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Sex differences in the structure and stability of children's playground social networks and their overlap with friendship relations

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Sex differences in the structure and stability of children's playground social networks and their overlap with friendship relations

Abstract

Gender segregated peer networks during middle childhood have been highlighted as important for explaining later sex differences in behaviour, yet few studies have examined the structural composition of these networks and their implications. This short-term longitudinal study of 119 children (7-8 years) examined the size and internal structure of boys' and girls' social networks, their overlap with friendship relations, and their stability over time. Data collection at the start and end of the year involved systematic playground observations of pupils' play networks during team and non-team activities and measures of friendship from peer nomination interviews. Social networks were identified by aggregating play network data at each time point. Findings showed that the size of boy's play networks on the playground, but not their social networks, varied according to activity type. Social network cores consisted mainly of friends. Girl's social networks were more likely to be composed of friends and boys' networks contained friends and non-friends. Girls had more friends outside of the social network than boys. Stability of social network membership and internal network relations were higher for boys than girls. These patterns have implications for the nature of social experiences within these network contexts.

Keywords: Social networks; sex differences; friendship; primary school

Sex differences in the structure and stability of children's playground social networks and their overlap with friendship relations

Recent studies of peer relations processes emphasise an ecological approach to the investigation of social networks (Kindermann, 1993; Kindermann & Valsiner, 1995). In their bioecological model, Bronfenbrenner and Ceci (1994) conceptualise the individual at the centre of a set of nested social contexts and highlight the influence of proximal, as opposed to distal, processes that arise through everyday interactions with others. An individual's social network, conceived as the group of peers they most often hang about with, is an immediate social context where proximal processes affecting children are likely to be in evidence. This approach emphasises that social networks develop their own micro-culture and socialising effects. Within this ecological perspective, Sutton-Smith (1982) argues that "the most important thing to know about peer culture is what is going on there. That is, that we might learn more of the structure and more of the function if we first studied what the action is (that is) the performances that are central to children..." (p68). A prime arena for capturing the performances and processes involved in the formation and functioning of enduring peer social networks is during break-time (or recess) where peers socialise and play games together in groups (Blatchford, 1998; Blatchford, Baines & Pellegrini, 2003; Pellegrini & Smith, 1998). It is this intrinsic group nature of playground life that led to the current investigation of the social networks of boys and girls.

Sex Differences in Social Networks

Consistent with an ecological approach, recent research and theory on sex differences in peer relations emphasises a notion of gender differentiated micro-worlds (Belle, 1989; Maccoby, 1998). Central to the 'two worlds' model is the finding that children in early to middle childhood actively organise themselves into homogenous gender networks (Belle, 1989; Benenson, 1990; Cairns, Xie

& Leung, 1998; Maccoby, 1986; Martin & Fabes, 2001). Maccoby (1998) argues that sex differences in terms of behaviour and interaction style may result from involvement in these separate social network contexts (Leaper, 1994; Maccoby, 1998). Male groups are characterised as involving higher levels of aggression and rough and tumble play, dominance, independence and status acquisition (Belle, 1989; Maccoby, 1998; Thorne & Luria, 1986; Zarbatany, Mcdougall & Hymel, 2000). Female groups engage in more co-operative play with shared outcomes and interactions involving greater intimacy and exclusivity (Eder & Hallinan, 1978; Lever, 1976; Zarbatany et al., 2000). Similarity in play styles and interests are considered to be a central force in drawing children together to form single sex groups (Maccoby, 1998; Serbin, Moller, Gulko, Powlishta & Colbourne, 1994). Diverse play styles may explain sex differences in the size and structure of social networks and, in turn, these dissimilar network contexts may have implications for other gender differences (Leaper, 1994; Maccoby, 1998). However, studies have rarely examined this relationship, often preferring to focus on sex differences in the content rather than the structural nature of experienced peer networks (Rubin, Bukowski & Parker, 1998). In addition Benenson, Apostoleris and Parnass (1998) suggest that differences in the structure of networks may be a cause of sex differences in the content of peer relationships. While we know quite a bit about the size of male and female networks, examination of single aspects of structure may provide limited insights and there is a need for research on multiple dimensions of social network structure. Little is known about the internal structure, friendship composition and stability of male and female networks and yet these features together have overlapping implications for particular aspects of social functioning and development. Taking these points as its departure, this study examines the nature of boys' and girls' social networks in terms of their: size, internal structure, overlap with friendship relations, and their stability over time.

The first main area addressed concerns the finding that during middle childhood boys tend to form large social networks with many inter-connections while girls form a number of smaller mutually exclusive networks, usually pairs or triads (Belle, 1989; Benenson et al., 1998; Waldrop &

