessions to establish shared understanding between two attackers that will be playing together in competitive matches. They can use the evidence gathered by this study to demonstrate to their players that performing together has an important role in shared understanding and efficient team performance.

4.5 Limitations

Participants provided some interesting data during this project based on their experience performing with their partner. However, there were some limitations to this study, which could have been improved in order to provide further information.

One factor, which would have been good to consider during this project, was the type of experience participants had. For instance, just because a participant had years of experience performing in the sport it did not mean the quality of their experiences was better than someone who had less time playing football. Therefore, during a future research project it would be sensible to consider trying to identify the type and quality of experience rather than just the amount. For example, potentially a questionnaire prior to the commencement of data collection which looked at the quality of experience such as frequency of training sessions and performance level of those sessions.

A limitation that could have been taking into consideration during this study would have been to find out why participants made the choices they did, and whether these were the right or wrong options. MacMahon and Mildenhall (2012) suggest that

there are a number of factors that could influence the ability to choose how to react in certain situations. This could have led to an explanation for why participants chose the actions they did rather than just looking at the actions participants took.

Another issue with the current project was the length of time that the data collection phase took. Unfortunately, due to participants cancelling data collection sessions as well as taking longer than expected to be able to complete sheets and hand them back to the primary researcher this phase of the research project took a lot longer than expected. In the future, it would be better to hold data collection sessions for each team rather with individual dyads separately. Even though this would accelerate the data collection process, it is not a practical suggestion, as it would prove even more difficult to coordinate multiple dyads all at the same time.

Including more complex scenarios in this project data collection would have been beneficial. This could have allowed further comparisons to see if dyads were able to make more coordinated decisions in order to demonstrate shared understanding depending on whether or not there was a clear and correct answer available. This would helpful for future projects. However, for this initial study the type and number of scenarios was adequate for what was the project was looking to investigate.

4.6 Future Research

This study has looked to determine whether experienced football dyads could make a coordinated decision when there was a clear correct answer available to them. Research in the future could build on the findings of this project by further investigating shared understanding between experienced dyads and their ability to make a coordinated and correct decision. This would be a useful field of research to consider, as this would help to show if dyads could demonstrate coordination and produce

successful performance. This could be achieved through similar data collection methods, which could even be slightly altered in order to incorporate different positions instead of just defenders, which were used in the current project. It would also be beneficial to look at more than two players at once to see if these findings are the same across more team players rather than just dyads. Comparable data collection methods can be altered to be used in different team sports.

In the future, obtaining players' perspectives could be a valuable line of research in order to gain some knowledge of how partnerships function and how they feel they are able to make a coordinated decision. This could explain whether players focus more on their experience together rather than their time playing the sport. This could also lead to the potential to have a better understanding of how shared understanding develops between football dyads and what process partners have to go through in order to make a coordinated decision. If these steps are followed, it could provide the foundation to develop a training program that could possibly develop shared understanding between team members improve the performance of the team in a shorter timeframe.

4.7 Conclusion

The purpose of this research was to explore the level of shared understanding displayed by dyads of football defenders in game situations that had either a clear correct course of action or where there was no clear correct action to take. Since shared understanding between team, members in football can influence their ability to make a coordinated and correct decision (Eccles and Tenenbaum 2004). The data collected provides a valuable insight into how partnerships work together and read specific situations. The data showed that dyads were just as likely to pick a coordinated decision

whether or not there was a correct decision available. The findings of the current project state that when there is a clear and correct answer, dyads are more likely to select a correct course of action rather than be similar and have not selected the correct course of action. This suggests that team members are required to combine their own experience in a sport with experience performing with their partner in order to make a coordinated decision.

The results also suggest that individual player experience was found not to be consistently correlated with percentage of similarity in game situations that had a clear correct course of action, nor was dyad experience correlated with percentage of similarity in game situations that had no clear correct course of action. This suggests that in order to make a coordinated decision, players must have a general sporting knowledge as well as experience performing with their partner (Silva et al. 2013). The results state that in order to make a coordinated decision, dyads would benefit from having a mixture of sport specific knowledge (based on their role) and experience performing with their partner. Therefore, both of these factors are required to develop and demonstrate shared understanding and make a coordinated decision.

It was hypothesised that dyads that have experience performing together would score better than randomly paired dyads that had no prior experience together. Trends towards significance for Coordinated and Correct were found between actual dyads compared to random pairings when examining percentage of similarity. This suggests that when paired with players they had no experience performing with; participants were unable to achieve as high percentage of similarity, which is similar to suggestions made by Blickensderfer et al. (2010) who emphasise experience, is crucial to being able to make a coordinated performance. The lack of a significant difference between the two groups could be due to participants referring back to their experience within the

sport (Baker et al. 2003) as there is a clear correct answer and they understand what the 'right' course of action was to take.

However, percentage of similarity between actual and randomly paired dyads when there was no correct answer available produced a significant difference. This finding emphasises that when there is no clear action to take, dyads were relying on their own shared mental model with their mutual understanding, which was also of the other member in the dyad suggested by Eccles and Tenenbaum (2004) in order to make a coordinated decision. Therefore, experienced football dyads possessed an efficient shared mental model and were able to demonstrate their shared understanding and be make a coordinated decision when there was a clear right answer or when there is no right answer available compared to randomly paired dyads.

Chapter 5 - Factors Contributing to the Development of Shared Understanding within Football Dyads.

5.0 Introduction

5.0.1 The Importance of Shared Understanding

As suggested in Chapter 3 (See Section 3.0.1) and Chapter 4 (See Section 4.0.1), a shared understanding between team members is crucial for an effective performance. Benson, Eys, and Irving (2016) state that an effective performance is possible when team members have an understanding of each other's abilities. For instance, two attackers would benefit from having an understanding of each other's abilities if they are going to perform together in a 4-4-2 formation (Figure 1.1).

This would be important as each of the strikers would know how each other would react in certain situations, making it easier for them to work together in order to score goals. However, this situation would not be possible without the mutual understanding between both players. Williamson and Cox (2014) emphasise that shared understanding provides an overall understanding of everyone's role in the team (See Section 1.1.2); helping to coordinate actions. Mathieu et al. (2000) suggest that this is possible in a sports team, through a shared mental model between team members. Therefore would make sense to explore the construct of a shared mental model within a sports team to see how shared understanding is able to develop between team members.

5.0.2 Shared Mental Model between Team Members

The importance of a shared mental model between team members has been evaluated in Chapter 3 (See Section 3.0.2) and Chapter 4 (See Section 4.0.2). To surmise, possessing a shared understanding of team members is crucial to a successful team performance (Smith-Jentsch, Mathieu and Kraiger 2005) and is achieved through having a shared mental model between its members (Mathieu et al. 2000). For instance, team members would know the best players to pass the ball to in order to get a successful cross into the box to give their attackers to give them the best chance of scoring (i.e. an efficient team performance). Gershgoren et al. (2016) suggests that possessing shared understanding between team members - through an effective shared mental model –is ideal for teams in order to achieve a better team performance. This situation can lead to team members coordinating their actions based on their ability to successful prediction each other's likely actions.

5.0.3 Prediction Leading to Coordination

Team Members who have an effective shared mental model would have an understanding of their own and team member's abilities (Williamson and Cox 2014) leading to the ability to accurately predict the actions of others and the coordination of actions (Mathieu et al. 2000). For instance, if an attacker has an understanding of a specific central midfielder in the team that when they receive the ball, they are likely to play a pass over the opposition into the space behind, they can predict this action prior to a pass being played. However, this situation cannot be achieved consistently if there is not a sufficient shared understanding between both players. Baker, Côté, and Abernethy (2003) suggest that these assumptions are also based on a player's general understanding of the sport and how they think a player should react in a specific situation. For instance, if an attacker sees their team member with a ball at their feet

looking towards them, they can assume that they are going to pass the ball to them, based on what they think should be done during this situation normally. However, Eccles (2010) suggests that this general knowledge must be mixed with an understanding of how certain team members perform. This is because there may be a certain action that should happen in a certain situation, it does not mean that their team member will choose to perform that way. This proposes that a mixture of sporting understanding and a shared understanding between team members is required to successfully predict the correct actions of others, allowing coordinated performances.

Kermarrec and Bossard (2014) state that being able to predict the actions of others facilitates a coordinated team performance, which Eccles and Tenenbaum (2004) stress is crucial for an effective team performance. In relation to an attacker seeing a midfielder receiving the ball and looking towards their direction, the attacker would move into the space where they expect the ball to be played based on what they think the midfielder will do. This would allow the striker to have the best chance to receive the ball, resulting in these two players coordinating their actions. This situation is able to occur because both the midfielder and the striker will have a mutual knowledge of one and other and can base each other's actions on what they think each other will do. For instance, the second striker would understand that their midfielder would play the ball over the top to the other striker, so they would have to make a run into the opposition's box to help their striking partner to try to score a goal.

However, if an individual does not have an understanding of their team members, their actions would not always be the right ones, which would lead to uncoordinated movements (Jonker, van Riemsdijk and Vermeulen 2010). This proposes that in order to make accurate predictions of other's actions, a mutual understanding of each other's ability and likely actions is crucial. This places shared understanding as an

important ability for team members to have to be able to predict other's actions and facilitate a coordinated team performance. However, in order to develop coordination, team members must have the experience of performing together (Williamson and Cox 2014) as this provides the environment for developing a mutual understanding between team members.

5.0.4 Experience Together

Cannon-Bowers and Bowers (2006) theorise experience to be central to creating shared understanding between team members. In Chapter 3 (See Section 3.0.8) and Chapter 4 (See Section 4.0.3), experience of performing together was explored in depth and was attributed to being a crucial factor for developing shared understanding between team members. Williamson and Cox (2014) state that experience of performing together creates successful expectations of one and other's actions. For example, when a number of new players join a team at the start of the season their understanding of each other is low. This is because individuals have no experience of performing together, meaning they will have no mutual understanding. However, as these new players work with each other in training and competitive games, they will see how each other react in certain situations. Stout, Cannon-Bowers, Salas and Milanovich (1999) suggest practicing together to be effective for increasing understanding between athletes by allowing team members to see what each other do during specific situations. Baker et al. (2003) acknowledge this the development of understanding between team members can take some time. This is because experience together allows team members to build up knowledge of each other (See Section 3.0.8 and Section 4.0.3), but individual characteristics can alter how the teamwork mental model develops. However, Cooke, Gorman, Duran and Taylor (2007) propose that understanding is also facilitated

by effective communication during partners' experience together and feel these two factors combine to develop shared understanding.

5.0.5 Effective Methods of Communication

Sullivan and Feltz (2003) suggest that effective methods communication are one of the most important aspects of intra-team interaction. One such example of communication methods being linked to a positive team performance that is suggested by LeCouteur and Feo (2011) is that mistakes that occur can be reduced by having effective communication between members of a team. For example, if team members possess effective methods of communication it will prove easier to coordinate players when trying to defend a free kick. For instance, if some of the team's defenders give a shout to push the defensive line up towards the edge of the penalty box, this will reduce the chance of the free kick being played to one of the opposition, leading to an easier shot on goal. If methods of communication are not effective and some players do not understand what their team member is trying to say, this will lead to a poor defensive line. This will mean the likelihood of the ball going to an opposition attacker will increase, giving the opposition a better chance of scoring. However, if team members have a mutual understanding of what certain players mean when they give certain instructions, their ability to defend the free kick is increased, making it more difficult for the opposition to score.

Eccles and Tenenbaum (2004) suggest that effective methods of communication improves as team members gain more experience together and this can lead to better performance. This would be based on players seeing what specific instructions from individuals mean, facilitating a mutual understanding between players depending on what a specific player means. For instance, through experience performing together, defenders will understand what they should be doing if one of the centre halves

instructs them to move forward to play the opposition offside. If the team's

understanding of this individual is accurate, they will be able to choose to move

forward up the pitch in sync with their teammates. This example suggests that effective

methods of communication and experience performing together are interlinked and help

to facilitate an effective mutual understanding between team members and if these are

both effective, team members will be able to coordinate their actions. However,

possessing an effective understanding between team members is central to this.

5.0.6 The Current Study

The two previous chapters have looked to establish shared understanding

between dyads (See Chapter 3) and if dyads can use their shared understanding to make

a coordinated decision in situations that have a correct option available to them (See

Chapter 4). Based on the findings of Chapter 3 (See Section 3.3.0) and Chapter 4 (See

Section 4.3.0), the purpose of this study was to gain an understanding of potential

factors that could contribute to the development of shared understanding between

football dyads. This study considered twelve male football players' perspectives on

factors they believed to be important for creating and developing shared understanding

between team members through an interview schedule of 17 questions. This chapter

aimed to gain the opinions of players to attempt to establish potential reasons behind the

findings of the two previous Chapters – Chapter 3 (See Section 3.3.0) and Chapter 4

(See Section 4.3.0) – which did not look at participants' opinions on their relationship

with their partner.

Research suggests that shared understanding is facilitated in a shared mental

model between team members (Mathieu et al. 2000) and developed over time working

with partners (Jonker et al. 2010). In addition to this, effective communication

(Williamson and Cox 2014) can lead to the ability to predict the actions of others,

resulting in a coordinated performance (Blickensderfer, Reynolds, Salas and Cannon-Bowers 2010). Based on research that has looked at shared understanding and the potential factors which contribute to its development between team members, this project considers factors such as length of time performing together, how the relationship has developed over time and if the participants feel they produce a coordinated performance. It was expected, that in addition to these factors, participants would suggest that effective methods of communication, the importance of the type of shared experiences and how their mutual understanding is related to performance would be discussed. Since this research project was exploratory, other factors were expected to be discussed, based on the participants own views and experiences.

5.1 Methodology

5.1.1 Participants

Twelve male football players (See Participant Table below) over the age of sixteen years old (M_{age}=21.83 +/- 6.34) from youth ($n = 4$), amateur ($n = 6$) and junior levels ($n = 2$) from within the Tayside area were recruited. The population sample was comprised six defensive (M_{age}=23.5 +/- 8.38) and six attacking (M_{age}=20.17 +/- 3.37) football players. The number of players interviewed was similar to studies which looked at dyadic sporting relationships including Stirling and Kerr (2009) (nine participants), Rhind and Jowett (2010) (twelve participants) and Jowett, Kanakoglou and Passmore (2012) (ten participants).

Participant Table

Participants	Years of Experience	Position	Level of Performance
Participant 1	16 years' experience	Defender	Juvenile/Amateur
Participant 2	12/13 years' experience	Defender	Amateur
Participant 3	22 years' experience	Defender	Semi-pro
Participant 4	9 years' experience	Attacker	Youth
Participant 5	8 years' experience	Attacker	Youth/Pro Youth
Participant 6	12 years' experience	Defender	Youth/Pro Youth
Participant 7	15 years' experience	Attacker	Junior
Participant 8	15 years' experience	Attacker	Junior/Amateur
Participant 9	31 years' experience	Defender	Amateur
Participant 10	13 years' experience	Defender	Youth/Pro Youth
Participant 11	10 years' experience	Attacker	Amateur
Participant 12	8 years' experience	Attacker	Youth/Pro Youth

5.1.2 Materials

Interview Schedule

The interview schedule (See Appendix Thirteen) that was chosen for this project included three different sections: Demographic Information, Narrative and Perception of Theory. The first section of this interview schedule started by asking participants some demographic information such as their background within football, their position and what their performance level they currently was. This information was required to gain an understanding of the participant's football background and to identify their experience in the sport. As suggested previously (See Sections 2.6.0, Section 4.0.4 and Section 5.0.4), experience is a crucial factor in the development of shared understanding between team members. Therefore, having the knowledge of each

participant's background could have helped to explain why they answered questions in a certain way.

The second section was where participants began to talk about their current partner(s) who they currently perform with on a regular basis. Questions in this part of the interview allowed participants to discuss their chosen relationship and how they felt it has developed over time. This section was designed based on research that suggested shared understanding takes time to develop (See Section 2.7.0 and Section 5.0.4) and improves over time (See Section 2.6 and Section 5.0.4). Based on this knowledge, participants were asked to suggest any factors that they felt had influenced this.

The final section asked participants about theory covered in Chapter 2 such as shared understanding between partners (See Section 2.6), shared mental models (See Section 2.7) and how these link to performance (See Section 2.7.4). This allowed participants to give their thoughts on how they felt shared understanding was linked to performance within their dyadic relationship. The questions in this section of the interview schedule were designed to provide commentary from participants on the importance of shared understanding and how this links to their performance.

