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## An examination of the relationship between athlete leadership and cohesion using social network analysis

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### ABSTRACT

Two studies investigated the structure of different athlete leadership networks and its relationship to cohesion using social network analysis. In Study 1, we examined the relationship between a general leadership quality network and task and social cohesion as measured by the Group Environment Questionnaire (GEQ). In Study 2, we investigated the leadership networks for four different athlete leadership roles (task, motivational, social and external) and their association with task and social cohesion networks. In Study 1, the results demonstrated that the general leadership quality network was positively related to task and social cohesion. The results from Study 2 indicated positive correlations between the four leadership networks and task and social cohesion networks. Further, the motivational leadership network emerged as the strongest predictor of the task cohesion network, while the social leadership network was the strongest predictor of the social cohesion network. The results complement a growing body of research indicating that athlete leadership has a positive association with cohesion.

### ARTICLE HISTORY

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### KEYWORDS

Athlete leadership; cohesion; leadership; social network analysis

Athlete leadership is defined as an athlete occupying a formal or informal role within a team, who influences group members to achieve a common goal or objective (Loughead, Hardy, & Eys, 2006). Contained within this definition are two types of athlete leaders based on their status within the team. First, there are formal athlete leaders who are formally designated as leaders by the team, such as team captains and assistant captains. The second type refers to informal athlete leaders – individuals who emerge as leaders by interacting with other team members. While athlete leadership research is in its infancy (Loughead, Munroe-Chandler, Hoffmann, & Duguay, 2014), the research that has been conducted to date highlights its importance to effective team functioning.

To date, research examining athlete leadership can be classified into three main categories – the characteristics and attributes of athlete leaders, the quantity of athlete leaders within teams and the behaviours exhibited by athlete leaders. Research examining the characteristics and attributes has shown that athlete leaders are high in ability (Yukelson, Weinberg, Richardson, & Jackson, 1983), play in central positions (Glenn & Horn, 1993), possess certain personality characteristics such as being assertive, confident, friendly, nurturing, organised and responsible (Glenn & Horn, 1993), and generally are well liked by their teammates (Tropp & Landers, 1979). As for the quantity of athlete leaders, research findings are fairly consistent that there are numerous athletes fulfilling leadership roles ranging from 56% (Fransen, Vanbeselaere, De Cuyper, Vande Broek, & Boen, 2014) to 66% (Loughead & Hardy, 2005) of athletes on teams. Lastly,

the majority of research investigating athlete leadership has examined the leadership behaviours exhibited by formal and/or informal leaders in relation to various constructs. In particular, research has shown that an increase in athlete leadership behaviours has been positively associated to an increase in team cohesion (Callow, Smith, Hardy, Arthur, & Hardy, 2009; Paradis & Loughead, 2012; Vincer & Loughead, 2010), satisfaction (Paradis & Loughead, 2012), intra-team communication (Smith, Arthur, Hardy, Callow, & Williams, 2013), enjoyment, intrinsic motivation (Price & Weiss, 2013) and collective efficacy and team identification (Fransen et al., 2014, 2015). In sum, this body of knowledge clearly highlights that athlete leadership is shared amongst numerous athletes within teams (Fransen et al., 2014, 2015a; Loughead et al., 2014).

As can be seen above, athlete leadership has been positively associated to various team dynamics variables. In the organisational setting, several authors (e.g., Guzzo, Yost, Campbell, & Shea, 1993; Zaccaro, Blair, Peterson, & Zazanis, 1995) have noted that leadership is an important antecedent to building a group's collective confidence and cohesion. In fact, some researchers have long considered cohesion as the most important small group variable (Golembiewski, 1962; Lott & Lott, 1965). Further, the importance of cohesion in the study of sport teams has long been recognised by group dynamics researchers (e.g., Carron & Eys, 2012). Cohesion is defined as "a dynamic process that is reflected in the tendency for a group to stick together and remain united in the pursuit of its instrumental objectives, and/or for the satisfaction of member affective needs" (Carron, Brawley, & Widmeyer,

1998, p. 213). Inherent in this definition is the notion that cohesion is a key variable in terms of group formation, maintenance and productivity.

Given the importance of team chemistry and to help guide research in the area, Carron (1982) and Carron and Eys (2012) advanced a conceptual model for the study of cohesion in sport. The model is a linear framework comprised of inputs, throughputs and outputs. The inputs are viewed as the antecedents of cohesion and are comprised of four categories. The first antecedent is labelled *environmental factors*, which consists of both contractual responsibilities (e.g., eligibility and contract demands) as well as organisational orientations (e.g., the goals of the organisation). The second antecedent is labelled *personal factors*, which includes constructs such as individual motivation (e.g., task affiliation and self-motivation), individual satisfaction and individual differences (e.g., race). The third antecedent influencing cohesion is *team factors* and consists of such variables as group orientation, group productivity norms, team stability and desire for group success. The last antecedent impacting the development of cohesion is *leadership factors*, which refers to the behaviours, characteristics, attitudes and cognitions of leaders. While not a focus of the current study, the conceptual model also highlights the importance of the outputs viewed as consequences related to cohesion. Carron noted that the consequences of cohesion could be related to individual outcomes such as personal satisfaction, role clarity, individual performance and conformity. Conversely, team outcomes could also be examined that include but are not limited to aspects such as team performance, team stability, team satisfaction and collective efficacy.