Halverson, 1975). This difference may be explained by diverse play interests with girls' underlying preference for intimacy-enhancing activities causing them to form small networks (Belle, 1989; Sutton-Smith, 1979; Zarbatany et al., 2000) and boys' interest in playing team games leading to numerous players and thus larger networks (Hartup, 1983). An alternative explanation suggests that boys have an inherent preference for forming larger networks and that boys play team games because of this (Belle, 1989; Benenson et al., 1998). This model would predict that boys may sustain large networks whether they are playing team games or not. The 'activity influences network size' view would, by contrast, allow for the possibility of smaller networks forming for the playing of non-team games but would suggest that the greater tendency of boys to play team games means that generally their social networks are larger. In a study aimed at distinguishing between these explanations, Benenson, Apostoleris & Parnass (1997) reported that in an experimental situation where team games were not possible, there was evidence of a 'centripetal social force' causing boys to remain together as a larger group than girls. It is unclear, however, whether this finding was due to pre-formed friendships and former interaction history, a 'natural' difference in interaction style or some other factor. Another way of comparing the two explanations for boys' larger social networks is to examine the groups of children when involved in team and non-team activities as they occur in the naturalistic context of the school playground. However, examining the extent to which large enduring social networks (as based on an aggregation of playground groups) are determined by the playing of team games will also be important. These comparisons were made in this study. The 'centripetal force' hypothesis would predict that male networks are larger than those of females regardless of game type while the 'two worlds' hypothesis would indicate that male networks would only be larger than those of girls when boys are playing team games.

The second area addressed by this paper concerns the internal structure of male and female social networks. Few studies have examined this in detail except to indicate that because of an interest in intimacy, girls may spend substantial amounts of time together and may form more egalitarian cliques (Maccoby, 1998). In relation to boys' networks, research suggests that boys

sustain one large highly interconnected network where they spread themselves thinly across members and interact as a whole large group (Best, 1983; Belle, 1989; Benenson et al., 1998). This may explain reported sex differences in content, since in these large whole group contexts there is less call for intimacy and greater opportunity for autonomy between play mates (Leaper, 1994). However studies have noted the presence of sub-structures within boys' large networks (Best, 1983; Benenson et al., 1998) and boys' larger networks may consist of sub-groups which cohere into larger units because they engage in large team activities. We know that, as well as engaging in team games, boys do participate in smaller group games such as fantasy play and chasing and catching games (Blatchford et al., 2003; Pellegrini, Kato, Blatchford & Baines, 2003). Maccoby (1998) reports research showing that girls occasionally congregate in larger groups but these are not sustained and girls fall back into smaller cliques. Boys' networks may function in a similar way but because of the mutually motivating nature of team games, sub-groups are less transparent. In this study we examined the internal structure of social networks and, on the basis of claims of higher intimacy and equality in girls groups, hypothesised that girls would spend large but relatively equivalent amounts of time together in a network. Boys on the other hand would spend relatively little time in the company of particular others and would tend to be interconnected as a whole network.

The third issue addressed in this paper, relates to the overlap between social networks, friendship and best friendship relations. Since girls show greater interest in establishing intimate relationships, a greater overlap would be expected between social networks and friendship and best friendship relations for girls than for boys. Few studies have examined the overlap and none, as far as we are aware, have focused on this in terms of sex differences. General findings suggest a moderate overlap with around 60% to 80% of total friends also being part of the network (Cairns, Leung, Buchanan & Cairns, 1995; Kindermann, McCollam & Metzler, 1996). Kindermann et al. (1996) found, however, that only 26% of network members were also reciprocal friends indicating that in many instances other network members were not friends. These two different representations

of overlap, from the perspective of the total number of friends and the total number of group members, may provide different insights into sex differences in social networks and friendship and different implications for social development. In this study it was predicted that there would be a greater overlap between social networks and friendship relations for girls than boys.

The fourth issue addressed in this paper concerns the stability of social networks and friendships. Because girls' activities are more centred on intimacy and friendship than those of boys, we might expect their networks to be more stable over time. Little research has studied network stability but, where examined, the use of different methodologies and definitions have led to ambiguous results (see Cairns et al., 1998). Findings suggest high stability over a few weeks and lower stability over the longer term, especially between years and school transitions. In the current research we studied the stability of both social networks and friendships in relation to sex and predicted that girls' networks and friendship relations would show greater stability over time.

The Structure of Social Networks

A further contribution of this paper relates to the method of identification and analysis of the structure of networks. Most studies rely on self or peer report involving a top down approach to social network identification. The peer report approach assumes that children have similar knowledge, based on informal observations, about social network membership (Kindermann, 1996) and network identification involves examining the consensus among pupils about which members co-exist in the social network. This approach is not without its problems (Gest, Farmer, Cairns & Xie, 2003) and children may not have full knowledge of network membership, particularly in relation to the opposite sex, and some networks and individuals may be more salient than others. An alternative method that identifies social networks 'bottom-up' on the basis of repeated and aggregated systematic observations of children interacting on the playground and conducted by trained observers, provides a more accurate view of social network membership and structure.

Aggregation of observation data across time points in close proximity has been employed in the past and found to be robust (Martin & Fabes, 2001). Few studies make use of direct observation to identify social networks, yet there is a need for research to examine how social networks arise from day-to-day behavioural interactions and processes (Rubin, et al., 1998). Direct observation also enables analysis of the emergent internal network structure in terms of the differential time members spend together and the way members cohere into full networks. Peer report approaches cannot examine emergent network structure except in terms of limited indicators of the salience of individuals within the network. Systematic observation of pupil social interactions on the playground was the approach used in this study.

This study therefore seeks to examine sex differences in the size and internal structuring of social networks, the overlap between social network, best friendship and friendship relations, and stability in social network membership and friendship. Social networks are identified from the aggregation of repeated observations of children interacting together during breaktime at the start and end of a year in school.