Open-ended questions were chosen to be part of the schedule as they allowed participants to talk as much as they wanted to around the subject areas. Turner III (2010) stated that open-ended questions are an effective inclusion in qualitative interviews as this methodology allows participants to be able to discuss their viewpoints and experiences. This allowed participants to talk in depth about their thoughts and experiences, while providing some interesting data that was later used for comparison during the data analysis phase. Sometimes prompts were needed to assist participants depending on the length or quality of their answers. For instance, the primary researcher

sometimes had to ask, "Can you tell me a bit more about…" and "Do you have anything else you wish to add about…" Creswell (2007) suggests that sometimes prompts from the primary researcher are required to clear up any confusion and to help gain the optimal amount of information from participants for each question. These were used after each question to make sure that each participant was content with the information that they had provided and to allow the chance to add anything further.

The purpose of these interviews was to attempt to establish a number of common themes which could understand how shared understanding develops over time and what participants thought was crucial to developing their relationship with their partner(s). The questions focused on participants' time and experiences playing football with their chosen partner(s). Perceptions of how each participant saw their relationship and how well they think the partnership functions now after their experience with their partner were investigated. The whole interviewing process lasted at the most sixty minutes, depending on how much information the participant chose to share.

The Recording of Interviews

Each of the twelve interviews were recorded by a dictaphone after permission was given by the individual participants. Recording the interviews allowed for transcription to occur after they had taken place. Through using a dictaphone, each interview was captured with good sound quality that allowed for easier transcription for the primary researcher because the information which participants gave was easy to listen back to.

5.1.3 Procedure

Before the project was able to begin, ethical approval had to be given by the Abertay University Ethics Committee (Appendix Fourteen). Once Ethical Approval was

given, participants were then contacted and invited to take part in the project (Appendix Fifteen). After the aims, background, procedure and the participants' role had been outlined, they were able to ask any questions which they may have had about their inclusion in this research project. Firstly, participants were asked to choose a suitable location for where the data collection could take place. This had to be a safe and secure environment where the participant felt comfortable to complete the project (i.e. a sport centre or training facility). This allowed for data collection to take place in a private place but still with people nearby for safety reasons in case something went wrong. After the location had been established, the data collection was able to begin. Participants were asked to fill in an Informed Consent Form (Appendix Sixteen), allowing the following schedule to commence.

After Informed Consent Form had been signed, participants were asked if they gave their permission for their interview to be recorded, to allow for transcription afterwards. Participants were informed that each their interview recordings would kept on the primary researcher's password protected laptop. Each participant were informed of this and were also assured that their data would be kept entirely anonymous, they had the right to withdraw at any time and they had the right to not answer any questions if they chose not to without any pressure from the primary researcher. After the essential forms had been signed and once participants completely understood what rights they had and what their role was during their interview, a seventeen-question interview schedule (Figure 5.1) was followed. Each of the questions were open-ended questions that were chosen based on specific theory (See Section 5.1.2). A semi-structured interview improved the flow of the process and allowed for a flexible and relaxed interview (Jackson and Beauchamp 2010b). The same schedule was used for each of the twelve participants and lasted between thirty and sixty minutes.

After the completion of the interview, participants were thanked for giving up their time and participating in the study. They were also asked if they had any questions concerning the project. A follow up meeting was also discussed with the participants where they could look over their data if they wished in order to make sure that they were completely happy with the information they had given. If this meeting could not be organised at the time, they were asked to provide an email address where the primary researcher could send a copy of the transcribed data directly for their approval to include in the study. Once this had been decided, all participants were asked to provide their email address – if they had not done already – or a postal address in order to send their final interview transcripts and a summary of the project's findings.

5.1.4 Data Analysis

Transcription

Participant's data was transcribed with their permission after the interviews had taken place. The process for this started with the primary researcher listening to the recordings of the interviews multiple times. Silverman (2016) states that the primary researcher must listen to recordings numerous times to allow transcription that is more accurate so none of the participant's data would be missed out. The interviews were listened to numerous times so that no data was missed or misheard, giving an accurate assessment of what participants actually said. While listening to each of the interviews, the information from the recordings was typed into Microsoft Word on a password-protected laptop by the primary researcher. This process allowed for comparisons to be drawn out through thematic analysis.

Thematic Analysis

Players' answers were transcribed and analysed through thematic analysis in order to surmise common themes between each of the players. Clarke and Braun (2013) state that thematic analysis is a qualitative method of analysis that is used for identifying, analysing and reporting patterns in participant's transcripts. In order to be able to analyse the data collected from participants in this study, the six-stage thematic analysis described by Braun and Clarke (2006) was used.

Stage One: Familiarizing with the Data

The first stage of this analysis was for the primary researcher to familiarise themselves with the data. This included transcribing all twelve interviews from the original recordings. This process involved listening to each recording numerous times to accurately capture what the participants said precisely. Riessman (1993) suggests that transcription allows the researcher to familiarise themselves with the collected data and helps to form early opinions of what the participants have said. Braun and Clarke (2006) and Goodwin (2016) also state that the primary researcher also read the transcripts multiple times and noted down their initial ideas based on the collected data.

Stage Two: Generating Initial Codes

The second stage of Braun and Clarke's six-stage analysis (2006) is to generate initial codes. This part of the process helps to organise the data into meaningful groups (Tuckett 2005). During the current study, generating the initial codes allowed the primary researcher to be able to collate data relevant to each code. The primary researcher used highlighted the text in different colours on the electronic copies of the transcribed data to be able to generate their initial codes, similar to suggestions made by Braun and Clarke (2006) of how to create these codes. Smith (2015) also states that

these initial codes help to produce themes in the next stage of the six stage thematic analysis.

Stage Three: Searching for Themes

The third stage of Braun and Clarke's six-stage analysis (2006) is to collate the generated codes into potential themes by gathering all the relevant data into categorised themes. During this stage, Silverman (2016) states that this is where the researcher begins to analyse each code and consider how the individual codes may combine to form a theme. For instance, during the current study the primary researcher used the colour-coordinated codes to establish a number of themes. These themes were then categorised by specific colours with one being assigned to each theme. Similar to Braun and Wilkinson's approach (2003) each of the themes had sub-themes within each theme (based on each generated code). This demonstrated the link between each sub-theme and the overarching theme.

Stage Four: Reviewing the Themes

The fourth stage of the analysis is to carefully review each theme to make sure the themes accurately reflect the coded extracts and the entire data set (Braun and Clarke 2006). This section of the analysis can be broken down into two levels as there are a number of checks that are required prior to establishing the final themes. For the first level, the primary research of the current study had to read the collated codes that were chosen for each theme and establish whether they formed a clear pattern. Braun and Clarke (2006) state that if this were successful, the researcher would be able to produce a thematic map and move onto level two of this stage of the analysis. During this stage, the primary researcher in the current researcher had to consider the validity of each individual theme in relation to all the transcripts. Braun and Clarke (2006) also

suggests that during level two, the primary researcher establishes whether or not the thematic map is an accurate representation of the information given by the participants. Smith (2015) argues that at the end of these two levels, the primary researcher will know what their themes and sub-themes are.

Stage Five: Defining and Naming Themes

The fifth stage of Braun and Clarke's six-stage analysis (2006) is to define and further refine the different themes that have come through the previous stages of analysis and how the sub-themes link together. During this stage, the primary research had to provide an accurate representation of what participants stated, why each quote links to a specific theme and why. Braun and Clarke (2006) and Silverman (2016) state that during this stage of the analysis the different sub-themes within the overarching them are established to give structure and provide explanation for each theme. During the current study, the primary researcher had to categorise each theme with their individual sub-themes in a logical order to allow for the discussion section to have the correct flow.

Stage Six: Producing the Report

The sixth stage of Braun and Clarke's six-stage analysis (2006) was to produce the discussion section where the primary researcher provides their analysis of each theme and chooses specific examples of participants' statements to link to the research question. For example, during the current study the primary researcher chose specific and relatable examples to link with the research question. In addition, each interpretation was critically analysed in relation to other research to see if the themes reinforced previous findings or not (Braun and Clarke 2006).

Biographical Baggage

As stated by Sparkes and Smith (2014), it is extremely difficult to remove bias in qualitative research completely. However, Wolcott (1995) suggests that bias can have a positive impact during qualitative interviews. In this study, the primary researcher had a background in football (17 years performing and 5 years coaching) and therefore brought their own assumptions and bias with them. (Creswell and Poth 2017) argues however, this is not a bad characteristic to have and further suggests that bias is common within qualitative research and is accepted as a potentially positive influence. Sparkes and Smith (2014) acknowledged that an individual's personal insight into a research topic could help uncover extra information from participants. For instance, the primary researcher was able to share common understanding with participants due to having similar experiences in the sport at a different team. Sparkes and Smith (2014) suggests that this approach can help expand the discussion between the researcher and the participant and gather extra information. This would not have been possible without the primary researcher's background in football. However, an important consideration had to be made to make sure that the researcher's bias was not affecting the results in a negative manner (i.e. overemphasising or underreporting the importance of a theme).

To be able to effectively evaluate the influence of the primary researcher's bias, a critical friend was included during the data analysis stage of this study. Sparkes and Smith (2014) state that one of the best ways to embrace the self-awareness of the primary researcher's bias is to work with a critical friend. The primary researcher used this approach in order to be able to accurately identify the themes of this study and to make sure their bias was not influencing results in a deliberate manner. Sparkes and Smith (2014) suggest that the role of the critical friend is to provide an open discussion

about themes (which have been identified through thematic analysis) and to provide alternative explanations to make sure the data is being analysed in the correct way. Brewer and Sparkes (2011) used this method during their research and found that their critical friend was able to query the primary researcher's opinions as they felt that their questions did not consider negative aspects. This was stated to be based on the primary researcher's own viewpoint so Brewer and Sparkes (2011) argue that the role of the critical friend was crucial to making sure there was a fair line of questioning and analysis of the information given by participants. Therefore, the use of a critical friend helped the primary researcher acknowledge their bias during the data analysis stage to be able to get a fair and accurate representation of the participant's information.

Data Analysis

Participants were sent a copy of the transcribed data for them to read over before their information could be included in the project in order to give an accurate reflection of what they had stated during their interview. This was where participants were given the opportunity to alter or change any of the information that they had given and if they were completely satisfied with this, they gave their permission for their information to be used during data analysis. A trusted independent party was asked to check over the collected data. This was done to remove investigator bias and to make sure that no information had been altered in any way that could influence the results. The use of an independent party can help to remove any threat of investigator bias by reaffirming the assumptions made by the researcher and the conclusions drawn were correct based on the information gathered during data collection (Shenton 2004). This independent party had a basic knowledge of playing and coaching football and were asked to read all the transcripts of the interviews to identify the common themes and see if they matched those of the primary researcher that they found during their own thematic analysis. This

method resulted in an agreement through discussion between the primary researcher

and the independent party.

5.2 Discussion of Findings

5.2.1 Summary of Themes Table

Table of Themes	Example
Experience	
Playing Different Positions	*I've been playing football since 99 so 15 years. During what positions have I played, I've played every single position there is. Even in goal, I used to be subby [substitute] keeper.* [Participant 7]
Difficult at First	*I didn't really know him at first but just got know him from playing with him* [Participant 5]
Performing Together	*It's pretty good because we've played with each other for two year now so we know everything inside out of each other.* [Participant 1]
Competitive and Training Experience	*Just working with each other, playing and training with each other on a weekly basis definitely [Participant 11]*
Specific Drills in training	*I think working together in training, doing a drill such as team shape and knowing each other, where everybody else is meant to be and yeah.* [Participant 5]

The Influence of the Coach	
Light-hearted Atmosphere at Training	*It needs to be serious and competitive but you also need a bit of light heartedness...* [Participant 8]
Type of Training Drills	*Mostly working on tactical work and passing, shooting. Just like, not necessarily shooting but getting on the ball. Working together as a team, putting like the back four in one team if we're doing a training game. Conditioning it so that we can only pass to each other. Just to get each other well know each other and stuff.* [Participant 12]
Coaching From an Early Age	*Well where they are meant to be that sorta [sort of] comes from coaching from an early age. Sorta [sort of] ingrained in the brain so that they can know where to be sorta [sort of] a bit of structure to the play so it's not just a swarm. So that's where they know where to be.* [Participant 6]
Relationship Between Partners	
Spending Time Together Outside Football	*....things like doing more social things out with sport. If you get to know the person better, I think that helps to get to know them. To get to know how they play. Just have a better sorta [sort of] friendship then you can have a better partnership* [Participant 6]

Enjoyable Setting at Training	*We are always training together and having a laugh together so yeah it's been enjoyable getting, playing with him* [Participant 11]
Effective Relationships	*I think the fact that we have become better friends over the years it's made us play better together because we are used to each other's company* [Participant 4]
Effective Methods of Communication	
Creates a Better Performance	*Think, through good communication from the players around us. That's definitely helped play better.* [Participant 8]
Understanding of Partner's Movements	*Just the communication and knowing where they'll be at that point of time so then you've always got someone to pass to.* [Participant 10]
Better Team Performance	*Players would be able to coordinate on the park definitely through communication.* [Participant 2]
The Importance of Shared Understanding	
Experience and an Effective Relationship	*You know, how good, are they more left footed, more one sided but you learn how to play these types of runs and stuff obviously through your experience but also from your team mates as well. Understanding.* [Participant 2]

Leads to Prediction	*As we've got to know each other's strengths and weaknesses we've sorta [sort of] been cover that and just through time, working together, playing together.* [Participant 8]
Training Together Facilitates Shared Understanding	*Just working with each other, playing and training with each other on a weekly basis definitely. I mean, like I say before kinda [kind of] sometimes know what the other boy's doing and he knows what I'm doing right away so it's kinda [kind of] instinct* [Participant 11]
Accurate Prediction Based on Shared Understanding	*Obviously, the more you play the more understanding you get. You understand what that player wants to do even if you're not sure if that's what he should be doing but you make up for that.* [Participant 3]
Coordinated Team Performance	
Shared Understanding Leads to Coordination	*So you have a general knowledge sorta [sort of] what's happening at any point so you know how best to sorta [sort of] give a bit of cover, bit defensive strategy as well as when you're attacking.* [Participant 6]
Coordination is the Desired Outcome	*In a few of the games it's been played where we've had a couple of one twos and stuff like that and you know, after that you score a goal and stuff like that and you know.* [Participant 2]
Coordination Based on Performing Specific Roles	*So as long as you carry out your role to the best of your ability and other players carry out their role, it should all slide together and work.* [Participant 8]

The Importance of a Shared Mental Model	*I think that's probably the best way. That's the way you're wanting to play football. If everyone's on the same wavelength, all know what each other are going to do at any one point it's sorta [sort of] gives the best balance to the team. If you don't know what the boy beside you is going to do, then you can't tailor your role to do the best for the team…* [Participant 6]

5.2.2 Summary of Themes

Throughout the interviews, the participants discussed a number of themes that they felt had an influence on the development of shared understanding between themselves and their partner (See Section 5.2.1).

Firstly, participants reinforced the importance of individual experience (including in multiple positions) and suggested that this built a general understanding of multiple roles including their own. Participants acknowledged that when they started performing with their partner it was difficult and they did not work well together due to the lack of experience. However, through experience performing together during training and competitive matches they began to perform much more effectively together.

Secondly, participants discussed the importance of the role of a coach in relation to the development of shared understanding between football dyads. Participants stated that a coach has the potential to influence shared understanding between football dyads during training sessions. Participants argued that having a light-hearted atmosphere at training plus the type of training drills they used (i.e. specific team shaping drills) benefited their shared understanding with their partner. In addition to this, participants suggested that shared understanding was benefitted by specific coaching from an early age could help to give a general understanding of specific requirements for roles within a football team.

Thirdly, participants maintained that having an efficient relationship was paramount to the development of shared understanding between football dyads. Participants argued that spending time out of football (i.e. socialising with their partner) was an important part in having an effective relationship with their partner. Participants

also highlighted the importance of having a light-hearted and enjoyable training environment and stated that this was a crucial to establishing an effective relationship between dyads, resulting in the development of their shared understanding.