The central component of Carron's (1982) conceptual model is the throughput of cohesion. The definition of cohesion presented earlier in the current paper highlights the multidimensionality of cohesion. Carron, Widmeyer, and Brawley (1985) noted that cohesion's multidimensionality could be examined from an individual or group and task or social perspective. The individual-group distinction assumes that each team member has thoughts about both the cohesiveness of the team as a whole, as well as their own individual perceptions of their team. The task-social distinction reflects the notion that team members can be interested in the achievement of the goals of the team and/or in the development and maintenance of social relationships within the group. Taken together, Carron et al.'s conceptualisation of cohesion is comprised of four separate but related dimensions: individual attractions to the group-task (i.e., the individual-group member's perceptions of his/her personal involvement in task aspects of the team), individual attractions to the group-social (i.e., the individual-group member's perceptions of his/her involvement in social aspects of the team), group integration-social (i.e., the individual-group member's perceptions concerning the degree of unity the team possesses around social aspects) and group integration-task (i.e., the individual-group member's perceptions concerning the degree of unity the team possesses in relation to task aspects). However, it should be highlighted that there has been some debate about the usefulness of examining perceptions of "individual attractions to the group" in cohesion research. It is well beyond the scope of the current study to provide a comprehensive overview of this issue (for a discussion, see

Carless, 2000; Carron & Brawley, 2000; Dion, 2000). Despite this debate, Carron, Brawley, and Widmeyer (2002) noted that composite task and social cohesion scores could be used depending on the nature of the research question. That is, there are circumstances where the research question requires insight on task and/or social cohesion in general (Carron et al., 2002). The approach taken in the present study was to focus on task and social cohesion from a general perspective as it allowed for generalisability between the two studies undertaken in the current paper. Thus the decision was made to utilise summated scores reflecting task and social cohesion.

While it could be argued that all of the antecedents (i.e., environmental, personal, team and leadership) are important in terms of their relationship to cohesion, the present study focused on the association between leadership and cohesion. Leadership was selected since it is a variable closely related to group effectiveness (Carron & Eys, 2012). Similarly, a survey of US Olympic coaches revealed that two of the most important team-related variables influencing athlete performance were cohesion and strong team leadership (Gould, Guinan, Greenleaf, & Chung, 2002). There are different sources of team leadership within sport teams with coaches being one of the most obvious. However, athletes are also an essential and critical source of leadership within teams (Price & Weiss, 2013). The importance of athlete leadership was noted by Fransen et al. (2014) when these authors proposed that athlete leaders fulfilled numerous roles within the team environment. Consequently, the present study utilised Fransen et al.'s classification concerning the leadership roles of athletes. Specifically, this athlete leadership categorisation encompasses two on-field leadership roles (i.e., task and motivational leadership) and two off-field leadership roles (i.e., social and external leadership). Task athlete leadership is performed by those individuals who take charge on the field, help the team to focus on its goals and provide tactical guidance during games. Motivational athlete leadership is conducted by those who encourage teammates during competition, and lift the spirits of teammates who are discouraged. Social athlete leadership is accomplished by those who promote good relationships between teammates, promote a good team atmosphere off the field, and are trusted by teammates. External athlete leadership is carried out by those who serve as a liaison between the team and the external environment, representing the team at functions such as meetings, press conferences, community events and team receptions.

Taken together research examining athlete leadership and its relationship to various correlates (e.g., cohesion and satisfaction) has typically used questionnaires that focus on the attitudes of team members about the team as a whole. However, researchers should equally be concerned about dyadic relations between team members (Lusher, Robins, & Kremer, 2010). In order to do so, it is important to utilise alternative measurement tools that provide a different perspective and an innovative method to evaluate team dynamics variables such as cohesion and leadership (Warner, Bowers, & Dixon, 2012). One such tool is social network analysis that provides insight into the structure (e.g., cohesion) and hierarchies among players (e.g., athlete leadership), in particular dyadic relationships between athletes. That is, social network analysis is a technique that focuses on the relations (ties) between

entities (nodes) in a specific network (Wasserman & Faust, 1994). In the case of sport, social network analysis would utilise a roster-based adjacency matrix in which the  $(ij)$  cell refers to the presence or the strength of the relation between node  $i$  (e.g., Athlete A) and node  $j$  (Athlete B). The term relation does not necessarily refer to a social relation but could be widely interpreted and depends on the context. For example, in a sport context it can refer to leadership evaluation (e.g., a rating of leadership quality that Athlete A gives to Athlete B). It is important to note that these networks can be symmetric (e.g., being a member of a sport team), in which the relation between Athlete A and Athlete B is always equal to the relation between Athlete B and Athlete A. In contrast, networks can also be directed (e.g., leadership), in which the relation between Athlete A and Athlete B (e.g., the extent to which Athlete A is viewed as providing leadership by Athlete B) is not necessarily equal to the relation between Athlete B and Athlete A (e.g., the extent to which Athlete B is viewed as providing leadership by Athlete A). The latter type of network relation was utilised in the present study.

The purpose of the present study was to examine the structure of different athlete leadership networks and its relationship to cohesion. This purpose was accomplished through two studies. In Study 1, the relationship between a general leadership network, measured using social network analysis, and task and social cohesion, as measured by the Group Environment Questionnaire (GEQ; Carron et al., 1985), was investigated. It was hypothesised that there would be significant positive correlations between the general leadership network and the measures for task cohesion (H1a) and social cohesion (H1b). In other words, the greater the perceived general athlete leadership within each team, the stronger the task and social cohesion would be in the team. In Study 2, the leadership networks for four different athlete leadership roles (i.e., task, motivational, social and external) and their association with task and social cohesion were examined using social network analysis. Similarly, it was expected that there would be positive correlations between the four leadership networks and the two cohesion networks (H2a). Further, it was expected that the task leadership network would be the strongest predictor of the task cohesion network (H2b). In other words, if an athlete perceived one of his/her teammates as providing quality task leadership, then this player would also feel strongly cohesive with this teammate with regard to achieving the team's goals and objectives. Furthermore, it was expected that the social leadership network would be the strongest predictor of the social cohesion network (H2c). In other words, if a player perceived one of his/her teammates as providing quality social leadership, then this player would also feel cohesive with this teammate with regard to maintaining good social relationships within the team.