Method

Design

Children entering Year 3 of primary school in England were studied longitudinally for one academic year. Data were collected over 8 weeks at Time 1 (T1), the start of the year (September - October), and then a further 8 weeks at Time 2 (T2), the end of the year (June-July). The independent variables were sex and time point and the dependent variables were: size of play networks during team, non-team and all games and reciprocated peer nominations of best friends and friends.

Participants

Four classes of Year 3 pupils (7-8 year olds), from four separate schools in London, participated in this study. Permission to conduct the research was sought from and granted by

schools, parents of the children involved in the study as well as from the university ethics committee. The four classes constituted a sample size of 126 pupils at T1 (59 boys and 67 girls) and 122 pupils at T2 (55 boys and 67 girls). Between time points, 6 boys and 1 girl left and 2 boys and 1 girl entered the classes studied resulting in 119 children present at both time points. Two classes had approximately equal numbers of boys and girls, one class had a majority of girls (65%) and the other had a majority of boys (73%). Schools were located in low to middle socioeconomic status areas. Three schools had a broad mix of children from different ethnic backgrounds (16% black African/Caribbean, 16% west Asian, 2% east Asian, 53% UK white, 9% European white and 3% other). The fourth school was almost exclusively UK white.

Data Collection

A male and female researcher, both UK white and aged 28-30, spent two weeks in each school at both time points observing pupils on the playground and conducting structured interviews. To facilitate easy identification of pupils and to get students used to their presence, researchers sat in class and observed children undertaking their work. Children were given opportunities to question the researchers in the classroom, but not the playground. Every effort was made by the researchers to avoid being perceived as an authority figure or part of the school establishment. These steps facilitated unobtrusive observation of pupils on the playground.

Observations of playground behaviour.

Pupils were observed on the playground using a systematic scan sampling technique based on previous research (e.g. Boulton, 1992; Ladd & Price, 1993). Scan observations of pupils in each class were conducted for the duration of every playtime (approx. 1½ hours per day) over the two week period. Once the target child was located on the playground, they were observed for 20 seconds and then their behavioural interactions were coded, using pre-selected categories, via commentary into a tape recorder with a hidden microphone. The 20 seconds of observation prior to

coding were crucial for researchers to understand the child's involvement in a social activity, their behaviour and the identity of others jointly engaged in the activity. The researchers did not speak to children on the playground except on the rare occasion to clarify coding when the target's activity was ambiguous. To reduce order effects, pupil observations were counterbalanced with each breaktime observation period beginning with the next child on the class list. Efforts were made to ensure that all pupils were observed an equal number of times. There were a total of 7906 scan observations, an average of 26.5 scans per child in the autumn and 37.5 scans per child in the summer term.

Target child observations focused on the following dimensions: the nature of interaction with peers, identity of peers that the target was interacting with, interaction with/presence of adults, the target's behaviour, the type of activity engaged in and the play network. Only two category sets are relevant to this paper and are detailed here (see Blatchford et al., 2003 for further details of the coding scheme).

Where children were deemed to be engaged in a social activity with peers, we coded the nature of the activity as either 'team-based' or 'non-team based' and noted the play network. A target was coded as engaged in a social activity when he or she was participating in physical and/or communicative interaction or involved in a socially organised game or activity. For example, a child that is standing alone as part of a game (e.g. the goalkeeper in a game of soccer), would be coded as 'social', whereas a child playing with a toy on their own would not be.

If the target was engaged in an activity that required children to cooperate as a team to compete with another group of children, then they were coded as involved in a team based activity. Examples of team based activities are football, basketball and other types of ball games, chasing and seeking games (British Bulldogs, cops and robbers) and racing games (relays, individual-team races). All other activities were coded as non-team based activities, for example, conversation, vigorous, sedentary or fantasy play, skipping (jump rope), as well as a number of types of ball games.

The ‘play network’ comprised those children jointly engaged, along with the target child, in the social activity (e.g. playing a game together, engaged in conversation etc). This involved noting the identity of peers engaged in the activity (when from the same class, otherwise whether they were older or younger, of the same/different sex etc.). Using this information we were able to determine the size, numbers of males and females and ethnic mix of the play network.

Video footage of pupils interacting on the playground was used to train the second observer in the application of the coding scheme over two afternoons prior to school visits. Observers also spent the first two days of school visits observing pupils together as part of further training and to get pupils used to the observers’ presence on the playground. After this period observers worked independently to collect data but continued to discuss the observation system.

To determine reliability, observers independently coded the same target’s behaviour at a synchronised point for two breaktimes at the start and the end of the year. Kappa reliabilities exceeded acceptable levels and were .94 for the coding of focus children as engaged in social interaction and .95 the coding of play activities as team or non-team games. An intra-class correlation of .97 was achieved for agreement in the number of pupils in the play network. Inter-observer agreement for the inclusion of pupils from the class studied within a play network was 93% (Kappa = .92).

Peer nomination data.

At T1 and T2, all children undertook individual peer nomination interviews where they answered 10 sociometric type questions. Two questions required children to identify their friends and best friends. To help recall, children had a sheet with photographs of all pupils in the class with each child’s name listed below. Children were allowed to nominate as many or as few pupils as they wished, including themselves (though self nominations were excluded from the analysis). Researchers recorded each child's response. Measures of the number of friendships and best

friendships were calculated from reciprocated friendship and best friend nominations. Friendship relations were identified on the basis of reciprocated nominations.