Fourthly, effective methods of communication between dyads was discussed by participants to be a fundamentally important factor in the development of their shared understanding between them and their partner. Participants suggested that effective methods of communication improved their ability to understand their partner's future movements (i.e. prediction). This was argued by participants to lead to a more efficient team performance, based on their improved shared understanding.

Fifthly, participants discussed the importance of the combination of these four factors (experience together, the role of the coach an efficient relationship and effective methods of communication) and that these are fundamental to the development of shared understanding between football dyads. However, participants elaborated on these factors and suggested that shared understanding gives team members the ability to consistently predict the actions of others and facilitate a more efficient team performance.

Sixthly, participants surmise the above factors an strengthen the link between each of these and the importance of shared understanding as the cornerstone to the ability to effectively perform together as this is the ideal outcome for team performance. However, participants elaborated on this suggestion and state that this is based on having specific roles within a team as well as having an understanding of other roles as well. Participants also highlighted the importance of an efficient shared mental model between team members to be able to facilitate and develop their shared understanding.

5.3 The Role of Experience in Football Partnerships

During the interviews, participants stressed the importance of experience in relation to the development of shared understanding between football players. The players discussed a number of different examples of experience such as performing in different positions during their career as well as performing with their partner in training and competitive settings were crucial to developing shared understanding between football players. They felt that this gave them knowledge of what actions were required for specific roles as well as seeing what abilities their team members have and what likely actions. Participants discussed some personal examples to help explain reasons why they felt experience was important to the development of shared understanding between team members.

5.3.1 Performing in Various Positions

The twelve participants discussed during their interviews that during their time playing football, players had the experience of performing in a number of different positions. For example, numerous participants stated they had spent time in attacking positions as well as sometimes performing in defensive roles during their football career.

> *I've been playing football since 99 so 15 years. During what positions have I played, I've played every single position there is. Even in goal, I used to be subby keeper.* [Participant 7]
>
> *Well I've been playing for roughly 15 years I would say. I started off when I was very young, about 7 years old or something. During that time, I've played various different positions, mainly in the midfield. I've played at right back*

before, centre back when I was younger but my position right now is centre midfield. That's where I'm most comfortable. [Participant 8]

This could suggest that performing in numerous positions during their time playing football can help to improve a player's overall knowledge of the sport and can give an individual an understanding of what they should be doing during specific situations. Gershgoren et al. (2016) also stress the importance of having a general understanding of different positions within a team as this allows for an appreciation of what is required in certain roles, leading to a better understanding between team members. For example, if a full back has the experience of playing as a centre half, they will have an understanding of what is required to perform that role effectively.

This would be useful when their defensive line is being pressured by a counter attack by the opposition, as the full back would have a rough knowledge – based on their experience performing at centre half – of what the centre haves would be doing in this situation. This type of experience can give players an understanding and appreciation of what is required in other roles as part of the same team based on their positions as they have had the experience performing in that position previously in their future career. Entin and Serfaty (1999) suggest that it is beneficial for team members to have a general understanding of various positions in order to improve shared understanding between team members. This example demonstrates a full back who has played at centre half before will have an understanding of the role and they can have expectations of what their fellow defenders are likely to do in certain situations.

Baker et al. (2013) suggested that within a sports team (basketball), it was common for players to perform in different positions instead of specialising in just one role in the team. This can also be important for football players as well as it can help

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players to adapt to in game situations that they are faced with. In relation to above example with the full back who has had experience performing as a centre half, this can be useful as they can potentially change their role within the team. Araújo and Davids (2016) supports this by proposing that the adaptability of team members can be beneficial for successful teams. However Marks, Sabella, Burke and Zaccaro (2002) and Reimer, Park, and Hinsz (2006) state that this is based on understanding multiple roles.

Therefore, the opinions of the participants in this study could support the theory suggested by Araújo and Davids (2016) that playing in multiple positions can help to improve a player's overall sporting knowledge of different roles within a team sport like football. This could assist an individual to understand their own role better as they have an appreciation of other team members are required to do which can allow for certain expectations for other team members based on their own experiences. This knowledge can also help players to perform in different roles in order to assist the team.

5.3.2 Coming to a new club

Some participants (7/12 participants, 3 defenders and 4 attackers) discussed the difficulty faced when coming to a new club as they did not know anyone in that team. However, they further suggested that since there is a lack of any familiarity with team members at a new club, the best way to overcome this is through experience playing together and partnerships will improve over time.

> *I didn't really know him at first but just got know him from playing with him*
> [Participant 5]

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When I first started, I didn't really know anyone so then getting used to them was a bit difficult to start with but now that I've been playing for a few years it's connecting well and that's about it. [Participant 10]

I think the first game of the season due to the first time us playing together and we weren't exactly know each other very well. [Participant 12]

Eys, Carron, Beauchamp and Bray (2003) support the findings of the current study by stating that it takes time as at the beginning of a partnership there is a lack of knowledge and understanding of each other. Participants of the current project highlighted this as they felt that if they did not know their partner personally or what skills their partner possessed made it difficult for participants to work with their partner at the beginning of the relationship. Building an understanding between team members through a lot of experience performing together was stated by participants to be one of the main influences that facilitate the development of football partnerships. All of the participants stressed the importance of partners having a lot of experience performing together in relation to the development of developing partnerships in football.

It's pretty good because we've played with each other for two year now so we know everything inside out of each other. [Participant 1]

Participants stressed that over time however, their ability to work together increased through experience performing together. Jonker et al. (2010) and Bourbousson, Poizat, Saury and Sève (2011) suggest that through time it is possible for team members develop their own efficient shared mental model. Silva et al. (2013) state that task experience together increases an individual's knowledge of how to perform a skill as well as increasing their understanding of other team members. For example, if a new central defender joins a team, the other defenders will not know much about that

player. They will also not know how their new team member is likely to perform in certain situations or what ability they have meaning that their shared understanding between them and the new player would be very low. At this stage, team members would not have experience of performing together which would be required for an efficient team work mental model (Mathieu et al. 2000). Blickensderfer et al. (2010) also suggest that shared understanding will not be very high in team members who have little experience performing together. The could be because the actions which team members take during certain situations will build up this understanding for others in the team of what certain players are likely to do in certain situations. Therefore, as partners gain more experience over time, their understanding of each other and their ability to work together is likely to improve.

> *Major factor obviously is just game time together. Can't really put it more than that. The more time you play the more you learn.* [Participant 3]

> *Just training more regularly with them* [Participant 6]

Hill, Stoeber, Brown and Appleton (2014) suggest that sharing common experiences is a successful method of increasing shared thinking between members of a team within a sporting situation. Nine out of the twelve participants of the current research project shared a similar view and discussed that as players shared more experiences together, their understanding of each other's abilities. Salas, Cooke and Rosen (2008) suggest that team members who possess a high level of understanding of each other's abilities can help to lead to more efficient team performance. In relation to the above example of a new central defender being brought to a new team, their shared understanding between each other will improve the more the rest of the defenders work with them in training or during competitive matches. This would be because each player

will see how their new team member reacts in specific situations, building up a shared understanding of each other's abilities and this will help them to perform better as a defensive line.

5.3.3 Training Together to Improve the Partnership

Eight participants of the current study suggested that their shared understanding with their partner was influenced by the methods of training that they had participated in together. Leo et al. (2013) proposed that different types of training are required for teams to produce a successful performance. For instance, participants of the current study discussed one method of training – positional specific training – such as shaping or tactical work as an effective way of facilitating the development of shared understanding within their partnership. Through experience performing together Jonker et al. (2010) theorises that team members' Task and Team Work Mental Model would become more efficient. This could be due to players gaining experience and knowledge of their own position during certain situations as well as gaining an understanding of what their partner will be doing at the same time. Once the team's shared mental model improve, they will be able to work together more effectively (Mathieu et al. 2000) based on their knowledge of each other (Kim 1997).

> *Yeah well now we've started playing up front together, it can only develop more 'cause it's only going to get better the more of us play together.* [Participant 4]

Gréhaigne and Godbout (1995) examined the importance of tactical knowledge within team sport and their conclusions suggest that teaching players this type of information through specific training sessions was beneficial to team performance. Silva et al. (2013) also suggest that tactical work with team members is crucial to overall performance as this type of training creates and develops an understanding of

each team member's role within the team. For example, if defenders participate in shaping drills with each other they will learn more about their own role in the team as well as what their other defenders will be doing at the same.

> *Things like that has got a lot better over time than it was in the first game that we played.* [Participant 6]

This would improve their knowledge of what each other were doing during certain situations as well as improving their ability to work together. Gréhaigne and Godbout (1995) state that over time during this type of training, players build knowledge of one another and what they should be doing in situations that they have previously practiced together. The suggestions made by some of the participants who stressed the importance of working through tactical situations within training sessions helps to support research by Silva et al. (2013) and Williamson and Cox (2014), which places emphasise on tactical training. Performing together on training sessions as well as games was discussed by participants in relation to improving their partnership with team members. Nine participants offered their thoughts on this suggestion and highlight that improvements to the quality of partnerships can come from training and playing together.

> *Maybe having training sessions where just the players you're wanting to work together or player trains where they are involved a lot together; to build up the partnership* [Participant 4]

> *Training players and working together is. I think you've work the position you are playing in; you should be linking up with the other guy that's in that position* [Participant 10]

Just working with each other, playing and training with each other on a weekly basis definitely [Participant 11]

Harrison et al. (2003) suggest that task experience together leads to a better team performance. The current study recommends that when players work closely together during regular training sessions, their knowledge of one and other will improve and their ability to work successfully as a partnership. Blickensderfer et al. (2010) further stresses the importance of working together and being able to develop and understanding of others, leading to a better team performance. In relation to the above example of the defenders working together to improve their performance, the defenders will have a better shared understanding of each other if they are able to work together. This will then lead to an understanding of what they were likely to do in certain situations, meaning their ability to perform more effectively (i.e. a successful offside trap will improve).

5.3.4 Specific Training Drills

Another common theme that was discovered between different participants was that they felt that working together during specific training drills such as shaping can be important experience when developing football partnerships. Two participants suggested this to be an important factor in developing partnerships.

I'd think in some sort of tactical formation in training where you understand your roles and responsibilities. [Participant 1]

Ten of the participants of the current study also discussed this during the interviews and proposed that a shared understanding between team members can result in a more coordinated team performance. One of the ways this is created is further suggested by Eccles and Tenenbaum (2004) and Silva et al. (2013) that over time,

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working closely together can create expectations of what one another will do in future situations. Similar to the findings of Eccles and Tenenbaum (2004) and Silva et al. (2013), some participants of the current study indicated that being able to predict the actions of actions of team members is based on the knowledge build up over time. Therefore, the opinions of some of the participants of this research project help to support the idea that understanding of other team members requires experience together over a period of time working together.

> *I think working together in training, doing a drill such as team shape and knowing each other, where everybody else is meant to be and yeah.* [Participant 5]

The conclusions of Mullen and Copper (1994) also suggested that teams who have players who have worked together are likely to produce a better team performance that a team which contains players with no experience performing together. The findings of Mullen and Copper (1994) and Blickensderfer et al. (2010) help to support the suggestions made by the participants of the current study that emphasised the importance of working together with their partner. Cooke et al. (2007) stressed the importance of experience practicing tasks together for team members to be able to produce a better team performance as their understanding of each other improves. Cannon-Bowers and Bowers (2006) also advises that task experience is an important factor that can have a positive effect on overall team performance. Two participants felt that if players are encouraged to work together at training regularly improved a partnership's ability to work together.

Pair them up at training together basically every week in week out. Train them together, keep them together, keep your back 4 steady when they train together. [Participant 9]

Training players and working together is. I think you've work the position you are playing in; you should be linking up with the other guy that's in that position. [Participant 10]

Experience performing a task together is also a central part to Blickensderfer et al's Hypothesised Model of Implicit Team Coordination (2010) which emphasises team members working together and performing tasks together to develop a mutual understanding, leading to a better team performance. Jonker et al. (2010) theorise that this possible for team members whose team and task work shared mental model becomes more efficient. For example, through experience performing tasks will improve team members understanding of performing the team's necessary tasks (Silva et al. 2013) in addition to improving their ability of working together more effectively. Therefore, the suggestions made by participants of the current study are supported by the findings of Eccles and Tenenbaum (2004) and Blickensderfer et al. (2010) in relation to the importance of working together to developing an understanding between team members.

5.4 The Influence of the Coach

Four of the participants also discussed the influence their coach can have on the development of understanding between team members. Players suggested that training together was important. However, the coach can influence types of training as well as controlling which players work together. This was suggested to develop shared understanding because their mutual knowledge of each other will improve over time

through working together. This was proposed by some participants to have an effect on the team members' moral as well as their motivation to work together. It was suggested that if a coach was able to maintain a positive atmosphere, shared understanding between team members can develop. The role of the coach was also suggested to facilitate the learning of general knowledge by players through suggesting what should be done in certain situations, facilitating an understanding of specific roles between team members.

5.4.1 Improvements to Moral

A factor that was noted during some of the interviews was that three participants suggested that a coach can have an influence of football partnerships and relationships between players and coaches. It was proposed by some participants that when coaches allow a light-hearted and enjoyable atmosphere with a competitiveness in training, the development of relationships between team members is possible.

> *There wasn't really any specific objective in training apart from just fitness so wasn't, a few possession boxes and stuff like that. But, it allowed you again to gel with the team, to get to know the guys in the team* [Participant 2]

> *It needs to be serious and competitive but you also need a bit of light heartedness...* [Participant 8]

Carron, Bray and Eys (2002) discuss player's enjoying training sessions and state that this environment can lead to improvements in the understanding of fellow team members. This proposes that if a coach incorporates enjoyment within their sessions, players will get to know their team members better. Gréhaigne and Godbout (1995) state that one of the methods to improve a player's understanding of what they should be doing in certain scenarios came from performing together in training.

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5.4.2 Types of Training Sessions

Some participants also suggested that the type of training which a coach chose and the feedback that they gave players can influence how players build up an understanding between one another. Five of the participants demonstrated this during their interviews about what type of training to understanding.

The most effective way I would say of doing training is where coaches would just let you play the game and as soon as they see anything going wrong they would stop, tell everyone to look at their positions and see where everybody else is. Where they should be playing the ball etc. etc. etc. [Participant 5]

They also need the right coaching in the sense that they are getting the right messages passed and they can get their shape all done correctly and everything will work out as best it can. [Participant 6]

Mostly working on tactical work and passing, shooting. Just like, not necessarily shooting but getting on the ball. Working together as a team, putting like the back four in one team if we're doing a training game. Conditioning it so that we can only pass to each other. Just to get each other well know each other and stuff. [Participant 12]

Participants in the current study suggested that there was not one specific type of training seems to the correct method for creating an enjoyable environment and improving their overall understanding of each other. Gabbett (2006) argues that there are different methods of training that coaches use in order to improve a number of skills in game related drills. This could help to explain some of the information from some of the participants of this project who suggested that "small sided games" are an effective method of training players to work effectively together by a coach. Therefore, the

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suggestions made by the participants of the current study propose one method of training to improve shared understanding by a coach however; there could be more types of drills that a coach can use to improve understanding between players.

5.4.3 Coaching from an Early Age

Three participants discussed coaching influences from an early age affecting players later in their playing career. For instance, during the interviews two participants discussed how coaching at early age could create a platform of knowledge of how to act in certain scenarios for players to refer back to. For example, if a younger player has experience playing as an attacker but develops into a defender, they will have knowledge of performing in various positions. This will give this player a general understanding of what is required in different roles. This further advises performing in certain situations over a number of years can help players to decide what to do in current of future situations based on what was successful in the past.

> *Where they are meant to be that sorta comes from coaching from an early age. Sorta ingrained in the brain so that they can know where to be sorta a bit of structure to the play so it's not just a swarm. So that's where they know where to be.* [Participant 6]

Research conducted by Eccles and Tran (2012) suggested that general knowledge about playing a team sport like football comes from years of experience performing the sport itself. Baker et al. (2003) argue that having a background performing a specific sport over a number of years can help to create a basic knowledge of that sport and how they should be performing in a specific situation. Therefore, if a coach is able pass on knowledge at a younger age – as suggested by some participants – a football player's general knowledge of different positions will be better, leading to a

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better shared understanding between players whose roles are very different. This is supported by Eccles and Tenenbaum (2004) who state that team sport athletes rely on past information and instruction given to them by coaches about various roles in the team. With this information, they will have a better knowledge of how their team members are likely to perform.

