Emotional Social Networks and Interpersonal Communication of Emerging Adults

TOMLIN, PETER,ROBERT

Peter Tomlin – Emotional Social Networks and Interpersonal Communication of Emerging Adults

Abstract

This study examines the emotional social networks and interpersonal communication of emerging adults, focussing on both general patterns and individual differences, with data collected via questionnaire. Thirty-seven questionnaires were completed by students at Durham University aimed at eliciting details on their intimate social relationships (the support clique and sympathy group), usage of technology for communication, and personality according to the Five Factor Model of the respondents.

This study found support clique sizes of 6.44 ± 3.22 and sympathy group sizes of 14.31 ± 7.06, with female networks being approximately 1.5 times larger than male networks. Personality was also related to network size, with Agreeableness being correlated with both support clique and sympathy group size. This association was determined to be the result of individuals who had higher Agreeableness scores having both a larger number and proportion of non-kin to kin. Additionally, a trend towards sex and age biased homophily was observed, along with a preference for genetic kin in emotional social networks.

The time to last contact with a member of the network was seen to be related to their emotional closeness and geographical distance, with the respondents' personality also playing a significant role characterised by higher levels of Extraversion and Conscientiousness reducing the time to last contact, while higher levels of Agreeableness were associated with an increased time to last contact attributed larger network size. Additionally, the form of last contact (email, social network site etc.) was found to be dependent upon the emotional closeness, geographical distance and the type of relationship.

Finally, this study found that emerging adults are heavy users of technology in communication, and that those individuals who used one form of communication were also likely to make use of others.

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Peter Tomlin

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1 Introduction

1.1 Overview

This thesis aims to examine the emotional social networks and communication both within these networks and in general, through studying the patterns of usage of computer-mediated and technological forms of communication in emerging adults.

A number of studies have examined human sociality from an egocentric perspective, collecting data on the number and type of people that an individual knows. Such studies have ranged from collecting data on the whole social network of individuals (Killworth et al 1990, Hill & Dunbar 2003, Roberts et al 2009), to examining only the most intimate relationships of an individual (Wellman 1979, Dunbar & Spoors 1995). What is clear from these studies is that, while there are certain patterns in human networks, particularly related to the size and composition of the networks, there is also a high degree of variation. However, to date few studies have actively explored the reasons behind such variation at the individual level, with notable exceptions being found in studies looking at the relationship between and social network size and performance in cognitive tasks (Stiller & Dunbar 2007) and personality (Roberts et al 2008).

One of the primary objectives of this thesis is to examine both the general pattern of the emotionally closest social relationships in emerging adults, while also ascertaining the basis of individual variation in network size, structure and composition, focussing on demographic aspects (sex and age), as well as the influence of personality. In addition, this thesis will draw upon the field of Social Network Analysis (SNA), employing analytical methods to determine the general level of connectedness between the members of egocentric social networks, along with determining if certain individuals have greater prominence in the networks of emerging adults.

"Emerging adulthood" is a term developed by Arnett (2000) to refer to the period of life between late adolescence and early adulthood, covering the period from the late teens to the early twenties. This age range falls neatly within the ages of university

students, both undergraduates and postgraduates, who are excellent subjects for a study on social networks and communication. University students exist in a state of flux; still connected to their previous home lives, yet on the brink of coming into their own and forging their own path through life. This transitional status means that they may have trouble reconciling the need to make new social contacts while maintaining existing relationships, and due to the geographic estrangement from established contacts may also lead to a risk of developing negative socioemotional feelings such as homesickness (Watt & Badger 2009).

With the various communication technologies now available, from mobile telephones to Social Network Sites (e.g. Facebook), geographical distance is no longer a barrier to communication. The internet alone encapsulates a combination of all previous communication technologies (Bargh & McKenna 2004), and when combined with mobile telephony and the recent advances in mobile internet, has led to a communication schema characterised by a constant "connected presence" (Licoppe & Smoreda 2005) in which it is always possible to contact someone in some manner or another, irrespective of geographical distance. This thesis therefore aims to examine not only how emerging adults communicate with their closest friends and family, but also how they use technological forms of communication in general, along with determining the underlying reasons behind individual differences in the use of communication technology.