Measures and Identification of Social Networks

Mean sizes of play networks are reported for all games, team games and non-team games. Social network membership was identified on the basis of the aggregation of the observed play networks at each time point and included only members of the class studied. A symmetrical person-person data matrix was derived for each time point and each cell contained the proportion of total observations that each child in the class appeared in each target child's play network. Cells on the diagonal were empty. Proportions, rather than frequencies, were used to take account of the slight variation in pupil observation frequency.

The identification of network boundaries is a problem for all social network research and all approaches require the use of a relatively arbitrary inclusion-exclusion threshold. As part of this research and in order to identify the most applicable threshold, observers were asked to keep a field journal on pupils' interactions, groups, group roles and games on the playground. After the first data collection point, these notes were used to identify the social networks that were perceived to exist on the playground. This was then compared to the networks identified in the data firstly through the use of a variety of thresholds for inclusion in a network and secondly through the use of the Social Composite Map procedure from Cairns, Gariépy, Kindermann & Leung (1989). The threshold approach, but not the SCM approach, allows examination of emergent network structure. The researchers' notion of the networks corresponded closely to that resulting from the SCM procedure and to a 25% threshold imposed on the data for inclusion in a network[1]. That is, children who spent 25% or more of their scans with each other were included in a network which we termed a 'group'. To examine the internal structure of networks and to examine how members connect together into groups, two further thresholds were imposed on the data to provide three levels of involvement in social networks. Children observed together for 50% or more of their combined scans were

classified as a 'core' and for 37.5% or more of their scans a 'cluster'. Groups were therefore the most, and cores the least, inclusive (see Figure 1).

Logical rules were implemented to identify the boundaries between social networks, when a member was shared between two networks and to prevent the existence of networks based on sequentially linked individuals (e.g. A connected to B and B connected to C in the absence of a connection between A and C) becoming incorporated as members of a social network. A core, cluster or group can have just 2 members. For additional members to be included they must either be: linked to at least 2 members in the network at that level, or be linked to 1 established member at that level AND be linked to another at the next level down (i.e. cluster, group or approaching group level which related to >17% of the combined observations). If a pupil is connected to another established member of a network but not to any others within the network (in terms of the above criteria), then this would result in a new network being identified with the established member shared between the two networks.

The term ‘social network’ is used in the literature to refer to a range of relationships between people (e.g. friendship networks, collections of individuals that hang around etc.). In the current study, a social network is the web of inter-connected persons that arise from imposing a threshold on the aggregated play network data. We refer to networks resulting from imposing a 50% threshold as cores, 37.5% as clusters and 25% as groups. A network at the group level is considered to be the ‘whole network’ and is equivalent to the notion of a ‘social network’ (‘peer-group’ or ‘clique’) as currently used by researchers in this field (Cairns et al., 1998; Kindermann, 1993).

To determine the overlap between social networks and best friend and friendship relations, connections were compared on a dyadic basis. For instance, if two children were connected as part of a network, their data was also examined to see whether they were connected by a friendship. This then provided a proportion of the total group level relations that were also friends.

Social network stability was measured in two ways. The first method examined the stability of each individual’s connections with others in their social network (recall that a connection only

exists if they were observed for more than 25% of their combined scans). This was based on the proportion of an individual's connections at T1 that were still in existence at T2 (friendship stability was also measured in this way). This dichotomous categorisation of the stability of a connection between two members provides limited insight into the stability of the whole network. The second method, therefore, was based on the stability of membership of the social network and could fit into one of 3 categories. Following previous research (see Cairns et al, 1998; Hallinan, 1981), the network was deemed completely stable if membership was identical at both time points, predominantly stable if 51% or more members at T1 remained members at T2 or unstable where 50% or less of members at T1 remained at T2. The predominantly stable category allowed for the loss of or increase in members as well as the increase/ reduction in integration into the social network (e.g. some members at the group level at T1 becoming core members by T2).

**********FIGURE 1 HERE**********

Results

Social network size

Examining social networks at their most general level (see Table 1) there were 29 groups at T1 and 28 at T2. Virtually all groups were homogenous by gender. At T1, three groups contained a single member of the opposite sex and by T2 this had reduced to two groups. In all cases members of the opposite sex were a significant minority and thus for the purpose of analysis these networks were considered according to the sex of the majority of membership.

**********TABLE 1 HERE**********

The number and size of groups varied according to sex (see Table 1). Female groups outnumbered those of males and thus logically, given the finite number of children in a class, male

groups were significantly larger than those of females ($F(1,28)=19.73$, $p< .001$, $d = .90$ at T1; $F(1,27)=6.10$, $p< .05$, $d = .92$ at T2). In each school class and at both time points there were approximately two male groups, one very large and the other small (see Figure 1 Networks 4 and 3). The number of girls' groups varied from a single group in one class to nine in another. The smaller male networks were similar in size to those of females and always consisted of between two and four members (see Figure 1 Network 3).