5.5 The Relationship between Partners

Participants stressed the importance of having good quality relationships with team members can facilitate the development of shared understanding. This was suggested to be important in the sport and out with the sport as well. Firstly, within the sport it was discussed by participants that having a good quality relationship with their partner improved their ability to work together and in turn, improved their understanding of each other. It was also proposed by five participants that spending time out of the sport was important for players to get to know their team members and develop an understanding of each other.

5.5.1 Spending Time Together out of Sport

A large amount of experience together was deemed by participants to be crucial to creating an effective partnership between football players of the same team. Participants highlighted that experience in competitive and training situations to be a crucial factor however; spending time in more relaxed social settings outside football was also needed to develop an effective partnership. Five participants suggested that being friends with your partner or even just getting on with your partner, can improve both player's performances.

> ....things like doing more social things out with sport. If you get to know the
>
> person better, I think that helps to get to know them. To get to know how they

play. Just have a better sorta friendship then you can have a better partnership
[Participant 6]

I think the way to do it would be is to know each other more, be friends.
[Participant 7]

When we started training together, it was the same cause we're quite close

friends as well [Participant 11]

Aristotelis, Nektarios, Aristomenis and Maria (2014) also suggested that social cohesion within team sport can have a positive impact on team performance. In relation to the above example of players spending time together out with their sport, their understanding of each other will improve and this will help to create a positive and effective relationship. This will also help to develop their understanding within a sporting setting because team members will get along with one and other. Gershgoren et al. (2016) states that as team members' understanding improves, their Team Work Mental Model will also become more efficient. For instance, team members can use their knowledge of each other to work together effectively (Jonker et al. 2010). This argument is similar to the suggestions made by most participants of the current study who stated that this approach expands their understanding of each other and improves their performance in the sport together. This finding supports some of the suggestions made by participants of the current study who discussed the importance of having a positive relationship with their partner being able to improve how they develop their understanding of each other and allowing for a better team performance. Carron and Brawley (2008) also propose that both team and task cohesion helps to produce a better team performance. Therefore, even though some of the participants of the current research project placed emphasis on getting on with their partner, it may not be enough

to just have high levels of social cohesion in order to attain a positive team performance.

5.5.2 Enjoyable Training Sessions

Another suggestion made by four of the participants was that having a laugh in a happy emotional setting during training and games helps to develop partnerships.

If players don't enjoy themself then they're not going to want to be pals with the people, they are training with. They're all having a laugh, they're all having a joke then they will come together as a team. They'll have more interests in common, they'll be pals as well [Participant 6]

You also need a bit of light heartedness and a bit of banter to get the boys to interact and get everyone to be together as a family, as a group of mates and a good team morale [Participant 8]

A bit of banter in the middle of it to get us going. [Participant 9]

We are always training together and having a laugh together so yeah, it's been enjoyable getting, playing with him [Participant 11]

Some participants suggested that this could be achieved when there was a happy and light-hearted atmosphere with each other and this approach can facilitate a positive team performance. Bradley and Hebert (1997) state that individual members of a team possess their own varying characteristics such as willingness to work together and lack of understanding of communication methods and this could influence how teams are able to work together. For example, a certain player in the team may be likely to moan during training sessions if things are not going well for their team in a conditioned game - affecting the atmosphere of their team – that may motivate some players but it

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may make some players dejected. This suggests that it could be difficult to create a positive atmosphere for every member of a team member (Totterdell 2000). However, as participants of the current study suggested, it is beneficial for as many team members to demonstrate a positive atmosphere in order to facilitate a good team performance.

5.5.3 Good Quality Relationship

Six participants felt that having a positive emotional relationship with your partner can facilitate the development of shared understanding between football partnerships. Some participants discussed that this situation could also lead to improvements in performance of both players.

> *I think the fact that we have become better friends over the years it's made us play better together because we are used to each other's company* [Participant 4]

> *Also as well as you get to know the guys, you become more of a group of mates instead of a team. You can enjoy playing with each other and that definitely helps everyone play better together I think.* [Participant 8]

Carron et al. (2002) emphasise the importance for team members to enjoy performing together and stress that this can improve each member's desire to succeed for one another. Participants of the current study discussed the importance of enjoyment when performing together facilitates a good quality relationship amongst team members. For example, if players do not get one with one and other, they may not want to work together during training drills or even during games. O'Neill, Allen and Hastings (2013) state that conflict can have a negative effect on team performance. This suggestion supports the findings of the current study where participants stated that having a positive relationship improves understanding and facilitates a better team

performance. Carron et al's (2002) finding supports the opinions of a selection of the participants involved in this study by suggesting that having a positive atmosphere amongst team members creates an enjoyable environment for everyone and can assist team performance.

5.6 The Importance of Effective Communication between Team Members

Participants felt that effective communication methods were important for developing shared understanding between team members. This was suggested to be important as effective methods of communication was deemed to facilitate a coordinated performance, as players were able to accurately share information between each other. Also through experience performing together, methods of communication improved as understanding improved between team members as over time players were suggested to develop an understanding what each other mean when they give certain instructions. It was suggested that improvements to the methods of communication and shared understanding were interlinked.

One reoccurring theme which most of the participants discussed throughout the interviews was that effective communication was deemed to a crucial the development and improvement of football partnerships. This suggestion supports statements made by Sullivan and Gee (2007) and Rico, Sánchez-Manzanares, Gil and Gibson (2008) who state that effective communication methods are a crucial characteristic for team members to be able to work more efficiently together. For instance, some participants attributed effective communication to improvements in performance both members in the partnership.

Being able to speak to each other is the most important thing in football but it doesn't even have to be speaking. Communication is different, there's lots of different forms of communication. So it's about really getting the most out of your players. [Participant 2]

Think, through good communication from the players around us. That's definitely helped play better. [Participant 8]

Effective methods of communication was also suggested to improve the overall understanding of each partner's movements. This finding is supported by Rico et al. (2008), Lausic et al. (2009) and Onağ and Tepeci (2014) who state that methods of effective communication can improve team members understanding of each other's skills, roles and likely movements. This is proposed by multiple participants who felt that through effective communication, players know what they and their partner will be doing at any one time.

Just communication on the park between the pair of us. Our knowledge of each other. Kent [Knew] what each other were going to do. It was like reading each other's minds half the time [Participant 9]

Just the communication and knowing where they'll be at that point of time so then you've always got someone to pass to. [Participant 10]

This finding is also suggested by Eccles and Tenenbaum (2004) who also stated the link between improvements in understanding between team members and the refinement of their methods of communication. For example, if team members became familiar with what one another's instructions meant, this would demonstrate an efficient understanding between team members as well as effective methods of communication. This would demonstrate improvements to team member's Team and Task Work Shared

Mental Model that Jonker et al. (2010) theorises is facilitated by effective methods of communication. For instance, as team members understand more about how each other communicate their Team Work Mental Model would improve (Jonker et al. 2010). In addition to this, their methods of communication would also facilitate improvements to their ability to work together (Mathieu et al. 2000).

Rico et al. (2008) suggest that communication between members is how team members pass information to one and other during competitive scenarios, in order to be able to work together. Eccles and Tenenbaum (2004) support the opinions of the participants of the current study by stating that as methods of communication become more efficient, team member's shared understanding increases also. This finding proposes that the development of shared understanding and improvements to the methods of communication between team members are interlinked. Therefore, improvements to the methods of communication between team members are important to their development of shared understanding between one another.

5.6.1 Effective Methods of Communication Leading to a Coordinated Performance

Some participants stated that the understanding which came from effective communication between partners could help lead to a coordinated team performance. Two participants gave examples of how they felt about this link.

Players would be able to coordinate on the park definitely through communication. [Participant 2]

Like I've mentioned plenty times before, mostly communication, working together. Then we know each other's games well now. So usually it's like who wins the ball, who drops off we know that well. [Participant 12]

Participants suggested that the development of greater shared understanding that resulted from improved methods of communication was that players were able to produce a better performance together. Rico et al. (2008) suggest that more efficient methods of communication can lead to a more coordinated team performance as team members have more of an understanding of each other. This is because over time team members will develop an understanding of what each other mean when they give specific instructions. For example, through experience performing together a defensive line will understand the shout of 'come on everybody, let's push this line further up' which would be made by one of two players. They would begin to understand what this shout meant and they would be able to all work together when this shout was made. This demonstrates that improvements to the defender's understanding of each other is facilitated by their methods of communication, leading to more coordinated performance. Sullivan and Feltz (2003) also emphasised the importance of effective communication methods between team members and team members being able to produce an effective team performance. However, participants in the current study suggested that over time, their methods of communication became more efficient as their understanding of each other improved, the more they performed together.

This could be because according to LeCouteur and Feo (2011) players are speaking to each other during specific situations, suggesting instructions to help to establish and understand what role they should take to allow a coordinated performance with fewer errors. In relation to the example involving the defensive line who had developed an understanding of the shout of 'come on everybody, let's push this line further up', as they performed more often together, their methods of communication would become more efficient as their understanding of each other improved. Since the

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player's understanding of each other, they could then use shorter shouts like 'push up'. Eccles and Tenenbaum (2004) state more efficient communication methods can only be used if team members have a good understanding of how one and other perform in certain situations. If this defensive line had a high enough understanding of each other, they of even adopt non-verbal communication methods like pointing in the direction where the defenders should move. Onağ and Tepeci (2014) theorise that effective non-verbal methods of communication are centred on team members possessing a mutual understanding of each other. Some participants hinted that in their partnerships their understanding was high enough to use this method of communication and that this can facilitate a better team performance. Sheard and Kakabadse (2004) support this suggestion and stated the importance of effective methods of communication between team members as an essential skill that successful teams must possess. Therefore, the importance of the development of effective methods of communication between team members was highlighted as crucial by a number of participants during the current study for developing better shared understanding between players. However, participants highlighted that as their methods of communication became more efficient, their understanding of each other also improved.

5.7 Prediction and Coordination Based on Shared Understanding

Prediction leading to coordination was suggested to be facilitated by the development of shared understanding between team members and this was crucial to how participants performed with their team members. However, this was stated by participants to be based on experience performing together, in order to create the understanding required for an efficient team performance. This was suggested to then lead to improvements to shared understanding as through coordinated performances, players learn more about each other's likely actions.

5.7.1 Prediction Based on Shared Understanding

Participants have discussed experience together and having a positive relationship with a partner was essential to the development of a dyadic football partnership. Some participants attributed these two areas to creating and developing shared understanding between both members of the partnership.

You know, how good, are they more left footed, more one sided but you learn how to play these types of runs and stuff obviously through your experience but also from your team mates as well. Understanding. [Participant 2]

Different cause I've not long been with this team but over the course of the season so far I've obviously gained a better understanding of how they play, of how I play and we've started to get partnerships sorta going together and working well as a team. [Participant 6]

Some participants proposed that having this understanding between players allows for the ability to predict one and others actions based on the knowledge of each other's abilities in certain situations. In this situation, shared understanding facilitates improvements to the shared mental model between team members (Mathieu et al. 2000) and (Marks, Zaccaro, and Mathieu 2000). For instance, team members who are able to accurately able to predict one another's actions would be able to demonstrate an effective team work and task work model as this would show they were able to work effectively together, to perform team tasks.

The ability to predict other team members' actions is facilitated by possessing knowledge partners and will allow players to have an expectation of what actions their partner is likely to take in specific scenarios (Jonker et al. 2010). For example, if one attacker knows that their partner is better at challenging for a high ball in the air, in

similar situations they will expect this action from their partner and will make a run in behind the defensive line. This scenario demonstrates how one player is able to use their knowledge of their partner to predict what they are going to in certain situations and be able to pick their own actions based on this knowledge.

I know what he's going to do, most of the time. [Participant 3]

As we've got to know each other's strengths and weaknesses we've sorta [sort of] been cover that and just through time, working together, playing together. [Participant 8]

One of the participants discussed this further and suggested different methods of how players can work together over a period of time in order to build up knowledge of each other and how this allows for the prediction of one and other's actions.

Just working with each other, playing and training with each other on a weekly basis definitely. I mean, like I say before kinda [kind of] sometimes know what the other boy's doing and he knows what I'm doing right away so it's kinda [kind of] instinct [Participant 11]

Possessing knowledge of their partner was also suggested by some participants to be an important way of determining where players should be and what actions they are likely to take in certain situations.

Obviously, the more you play the more understanding you get. You understand what that player wants to do even if you're not sure if that's what he should be doing but you make up for that. [Participant 3]

I think over the time of playing together with everyone and the experience you get from playing with each other you should be able to understand each other's roles and what other players should be doing. [Participant 8]

The statements made by the participants of the current project support suggestions made by Blickensderfer et al. (2010) who theorise that having an overall understanding of each team member's skills, leads to knowledge of what actions they are likely to perform and ultimately the coordination of all the team member's actions. However, participants suggested that their shared understanding with their partner was crucial to be being able to predict what each other were going to do next. This suggests that if players perform certain actions in situations, they are likely to base future decisions based on the success of actions in the past (Cannon-Bowers and Bowers 2006; Silva et al. 2013). This scenario demonstrates team members possessing an effective shared mental model (Jonker et al. 2010) as they are using their knowledge of each other – Team Work Mental Model – to predict what others are likely to do to be able to work effectively together – Team Work Mental Model.

In addition, as team members are able to more accurately predict what each other are likely to do in certain situations; their understanding of each other will also improve. Mathieu et al. (2000) suggest that ability to predict what each other are going to do is based on the shared understanding that team members have developed with one another. The information gathered from a selection of the participants of the current study suggest that experience together, can allow partners to build up a knowledge of each other and facilitate the prediction of each other's actions, leading to a coordinated performance as well as improvements to their shared understanding.

5.7.2 Coordinated Team Performance

Factors such as experience together, having effective communication and shared understanding between both partners have been discussed and it has been suggested that these influence a coordinated team performance (See Section 5.0.3). Eleven of the participants stressed that a coordinated performance is possible when players base their performance on the knowledge of what they expect their partner to do.

> *So you have a general knowledge sorta what's happening at any point so you know how best to sorta give a bit of cover, bit defensive strategy as well as when you're attacking.* [Participant 6]

Blickensderfer et al. (2010) proposes a connection between familiarity of team members and experience performing tasks together creating an overall understanding of each other's skills and resulting in a coordinated team performance. For example, if a full back and wide midfielder used their knowledge of each other to be able to successfully predict when their partner was going to go forward, they would be able to coordinate their actions by choosing to stay back and cover their partner.

This would show team members accessing their combined Team Work and Task Work Mental Model to use their shared knowledge to work effectively together (Jonker et al. 2010). This demonstrates that having a shared understanding between team members can facilitate a coordinated team performance. During the interviews, eleven participants suggested a link between experience performing together creating shared understanding between partnerships, facilitating the prediction of actions and then coordination of performance. Rico et al. (2008) provide support for the opinions of some of the participants of this study by stating that building up a shared knowledge of

other team member's skills facilitates the prediction of future actions resulting in a coordinated performance

> *I mean probably over half the. Well half the goals I score now was through his assists just like I say before, because kinda my game is running all the time. He kinda hits the ball in the corner and I'm running onto it. So yeah I would say like it's, it's really good now and like I say he's kinda always assisted me if I'm scoring or kinda works both ways as well like.* [Participant 11]

Shared understanding was suggested by participants to improve the likelihood of a more efficient team performance. Mathieu et al. (2000) states that this is achieved when team members have an efficient Task Work Mental Model between team members, based on shared understanding between one and other (Williamson and Cox 2014). This finding is supported by Mathieu et al. (2000) and Vilar et al. (2013) who suggested a similar link. However, the ability for team members to be able to coordinate their actions can also lead to better shared understanding also. For example, if two defenders had an accurate understanding between each other, they would be able to predict what each other were going to do in certain situations. The more coordination that these players are to demonstrate, their understanding of each other is also going to improve. Participants also offered some examples of when their produced a positive and coordinated performance with their partner.

> *In a few of the games it's been played where we've had a couple of one twos and stuff like that and you know, after that you score a goal and stuff like that and you know.* [Participant 2]

> *When I was playing left back one game, I got the ball the centre midfielder, played it up into the left midfielder so that was a sort of working partnership*

and I overlapped him. He beat one player and managed to slip it through for

me. I went past their right back, crossed it in and yeah we managed to score a

goal. So that's pretty much as good as it can get from that sorta move.