## Methods

### Study 1

#### Participants

A total of 35 sport teams participated in the first study (8 volleyball, soccer and basketball teams, and 11 handball teams) from Flanders, Belgium, competing at the regional, provincial or

national levels. To conduct a social network analysis, it is required to have high response rates (Kossinets, 2006; Wasserman & Faust, 1994). For 10 of the teams sampled in the current study, we had a response rate of less than 75% of the team's roster (i.e., some players did not attend the training session at the time when the questionnaires were completed). When there was less than 75% completion rate, these teams were removed from the data set. This approach has been used in previous research (Sparrowe, Liden, Wayne, & Kraimer, 2001). The rationale for removing teams with less than 75% completion rate allowed for the testing of hypotheses, which was based on a whole-network approach that samples the majority of the network. The 25 remaining teams included six soccer teams (three male teams and three female teams), seven volleyball teams (four male teams and three female teams), six basketball teams (four male teams and two female teams) and six handball teams (four male teams and two female teams). In total, there were 308 players that participated in Study 1 with an average age of 24.9 years ( $SD = 7.5$ ), on average 15.7 years of experience in their sport ( $SD = 7.0$ ) of which 6.5 years ( $SD = 7.2$ ) with their current team and 2.3 years ( $SD = 2.5$ ) with their current coach.

#### Measures

**General leadership.** Each participant was asked to rate the general leadership quality of each teammate on a 5-point Likert scale, ranging from 0 (*very poor leadership*) to 4 (*very good leadership*). In particular, each participant was presented with the following statement: "Please rate the extent to which each teammate provided you with quality leadership". For each team, this resulted in an  $N \times N$  adjacency matrix, in which the  $ij$ th entry referred to the leadership rating of member  $j$ , rated by member  $i$ . In other words, Athlete A could perceive Athlete B as a good leader, but Athlete B would not necessarily perceive Athlete A as a good leader. In turn, this adjacency matrix referred to a finite  $N \times N$  social network with directed relations that referred to the rating of general leadership that team members gave each other.

**Cohesion.** Cohesion was assessed using the GEQ (Carron et al., 1985), an 18-item inventory that measures four dimensions of cohesion. The individual attractions to the group-task dimension contain four items and examine an individual team member's feelings about his/her personal involvement with the group's task, goals and productivity. An example item is: "I'm happy with how much my team wants to win". The individual attractions to the group-social dimension consist of five items and assess an individual's feeling about his/her acceptance and social interaction with the group. An example item is: "Some of my best friends are on this team". The group integration-task dimension is comprised of five items and assesses a team member's feelings about the similarity and closeness within the team as a whole around the group's task. An example item is: "Our teammates have different goals for how we want the team to play". Finally, the group integration-social dimension consists of four items and examines a team member's feelings about the similarity and closeness of the group in regards to their social matters. An example item is: "Our team would like to spend time together in the off season". All items are scored on a 9-point Likert scale anchored at

**Table 1.** Means, standard deviations, correlations and Cronbach  $\alpha$ 's for Study 1.

Variable	<i>M</i>	<i>SD</i>	1.	2.
1. Task cohesion	6.39	1.31	<i>(.86)</i>	
2. Social cohesion	6.35	1.39	.63*	<i>(.88)</i>
3. Density of general leadership quality network	1.92	.22	.58*	.60*

\* $P < .01$ .

The values in italics represent the Cronbach alphas.

1 (*strongly disagree*) and 9 (*strongly agree*). Twelve of the 18 items are negatively worded, and thus were reversed scored prior to data analysis. As noted earlier, a decision was made to utilise composite scores by combining the two task cohesion dimensions (individual attractions to the group-task and group integration-task) and the two social dimensions (individual attractions to the group-social and group integration-social) to form measures reflecting task and social cohesion (see Table 1 for Cronbach  $\alpha$  values).

## Study 2

### Participants

A total of 24 sport teams different than those in the first study participated in Study 2 (eight soccer teams, eight volleyball teams and eight basketball teams) from Flanders, Belgium competing at the regional, provincial or national levels. Based on the cut-off criteria of 75% for the response rate per team, three teams were removed from the data set. The 21 remaining teams included seven soccer teams, eight volleyball teams and six basketball teams. There was a gender balance across the different sports (with the exception of soccer in which four male teams and three female teams participated). This resulted in a total of 267 athletes participating in Study 2 who had an average age of 24.3 years ( $SD = 4.9$ ), 14.9 years of experience in their sports ( $SD = 5.8$ ) of which 3.7 years ( $SD = 3.4$ ) with their current team and 2.1 years ( $SD = 1.7$ ) with their current coach.

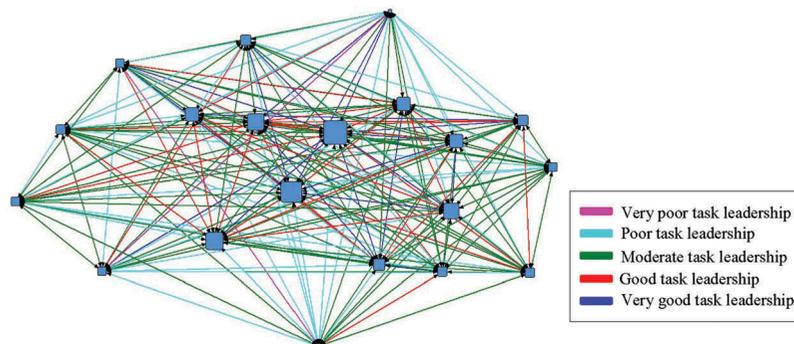
### Measures

**Task leadership.** The same procedure was used as in Study 1 where each participant rated the quality of leadership provided by each teammate (whose names were provided to each participant). Prior to rating each teammate, the participants read the following definition from Fransen et al. (2014, p. 4) to describe task leadership: "Task leaders are those in

charge on the field; they help the team to focus on the goals and help in tactical decision-making. Furthermore, task leaders give teammates tactical advice during the game and help to adjust them if necessary." Players had to rate each teammates' task leadership quality on a 5-point Likert scale, ranging from 0 (*very poor task leadership*) to 4 (*very good task leadership*). Specifically, each participant was presented with the following statement: "Please rate the extent to which each teammate provided you with quality task leadership". This procedure resulted in a finite  $N \times N$  task leadership network for each team. This network had directed relations, which referred to the rating of task leadership that team members gave each other. For instance, Figure 1 graphically represents an example of a task leadership network. In particular, this figure visually depicts how each teammate rated the task leadership quality of every team member. Those team members with larger nodes were rated as providing higher quality task leadership. In contrast, team members providing lower quality task leadership are represented by smaller nodes in the figure.