To test whether boy's larger networks are due to them playing team games, we re-analysed play network data from the 6249 observations of social interaction to determine whether the exclusion of team game data influenced the mean size of these play networks (see Table 1). Analyses indicated sex differences in the size of play networks for all games ($F(1,6247)=240.32$; $p< .001$, $d = .30$) and team games ($F(1,1001)=81.64$; $p< .001$, $d = .70$) but not for play networks when team game data were excluded ($F(1,5197)=0.54$; $p= .46$).

Re-identification of the T1 group level social networks using the play network data for non-team games (i.e. with team games removed) indicated little change in network size or membership. Boys' social networks averaged 6.90 members (SD 2.9) and girls' networks averaged 3.14 (SD 1.4) members and an analysis indicated that these social networks were not significantly different in size from those derived using all of the play network data ($F(1,27)=2.13$, $p= .16$).

Social network structure

To examine whether there are sex differences in the internal structuring of social networks and whether boys spread themselves across a wide range of play partners, we examined social networks across the three threshold levels of involvement. The data in Table 1 show that across the three thresholds and at both time points, male social networks were more likely to increase in size whereas female networks were more likely to increase in number. Focusing first on social network size, sex differences were evident at cluster and group but not core levels (Clusters T1 - $F(1,25)=6.87$, $p< .05$, $d = 1.02$; Whole-networks T1 - $F(1,28)=19.73$, $p< .001$, $d = .90$; Clusters T2 -

F(1,25)=5.52, p< .05, *d* = .98; Whole-networks T2 - F(1,27)=6.13, p< .05, *d* = .92). Between the core and group levels, boys' networks gained on average between 4 and 5 additional members but girls' networks only increased by one member. Male cores, but not those of females, are then expanded by additional members joining the network at cluster and group levels.

For females, the number of networks increased at each level indicating that some networks did not have members at the core or even cluster levels. To study this in more depth we examined at which threshold the social networks of boys and girls at both time points were established. The majority (82%) of male networks, though only just over half (53%) of female networks, were established with a core of members (for example, Figure 1 Networks 1, 3 and 4). Twenty percent of female networks, as opposed to 6% of male networks, consisted of children coming together at the 25% level only (for example, Figure 1 Network 2). Children in these group level only networks were thus loosely connected since they spent little time with each other. The remaining 12% and 27% of networks, for boys and girls respectively, were established at the cluster level. There are therefore two different structuring patterns. All of the male social networks had a core of members to whom others, who spend less time in the network, would join. By contrast some girl networks spent little time together and female networks expanded only minimally in size across the three levels indicating that members spend similar amounts of time together in the network. Because of the limited number of male networks, statistical analyses cannot be used to examine the data further.

Of further interest is the difference in the size of play networks in comparison with the social networks at the group level (see Table 1). Boys' play networks were smaller, while those of girls were larger, than their social networks at the group level. This is significant given that the play network data could include children from other classes and suggests that boys socialised in play networks that were smaller than their general social network.

**********TABLE 2 HERE**********

Overlap between Social Networks and Friendship Relations

Table 2 shows that on average girls and boys were best friends with 4-6% of the class and friends with 12 -14% of the class. Sex differences in the number of friends and best friends were not evident.

There are two ways of viewing the overlap between friendships and social networks, which provide different insights into boys' and girls' social networks and friendships. The friendship - network overlap can be viewed as a proportion of the total network relations at each of the core, cluster or group levels. Alternatively, the overlap can be considered as a proportion of total best friendship and friendship relations. For the sake of space and to make a parallel distinction to that of friends and best friends, data only at the end of the year and for core and group levels are presented.

Friendship-social network overlap as a proportion of the social network.

Table 2 shows that around half of core relations were also best friends and three-quarters were friends. While a similar core-best friend overlap was evident for males and females, a main effect of sex was found for the core-friendship overlap ($F(1,55)=13.14$, $p= .001$, $d = 1.14$), with a greater portion of female than male core members also likely to be friends. Less than a third of members at the group level were also best friends and over half of group members were friends. However these patterns also varied by sex with a larger proportion of female group members being best friends ($F(1,110)=11.73$; $p= .001$, $d = .67$) or friends ($F(1,111)=11.70$; $p= .001$, $d = .65$).

Friendship-social network overlap as a proportion of friendship.

Over a third of best friends and a quarter of friends were also core members (see Table 2). Main effects of sex were evident for the proportion of best friends ($F(1,93)=6.21$; $p= .015$, $d = .55$) and friends ($F(1,118)=24.73$; $p< .001$, $d = .94$) that were in the same group with the overlaps being greater for males than females. These effects may reflect the sex differences in social network size

and number, reported earlier, yet highlight the important social-relational implications of socialising in social networks of different sizes.

**********TABLE 3 HERE**********

Social Network Stability

Table 3 shows data for the stability of cores and groups over the year according to strict (100% stability) and more liberal criteria (51% or more stability). None of the male cores or groups were 100% stable. However, nearly two fifths of girls' cores and a quarter of girls' groups were completely unchanged over the year. Using the more liberal definition, approximately equivalent proportions of male and female cores were stable. All of the boys' groups were moderately stable while a third of girls' groups were unstable. These stability patterns, however, may be influenced by the size of the network and thus favour boys. Estimates of stability not affected by network size are based on the proportion of an individual's relational connections within groups at T1 that were still present at T2 (see Table 4). These show that on average boys' network relations were more stable than those of girls ($F(1,105)=8.17$; $p< .01$, $d = .57$).