1.2 Summary of Aims

This study has two primary objectives:

i) To determine the general properties of social networks in emerging adults, focussing on how large the networks are, who is placed within the networks, and how the networks are structured

ii) To determine both patterns of communication within the network and the use of technological forms of communication in general

Both of these objectives will be conducted with the intention of not only exploring the general patterns and properties, but also establishing the reasons behind individual differences, looking at the effects of age, sex and personality on both social network properties (e.g. size, composition, structure) and communication

within and without the network (e.g. use of communication technology, time to last contact, form of last contact). These aims were achieved by designing and distributing a questionnaire that elicited the respondent's core social partners, along with how and when they last had contact with these partners. Additionally, the connections between those individuals listed by the respondent were also requested. The questionnaire also included sections on the general usage of technology in communication, along with a series of questions designed to allow for an assessment of the respondent's personality according to the Five Factor Model (McCrae & John 1992).

1.3 Thesis Structure

This chapter has provided an overview of the central research questions addressed in this thesis. The next chapter (2) aims to provide a review of the literature relevant to this thesis in three areas; human sociality and social networks, personality, and the use of technology for interpersonal communication, before presenting a series of research questions that will be addressed in this thesis, and the hypotheses to be tested to fulfil these objectives. Chapter 3 presents the methodologies employed in this study, looking at both data collection protocols and methods used for data analysis, along with a rationale for why such methods were employed. Chapter 4 provides the results of the study, incorporating both exploratory and confirmatory results from hypothesis testing. Chapter 5 aims to provide a general discussion of the findings of this thesis, placing the results within a wider academic context while also critically evaluating the study, presenting recommendations for future research, and finally, the general conclusions of this study.

2 Literature Review

This chapter will examine some of the key points of emotional social networks, personality, and communication in humans, and introduce the hypotheses that will be tested in this study. The first section will deal with perspectives on human sociality, beginning with an overview on the non-human primate origins of human sociality before moving onto studies that have examined patterns in human sociality. The next section aims to provide an overview of the field of personality and the specific type of test that will be used in this study. The final section provides an overview on technological forms of communication, focussing upon internet-based forms such as Social Network Sites (SNSs).

2.1 Perspectives on Human Sociality

2.1.1 Non-human primate origins of human sociality

Primates are a highly diverse Order, varying greatly in body size, ecology and behaviour. However, almost all species of primates have one very important thing in common; in contrast with many other mammalian species, the majority of primates live in bisexual groups with more than 3 adults (Kappeler & van Schaik, 2002) in which group membership is relatively constant and in which members recognize each other as individuals and interact with one another on the basis of this recognition (Byrne & Bates 2010). Most primate species are intensely social, live in groups and must interact with more-or-less the same individuals over an extended duration.

Living in groups has a range of adaptive benefits that makes it an optimal strategy in primates, with one of the most important being defense against predation. Throughout their diverse habitats, primates are at risk of predation from a variety of other species (Cheney & Wrangham, 1987) and it has been shown that the relative risk of predation can have a dramatic effect upon not only group size, but also group composition (Hill & Lee 1998), with high predation risk associated with larger group size and the presence of more males within a group. Some of the best examples of complex referential vocal communication in primates come from studies of predator

alarm calls in a number of species (vervet monkeys (*Chlorocebus pygerythrus spp.*): Cheney & Seyfarth 1986; Diana monkeys (*Cercopithecus Diana*): Stephan & Zuberbuhler 2008), which suggests the general importance of predation and the various methods primates utilise to reduce the risk of predation.