[Participant 6]

Emphasis was placed on coordination by a number of participants as the desired

outcome of team performance as long as every member of the team worked together to

be able to achieve it. For instance, a few participants discussed the importance of

players having to perform their own individual roles effectively in order for the team to

produce a coordinated team performance.

So as long as you carry out your role to the best of your ability and other

players carry out their role, it should all slide together and work. [Participant 8]

Basically, at Team P we worked as a unit. As everyone went forward together

then everybody went back together. So if they weren't. the boys must've been in

a position all the time, if not the left back went forward the left midfielder

always dropped back in his place. So there was always somebody there to pass

the ball to basically in our team. [Participant 9]

This would be because they are continually witnessing how each other react in

specific scenarios, meaning that their understanding must also improve. Participants of

the current study also hinted at this theory as some suggested that the more experience

they get performing efficiently together, the better their understanding would be. This

finding proposes that shared understanding improves the chance of a coordinated

performance between team members. However, as coordination is facilitated by

understanding between team members, it also leads to a greater shared understanding.

5.8 The Impact of Having an Effective Shared Mental Model

Participants discussed the importance of team members possessing an effective shared mental model. It was suggested that this type of psychological construct, coordination based on prediction, was only possible through shared understanding. Participants discussed this being facilitated by experience performing together and acknowledged that shared understanding would develop between team members who followed an effective shared mental model.

5.8.1 Importance of an Effective Shared Mental Model

The majority of participants came to an agreement with the concept of a Shared Mental Model within a football team and suggested this was a highly positive inclusion to have between players. It was further proposed that possessing a Shared Mental Model between players would facilitate understanding between team members and result in a coordinated performance. Two of the participants give their views on this theory and how this influences team performance.

> *I think that's probably the best way. That's the way you're wanting to play football. If everyone's on the same wavelength, all know what each other are going to do at any one point it's sorta gives the best balance to the team. If you don't know what the boy beside you is going to do, then you can't tailor your role to do the best for the team…* [Participant 6]

These suggestions support the findings of Mathieu et al. (2000) and Reimer et al. (2006) who examined the importance of adopting a Shared Mental Model between team members of a sports team. Reimer et al. (2006) suggest that having this knowledge structure is used to describe, explain and predict the actions of others, through a mutual understanding of those involved. If a team possesses an efficient shared mental model

between their team members, they will be able to share an understanding of each other's abilities and likely actions.

I think it's important cause if we are all on the same wavelength and we all read each other's games well so that we know what to do next and who's got the ball, what they are going to do with the ball. [Participant 12]

Kermarrec and Bossard (2014) propose that this is possible due to members of a team refer back to large knowledge structures of how their team members perform under certain situations. Some of the participant's statements in the current study also stressed the importance of being able to possess shared knowledge approach-based on previous experience – in order to perform effectively. Jonker et al. (2010) theorise that a team which members all possess a shared understanding of each and other's abilities can have a positive impact on team performance. This is due to players having an understanding of what their other team members are likely to do in certain situations in order to make it easier for everyone to carry out their own role and resulting in the coordination of performance. The findings of the current study are supported by Mathieu et al. (2000), Reimer et al. (2006) and Jonker et al. (2010) when helping to explain the positive implications of sporting teams having a shared mental model amongst its members. Therefore, a shared mental model between team members is important for team members to be able to develop their shared understanding and to perform more effectively together.

5.8.2 An Efficient Shared Mental Model Takes Time to Develop

Participants however did acknowledge that creating an efficient shared mental model can take a long time and requires team members to have experience performing together in order to develop an understanding of one another. For example, a team

whose members had not performed together much would not have an effective shared mental model. This would be because there was a lack of shared understanding between one and other because they had not had much experience performing together. Jonker et al. (2010) suggested the importance of experience performing together to an effective shared mental model as this is how team members develop their understanding of each other.

This understanding is based on how team members see each other performing in certain situations. Mathieu et al. (2000) and Williamson and Cox (2014) who propose that performing together regularly was an important factor in creating an effective shared mental model. However, as this team gain more experience performing together, their knowledge of each other also improves, leading to a more efficient shared mental model. Jonker et al. (2010) and Silva et al. (2013) suggest that through time, team members benefit from having an effective team work and task work shared mental model. This is because players would use their knowledge of one and other to be able to accurately predict what certain players will do in specific situations, leading to improvements to their understanding.

Through experience performing together, Mathieu et al. (2000) state that team members learn more about each other's abilities and are able to predict what one and other will do in specific situations. Klein (2008) suggest that this is possible because team members are able to recall previously similar situations and base their own actions based on how they have seen their team members react before however, this takes experience performing together. The information gathered from the participants of this study helps to support the research of Mathieu et al. (2000) and Williamson and Cox (2014) who considered the importance of having an effective shared mental model in a sporting team. The use of an effective shared mental model facilitates the development

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and maintenance of shared understanding between team members and can lead to improvements to the team's ability to perform better together.

5.9 Practical Implications

There were three main findings from study one of this thesis. These results can provide valuable and practical guidelines of how to develop shared understanding between their players. This can be implemented throughout their training programme and provide a more effective team performance.

Firstly, similar to study one (See Section 3.6) and Study Two (See Section 5.2) experience performing together was found to be of paramount importance to being able to develop shared understanding between dyads. Coaches could use this suggestion when pairing up players during their training. For instance, if a coach wanted two central midfielders to play together regularly they could put them on the same team during possession drills at training. This would give each player the chance to see how one another perform in certain situations and build their own-shared understanding.

Secondly, effective methods of communication were found to be a crucial factor in developing shared understanding between dyads. Coaches could use this information to encourage communication between their players during training and competitive matches. Over time, methods of communication would become more efficient (Eccles and Tenenbaum 2004) and coaches would notice that their team would be using more effective communication. This would help to facilitate a better team performance.

Thirdly, participants indicated of the importance of having an efficient relationship with their team members. Coaches would be able to pair players up during training that were friendly with each other to be able to promote a more enjoyable training atmosphere. This would encourage coaches to make training sessions a better

balance between fun and serious. This would facilitate the development of shared understanding between their players and help them achieve a better team performance.

Fourthly, having an effective shared mental model was indicated by participants to be an important factor in the development of shared understanding between dyads. The participants suggested that the above three factors help to facilitate an efficient shared mental model and coaches could influence these three areas (i.e. through specific training drills and types of training) to build an effective shared mental model between their players. Through this approach, coaches would be able to develop their player's shared understanding and facilitate a more effective team performance.

Fifthly, participants suggested that shared understanding leads to the ability to predict one another's actions and coordinate their performance. This would give coaches guidelines on what factors they could influence in order to develop an understanding between their players and facilitate a more effective team performance. Coaches can design their training programme to use specific drills in order to allow shared understanding to develop and produce a better team performance as a result.

5.10 Limitations

This research project provided a wide variety of interesting pieces of information that were gathered from participants who had different backgrounds and experiences within football. The participants gave their opinions on different topics including developing partnerships over time, how to go about improving coordination and the importance of including a shared mental model within a football team. However, there were a few limitations to the current project. An improvement could have been to interview partnerships rather than just strictly individuals. This could have allowed for a comparison between both members of the partnerships to see if their

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opinions matched each other and provided more information to help support the theory of effective partnerships possessing high levels of shared understanding. Shared understanding is crucial for effective partnerships within team sport (Blickensderfer et al. 2010). This could have been done by interviewing players individually or together as a dyad and this could have uncovered more information that may not have been found through interviewing a singular player.

It would have been beneficial to have dyads demonstrate their understanding by completing similar tactical sheets which were used in Chapter Three (See Section 3.1.2) and Chapter Four (See Section 4.1.2). In addition to this, it would have also been beneficial to watch participants performing together to see if their suggestions during the interviews matched up with how they performed together. This would show in a competitive setting if participants demonstrated shared understanding which Mathieu et al. (2000) suggest leads to a coordinated performance. However, this would have delayed data collection too long for each dyad, which was not practical for the current study.

5.11 Future Research

There would be a benefit for future research to further investigate this topic, as there are many themes that could be further explored. For example, each of the themes identified in the discussion of findings section could be explored in depth to examine their influence over how partnerships function. This could give a more conclusive understanding to identify all factors that combine to develop shared understanding between team members. Blickensderfer et al.'s findings (2010) stress the importance of shared understanding to the coordination so it would be sensible to examine other factors that may influence the development of shared understanding.

Another idea for a future research project could use a similar methodology but include participants who are partners who perform together. This could allow for a comparison between both partners to see if their perceptions and opinions about certain areas are the same.

According to Jonker et al. (2010), team members who share similar thinking will be more likely to produce a coordinated team performance. It would also be important to take what has been suggested by participants to help design a training program to help develop shared understanding over a shorter period of time that would hopefully improve team coordination and performance more quickly. Eccles and Tenenbaum (2004) suggest that it takes time and experience for shared understanding to develop. Therefore, if this could be trained over a shorter period of time, a coordinated team performance could be achieved in a shorter period of time.

In addition to looking at actual football partnerships, future projects could include position on the pitch as a factor. For instance, do defensive partnerships require a different amount of shared understanding to attackers? This would be highly beneficial to improving the knowledge of how partnerships work within football. A future project could be to look at shared understanding in different or even multiple sports. The opinions of the participants of this project may be based on the sport they are performing and these could be different across different sports. This suggests that a future research project could theoretically look at other sports with a similar methodology to see if players of different sports have similar opinions to those of this project.

5.12 Conclusion

The aim of this research project was to explore how shared understanding develops within football partnerships. The twelve participants provided a variety of perspectives in a number of areas including experience together, shared understanding, communication between partners and the coordination of performances. The findings suggest that partnerships are required to have a large amount of experience together in order to create a level of shared understanding of one another's abilities. These findings support the suggestions made by Eccles and Tenenbaum (2004) and Blickensderfer et al. (2010) who both stress the importance of this process to developing shared understanding.

This helps to create an environment where players were able to predict each other's actions in certain scenarios and perform their actions accordingly. According to Jonker et al. (2010), this could be because players feel they know what their partner is likely to do in a specific situation based on their experiences together. This is described as a coordinated performance and this is the ideal goal for successful sports teams Eccles and Tenenbaum (2004). Therefore, it is suggested that members of a partnership within a team sport are advised to follow these steps in order to be deemed successful and be able to work well together.

Chapter 6 - General Discussion and Conclusions

The purpose of this programme of research was to investigate the existence and development of shared understanding between football dyads. The key questions were:

d) Does shared understanding exist between experienced football dyads?

e) Are experienced football dyads more likely to make a coordinated decision if there is a clear and correct course of action?

f) How does shared understanding develop between football dyads?

This chapter summarises the key findings of each of the three studies of this research. In addition to this, how the aims of the research were critically evaluated of the extent that each of the studies answered these. This section will take into consideration the contribution to the field of research of shared understanding within sporting dyads, the overall limitations of the research, the practical implications for theory as well as practice plus suggested directions where research can go within this field in the future.

6.1 Summary of Studies

	Study 1	Study 2	Study 3
Aims	To examine the existence of shared understanding within football dyads.	To explore the level of shared understanding displayed by dyads of football defenders in game situations that had either a clear correct course of action or where there was no clear correct course of action.	To explore factors which could contribute to the development of shared understanding between football dyads.
Design	24 football dyads stated their thoughts, feelings and actions based on a single player series of four tactical sheet scenarios and four videos.	Forty football dyads ranked the choices of three potential next actions based on a single player series of twenty separate scenarios	Twelve football players gave their opinions during interviews about how they felt shared understanding developed with their partners.
Measures/ Themes	Percentages of similarity. Experience vs no experience. Defenders vs attackers. Unlimited time vs specific time.	Percentages of similarity. Making a coordinated decision if there is a clearly right option. Individual Experience Vs Combined Dyad Experience. Experience vs no experience.	Experience together. Shared understanding. Communication Methods.
Findings	Experienced dyads achieved higher percentages of similarity compared to dyads that had no experience together. Defenders produced higher percentages of similarity for their Typical position compared to attackers and for attacking videos. There was no significant difference between the tactical sheets and video sections i.e. time pressure was not a factor.	When there is a clear and correct answer, dyads are more likely to select a correct course of action rather than be similar and have not selected the correct course of action. Individual player experience was found not to be consistently correlated with percentage of similarity in game situations that had a clear correct course of action, nor was dyad experience correlated with percentage of similarity in game situations that had no clear correct course of action. There was no significant difference between actual and random dyads in situations with a correct course of actions, but actual dyads had a significantly higher percentage of similarity than random dyads in situations where there was no clear course of action	Experience together, effective communication methods and efficient relationship facilitates shared understanding. Shared understanding leads to the prediction of future actions, then coordination of actions. An effective Shared Mental Model is important for facilitating Shared Understanding.

Table 13.1 *– Summary of Studies.*

6.1.1 Study One: The Existence of Shared Understanding within Football Dyads

The purpose of the study was to examine the existence of shared understanding within football dyads. Twenty-four football dyads (Age M = 19 +/- 3 years) from youth, amateur and junior levels from within the Tayside area were recruited. Participants looked at four scenarios-two defensive and two attacking football situations split into four sheets per scenario-displayed on tactical sheets. A single player in each scenario was clearly indicated to participants with a black circle. Participants had to state their thoughts and feelings based on the positioning and the situation that the player was in. Participants also had to suggest the future actions of the player under no time pressure. Once this was completed, participants watched four video scenarios of mirrored scenarios to the tactical sheets. Each video was separated into four sections, giving participants thirty seconds to write down the same information as was required for the tactical sheets. Partnership's answers were compared and analysed through a similarity scale (Ickes 2001) to determine the existence of shared understanding between each dyad.

The results showed that dyads who had experience playing together, produced higher percentages of similarity than dyads that were randomly paired together. The data showed that the dyads that have experience performing together, have a shared understanding and read situations in a similar way through their shared mental model. This helped dyads who had performed together previously to achieve higher percentages of similarity compared to dyads that had no experience together. Dyads also produced higher percentages of similarity during scenarios focused on their typical position compared to their atypical position. However, this was not the case for all categories and these results suggest that defenders also need to have knowledge of what attackers are going to do at any one time as well as knowing what actions they should be performing.

The results could have been achieved by defenders having to understand their opposition in order to perform their own role. Therefore, the results suggest that in order to be successful, team members are required to have a mixture of general knowledge of other roles in the team in addition to a more specific knowledge of their own individual role. The results also showed little difference between the percentages of similarity between the video sections where there was little time available compared to filling in the sheets which participants had an unlimited amount of time to complete. This would suggest in order to make their decision; dyads were using their own shared mental model and demonstrated their mutual knowledge to make a decision. The findings establish a link between the existence of shared understanding and having experience performing together.

6.1.2 Study Two: The Impact of Shared Understanding within Football Dyads on the Ability to Make a Correct Decision

The aim of this study was to explore the levels of shared understanding displayed by dyads of football defenders in game situations that had either a clear correct course of action or when there was no clear correct course of action. Forty-five football defensive dyads who perform together on a regular basis from within the Tayside area were recruited ($M_{age} = 19$ +/- 3 years). Participants had to rank three future options of the next movements of one player based on twenty scenarios to see if dyads could make a correct and coordinated choice if there was a clear and correct answer available. Eleven of the scenarios were deemed to have a correct answer available and nine scenarios had no correct answer. Both members of the dyad made their choices of actions independently in order for their data to be compared for similarity. Answers were compared between partnerships and analysed through an adapted version of Ickes's similarity scale (2001).

The results showed that dyads are more likely to be similar and select the correct course of action, than be similar and have not selected the correct course of action. It was found that players were more likely to pick the correct course of action than a wrong one. However, dyads were not more likely to be similar in situations with a correct course of action than in one where there were many different but suitable actions that could be taken. This suggests that team members are required to combine their own experience in a sport with experience performing with their partner in order to make a coordinated decision. Individual player experience was not consistently correlated with percentage of similarity in game situations that had a clear correct course, nor was dyad experience correlated with percentage of similarity in game situations that had no clear correct course of action.