**********TABLE 4 HERE**********

In contrast to the data for social networks, best friend and friendship relations were unstable (see Table 4). Girls' friendship, but not best friend, relations were more stable over time than those of boys ($F(1,123) = 4.03$; $p< .05$, $d = .36$).

Discussion

This study was concerned with sex differences in the size and structural composition of the social networks of 7-8 year old children arising from observations of interactions during breaktimes.

The study examined whether social network size was related to the type of games played, the nature of the emergent internal structure of male and female networks, the overlap between friendship, best friendship and social networks, and the extent to which networks and friendships were stable over time.

Social Network Size

Consistent with previous research was a sex cleavage in the composition of social networks and evidence that female networks were greater in number, while male networks were on average larger (Belle, 1989; Benenson et al., 1998). To evaluate competing hypotheses regarding the connection between team game play and social network size, we examined the size of male and female play networks observed on the playground when playing all games, non-team games and team games. Consistent with the 'two worlds' model, male larger play networks were due to the playing of team games because when the team game data were removed from the analysis there was no difference in play networks size. However, examination of the social networks from the aggregation of the play network data for non-team games only, showed that these were of equivalent size to those including the team game data. This favours the notion that there is a 'centripetal force' that draws boys together into large networks (Benenson et al., 1998). It therefore appears that large networks are sustained whether children engage in team games or not. The possibility remains, however, that an interest in team games establishes the boundaries of the social network, which is then maintained in other types of games. A number of other factors also point toward a 'team games determine network size' interpretation. Existence of a second male network in every class that was comparable in size to those of girls suggests that the 'centripetal force' model does not relate to all boys. Researchers' notes indicated that networks had relatively distinct game profiles with some networks engaging in primarily fantasy play while others involved more competitive/athletic, social and cooperative activities. Finally, other research suggests that networks increase in size from the early years and then decrease in size during adolescence (see Cairns et al., 1998; Pitcher & Shulz,

1983) when playground activities change from the playing of games to socialising and hanging around (Blatchford, 1998).

Social Network structure

Findings in relation to social network structure are only suggestive because of the limited data available. Contrary to the notion that boys spread themselves thinly across many members, all boys' networks contained a core of a few boys who spent a lot of time together which was then extended into larger networks with the addition of members at the cluster and group levels. Consistent with expectations was the observation that female social network members tended to spend relatively equivalent amounts of time together suggesting that they may value loyalty and be intolerant of the fluidity that was typical of the boys' large networks. This may function to enhance intimacy within girls' networks. The existence of networks of weakly associated girls was unexpected. It would be surprising if girls within these loosely formed networks engage in intimate activities but these may be instances of new developing networks rather than established ones. Future research could examine the emergent internal structure of a larger number of networks to determine whether observed differences in structure explain the different values attributed to boys and girls networks.

Overlap between Social Networks and Friendship Relations

Results on social network and friendship overlap were consistent with predictions in that there was a greater overlap in the proportion of network members that were friends or best friends for girls than boys. An interesting and unexpected finding was that girl's networks tended to consist of a sub-set of friends and best friends. Boys' networks, by contrast, contain virtually all best friends and friends as well as others that are not friends, though may be friends of friends.

These network contexts afford girls more opportunities for explicit intimacy, but also suggest that girls may be intimate with only a subset of their friends, since they do not spend much

time with friends outside of the group. The large social networks of boys consisting of friends and non-friends are not contexts which will encourage self disclosure of thoughts and feelings, though these may be evident in interactions outside school; however the small networks of boys observed in this study may be more likely to experience close social relations.

Findings also have implications for interactions and behaviour when social networks fragment and when individual children become ostracised from their group and thus implications for day to day interactions aimed at avoiding these states. The presence of friends outside of the social network provides girls with alternative relationships that can be called upon in times of conflict or further developed to facilitate entry to a new group when required. However, this safety net may also function to undermine the stability of networks and make conflict more likely. By contrast, for boys, ostracism from the group may have a much larger impact. With few friends outside of the group that they can link up with, boys are less likely to want to fall out with other members of their social network. This threat may ensure the stability of boys' social networks and will also ensure less conflict but more compliance within the network.

Results also indicated that the cores of both male and female networks consisted of children who were best friends or friends. This suggests that social networks are often centred on friendships and it may be the case that the stability of these networks is dependent on the stability of these friendships, particularly among girls. However it is unclear how important these core relationships are, since other children that were more weakly associated with the network also had best friends and friends in the group.

It was also notable that some cores did not consist of friends. The most obvious explanation for this might be that a friendship nomination was simply not reciprocated. Another explanation might be that some children use friends as a secure base from which to explore the rest of the social world and thus spend little time with their friends. It is also possible that there is a dynamic between social networks and friendships in school such that those children a child enjoys spending time with on a day-to-day basis may not be friends at that immediate point in time but may become friends at

a later point. Current friends may represent current playmates, old playmates from previous social networks or relationships within a network that have changed.

Social Network Stability

Results on social network stability were contrary to those expected. While girls' networks were predominantly stable, a third of groups were unstable. Boys' cores and groups were all moderately stable but this slight amount of instability can be explained by external events, such as boys leaving school. The examination of stability at the dyadic relation level also favoured boys. Larger networks may thus afford greater overall stability since when boys fall out they can shift their positive relationships to others within the social network (as is suggested by the sex difference in the stability of friendships). However, high stability may have implications for boys' ability to establish new relationships without the supportive presence of a network.