**Motivational leadership.** From Fransen et al. (2014, p. 4), motivational leadership was defined as follows: "Motivational leaders are individuals on the field who encourage teammates to go to any extreme; these leaders also support teammates who are discouraged. In short, these types of leaders steer all the emotions on the field in the right direction in order to perform optimally as a team." Players rated the quality of motivational leadership of each teammate on a 5-point Likert scale, ranging from 0 (*very poor motivational leadership*) to 4 (*very good motivational leadership*). In particular, each participant was presented with the following statement: "Please rate the extent to which each teammate provided you with quality motivational leadership". This procedure resulted in a finite  $N \times N$  motivational leadership network for each team. This network had directed relations, which referred to the rating of motivational leadership that team members gave each other.

**Social leadership.** From Fransen et al. (2014, p. 4), social leadership was defined as follows: "Social leaders have a leading role off the field; these people promote good relations within the team and help to establish a good team atmosphere (e.g., in the dressing room, in the cafeteria or during social team activities). Furthermore, these leaders help with

**Figure 1.** An example of a task leadership network.

conflicts between teammates off the field. These types of leaders are good listeners and are trusted by their teammates." Players rated the quality of social leadership of each teammate on a 5-point Likert scale, ranging from 0 (*very poor social leadership*) to 4 (*very good social leadership*). Specifically, each participant was presented with the following statement: "Please rate the extent to which each teammate provided you with quality social leadership". The same procedure as outlined above resulted in a finite  $N \times N$  social leadership network for each team with directed relations referring to the rating of social leadership that team members gave each other.

**External leadership.** From Fransen et al. (2014, p. 4), external leadership was described by the following definition: "External leaders provide a link between our team and the people outside of our team; these leaders are the liaison between our team and club management. If communication is needed with media or sponsors, these individuals represent our team. These leaders also communicate the guidelines of the club management to the team regarding club activities for sponsoring, club events, etc." Players rated the quality of external leadership of each teammate on a 5-point Likert scale, ranging from 0 (*very poor external leadership*) to 4 (*very good external leadership*). In particular, each participant was presented with the statement: "Please rate the extent to which each teammate provided you with quality external leadership". Using the same procedures as for the leadership networks above, a finite  $N \times N$  external leadership network was constructed for each team in which the directed relations referred to the rating of external leadership that team members gave each other.

**Task cohesion.** In order to construct a task cohesion network, participants indicated for each teammate the extent that they felt cohesive with him/her with regard to achieving the team's goals and objectives based on Carron et al.'s (1985) conceptualisation of task cohesion ("Please indicate for each teammate to what extent you feel united with him/her in regards to achieving the team's goals and objectives"). Players rated their feelings of task cohesion on a 5-point Likert scale, ranging from 0 (*not task cohesive*) to 4 (*strongly task cohesive*). This resulted in a finite  $N \times N$  directed task cohesion network for each team, in which the  $ij$ th entry referred to the extent  $i$  felt cohesive with team member  $j$  to reach the team's goals and objectives.

**Social cohesion.** Participants rated the extent they felt cohesive with each of their teammates with regard to maintaining good social relationships based on Carron et al. (1985) conceptualisation of social cohesion ("Please indicate for each teammate to what extent you feel united with him/her in regards to maintaining good social relationships within the team"). Players rated each teammate on a 5-point Likert scale, ranging from 0 (*not socially cohesive*) to 4 (*strongly socially cohesive*). This resulted in a finite  $N \times N$  directed social cohesion network for each team, in which the  $ij$ th entry referred to the extent player  $i$  felt cohesive with team member  $j$  in order to maintain good social relations within the team.

### Procedure

In both Study 1 and Study 2, an equal number of teams from the most important team sports in Flanders, Belgium (i.e., soccer, volleyball and basketball, and in Study 1 handball was added as the fourth sport), an equal number of male and female teams, and an equal number of teams playing at the regional, provincial and national levels were recruited. This strategy was adopted to increase the generalisability of the results.

The current research project was approved by an institutional review board and the American Psychological Association ethical standards were followed in the conduct of the study. No incentives were given for participation, informed consent was obtained from all participants and anonymity was guaranteed. The coaches were emailed to request their athletes' participation in the study. Once the coaches agreed to let their teams participate, a roster list was obtained from the coaches for the current season. Based on the roster for each team, the names of all players were listed so that the participants could rate each teammate.

Data collection occurred at the end of a training session where a research assistant was present to provide a description of the study. The players were sitting apart to complete the questionnaire and the research assistant was present to answer any questions. The completion of the survey took approximately 25 min. It should be noted that the findings are from a larger research project examining athlete leadership.

### Data analysis

All of the analyses involving social networks were conducted using UCINET software (Borgatti, Everett, & Freeman, 2002). Density was the social network analysis measure calculated in the present research given we were interested in the strength of the relations (i.e., degree of connectedness) between individuals on teams. Density can be utilised as a measure of cohesion (Borgatti, Everett, & Johnson, 2013) and has been used to examine leadership relations in teams (Carson, Tesluk, & Marrone, 2007). More specifically, the density of each network in the present study was computed by summing the values of all relations and dividing the result by the total sum of all possible relations (Sparrowe et al., 2001). For instance, the density scores of teams with greater athlete leadership would be higher than the density scores of teams with poorer athlete leadership. For each team, network density was computed for the general leadership network (Study 1) and four leadership and two cohesion networks (Study 2).