Primates are also at risk of predation from members of their own species, with infanticide being prevalent in many groups as a result of unknown males taking over a group and killing infants that are not their own in order to have receptive females for their own reproduction. By having year-long associations with males, the risk of infanticide will be reduced as the presence of associated males may deter other males (van Schaik & Keppeler 1997). In many species, the female reproductive cycle and mating behaviour has evolved in such a way as to minimise the risk of infanticide while also ensuring cohesion within associated males by increasing paternity uncertainty (Hrdy 1979), with biological adaptation serving to influence both group size and composition and infanticide prevention.

In addition to reducing predation and infanticide, living in groups also has benefits from a resource perspective; by living in groups, primates are able to successfully compete for food and other resource such as sleeping sites in order to increase their reproductive fitness. However, group size can have a detrimental effect if the size of the group becomes too large for the available resources. One of the basic assumptions of socioecological theory is that within a group, females compete for access to nutrition-based resources, while males compete for females as a reproductive resource (Wrangham 1980). Group size must therefore be by necessity constrained by the environment; if there is not enough food available for females, or enough reproductively active females available for males, group living will become a disadvantage as competition for limited resources will lead to an overall decrease in reproductive fitness.

Ecological limitations are not the only factor that can constrain group size, and one of the most important of these is the time and effort required for maintaining cohesion between members of the group. Primates spend a great deal of time socialising and bonding with one another in order to maintain relationships between group members, with grooming being seen as an important medium through which this can be achieved (Dunbar 1991, Bitetti 1997); the most social primates spend up

to 20% of their daily activity budget engaging in social grooming (Dunbar 1991) . If the group size becomes too large, cohesion will be reduced as not only will there be too many members of the group to socialise with, there will also be less time available to do so as there will be greater competition for resources. Thus more time will be spent foraging leading to a reduction in the time spent grooming (Lehmann et al 2007).

While time is a constraint for group size, there is also another factor which is just as important; cognition. Social interactions in primates are cognitively demanding, with knowledge required not just of an individual's own interactions with other members of the group, but also of the interactions between other group members which can be used to enhance an individual's fitness and success. For example, Kummer (1967) showed that in hamadryas baboons (*Papio hamadryas*), females utilise males in order to threaten other females who are dominant to themselves (the protected threat), in the knowledge that the dominant female will not retaliate due to the presence of the male, while Silk (1999) has shown that in bonnet macaques (*Macaca radiata*), males seek coalitionary support from other males in agonistic encounters based on their rank relative to both their own and the individual they seek support against, consistently seeking support from individuals who rank higher than both themselves and their opponents.

Evidence of the cognitive complexity of primate social interactions has led to the Social Brain Hypothesis (Barton & Dunbar 1997, Dunbar 1998), in which primate cognition and brain evolution is reliant upon the requirements of social living. There have been numerous other theories that try to explain primate, and specifically, great ape and human intelligence, ranging from the requirements of spatial memory related to the distribution of resources in the landscape (Clutton-Brock & Harvey 1980), through to the cognitive requirements of extractive foraging and food processing (Yamakoshi 2004, Byrne et al 2001) and even the cognitive requirements of arboreality in a large-bodied primate (Povinelli & Cant 1995). While such theories undoubtedly have a role in helping to understand primate cognition, they are far from holistic, and the patterns of behaviour suggested as being the possible roots of primate intelligence may in fact just be manifestations and applications of the social intelligence of primates.

Empirical research has shown through studies on primate brain size that there is strong relationship between primate group size and cognition, with group size being found to be a function of the relative neocortical volume of a primate species (Dunbar (1992). Primates possess larger brains relative to many other mammalian species, but importantly also vary in their degree of encephalisation, and through studying the relative degree of encephalisation, taking neocortex size and comparing this to group size, it was shown that neocortex volume acted as a constraint on group size. Once group size exceeds this cognitive limitation the social group becomes unstable and at risk of fragmentation. Subsequent analyses have further proven the link between not only between group size and neocortex volume, but also between neocortex volume and measures of sociality such as the grooming clique size (and by extension coalitionary size), with neocortex volume acting as a raw cognitive constraint in terms of how many individuals a primate can maintain intimate relationships with (Kudo & Dunbar 2001), while also related to further aspects of social complexity such as tactical deception, social strategies and social play (Dunbar & Schultz 2007).