The lack of stability in girls' networks is hard to reconcile given suggestions that they involve higher levels of exclusivity, loyalty and explicit intimacy. It might be the case that these concerns, while potentially creating greater cohesion, may also increase the likelihood of conflict. This is consistent with Benenson and Christakos' (2003) suggestion that girls' networks are more fragile than those of boys. Our findings highlight the risk taken by girls in forming smaller and more intimate social networks such that when there is a falling out, network stability is threatened. However, the presence of friendships outside of the network allows the opportunity for becoming a member of a new network should the need arise.

Conclusions and Future Directions

A strength of this research is in its effort to identify how social networks emerge from day to day interactions of groups of children engaged in social activities on the school playground. This is just one context in which children form groups, but arguably the most important, where children can engage in activities and socialise with others relatively freely of adult control. These sites are

meaningful for children and may be the main context where gendered behaviour socialisation takes place.

A question that arose during the research is whether observation alone can identify networks. Networks must be perceived to exist by members as much as be observed by others and thus an approach that combines observational and peer report may offer the greatest insights into network membership. Related to this issue is whether in all cases the social networks identified actually exist as real entities. Some large male networks appeared to be a collection of playmates than groups with an identity and norms. This distinction is important because a pool of playmates, as opposed to coherent groups with norms, may have a limited role in the socialisation of an individual. Given the fluidity of boys' large social networks, though possibly not the cores of these networks, it is possible that network members are less socialised by peers than members of more coherent social networks.

The current findings indicate that there are sex differences in the structure of social networks, in the forces that control involvement in them and suggest differing implications of being involved in these diverse network contexts. However there is a need for ever more sophisticated longitudinal studies which track children before social networks form and which can distinguish the causal forces that function to bring children together from the implications of the structural differences in these network contexts.

Findings from the current study generally support the two worlds perspective and highlight variation in network size and structure which, in some cases, may be greater within than between the sexes. The presence of this variability is consistent with the marked variability in sex differences in individual level factors observed (Maccoby, 1998). The existence of small male networks (2-4 members) containing approximately a quarter of boys, networks of girls that spend little time together and female networks of 6-7 members containing a third of girls in the sample, are therefore suggestive of multiple rather than two worlds. Research could examine and consider the implications of these different network structures which may have implications for differences within as well as between the sexes. But there is also a sense in which these different micro-contexts

are connected in an overriding culture of the classroom and playground. The forces at work at this higher level as well as between networks may also have important implications for sex differences. However, in contrast to a notion of hierarchically nested contexts and re-emphasising Sutton-Smith's point presented earlier, it is probably closer to the nature of human experience that these multiple layers are embedded and intertwined within everyday interactions and proximal processes without contextual boundaries. Either way, further detailed research is needed to compare the interactive forces and processes within and between male and female networks.

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[1] The Social Composite Map (SCM) procedure uses frequencies of co-occurrence rather than standardised data. Despite this, the resulting networks across all classes at Time 1 were almost identical to the threshold method used here. There were inconsistencies in the placing of 3 individual children. This was due to a slightly more liberal inclusion threshold on the part of the SCM procedure.

Table 1

Number and Size of Social Networks at Group, Cluster and Core Levels by Time and Sex, and Play Networks by Sex

	Male			Female			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
				Social networks time 1					
Groups	7.5	4.1	8	3.2	1.2	21	4.7	3.0	29
Clusters	5.0	3.1	10	2.8	1.2	16	3.6	2.4	26
Cores	3.1	2.0	9	2.3	.63	13	2.6	1.4	22
Isolates	-	-	4	-	-	9	-	-	13
				Social networks time 2					
Groups	6.4	5.1	9	3.3	1.6	19	4.3	3.4	28
Clusters	4.9	4.2	9	2.5	.72	17	3.3	2.7	26
Cores	3.3	1.9	9	2.7	.82	10	3.0	1.5	19
Isolates	-	-	0	-	-	10	-	-	10
				Play networks					
All games	6.0	4.2	3044	4.6	2.7	3158	5.3	3.6	6202
Non-team games	4.4	2.5	2279	4.3	2.4	2921	4.4	2.5	5200
Team games	10.7	4.8	765	7.6	4.0	237	9.9	4.8	1002

Note. At Time 1, 1 core, 1 cluster and 3 groups and at Time 2, only 2 groups had a mix of males and females.

Table 2

Descriptive Statistics for the Number of Best Friends and Friends, the Overlap Between Friendship and Social Networks by Sex at Time 2.

	Male		Female		Total		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	N
Friendship relations							
Number of reciprocal best friends	4.94	5.50	4.47	3.87	4.68	4.65	121
Number of reciprocal friends	13.57	8.55	13.93	8.59	13.77	8.54	121
Social network – friendship overlap							
% core that are best friends	46.98	40.44	53.08	41.10	49.87	40.50	57
% core that are friends	72.70	34.61	97.53	8.89	84.46	28.52	57
% of group that are best friends	19.91	27.10	41.88	38.17	31.09	34.84	112
% of group that are friends	44.24	33.20	65.80	33.37	55.21	34.86	112
% best friends that are in core	48.45	47.77	31.17	43.68	38.53	46.03	94
% friends that are in core	33.10	37.90	21.44	29.97	26.63	34.08	119
% of best friends in group	90.15	26.65	71.67	40.95	79.53	36.58	94
% of friends in group	77.05	28.21	47.02	35.95	60.40	35.88	119

Note. Analyses are presented for Time 2 data only but replicate findings at Time 1.