Quadratic assignment procedure hypothesis tests were performed to examine the relations between the different types of networks (i.e., general leadership, task leadership, motivational leadership, social leadership, external leadership, task cohesion and social cohesion) within each team (Krackhardt, 1988). Due to the autocorrelated structure of network data (Wasserman & Faust, 1994), severe biases occur when classical hypothesis tests are conducted (Krackhardt, 1987). As a result, quadratic assignment procedure tests use restricted permutation tests, making them robust against autocorrelation (Dekker, Krackhardt, & Snijders, 2007). Quadratic assignment procedure correlations were first calculated between the different leadership networks and the cohesion networks, for

each team separately. The goal of this analysis was to examine whether the ties in the leadership networks were related to the ties in the cohesion networks. In other words, quadratic assignment procedure tests correlate two matrices and calculate a typical measure of statistical association, similar to Pearson's  $r$  (Borgatti et al., 2013). In order to determine the significance of the obtained correlation, the technique compares the obtained correlation against the correlations between several thousands of pairs of matrices that are similar to the data matrices, but known to be independent of one another (for a detailed explanation see Borgatti et al., 2013). For example, in the present research, a significant high quadratic assignment procedure correlation between the task leadership quality network and the task cohesion network would indicate that team members who perceived each other as good task leaders also felt highly cohesive to each other concerning the team's goals and objectives.

Second, multiple regression quadratic assignment procedures were computed. The association between multiple regression quadratic assignment procedure and quadratic assignment procedure correlations can be equated to the relationship between multiple regression analyses and correlational analyses in traditional statistics (Borgatti et al., 2013). Thus, multiple regression quadratic assignment procedure utilises multiple independent dyadic variables in order to model the values of one dyadic dependent variable (Borgatti et al., 2013). As such, in the present research, the dependent variable networks (i.e., task and social cohesion) were regressed onto the four independent variable networks (i.e., task, motivational, social and external leadership). The multiple regression quadratic assignment procedure assessed whether the R-square and regression coefficients were significant.

## Results

### Study 1

Means, standard deviations, correlations and Cronbach  $\alpha$ s for the examined variables are provided in Table 1. The results showed that, overall, players perceived their teams as relatively cohesive as measured by the GEQ. Specifically, task cohesion had a mean of 6.39 (SD = 1.31), while social cohesion had a mean of 6.35 (SD = 1.39), on a scale from 1 to 9.

In the current study, the density value of a network could be seen as an average value of the leadership attributed to the different players, and as such, could vary in range between 0 and 4; a high-density network had stronger ties (i.e., stronger leadership perceptions) than a low-density network. In the present research, the leadership density scores varied between 1.49 and 2.27, with an average density of 1.92 (SD = 0.22) across all teams. The findings showed a positive moderate correlation between the density of the general leadership network and the team's task cohesion ( $r = .58$ ;  $P = .002$ ), thereby confirming H1a. In line with H1b, a positive moderate correlation was found between the density of the general leadership network and the team's social cohesion ( $r = .60$ ;  $P = .002$ ). In other words, the greater the quality of athlete leadership, the more athletes perceived their teams as highly cohesive, both with respect to task and social cohesion.

## Study 2

### Quadratic assignment procedure correlations

First, the mean density values for the four leadership networks and the two cohesion networks were calculated. As in Study 1, network scores could vary between 0 and 4. Specifically, for task leadership, the density score ranged between 1.77 and 2.64, with a mean of 2.18 (SD = 0.24). For motivational leadership, the density score ranged between 1.77 and 2.86 with a mean of 2.34 (SD = 0.28). For social leadership, the density score ranged between 2.07 and 2.85 with a mean of 2.43 (SD = 0.22). For external leadership, the density score ranged between .83 and 2.69 with a mean of 1.80 (SD = 0.53). As for task cohesion, the density score ranged between 2.20 and 3.28, with a mean of 2.83 (SD = 0.28). And for social cohesion, the density score ranged between 2.22 and 3.27 with a mean of 2.72 (SD = 0.29). Next, we calculated the quadratic assignment procedure correlations between the two cohesion networks and the four leadership networks (H2a) for each team. An examination of the correlations in Table 2 shows that the majority of relationships between the task cohesion network and the four leadership networks were significant for each team. Consequently, when the quadratic assignment procedure correlations were averaged over all teams, the results indicated moderate positive correlations between the task cohesion network and the task leadership network ( $r = .43$ ), the motivational leadership network ( $r = .48$ ), the social leadership network ( $r = .44$ ), and the external leadership network ( $r = .31$ ) (see Table 2 for results by team). Similarly, the correlations in Table 3 demonstrate that the majority of relationships between the social cohesion network and the four leadership networks were significant for each team. As a result, for the social cohesion network, moderate positive correlations emerged in relation to the task leadership network ( $r = .42$ ), the motivational leadership network ( $r = .48$ ), the social leader-

**Table 2.** The quadratic assignment procedure correlations between the task cohesion network and the leadership quality networks.

Team	Task leader quality ( $r$ )	Motivational leader quality ( $r$ )	Social leader quality ( $r$ )	External leader quality ( $r$ )
1	.52***	.52***	.53***	.32**
2	.42**	.44**	.39**	.55***
3	.08	.15	.06	.20*
4	.48***	.56***	.46***	.44***
5	.22*	.35**	.31**	.22*
6	.31**	.48***	.48***	.38**
7	.51***	.54***	.62***	.37**
8	.47**	.49**	.27*	.33*
9	.57***	.55***	.47***	.57***
10	.48***	.55***	.64***	.32**
11	.50***	.47***	.32**	.27*
12	.43**	.55***	.48***	.09
13	.63***	.62***	.55***	.40**
14	.50***	.65***	.64***	.34*
15	.26	.50**	.39*	.23
16	.34*	.18	.33**	.19
17	.29**	.35***	.23*	.26*
18	.57***	.58***	.63***	.37**
19	.51***	.52***	.41**	.34*
20	.49***	.54***	.53***	.19
21	.52***	.59***	.46***	.16*
Average	.43	.48	.44	.31
$r$				

\* $p < .05$ , \*\* $p < .01$  and \*\*\* $p < .001$ .