The results state that in order to make a coordinated decision, dyads require to have sport specific knowledge in addition to experience with their partner. Therefore, both of these factors are required to develop and demonstrate shared understanding and make a coordinated decision. In addition, experienced dyads achieved also achieved higher percentages of similarity compared to dyads with no experience together when there was no clear course of action. Trends towards significance for Coordinated and Correct were found between natural dyads compared to random pairings when examining percentage of similarity. This suggests that when paired with players they had no experience performing with; participants were unable to achieve as high percentage of similarity. However, percentage of similarity between actual and randomly paired dyads when there was no correct answer available produced a significant difference. This finding emphasises that when there is no clear action to take; dyads were able to rely on their own shared mental model with their mutual understanding that was also of the other member in the dyad.

6.1.3 Study Three: Factors Contributing to the Development of Shared Understanding within Football Dyads

The purpose of this research was to investigate potential factors that could contribute to the development of shared understanding between football dyads. This project considered a sample of football players' perspectives to identify some of these factors and what they believed to be important when developing an understanding of team members. Twelve football players from youth, amateur and junior levels from within the Tayside area were recruited for this project (M_{age}=21.83 +/- 6.34). The study followed an interview schedule of 17 questions that lasted at most 60 minutes. The data underwent thematic analysis where similarities and differences between participant's answers were identified, coded, categorized and compared to produce the key themes from their answers.

Following this process, three key themes were established, which participants stated were crucial to the development of shared understanding with their partner. These were experience together, having an efficient relationship with their partner and effective communication methods between one another. Another factor that some participants discussed was that a coach had the ability to influence shared understanding between players. The results suggest these factors can create and develop shared understanding between the participants and their partners. This helps to create an environment where players were able to predict each other's actions in certain scenarios and perform their actions accordingly.

According to Jonker, van Riemsdijk and Vermeulen (2010) this could be because players feel they know what their partner is likely to do in a specific situation based on their experiences together. An important outcome of developing shared understanding with their partner, which emanated from this study, was that participants were able to predict what each other were likely do in future actions and they were both able to produce a more coordinated

performance. This was also stated to be facilitated by the dyads own effective shared mental model. Therefore, it is suggested that members of a partnership within a team sport are advised to follow these steps in order to be deemed successful and be able to work well together.

6.2 Contributions to the Field of Research

In this section, the discussion links each of the three study's findings (Chapter Three, Four and Five) with some of the research that has been outlined in the literature review (Chapter Two). This section will also highlight the contribution that this thesis makes to the research looking at shared understanding between team members.

6.2.1 The Existence and Importance of Shared Understanding between Dyads

The results of the thesis demonstrated the existence of shared understanding between football dyads that had experience performing together. Shared understanding is suggested to be when two or more people use their previous experience with each other and possess similar thoughts in certain situations (Blickensderfer, Reynolds, Salas and Cannon-Bowers 2010 and Silva et al. 2013). The findings of the current studies show a link between shared understanding and experience performing together. This was demonstrated in Studies One and Two by higher percentages of similarity for dyads who had experience performing together compared to dyads who had no experience together. However, it would have been valuable to collect participants' opinions and suggestions of the link between experience and shared understanding. This could have provided qualitative and quantitative evidence for the link between experience and the existence of shared understanding between dyads. The findings of Study One and Two support suggestions made by Eccles and Tenenbaum (2004) and Araújo, and Davids (2016) who stressed the existence of shared understanding between team members who have experience performing together. Williamson and Cox (2014) also

found that experience performing together was essential for shared understanding between team members. The results of Study One and Two supports the finding that experience performing together is fundamental for the existence and development of shared understanding between team members.

Experience was also suggested to be important for shared understanding by the participants in Study Three. Throughout the interview schedule (See Section 5.1.2), open-ended questions gave participants the chance to speak at length and state their opinions on their own relationships. Experience performing together was proposed by participants to the existence and development of shared understanding, leading to the ability to predict what each other are going to do. Rico et al. (2008) and Gershgoren et al. (2016) support the findings of Study Three by stating that experience performing together creates a shared understanding between team members and this situation leads to the ability to predict what their other team members will do in certain situations.

Mathieu et al. (2000) also suggest that team members are able to use their understanding of each other in order to predict what each other would do next. Participants in Study Three demonstrated this as some suggested that they were able to use their understanding of one another in order to predict what they would do next. This finding also supports the suggestions made by Eccles and Tenenbaum (2004) that team members with experience performing together were able to predict each other's actions because they have witnessed how their team members perform in certain situations. Therefore, the results of the current studies provide further evidence of the existence of shared understanding between dyads who have experience performing together. This conclusion supports the theories of Blickensderfer et al. (2010) and Silva et al. (2013) who stress that experience performing together facilitates the development of shared understanding between team members.

The findings also emphasise the importance of shared understanding between dyads based on their experience together in order to predict what each other were going to do. Correia et al. (2011) and Gershgoren et al. (2016) reinforce this theory by stating experience performing together facilitates the development of shared understanding between team members and can lead to the prediction of team member's future actions. This result also supports other findings of Blickensderfer et al. (2010), Silva et al. (2013) and Gershgoren et al. (2016) that state a link between experience, shared understanding and prediction.

6.2.2 The Use of Different Knowledge Structures to Make a Coordinated Decision

The findings in the thesis showed dyads would be more likely to be similar and select the correct course of action, than be similar and have not selected the correct course of action. It was found that players were more likely to pick the correct course of action than a wrong one when there was a correct option available to them. This suggests that since there was a correct answer in these situations, players were able to use their own individual experience to be able to select the correct answer. This result supports the findings of Baker, Côté, and Abernethy (2003) who also stated the importance of individual player experience in relation to being able to make a decision. However, the findings of the current studies showed that dyads were not more likely to be similar in situations with a correct course of action than in one where there were many different but suitable actions that could be taken.

This suggests that dyad experience is fundamental for dyads to make a coordinated decision. This supports the suggestions made by Entin and Serfaty (1999) who stated the importance of joint experience, leads to a shared understanding between team members. Smith-Jentsch, Mathieu and Kraiger (2005) theorise that shared understanding between team members facilitates their ability to make a coordinated decision. The findings of the current studies support Blickensderfer et al.'s (2010) findings that experience performing together is crucial for dyads being able to work together effectively.

The results of Study Two could suggest that different knowledge structures are being utilised in different situations. For example, if there is a clearly correct option for a player to choose, dyads are able to use their own individual experience in the sport to make the correct choice. However, if there is no clear and correct option – which is more likely in team sport – players use their knowledge of each other i.e. their shared understanding to perform together and pick a coordinated action. This argues that in order to be coordinated, shared understanding between team members is essential. This finding is supported by Mathieu et al. (2000), Blickensderfer et al. (2010), Jonker et al. (2010) and Gershgoren et al. (2016) who all state that shared understanding between team members is fundamental to be able to coordinate their performance – leading to a more effective team performance. Therefore, the findings of the thesis support the findings of research in the field by emphasising the importance of individual player experience in addition to experience performing together is crucial for making a joint decision.

6.2.3 Factors Which Facilitate the Development of Shared Understanding

The findings of this thesis propose several factors that are attributed to the development of shared understanding between dyads. The results of the thesis propose similar factors that have been discussed previously e.g. experience (Cooke, Gorman, Duran and Taylor 2007, Silva et al. 2013), effective relationship (Jonker et al. 2010) and effect communication (Salas et al. 1999, Eccles and Tenenbaum 2004) in regards to shared understanding between team members. However, this thesis focused on relationships between dyads and attributed these factors to facilitating the development of shared understanding. As stated previously (See Section 1.2), sub-teams – which can be dyadic relationships – are crucial for the overall functioning of sports teams. Therefore, experience performing together, the influence of a coach, having an effective relationship with each other and effective communication methods – which was found in Study Three - are fundamental to the

development of shared understanding between dyads. This supports suggestions made by Stout et al. (1999) – variety of team sports at a South Eastern US University - and Williamson and Cox (2014) – such as hockey, football and basketball - who theorised that experience performing together was an important factor for creating and developing shared understanding between team members.

The results also supported Gréhaigne and Godbout's (1995) theory that one of the methods to improve a player's understanding of the sport and of their team members is through specific drills in training. This proposes that the coach can play a role in the development of shared understanding, which was also stated in the results of Study Three. Carron, Bray and Eys (2002) also emphasised the importance for team members to enjoy performing together and stress that this can improve each member's desire to succeed for one and other. These suggestions were also supported by the results of the thesis. Effective methods of communication were also found by Eccles and Tenenbaum (2004) to facilitate shared understanding between team members as well as experience performing together. The results of the thesis suggest that these factors are all important characteristics which team members are required to have in order to improve their shared understanding between team members.

In addition to these factors, the findings of the thesis showed that shared understanding was possible if team members had an efficient shared mental model – based on experience performing together. A shared mental model is defined as knowledge structures between people, allowing sharing of information and the coordination of actions (Cannon-Bowers, Salas and Converse, 1993) providing description, explanation and prediction of behaviours within a team (Jonker et al. 2010). The findings of Study Two support the results of Reimer, Park and Hinsz (2006) who stated the importance of an efficient Shared Mental Model

between members of a sports team for being able to facilitate shared understanding between one and other.

6.3 Extensions to the Literature

In this section, there will be a discussion about the extensions to the research which the thesis provides. The areas where the research has been further developed will be established and future research direction – based on the current thesis – has been suggested.

6.3.1 The Importance Experience for Shared Understanding between Football Players

The results of the thesis demonstrated the existence of shared understanding between football dyads that had experience performing together, based on higher percentages of similarity for dyads who had experience performing together compared to dyads who had no experience together. The findings of all three studies support suggestions made by Eccles and Tenenbaum (2004), Williamson and Cox (2014) and Araújo, and Davids (2016) who stressed the existence of shared understanding between team members who have experience performing together as well as a background in the sport (individual experience). For instance, experience was suggested to be important for the existence and development of shared understanding by the participants in Study Three. These findings provide further evidence that experience together is crucial to shared understanding between dyads. However, this new evidence contributes justification for the creation of a training program that specifically gives dyads the opportunity to experience situations together on and off the field of play. For instance, this type programme would be beneficial for academy level players at semi-professional and professional clubs during or in addition to their training schedule. This could start as a pilot study that looks at dyadic relationships but could be scaled up to consider shared understanding between multiple members of the same team. Based on the findings of this thesis, a targeted approach to increase experience between two

or more people is now possible and would aim to improve their shared understanding of each other. This evidence would advance the research that has looked at shared understanding between dyads (i.e. Blickensderfer et al. (2010)) and provide a programme that could be replicated with players of different positions in various team sports. The findings of this thesis provides a new foundation for future research and with a similar methodology, a strategic training programme can increase players' experience together and improve their shared understanding too. These results offer justification for one of the main implications of this thesis by advocating that gelling time between football players could be reduced through this type of approach.

6.3.2 The Importance of an Efficient Shared Mental Model

In addition to these factors, the findings of the thesis showed that shared understanding was possible if team members had an efficient shared mental model – based on experience performing together. The findings of Study Two for instance, support the results of Reimer, Park and Hinsz (2006) who stated the importance of an efficient Shared Mental Model between members of a sports team for being able to facilitate shared understanding between one and other. This thesis introduces the importance of an effective shared mental model between dyads with a football team (between defensive dyads and attacking dyads) and the findings provides reasoning for future research projects that could consider shared mental models between team members who have different roles within football teams. For example, research in the future could use similar data collection methods to this thesis and investigate whether different dyads (i.e. a dyad of one attacker and one defender) had a shared understanding through an efficient shared mental model. This could provide the next step in research to identify shared understanding between multiple players and ultimately throughout the whole team. For instance, some of the suggestions made by participants in Study Three were that an effective shared mental model between team members required general

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knowledge about other roles in addition to specific knowledge of their own role. Therefore, it would be important to consider the existence and development shared understanding between different roles –through a training programme based on the findings of this thesis - in order to establish an effective shared mental model between team members. This could help to reduce the time each team member needs to be able to develop shared understanding between one and other plus they would be able to produce a more effective team performance earlier.

6.3.3 Development of Shared Understanding

The findings of this thesis propose several factors that are attributed to the development of shared understanding between dyads. The results of the thesis propose similar factors that have been discussed previously e.g. experience (Cooke, Gorman, Duran and Taylor 2007, Silva et al. 2013), effective relationship (Jonker et al. 2010) and effect communication (Salas et al. 1999, Eccles and Tenenbaum 2004) in regards to shared understanding between team members. However, this thesis focused on relationships between dyads and attributed these factors to facilitating the development of shared understanding. As stated previously (See Section 1.2), sub-teams – which can be dyadic relationships – are crucial for the overall functioning of sports teams. However, this thesis brings all of these factors together and provides coaches with factors – which they can have an influence over – to facilitate shared understanding between dyads. From these findings, coaches could interpret the different factors as a set of suggestions to help them develop shared understanding between their players and improve the performance of the team. In addition to this, similar methods could be used in a variety of different team sports to see if there were similar requirements for dyads in other team sports such as basketball, netball or rugby. This innovative approach has rarely been considered other than Blickensderfer et al. (2010) to look at shared understanding between dyads. Therefore, the methodologies within this thesis could be altered to different sports to investigate whether certain factors are as important in dyadic

relationships in football – as found in this thesis – are as important in other sports like hockey. A future training programme (as mentioned above) as a research project could take these factors and be replicated in the majority of team sports, with the findings of this thesis as the starting point with the focus of developing shared understanding between dyads. This would lead to investigations into shared understanding between more than two player relationships and eventually looking at shared understanding within a full team and how it develops. This could help to establish which factors required specific focus and could lead to a more effective team performance quicker. For example, if a football team adopted a training programme during preseason - based on the findings in this thesis – they could accelerate the development of shared understanding between their team members and perform more efficiently earlier in the season.

6.4 Practical Implications for Research

The three studies of this thesis have demonstrated the existence of shared understanding between football dyads. This was shown in dyads that have experience performing together and the results have suggested a number of factors that can facilitate the development of this understanding. This thesis can help to establish a platform for future research topics to investigate shared understanding within dyadic relationships or even relationships between more than two people. The data collection methods – more specifically from Study One and Two – can be used in future research looking into similar areas or even tailored to different sports in order to see if other dyads are able to demonstrate shared understanding. However, if methods from Study One and Two were to be used in further research, a questionnaire or an interview following these methods should be used in order to gain the perspectives of the participants to find out the reasons behind why they made their decisions.

This knowledge can be taken into consideration and allow for the development of a training program which would be designed to improve shared understanding over a shorter period of time. Casey-Campbell and Martens (2009) and Blickensderfer et al. (2010) proposes experience together to be crucial to developing shared understanding. Therefore, if experience together is a crucial factor – which has been shown in the findings of each of all three studies – in theory, if this time can be shortened team success can come quicker. This potential training program could be achieved through using some of the data collection materials that were used during the current studies. Due to time constraints throughout the thesis, a pilot study of a training program has not been designed as of yet. However, there are future plans for this to be researched and implemented. These could include the tactical sheets from Study One and Two and the videos from the first Study for players to see what shared understanding which they already possess and examine further how they could similarly understand situations. These could also be used as training tools in order to develop similar thinking between two football players to help them perform better.

Ideally, this type of program – which can be derived from the three studies - can be further developed in order to work with academy level players. This could be beneficial to improve the shared understanding between players at this level and help to increase their chances of being successful in the first team in the future. As suggested by Blickensderfer et al. (2010), Silva et al. (2013) and Gershgoren et al. (2016), shared understanding is a crucial characteristic which team members are required to perform effectively together. If a training program was devised, some teams can gel – suggested by Williamson and Cox (2014) to be a trait in expert teams – this process can potentially shorten this process to create a more effective team performance. For instance, in Study Two participants had to compare their choice of answers to a coaching panel to see if they made a correct choice. Based on similar scenarios, managers and coaches of the first team could give youth players similar scenarios

and grade their answers to what they as coaches feel is the right course of action to take and train them based on their thoughts. This could also help to improve their chances of fitting into that manager's system when they are ready rather than teams having to spend a lot of money to bring in a new player.

Wylleman and Lavallee (2004) and Finn and McKenna (2010) suggest that a number of youth players struggle to make the transition from academy level to the first team in football as some players are unable to adjust to performing at this level. Therefore, if youth players are able to develop a shared understanding of one and other – which according to Blickensderfer et al. (2010), Silva et al. 2013) and Gershgoren et al. (2016) is crucial to being able to perform effectively together- in addition to what their coaches need them to do their transition to the first team could be made easier. This method can improve the chances of academy players at football clubs making it into the first team if they are not only thinking similarly to each other but also to the manager and the coaching staff as well.