Table 3

Social Network Stability between Time 1 and 2

		Boys	Girls	Total
		Cores		
Stable 100%		0%	38%	23%
	Count	0	5	5
Stable >50%*		89%	77%	82%
	Count	8	10	18
Unstable <50%		11%	23%	18%
	Count	1	3	4
Total		41%	59%	100%
	Count	9	13	22
		Groups		
Stable 100%		0%	24%	17%
	Count	0	5	5
Stable >50%*		100%	67%	76%
	Count	8	14	22
Unstable <50%		0%	33%	24%
	Count	0	7	7
Total		28%	72%	100%
	Count	8	21	29

Note. *Figures include social networks that were 100% stable.

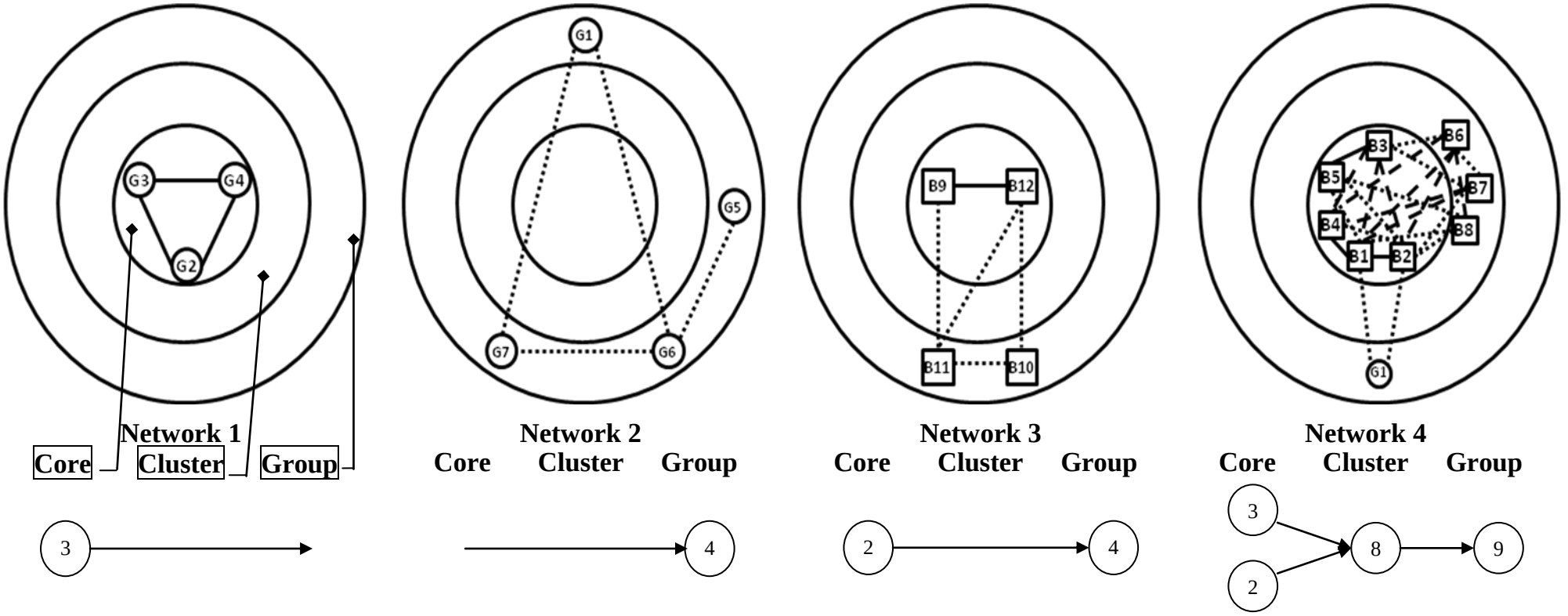
Table 4

Stability of group level, friendship and best friendship ties (mean %) between Time 1 and 2.

	Male		Female		Total		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	N
Stability of dyadic ties							
Stability of group level ties	75.6	24.8	57.7	37.6	66.0	33.4	113
Stability of best friendships	25.6	41.3	36.9	45.5	31.8	43.9	119
Stability of friendships	31.9	30.6	43.5	33.4	38.1	32.5	124

Figure 1

Examples of the emergent internal structure of four whole social networks showing connections between individuals and an illustration of the numbers of members cohering together at each threshold level.



Notes: Encircled numbers indicate the number in the network at that level. Girls are marked with a ‘G’, boys with a ‘B’. A solid line between members indicates 50%+ co-occurrence, a dashed line indicates 37.5%+ co-ocurrence and a dotted line 25%+ co-ocurrence. Network 1 consists of members connected only at the core level. Network 2 consists of members connected only at the group level. Network 3 consists of members connected only at core and group levels. Network 4 consists of two cores that come together at the cluster level with 3 additional members and a final member at the group level.