**Table 3.** The quadratic assignment procedure correlations between the social cohesion network and the leadership quality networks.

Team	Task leader quality ( <i>r</i> )	Motivational leader quality ( <i>r</i> )	Social leader quality ( <i>r</i> )	External leader quality ( <i>r</i> )
1	.54***	.60***	.67***	.33**
2	.32**	.38***	.27**	.30**
3	.21*	.26**	.28**	.13
4	.52***	.59***	.63***	.44***
5	.37**	.44**	.47***	.45**
6	.42***	.52***	.47***	.38**
7	.38***	.51***	.72***	.48***
8	.40**	.65***	.75***	.53***
9	.70***	.61***	.55***	.60***
10	.48***	.49***	.52***	.24*
11	.47***	.49***	.62***	.33**
12	.24*	.32**	.40**	.07
13	.54***	.54***	.60***	.53***
14	.40***	.50***	.60***	.27*
15	.28*	.70***	.56**	.38*
16	.37*	.23	.44***	.41**
17	.33**	.44***	.34**	.30**
18	.52***	.52***	.81***	.26**
19	.39**	.42***	.45***	.42***
20	.49***	.40***	.56***	.13
21	.41***	.45***	.47***	.28**
Average	.42	.48	.53	.35
<i>r</i>				

\**P* < .05, \*\**P* < .01 and \*\*\**P* < .001.

ship network (*r* = .53) and the external leadership network (*r* = .35). These findings confirmed hypothesis H2a.

### Quadratic assignment procedure regressions

To determine the extent to which each of the leadership networks explained variance in the cohesion networks, multiple quadratic assignment procedure regressions were conducted both for the task cohesion network (Table 4) and the social cohesion network (Table 5). In all of the quadratic assignment procedure regressions, the four different leadership networks functioned as independent variables while the task and social cohesion networks as the dependent variables. In Table 4 and Table 5, the standardised regression weights of the multiple quadratic assignment procedure regressions are reported for each team. In addition, the average regression coefficients over all teams are reported (i.e., average β), as well as the weighted regression coefficients (i.e., β × number of players in the team/total number of players), averaged over all teams.

In contrast to H2b, the results in Table 4 indicate that the motivational leadership network was the strongest predictor of the team's task cohesion network. In other words, if an athlete perceived a teammate as a good motivational leader, then this athlete felt more task cohesive with this teammate. It should be noted that in half of the teams the task leadership network emerged as a significant predictor of the team's task cohesion network.

With regard to the social cohesion network, the results confirmed H2c by demonstrating that the perceived social leadership of a teammate was the main predictor of social cohesiveness with that person (see Table 5). In other words, if an athlete perceived a teammate as a strong social leader, then this athlete felt more cohesive with their teammate and wanted to maintain good social relationships with him/her.

**Table 4.** The standardised regression coefficients of the multiple quadratic assignment procedure regressions with the task cohesion network as the dependent variable and the leadership quality networks as independent variables.

Team	R <sup>2</sup>	Task leader quality (β)	Motivational leader quality (β)	Social leader quality (β)	External leader quality (β)
1	.31***	.22	.17	.27*	-.04
2	.33**	.15	.06	.03	.42**
3	.04**	-.01	.16*	-.01	.20*
4	.33***	-.18	.53**	.10	.19*
5	.15***	-.54**	.56**	.31*	.01
6	.25***	-.11	.36*	.33*	-.08
7	.47***	.27***	.08	.46***	-.001
8	.28***	.22*	.35**	-.08	.12
9	.39***	.16	.16	.12	.30**
10	.49***	.05	.25**	.49***	.11
11	.23***	.34*	.21	.01	-.05
12	.41***	.11	.40***	.33***	.18
13	.44***	.34***	.26**	.12	.03
14	.49***	.07	.37**	.42**	-.11
15	.21**	.05	.41**	.18	-.11
16	.16***	.36*	-.15	.27**	.01
17	.11***	.07	.25	.04	.07
18	.44***	.20*	.10	.37***	.14
19	.23***	.32*	.14	.12	-.03
20	.41***	.23**	.31***	.27**	.04
21	.41***	.24***	.37***	.12*	.12*
Average β		.12	.25	.20	.07
Weighted average β		.12	.25	.21	.08

\**P* < .05, \*\**P* < .01 and \*\*\**P* < .001.

**Table 5.** The standardised regression coefficients of the multiple quadratic assignment procedure regressions with the social cohesion network as the dependent variable and the leadership quality networks as independent variables.

Team	R <sup>2</sup>	Task leader quality (β)	Motivational leader quality (β)	Social leader quality (β)	External leader quality (β)
1	.46***	.10	.22*	.49***	-.10
2	.16**	.11	.29*	-.05	.09
3	.10**	.06	.19*	.19*	.09
4	.43***	-.15	.31*	.44***	.14*
5	.26***	-.46*	.37*	.36**	.27
6	.27***	.08	.37*	.21	-.10
7	.55***	.09	-.08	.63***	.20*
8	.62***	-.09	.37***	.54***	.04
9	.53***	.43***	.05	.17*	.18*
10	.35***	.19*	.20*	.34***	.01
11	.38***	.11	.10	.51***	-.05
12	.19***	.01	.21	.35**	.15
13	.43***	.19*	.08	.29**	.23*
14	.37***	.07	.16	.54***	-.13
15	.47***	-.06	.60***	.22	-.05
16	.27***	.04	-.02	.36***	.31**
17	.19***	.01	.32**	.14	.07
18	.65***	-.09	.13	.76***	.02
19	.22***	.05	.19	.14	.20
20	.37***	.27***	.11	.38***	-.002
21	.33***	.22**	.18*	.24**	.23**
Average β		.06	.21	.34	.09
Weighted average β		.06	.20	.35	.09

\**P* < .05, \*\**P* < .01, \*\*\**P* < .001.