While much of the research conducted on the relationship between sociality and cognition in primates has used the relative size of the brain, focussing on the neocortex ratio in particular, recent studies have returned to examining not just at the relative size of the brain, but also the absolute size of the brain as a means of understanding why, for example small bodied primates which have large brains relative to their body size lack certain markers of cognitive complexity. Brain size generally scales allometrically with body size, and Deaner et al (2007) found that not only is overall brain size a good indicator of cognition in primates, but that overall body size is an equally good predictor. When overall brain size is included in models, neocortex size and neocortex ratio were found to be no longer significant, which may suggest that the relative size of the neocortex used in many studies may be simply an analogue for absolute brain size, a measure which has previously been largely disregarded by the academic community precisely because of the allometric relationship between body size and brain size (Marino 2006).

Primate cognition and sociality can therefore be seen to be highly correlated, particularly in relation to the constraints that are put upon maximum group size. The

next section will show the implications that this holds for human sociality, along with an overview of the structure of human sociality and social networks.

2.1.2 Human sociality and social networks

Human sociality and social networks have been found to be constrained in similar ways to non-human primates. Relative neocortex size acts as a constraint on group size in non-human primates, and this relationship can also be seen in human populations. Dunbar (1992, 1993) suggested that on the basis of human neocortex size, the maximum theoretical limit for a human social group size is approximately 150 people. While only a theoretical limit, human group sizes of around 150 individuals are prevalent in the anthropological and archaeological record, being the average size of clans in hunter-gatherer societies, the size of villages in traditional and historic societies, the size of companies in the majority of modern armies, and even the number of individuals working in Goretex factories (Dunbar 2008).

While such examples are somewhat anecdotal in nature, and could be the result of mere coincidence, empirical studies have shown that human social networks do indeed appear to have an upper limit of around 150 people. In a study conducted on human social networks by looking at the people to whom individuals send Christmas cards to (with Christmas being an ideal occasion to study human social networks as it is a time when relationships are at the forefront and will be recognized and validated), Hill and Dunbar (2003) found that the average number of cards sent to others by 43 individuals was 153.5 if the cards were sent to multiple individuals (e.g. sent to someone *and family*), and 124.9 when only individuals named on the cards were taken into account. Similarly, Roberts et al (2009) found that while the average social network size found in a sample of 160 individuals was 71.84, there appeared to be an upper limit on the number of relationships that could be maintained of between 136-150 people. Furthermore, Zhou et al (2005) have suggested that the mean community size in a contemporary cross-cultural study is around 132.5 individuals, while Hamilton et al (2007) report that data from 339 hunter-gatherer societies suggests that the average periodic aggregation size was 165.32 individuals.

It must be appreciated that this number of 150 people does not refer to the total number of people that a person may know, but rather the number of people that an

individual knows as *persons*, and has a personal relationship with characterised by levels of reciprocity and obligation not found in interactions with other people (Dunbar 2008). While the above examples all find network sizes of approximately 150, there are other studies which have reported vastly different sizes, by choosing to use methodologies which are designed to elicit potentially different measures on the total network of an individual.

At the extreme end of the spectrum, Killworth et al (1990) suggest that personal networks may contain as many as 2000 individuals, using methods such as scaling up the number of last names that a person can recall when presented with a representative list of names from a telephone book. As Killworth et al (1990) suggest themselves, trying to get accurate data on complete networks is largely unfeasible, hence the requirement for proxies of network data that can be scaled up in various ways. While it may well be that individuals may know this many people, it is debateable whether or not they actually have an intimate, personal relationship with all of them, and ultimately results attributable to such scaling and extrapolative methods lack the rigour of fully empirical evidence in which respondents actively list people in their network.