6.5 Limitations to the Current Research

The results of these three studies provided a useful insight into the existence of shared understanding between dyadic partnerships in football and how these develop over time. However, the limitations to this thesis must be acknowledged before looking at practical implications of this work.

One of the main limitations throughout the whole thesis, which would have been good to consider during the three studies would was the type of experience which participants had. This was thought to be easily quantifiable by number of months together but other factors in relation to experience should have been looked at. For instance, just because a participant had years of experience performing in the sport it did not mean the quality of their experiences was better than someone who was less experienced. Since experience was

considered to be extremely important to the development of understanding between team members (Eccles and Tenenbaum 2004; Blickensderfer et al. 2010), the type and quality of dyad's experience needs to be considered and evaluated. This is a factor that should have been considered as part of this thesis to provide an understanding how different types of experience could influence dyad's shared understanding. Therefore, during a further research project it wold be sensible to consider trying to identify the type and quality of experience rather than just the amount. For example, potentially including a questionnaire prior to the commencement of data collection sessions that looked at the quality of experience such as frequency of training sessions and performance level of sessions.

A limitation that could have been taken into consideration throughout the thesis was to find out the reasons why participants made the choices that they did. MacMahon and Mildenhall (2012) suggest that there are a number of factors that could influence the ability to choose how to react in certain situations. This could have provided an understanding behind how dyads make decisions and what mechanisms are they feel are being utilised during their decision-making processes, rather than just looking at the actions that participants took. If participants were able to explain the reasoning behind their thinking, it could have given a more comprehensive understanding of shared understanding between dyads and an explanation of how this process functions.

Participants in this thesis should also have been asked to provide their opinions of how similar they felt their answers would be. This could have given an extra dimension to consider during the data analysis stage of this thesis. This could have allowed the comparison of how the expected their dyadic partner would score against their actual scores. This may also have allowed for participants to discuss how they felt shared understanding had developed between themselves and their partner. As suggested by Eccles and Tenenbaum

(2004), shared understanding between team members develops over time based on a number of factors such as experience performing together and effective methods of communication.

If this project considered investigating these potential factors, this could have allowed the study to find the reasoning behind how partnerships develop over time, leading them to make coordinated decisions. However, the opinions of participants were investigated in Study Three and were able to provide their commentary of how they felt shared understanding was incorporated within their relationship and how they felt that this developed. This would still have been an effective inclusion for Study One and Two and should have been considered in order to gain a full understanding of why participants chose the answers they did.

A favourable inclusion during this thesis could have been to create a situation that was more like what participants would experience during competitive situations. This would be an important consideration to see if this influenced their ability to demonstrate shared understanding and if they could make a coordinated decision. In Study One for example, participants had thirty seconds to state their thoughts, feelings and actions based on how they assessed the situation of a singular player. During a practical situation (i.e. during a game) players would never have had that kind of time to make a decision but these were the data collection methods which were available at the time. A more immersive situation where participants have to choose decisions instantly would have been important to consider however, this was not a viable option for these three studies.

A further improvement to this thesis could have been to interview partnerships rather than just strictly individuals. Shared understanding is crucial for effective partnerships within team sport Blickensderfer et al. (2010). This could have allowed for a comparison between both members of the partnerships to see if their opinions matched each other. Again, this should have been included in order to provide a better knowledge of how the process of

shared understanding is possible and how dyads feel it can develop. This could have provided more information to help support the theory of effective partnerships possessing high levels of shared understanding.

In an ideal research setting, it would have also been beneficial to watch participants performing together. This would have showed whether or not what they stated during each of the three studies is actually how they would choose to perform in competitive situations. This would show in a competitive setting if participants demonstrated shared understanding which Mathieu et al. (2000) suggest leads to a coordinated performance. By trying to get two players to be interviewed in a short space of time proved too difficult, as it would have extended the data collection time considerably.

6.6 Future Research

Future research projects can build on the findings of these three studies. Future projects could include position on the pitch as a factor. For instance, do defensive partnerships require a different amount of shared understanding to attackers? Eccles and Tenenbaum's (2004) findings suggested that team members are likely to have a general knowledge about the sport and specific knowledge based on their role within the team. This would be highly beneficial to improving the knowledge of how partnerships work within football. One suggestion for a future project could be to look a different or even multiple sports. The opinions of the participants of this project may be based on the sport they are performing and these could be different across different sports.

Similar methods could be used to investigate shared understanding between more than two players within a team as well (i.e. a back four in football to see if shared understanding exists between more than two team members based on their experiences performing together). This would be important to look in as based on the suggestions made by Jonker et

al. (2010), shared understanding leads to a better performance. If all players in a team are thinking similarly however, they should be able to produce a coordinated performance. This could provide evidence for shared understanding between multiple team members and positions and provide further support for research that states the importance of this between full teams (Silva et al. 2013). This would be a worthwhile future research direction since football teams have eleven players on the pitch at any one time plus numerous substitutes and reserves. In addition to the findings of these three studies, further investigation into shared understanding between more than two players can establish if this process occurs effectively across different positions. As previously suggested by Blickensderfer et al. (2010) to an outcome of shared understanding between team members, this research direction could help improve team coordination if shared understanding can be demonstrated between more players.

Comparable data collection methods could be used but tailored to a variety of different team sports. This would be an interesting line of research as the findings of the current three studies could be tested to see if these would be the same in other dyadic relationships or relationships between multiple team members in other sports teams such as basketball, rugby or hockey. Similar research methods have only been used by Blickensderfer et al. (2010) to investigate implicit coordination in dyadic relationships in tennis – through a mutual understanding. This shows that similar methods – adapted for different sports – could be used to look at similar factors in how shared understanding can lead to a coordinated team performance. This could provide a greater knowledge of the dynamics of different dyadic relationships and relationships between team members to see if the influences are similar or are even contrasting across different team sports. Through further investigation into different team sports, other factors could be discovered that contribute to the establishment or

development of shared understanding between sporting dyads. In addition, more team members within these teams, instead of just dyadic relationships could be looked at.

It would be important to consider if partners are able to make a coordinated decision as according to Mathieu et al. (2000) this is the ideal function of team members. This was considered as part of Study Two but it would be effective to determine whether players not only think similarly in the same situation but also if they can both pick coordinated actions based on what they know about one another through experience performing together. This idea could be looked at across a greater number of teams to establish team coordination.

Building on the findings of the three studies – shared understanding exists and certain specific factors that help to develop this - could possibly lead to the creation of a training program aiming to increase understanding between dyads over a shorter period of time, resulting in a reduction in 'gelling time.' As stated by Jonker et al. (2010) shared understanding could take a lot of experience performing together and since it was shown during the current studies that shared understanding existed between dyads who have experience performing together and certain factors contribute to its development between dyads, similar data collection methods can be turned into tools for developing shared understanding over a shorter period of time. This could include working through sheets, videos and interviews in order to establish the level of shared understanding between dyads. This could also be used to develop this understanding for football teams to try to improve team performance.

6.7 Overall Conclusion

In conclusion, the three studies have demonstrated the existence of shared understanding between dyads who have experience together and the findings suggest different factors that can contribute to its development between football dyads. The findings

of Studies One and Two showed that dyads who had experience performing together were able to produce higher percentages of similarity when suggesting or picking the future actions of a specific player. Blickensderfer et al's (2010) conclusions support these findings by stating that experience together is crucial for developing a shared understanding between team members. Study One also showed that defenders produced higher levels of similarity for their natural position compared to attackers and also for attacking videos, suggesting that defenders not only require specific positional knowledge to perform their role effectively, but they need to understand other player's roles as well.

Time was also found to not play an important role in the percentage of similarity for Study One but this could have been attributed to the lack of an immersive situation where decisions had to be made instantly rather than having a period of time to answer. MacMahon and Mildenhall's (2012) suggestions were not supported by the findings of this study where time pressure was not deemed an influence to the dyads' ability to make similar decisions. This possibly because there many more factors which a referee has to consider before making a decision - which are more difficult to replicate. Whereas the participants of this study work through scenarios together to practice performing in situations which are likely to occur on a regular basis.

The findings of Study Two suggest that when there is a clear and correct answer, dyads are more likely to select a correct course of action rather than be similar and have not selected the correct course of action. This data showed that dyads were just as likely to pick a coordinated decision whether or not there was a correct decision available. The results of Study Two also suggest that individual player experience was found not to be consistently correlated with percentage of similarity in game situations that had a clear correct course of action, nor was dyad experience correlated with percentage of similarity in game situations that had no clear correct course of action. This suggests that in order to make a coordinated

decision, players must have sporting knowledge as well as experience performing with their partner (Silva et al. 2013). Similar to Study One, Study Two further emphasised the importance of experience together in order to be able to demonstrate shared understanding by producing a higher percentage of similarity than those who had no experience performing together. This suggests that when paired with players they had no experience performing with; participants were unable to achieve as high percentage of similarity, which is similar to suggestions made by Blickensderfer et al. (2010) who emphasise experience, is crucial to being able to make a coordinated performance.

The findings of Study Three suggest a core theme throughout the interviews that was that partnerships are required to have a large amount of experience together in order to create a level of shared understanding of one and other's abilities. These findings support the suggestions made by Eccles and Tenenbaum (2004) and Blickensderfer et al. (2010) who both stress the importance of this process to developing shared understanding. This helps to create an environment where players were able to predict each other's actions in certain scenarios and perform their actions accordingly. According to Jonker et al. (2010), this could be because players feel they know what their partner is likely to do in a specific situation based on their experiences together. This is described as a coordinated performance and this is the ideal goal for successful sports teams Eccles and Tenenbaum (2004). Therefore, it is suggested that members of a partnership within a team sport are advised to follow these steps in order to be deemed successful and be able to work well together. However, it was also suggested that this environment led to an effective shared mental model between team members, which was also acknowledged to facilitate shared understanding.

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Appendices

Appendix One - Study 1 Ethical Approval Letter

RL/SP/CR/SHS/13/P/003

30th September 2013

Michael Malone

███████████████████

████████████

██████

████████

Dear Michael

Shared Understanding and Team Cohesion in football players

This is to notify you that the Ethics Committee have looked at your resubmission and you have been granted **full ethical approval** to collect data for your project as entitled above. This is subject to the following standard conditions:

i   You must remain in regular contact with your project supervisor

ii   Your supervisor must see a copy of all experimental materials and your procedure prior to commencing data collection

iii   If you make any substantive changes to your project plan, you must submit a new ethical approval application to the Committee. Application forms and the accompanying explanatory document are on the Intranet. Completed forms should be handed in to the School Office, School of Social and Health Sciences, Level 5, Kydd Building, Dundee

iv   Any changes to the procedures must be negotiated with your supervisor

The Committee also asked you to consider the following:

For future submissions, please give a little more information on your participants (gender, specific inclusion/exclusion criteria). Also, please detail how your participants will be recruited. You say that they "will be approached". This is not sufficient information to determine if they are being approached in an ethical way.

Please confirm with the ethics committee exactly how you will recruit your participants.

Please add your supervisor's contact details to all information and advertising sheets/communications.

Failure to comply with these conditions will result in your ethical approval being revoked by the Ethics Committee.

Should you have any queries please contact your Supervisor.

Yours sincerely

School Ethics Committee

School of Social and Health Sciences

Player's decision making in football

1.   Invitation

You are being invited to take part in this research study to look at the level of understanding between football partnerships. You are being selected as you are either a football player with experience playing in a defensive or attacking partnership. There are no other criteria for your selection other than you being aged 18 or above, and being able to freely consent to participation.

Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information sheet carefully, and discuss it with others if you wish. Ask us if there is anything that is not clear, or if you would like more information. Take time to decide whether or not you wish to take part.

2.   What is the purpose of the study?
The purpose of this study is to investigate the level of understanding of different defensive and attacking football partnerships. This includes knowing what you and your partner are thinking during different scenarios and being able to make joint decisions in a short period of time.

3.   Do I have to take part?

No. It is up to you to decide whether or not to take part.   If you have decided to take part, you have been given this information sheet to keep and will be asked to sign a consent form to confirm that you understand what is involved when taking part in this study. If you decide to take part, you are free to leave the study at any time and without giving a reason.

3.   What will happen to me if I take part?

If you are an in a defensive or attacking partnership, you and your partner will be asked to give up a maximum of sixty minutes of your time to attend a venue which can be arranged to suit you. All participants will be given six tactics sheets and they will look at where the ball is on the pitch and state where they believe their positions should be if they were a defender or an attacker in this situation during a game. Two different positions (one attacker and one defender) will be looked at and dyads will be asked to discuss where they should position themselves during each part of the attacking play and what they are thinking and feeling in a relaxed setting without a time limit. After this stage has been completed, you will be asked to watch a maximum of four short videos of a period of football which mirrors the tactics sheets which were used in the first part of this project. The only difference in this stage is that you will only have a short period of time thirty seconds to write all this information down

between each part of the videos. The videos will be viewed two different times, once looking at a specific defensive player and once concerned with a single attacking player.

5.   What are other possible disadvantages and risks of taking part?

All procedures have been risk assessed and their no risks to your health. Your data will also be anonymous and will be kept secured at all times. You will not be identified in any report or publication.

6.   What if there is a problem?

If you have a concern about any aspect of this study, you should ask to speak with the researchers who will do their best to answer your question. You are free to leave the study at any time and without giving a reason.

7.   Will my taking part be kept confidential?

All the information about your participation in this study will be kept confidential. Only the investigators will have access to your name and contact details which will be kept on a password protected computer for 5 years to comply with legislation. The information you provide will be anonymous and audio recordings and transcripts will be either kept on password protected computers or in locked filing cabinets.

Yes. All the information about your participation in this study will be kept confidential.

8.   What will happen to the results of this study?

The results of the study will be available after it finishes. They may be published in a scientific journal or presented at a scientific conference. The data will be anonymous and you will not be identified in any report or publication. Should you wish to see the results of the study, or the publication, please let us know and we will arrange to provide you with these.

9.   Who is organising and funding this study?

This is a University of Abertay Dundee led study.

10.   Contact for further information

You are encouraged to ask any questions you wish, before, during or after the study. Should you have any queries or concerns at any time please contact myself – Michael Malone ███████ ███████████████████████).

This project has been reviewed and approved by the Research Ethics Committee of the
School of Social and Health Sciences

Appendix Three - Study 1 Informed Consent Form

The purpose and details of this study have been explained to me. I understand that this study is designed to further scientific knowledge and that the University of Abertay Dundee has approved all procedures.

☐   I have read and understood all information provided and this consent form.

☐   I have had an opportunity to ask questions about my participation.

☐   I understand that I am under no obligation to take part in the study.

☐   I understand that I have the right to withdraw from this study at any stage for any reason, and that I will not be required to explain my reasons for withdrawing.

☐   I understand that all the information I provide will be treated in strict confidence.

☐   I agree to participate in this study.