### Discussion

The general purpose of the present study was to investigate the structure of different leadership networks and its relationship to cohesion by conducting two separate studies. In Study 1, the relationship between a general leadership quality network, measured using social network analysis, and task and

social cohesion as measured by the GEQ (Carron et al., 1985), was examined. The results supported the hypotheses demonstrating significant positive moderate correlations between the general leadership network and both task (H1a) and social (H1b) cohesion. The purpose of Study 2 was to examine the leadership quality networks for four different athlete leadership roles (i.e., task, motivational, social and external leader) and to investigate their relation to task and social cohesion networks. The first hypothesis from Study 2 (H2a) was confirmed, with results showing positive correlations between the four leadership quality networks and both task and social cohesion networks. Further, the findings partially supported the following two hypotheses (H2b and H2c). On the one hand, the motivational leadership network was found to be the strongest predictor of the task cohesion network, even though it was predicted the task leadership network would be most strongly related to the task cohesion network (H2b). On the other hand, the results supported the hypothesis (H2c) that the social leadership network would be the strongest predictor of the social cohesion network. Overall, the results complement a growing body of research indicating that athlete leadership has a positive influence on perceptions of team cohesion (Callow et al., 2009; Crozier, Loughead, & Munroe-Chandler, 2013; Dupuis, Bloom, & Loughead, 2006; Paradis & Loughead, 2012; Price & Weiss, 2011, 2013; Vincer & Loughead, 2010).

In terms of Study 1, the results showed that the general leadership quality network was positively related to task and social cohesion. In other words, athletes perceived greater unity and closeness regarding the attainment of group goals and maintenance of social interactions when they observed a higher degree of athlete leadership within their teams. This outcome is similar to past research operationalising cohesion using the GEQ (Carron et al., 1985), which has shown positive relationships between athlete leadership behaviours and the task and social dimensions of cohesion (e.g., Callow et al., 2009; Price & Weiss, 2013; Vincer & Loughead, 2010). In particular, these previous studies examined how the frequency of various leadership behaviours assessed by questionnaires such as the Leadership Scale for Sports (Chelladurai & Saleh, 1980) and Differentiated Transformational Leadership Inventory (Callow et al., 2009) were related to cohesion. In the present study, a gap in the literature was addressed by considering how the density of a general leadership network (i.e., leadership ties between athletes) was associated with cohesion as assessed by the GEQ (Carron et al., 1985). Since greater leadership quality was found to be positively associated to task and social cohesion in Study 1, the results suggested that the more effective the leadership amongst athletes, the better. In fact, Crozier et al. (2013) recently found that ideally 85% of athletes should provide leadership within their teams. Further, the Crozier et al.'s results showed that having the ideal number of athlete leaders on teams enhanced perceptions of cohesion. Given the results of the current study and the findings of Crozier et al., it is reasonable to conclude that cohesion is enhanced when there is a high quality of athlete leadership distributed across the team.

The results of Study 2 expanded upon the findings of Study 1 by considering leadership networks for four athlete

leadership roles (i.e., task, motivational, social and external) and their relationship to task and social cohesion as operationalised using social network analysis methodologies. The results revealed positive moderate correlations amongst the four leadership quality networks and both task and social cohesion networks. In practical terms, this suggests that athletes who reported greater leadership quality for any of the four athlete leadership roles also experienced greater cohesion in terms of achieving the team's performance objectives and maintaining social relationships.

With the exception of the work by Eys, Loughead, and Hardy (2007), and a recent influx of research by Fransen, Vanbeselaere et al. (2014), Fransen, Coffee et al. (2014), and Fransen et al. (2015b), no known research has investigated the relationship between the athlete leadership roles and group dynamics variables. Eys et al. found that athletes were most satisfied with their team's performance and the integration of team members when they perceived the task, social, and external athlete leader roles to be represented to the same degree within their teams. More recently, Fransen, Vanbeselaere, et al. showed that as the number of leadership roles that were fulfilled by athletes increased, so did the collective efficacy beliefs of athletes and coaches on those teams. Furthermore, Fransen, Coffee, et al. demonstrated that higher leadership quality for each of the four athlete leadership roles resulted in higher team identification and collective efficacy. Given the scarcity of research examining athlete leadership roles and their association to various outcomes, the results of the present study extend the knowledge base by showing that the four leadership roles of an athlete are positively related to perceptions of cohesion. Taken together, the results confirm the importance and classification of the athlete leadership roles examined in previous research (e.g., Eys et al., 2007; Fransen et al., 2014) and their impact on team functioning.

Another objective of Study 2 was to determine which of the four athlete leadership networks most strongly predicted the task and social cohesion networks. The results diverged from the hypothesis that the task leadership network would be most strongly related to the task cohesion network. Rather, the results revealed that the motivational leadership network was the strongest predictor of the task cohesion network. This outcome highlights the significance of the motivational leadership role identified by Fransen et al. (2014) and supports previous research (e.g., Dupuis et al., 2006; Holmes, McNeil, & Adorna, 2010) indicating the importance of enthusiastic and motivational athlete leaders as it relates to effective leadership on sport teams. Further, given the definition used in the present study to describe the role of motivational leader, the finding that the motivational leadership network most strongly predicted task cohesion is not surprising. Specifically, the role of motivational leader is inherently task-oriented due to its emphasis on the leader motivating and encouraging teammates *on* as opposed to *off* the field. Therefore, if the goal is to enhance perceptions of unity in terms of accomplishing the team's task objectives, then athlete leaders should focus on guiding teammates' emotions towards performing optimally.