The same group of researchers have also suggested that personal networks have an average of approximately 290 individuals (McCarty et al 2001), using different criteria and two different methods, both of which involved telephone surveys in which respondents had to simply state the number of people they know in different categories, with "know" here defined as "*you know the person and they know you by sight or name; you can contact them in person, by telephone or by mail; and you have had contact with the person in the last 2 years" (*McCarty et al 2001 p. 29). In contrast, studies which have found personal networks more in line with Dunbar's Number of 150 people often require the respondent to go beyond simply stating a number of people they know according to various categories, but actively require the respondent to name these individuals. For example, Roberts et al (2009) required respondents to list all of their known relatives (both genetic and affinal), before listing unrelated people with whom they have a personal relationship and which satisfied three criteria: (i) the respondent has contact details of the person (ii) they have had some sort of contact with in the last 12 months (iii) they want the relationship with the person to continue.

Thus, the type of study, along with the questions that are used to elicit details of a personal network can have a great impact upon the data collected. Indeed, different studies which purport to be examining personal networks may in fact be looking at very different types of networks, particularly in terms of scale. There is often little methodological consistency between researchers, and therefore little agreement on what actually constitutes a personal network. However, with the aforementioned prevalence of human societies and groups which centre around a group size of 150 individuals, the most parsimonious explanation would be that there does indeed appear to be a selection for groupings at this level.

One thing that is clear about human social networks is that the relationships with individuals found within the network are not equal, and there is evidence suggesting that human social groups are hierarchically differentiated (Hill & Dunbar 2003). Human social networks can be viewed as a series of hierarchically inclusive concentric circles (see Figure 2.1), with the most important relationships being small in number and placed in the inner most circles, and less important relationships being more numerous and peripheral. The closer the relationship is at an emotional level, the shorter the time will be since last contact (Hill & Dunbar 2003), and the more likely that other individuals at the same emotional level will know each other, leading to a highly dense, structurally embedded network (Roberts et al 2009). This principle of network density is an intrinsic aspect of social network analysis, and is based on the study of connections between individuals within a network (Scott 2000); the more connections within members of the network, the denser the network becomes. It is also possible to examine individual's within the network, by examining the connections between just a single individual and the rest of the network, known as centrality (Freeman 1979). Both density and centrality will be returned to and expanded upon in the methods section of this thesis.