Your name

_____

Your signature

_____

Signature of investigator

_____

Date

_____

Appendix Four - Study 1 Personal Details Form

Player Number	Team Code	Partner Number

Date of Birth: _____

Position: _____

Time Playing Football: _____
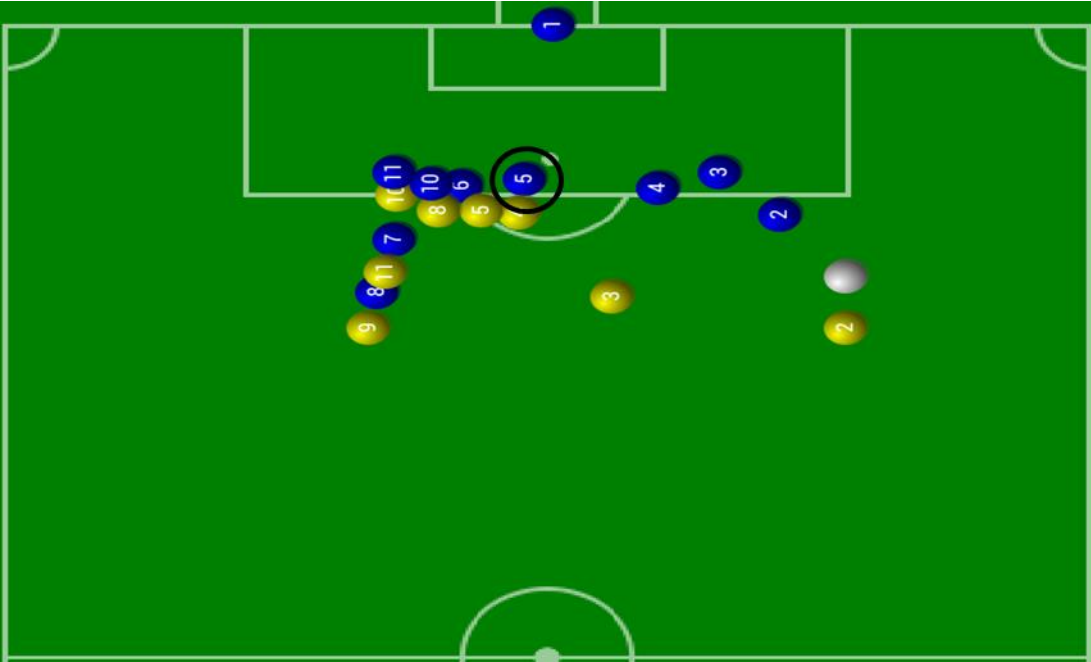
Time Playing with Current Team: _____

 Time Playing with Current Partner: _____

Number of months performing at this level: _____

Frequency of Training Sessions: _____

Length of Training Sessions: _____

Appendix Five - Study 1 Example Tactical Sheet

Thoughts:	
Feelings:	
Actions:	

Appendix Six - Study 1 Example Video Answer Sheet

Thoughts:	
Feelings:	
Actions:	

Thoughts:	
Feelings:	
Actions:	

Thoughts:	
Feelings:	
Actions:	

Thoughts:	
Feelings:	
Actions:	

Appendix Seven - Study 2 Expert Coach Information Sheet

Abertay
University

The role of shared understanding in decision making in Football

1.   Invitation

You are being invited to take part in this research study to look at the level of understanding between football partnerships. You are being selected as you are either a football player with experience playing in a defensive partnership or an expert coach with experience managing or coaching football players. There are no other criteria for your selection other than you being aged sixteen or above, and being able to freely consent to participation. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information sheet carefully, and discuss it with others if you wish. Ask us if there is anything that is not clear, or if you would like more information. Take time to decide whether or not you wish to take part.

4.   What is the purpose of the study?
The focus of the research project which will be looked at involves the effect of shared understanding on a footballer's decision making ability. This includes knowing what you and your partner are thinking during different scenarios and being able to make joint decisions in a short period of time.

3.   Do I have to take part?

No. It is up to you to decide whether or not to take part.   If you have decided to take part you have been given this information sheet to keep and will be asked to sign a consent form to confirm that you understand what is involved when taking part in this study. If you decide to take part you are free to leave the study at any time and without giving a reason.

4.   What will happen to me if I take part?

Each participant will be asked to answer a series of questions based on a theoretical scenario based on a tactics map. These scenarios were designed by the preliminary researcher and were then given to a total of six expert coaches and players. Participants will be asked to rank the next actions of a designated player if they were in that situation from one to three with one being the best option and three as the worst option. You will also be asked to choose from another three options of what your partner would be doing at the same time. The same scenarios will be used with all participants and will last approximately fifteen minutes each.

5.   What are other possible disadvantages and risks of taking part?

All procedures have been risk assessed and their no risks to your health. Your data will also be anonymous and will be kept secured at all times. You will not be identified in any report or publication.

6.   What if there is a problem?

If you have a concern about any aspect of this study, you should ask to speak with the researchers who will do their best to answer your question. You are free to leave the study at any time and without giving a reason.

7.   Will my taking part be kept confidential?

Yes. All the information about your participation in this study will be kept confidential. All the information about your participation in this study will be kept confidential. Only the investigators will have access to your name and contact details which will be kept on a password protected computer for 5 years to comply with legislation. The information you provide will be anonymous and audio recordings and transcripts will be either kept on password protected computer or in locked filing cabinets.

8.   What will happen to the results of this study?

The results of the study will be available after it finishes. They may be published in a scientific journal or presented at a scientific conference. The data will be anonymous and you will not be identified in any report or publication. Should you wish to see the results of the study, or the publication, please let us know and we will arrange to provide you with these.

9.   Who is organising and funding this study?

This is an Abertay University led study.

10.   Contact for further information

You are encouraged to ask any questions you wish, before, during or after the study. Should you have any queries or concerns at any time please contact me – ██████████ ████████████████████ or my supervisor Dr. Ross Lorimer ██████████████████████).

This project has been reviewed and approved by the Research Ethics Committee of the
School of Social and Health Sciences

Appendix Eight - Study 2 Ethical Approval Letter

Project Title: **The role of shared understanding in decision making in Football**

Project Reference Number: SHS-14-P-006

Supervisor: R. Lorimer

Dear Michael

You have been granted Conditional Approval with additional conditions to the standard conditions, as specified below for the above project.

Standard Conditions:

i   You must remain in regular contact with your project supervisor.

ii   Your supervisor must see a copy of all materials and your procedure prior to commencing data collection.

iii   If you make any substantive changes to your proposed project, you must submit a new ethical approval application to the Committee. Application forms and the accompanying explanatory document are on the Intranet. Completed forms should be resubmitted through the Research Ethics Blackboard course.

iv   Any changes to the agreed procedures must be negotiated with your supervisor.

Additional Conditions:

Please remove your personal mobile number from the participant information sheet.

Failure to comply with these conditions will result in your ethical approval being revoked by the Ethics Committee.

Should you have any queries please contact your Supervisor.

Yours sincerely

Research Ethics Committee

School of Social and Health Sciences

The UK's first national centre for excellence in computer games education

The University of Abertay Dundee is a charity registered in Scotland, no. SC016040

Appendix Nine - Study 2 Participant Information Sheet

The role of shared understanding in decision making in Football

1.   Invitation

You are being invited to take part in this research study to look at the level of understanding between football partnerships. You are being selected as you are either a football player with experience playing in a defensive partnership. There are no other criteria for your selection other than you being aged sixteen or above, and being able to freely consent to participation. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information sheet carefully, and discuss it with others if you wish. Ask us if there is anything that is not clear, or if you would like more information. Take time to decide whether or not you wish to take part.

5.   What is the purpose of the study?
The focus of the research project which will be looked at involves the effect of shared understanding on a footballer's decision making ability. This includes knowing what you and your partner are thinking during different scenarios and being able to make joint decisions in a short period of time.

3.   Do I have to take part?

No. It is up to you to decide whether or not to take part.   If you have decided to take part, you have been given this information sheet to keep and will be asked to sign a consent form to confirm that you understand what is involved when taking part in this study. If you decide to take part, you are free to leave the study at any time and without giving a reason.

4.   What will happen to me if I take part?

Each participant will be asked to answer a series of questions based on a theoretical scenario based on a tactics map. These scenarios were designed by the preliminary researcher and were then given to a total of six expert coaches and players. Participants will be asked to rank the next actions of a designated player if they were in that situation from one to three with one being the best option and three as the worst option. You will also be asked to choose from another three options of what your partner would be doing at the same time. The same scenarios will be used with all participants and will last approximately fifteen minutes each.

5.   What are other possible disadvantages and risks of taking part?

All procedures have been risk assessed and their no risks to your health. Your data will also be anonymous and will be kept secured at all times. You will not be identified in any report or publication.

6.   What if there is a problem?

If you have a concern about any aspect of this study, you should ask to speak with the researchers who will do their best to answer your question. You are free to leave the study at any time and without giving a reason.

7.   Will my taking part be kept confidential?

Yes. All the information about your participation in this study will be kept confidential. All the information about your participation in this study will be kept confidential. Only the investigators will have access to your name and contact details which will be kept on a password protected computer for 5 years to comply with legislation. The information you provide will be anonymous and audio recordings and transcripts will be either kept on password protected computer or in locked filing cabinets.

8.   What will happen to the results of this study?

The results of the study will be available after it finishes. They may be published in a scientific journal or presented at a scientific conference. The data will be anonymous and you will not be identified in any report or publication. Should you wish to see the results of the study, or the publication, please let us know and we will arrange to provide you with these.

9.   Who is organising and funding this study?

This is an Abertay University led study.

10.   Contact for further information

You are encouraged to ask any questions you wish, before, during or after the study. Should you have any queries or concerns at any time please contact myself – Michael Malone
███████████████████████████ or my supervisor Dr. Ross Lorimer
███████████████████████).

This project has been reviewed and approved by the Research Ethics Committee of the
School of Social and Health Sciences

Appendix Ten - Study 2 Informed Consent Form

The purpose and details of this study have been explained to me. I understand that this study is designed to further scientific knowledge and that Abertay University have approved all procedures.

☐   I have read and understood all information provided and this consent form.

☐   I have had an opportunity to ask questions about my participation.

☐   I understand that I am under no obligation to take part in the study.

☐   I understand that I have the right to withdraw from this study at any stage for any reason, and that I will not be required to explain my reasons for withdrawing.

☐   I understand that all the information I provide will be treated in strict confidence.

☐   I agree to participate in this study.

Your name

_____

Your signature

_____

Signature of investigator

_____

Date

_____

Appendix Eleven - Study 2 Participant Details Sheet

Personal Details	Team Code:
Sex	Male/Female
Date of Birth	
Number of Years Performing in The Sport	
Current Position	
Level of Current Performance	Recreational/Youth/Amateur/Junior/Professional
Amount of Time Performing at This Level	
Time Performing with Current Team	
Time Performing with Current Partner	
Partner's Position	

Appendix Twelve - Study 2 Example Tactical Sheet

The ball is coming high in the air towards **Orange no. 4** straight from **opposition No. 1's** drop kick.

Your Player – Orange No. 4	Rating 1st, 2nd or 3rd	Your Partner – Orange No. 5	Rating 1st, 2nd or 3rd
‧ You header the ball to No. 9.		‧ Keep an eye on opposition No. 9, step closer to No. 4 to provide cover.	
‧ Play ball to No. 2 then up to No. 9.		‧ Stand your ground and wait for No. 1 to collect the ball.	
‧ Let No. 1 collect the ball.		‧ Keep an eye on opposition No. 9, maintain shape and push up as a unit.	

Appendix Thirteen - Study 3 Interview Schedule

Part 1 - Demographic Information

1. How long have you been playing football?
2. During your time playing football, what positions have you played and what is your current position?
3. What teams have you played for and at what level? (Amateur, Junior, Semi Professional, Professional)

Part 2 – Narrative

4. In your current position are there players you regularly work with (a fellow striker or defender?)
5. Can you tell me what it was like when you first started training with that player(s)?
6. How did you perform as a team during your first game and why do you think this was the case?
7. How do you think your ability to work together has changed over time?
8. Are there any specific factors which you think have influenced this? (Communication, Coordination, Relationship quality, Personal knowledge)
9. What is it like when you play together now?
10. Would you say this has improved and if so how? (Coordination)
11. How do you see this developing in the future?

Part 3 – Perception of Shared Understanding

12. Can you give me an example of when you and a teammate have worked particularly well on the pitch?
13. Can you give me an example of when you and a teammate have worked particularly badly on the pitch?
14. How do you think players are able to coordinate their playing on the pitch?
15. How do players know where/who to pass the ball to and where they are supposed to be at any one time?
16. What do you think about the concept of a shared mental model (explain concept to interviewee)?
17. What do you think would be the most effective way of training players to work effectively together?

Appendix Fourteen - Study 3 Ethical Approval Letter

SP/DHS/CR/SHS/14/P/006

6th November 2014

Michael Malone

██████████████████

████████████

██████

████████

Dear Michael

This is to notify you that **conditional approval** has been granted for you to collect data for your project entitled **'*The role of shared understanding in decision making in Football* ',** but is subject to the following conditions:

You must remain in regular contact with your project supervisor

Your supervisor must see a copy of all research tools and your procedure ***prior to commencing data collection.***

If you make any substantive changes to your project plan you must submit a new ethical approval application to the committee. Application forms and the accompanying explanatory document are on the Intranet. Completed forms should be handed in to the School Office, School of Social and Health Sciences, Level 5, Kydd Building.

The Ethics Committee also raised the following points:

Please provide more detail on how you will "approach" participants to recruit them – voluntarism must be demonstrated.

Only a minor point, but some of your proposal is written in the past tense, suggesting the work has already been carried out. In future submissions, please ensure future tense language is used.

The "what will happen if I take part" section of the participant information sheet again shifts between past and future tense, and is not written in a particularly lay/user friendly way. Please re-write this section and remember this for future submissions.

There is repetition of questionnaires in the proposal. For future submissions, only include information once.

Please add your supervisor's contact details to all participant recruitment and information documents.

Failure to comply with these conditions will result in your ethical approval being revoked by the Ethics Committee.

I would be grateful if you could contact Mrs ▮▮▮▮▮▮▮▮▮ in the School Office on ▮▮▮▮▮▮▮▮▮▮▮▮▮ as soon as possible to advise that you accept the conditions stated.

Should you have any queries please contact your supervisor.

Yours sincerely

School Ethics Committee

School of Social and Health Sciences

The role of shared understanding in decision making in Football

1.   Invitation

You are being invited to take part in this research study to look at the level of understanding between football partnerships. You are being selected as you are either a football player with experience playing in a defensive or attacking partnership. There are no other criteria for your selection other than you being aged 16 or above, and being able to freely consent to participation.

Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information sheet carefully, and discuss it with others if you wish. Ask us if there is anything that is not clear, or if you would like more information. Take time to decide whether or not you wish to take part.

6.   What is the purpose of the study?
The purpose of this study is to investigate the level of understanding of different defensive and attacking football partnerships. This includes knowing what you and your partner are thinking during different scenarios and being able to make joint decisions in a short period of time.

3.   Do I have to take part?

No. It is up to you to decide whether or not to take part.   If you have decided to take part, you have been given this information sheet to keep and will be asked to sign a consent form to confirm that you understand what is involved when taking part in this study. If you decide to take part, you are free to leave the study at any time and without giving a reason.

4.   What will happen to me if I take part?

If you are in a defensive or attacking partnership, you and your partner will be asked to give up a maximum of sixty minutes of your time to attend a venue which can be arranged to suit you. All participants will be asked a series of questions looking at perceptions of how each dyad member sees the relationship and how they believe the partnership functions will be investigated. These questions will look to identify each player's perceptions in regards to its quality and practicality of the relationship. The questions are centred on the participant's time and experiences playing football with your current partner and how well you feel you work together and this will last at most an hour.

5.   What are other possible disadvantages and risks of taking part?

All procedures have been risk assessed and their no risks to your health. Your data will also be anonymous and will be kept secured at all times. You will not be identified in any report or publication.

6.   What if there is a problem?

If you have a concern about any aspect of this study, you should ask to speak with the researchers who will do their best to answer your question. You are free to leave the study at any time and without giving a reason.

7.   Will my taking part be kept confidential?

All the information about your participation in this study will be kept confidential. Only the investigators will have access to your name and contact details which will be kept on a password protected computer for 5 years to comply with legislation. The information you provide will be anonymous and audio recordings and transcripts will be either kept on password protected computers or in locked filing cabinets.

Yes. All the information about your participation in this study will be kept confidential.

8.   What will happen to the results of this study?

The results of the study will be available after it finishes. They may be published in a scientific journal or presented at a scientific conference. The data will be anonymous and you will not be identified in any report or publication. Should you wish to see the results of the study, or the publication, please let us know and we will arrange to provide you with these.

9.   Who is organising and funding this study?

This is a University of Abertay Dundee led study.

10.   Contact for further information

You are encouraged to ask any questions you wish, before, during or after the study. Should you have any queries or concerns at any time please contact myself – Michael Malone ▮▮▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮

This project has been reviewed and approved by the Research Ethics Committee of the School of Social and Health Sciences

Appendix Sixteen - Study 3 Informed Consent Form

The purpose and details of this study have been explained to me. I understand that this study is designed to further scientific knowledge and that the University of Abertay Dundee has approved all procedures.

☐   I have read and understood all information provided and this consent form.

☐   I have had an opportunity to ask questions about my participation.

☐   I understand that I am under no obligation to take part in the study.

☐   I understand that I have the right to withdraw from this study at any stage for any reason, and that I will not be required to explain my reasons for withdrawing.

☐   I understand that all the information I provide will be treated in strict confidence.

☐   I agree to participate in this study.

Your name

_____

Your signature

_____

Signature of investigator

_____

Date

_____