In regards to the strongest predictor of the social cohesion network, the results supported the hypothesis and showed that the social leadership network was most strongly related to the social cohesion network. This particular finding was expected given the theoretical link between these two constructs. As the role of social athlete leader is concerned with promoting harmony and good social relations among teammates (Loughead et al., 2006), it is therefore likely to relate to team members perceiving an increase in bonding with a desire to maintain social connections within the group (Carron et al., 1985). Further, this finding supports research conducted by Vincer and Loughead (2010) that examined the relationship between athlete leadership behaviours (measured using the Leadership Scale for Sports; Chelladurai & Saleh, 1980) and cohesion (assessed using the GEQ; Carron et al., 1985). Specifically, the authors found a positive association between the leadership behaviour of social support (i.e., satisfying teammates' interpersonal needs) and social cohesion – therefore providing similar evidence for the relation between social leadership and social cohesion as found in the present study.

Beyond the specific findings highlighted in the above paragraphs, the results from both studies provide unique contributions to the athlete leadership-cohesion literature due to the method in which these constructs were measured (i.e., social network analysis). Insofar as athlete leadership is concerned, previous quantitative research has typically examined this construct by asking athletes to rate the frequency of leadership behaviours exhibited by one (e.g., Callow et al., 2009; Price & Weiss, 2013) or several teammates (e.g., Paradis & Loughead, 2012; Vincer & Loughead, 2010; Zacharatos, Barling, & Kelloway, 2000). While this approach offers valuable information concerning the leadership provided by one or more athlete leaders, it clearly does not take into account the intra-team relations among *all* team members. Conversely, by calculating the strength of the relations (i.e., degree of perceived leadership quality) between athletes on teams using social network analysis, we were able to generate a density score more reflective of the overall leadership provided within sport teams. Therefore, the results of Studies 1 and 2 extend athlete leadership research by considering the degree to which all team members provide quality leadership to one another. Similarly, the study of cohesion in sport has traditionally examined athletes' perceptions of the team environment using the GEQ (Carron et al., 1985). However, as noted by Warner et al. (2012), “non-network measurements such as Carron et al. (1985) GEQ [Group Environment Questionnaire] are unable to test theoretical propositions related to structural properties” (p. 55). Lusher et al. (2010) advocated using social network analysis to explore the structural interdependencies between individuals on sport teams. With the exception of Warner et al. (2012) who found that a higher performing women's collegiate basketball team had a denser (i.e., more cohesive) network compared to a lower performing women's collegiate basketball team, it appears that social network analysis as a method of investigating cohesion has yet to garner interest in the field of sport psychology. Thus, by analysing task and social cohesion networks, the findings of Study 2 supplement previous research which has found a positive relationship between athlete leadership behaviours and cohesion as

measured by the GEQ (e.g., Callow et al., 2009; Price & Weiss, 2013; Vincer & Loughead, 2010).

From an applied perspective, the results suggest that higher levels of athlete leadership quality are associated with increases in cohesion from both a task and social standpoint. Thus, consistent with the findings of Crozier et al. (2013), it would appear that more athletes on sport teams, rather than a select few, should provide effective leadership to their teammates. In order to increase the quality of leadership exhibited amongst athletes, sport organisations should develop effective athlete leaders that encompass the four athlete leader roles using an educational approach. Importantly, this type of approach would ensure that all athletes on teams are given the opportunity to enhance their leadership skills (Loughead et al., 2014). Although research on athlete leadership development training is in its infancy (Loughead et al., 2014), there is some evidence to suggest that leadership development programmes for athletes are beneficial (e.g., Blanton, Sturges, & Gould, 2014; Duguay, Loughead, & Munroe-Chandler, *in press*; Gould & Voelker, 2010). Therefore, practitioners (e.g., coaches, sport psychology consultants) are encouraged to make concerted efforts to provide some form of leadership training to their athletes. In particular, given the results of the present study, practitioners should educate athletes about the importance of providing tactical advice to teammates (i.e., task leadership), motivating group members (i.e., motivational leadership), promoting harmony and social relationships within the team (i.e., social leadership) and representing the team in the community (i.e., external leadership). Similarly, practitioners should inform athletes that team unity is enhanced when athletes provide quality leadership amongst each other.

Although the present study enhances our knowledge of the relationship between athlete leadership and cohesion by examining these constructs using a unique and underutilised approach (i.e., social network analysis), there are a few limitations that should be noted. First, the results are correlational in nature. Therefore, the findings do not lead to the suggestion that athlete leadership causes cohesion or vice versa. Second, while the large sample size and diversity of sports included in the present study increased the generalisability of the results, the cross-sectional nature of the data did not permit the examination of team member relations over the course of the season. As Carron et al. (1985) noted, cohesion is a dynamic construct that changes over time. It would be interesting to examine how individual team member perceptions of cohesion change over the course of a season in relation to the four leadership roles (task, motivational, social and external). Similarly, Loughead et al. (2006) suggested that athlete leadership is a dynamic process that may change over the course of time. In this regard, it would be worthwhile examining how leadership quality changes over the course of a season or multiple seasons.

In addition to future research examining the relationship between athlete leadership and cohesion networks, sport psychology researchers could also explore how athlete leadership networks relate to other group dynamics constructs such as athlete satisfaction, communication and performance. Taken together, the results of the two studies in this paper indicate a positive association between athlete leadership and cohesion. It is hoped that these results will encourage researchers to examine the effect of athlete leadership and cohesion using

social network analysis methodologies. Further, given the paucity of research examining cohesion in sport from a structural standpoint, social network analysis may prove to be a useful and alternative method to examine what Dion (2000) considered an “unquestionably” important factor in sport groups.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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