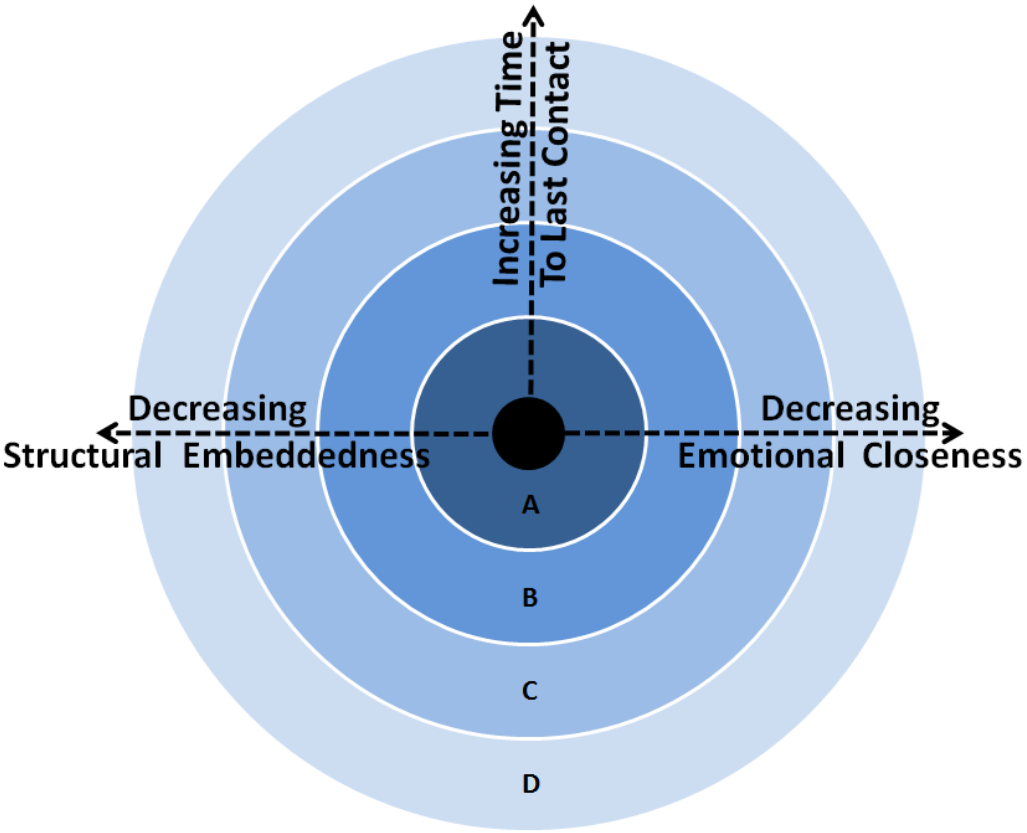


Figure 2.1: The hierarchical construct of an egocentric human network

Figure 2.1 illustrates the hierarchical nature of human social networks. The innermost layer (A) corresponds to the "support clique", and includes people from whom one would seek personal advice or help from in times of severe emotional or financial distress (Zhou et al 2005) or who have been contacted within the past week (Stiller and Dunbar 2007), and has been shown to be around 5 people (average of 4.72 ± 2.95 (Dunbar and Spoors 1995); approximately 7 (Hill & Dunbar 2003); 5.14 ± 4.6 for males, 6.55 ± 4.6 for females (Stiller and Dunbar 2007). The next layer (B) is known as the "sympathy group", and contains those individuals whose deaths would be personally devastating (Buys & Larson 1979) or are contacted at least once a month (Dunbar & Spoors 1995), and has been estimated at around 15 individuals (average of 11.6 ± 5.64 (Dunbar & Spoors 1995; approximately 21 (Hill & Dunbar 2003); 20.9 ± 13.4 for males, 20.2 ± 11.5 for females (Stiller & Dunbar 2007). These two layers can be said to constitute an individual's core social group, in which stable relationships are maintained over time (Stiller & Dunbar 2007). The next layer (C) has been seen to relate to groupings taken from hunter-gatherer ethnography, and has been regarded as the overnight group or 'band', ranging from 30-50 individuals

(Dunbar 1993), while the last layer (D) corresponds to the personal network, at approximately 150 individuals.

From looking at the membership at each layer in a social network from a wide range of sources, Zhou et al (2005) found that there was a consistent scaling of a factor of 3-4 between each layer (mean support clique = 4.6, mean sympathy group = 14.3, mean band size = 42.6. mean community group size = 132.5, mean mega-band = 566.6, mean large tribe = 1728). This scaling factor was repeated in a study looking specifically at a large range of ecologically and socially diverse hunter-gatherer groups (Hamilton et al 2007), suggesting that human groups have a strong tendency to self-organise into hierarchically scaled and similar groups. The fact that the base unit of social organisation here (the hunter-gather family unit at 4.48 individuals) is very close to reported values for support clique size in contemporary societies must be regarded as significant for human social organisation, as it suggests that social groupings that may have evolved in humans in our prehistoric, hunter-gatherer past have been retained in modern humans; the social structures found in human societies today are a manifestation of our evolutionary history, designed to create social groups with optimal levels of social support.

In addition to cognition being related to the maximum number of personal relationships that an individual can successfully maintain, there is strong evidence that the sizes of the core social groupings (the support clique and sympathy group) are also dictated by cognition. Working on the basis that while there appears to be a consistent pattern in the average size of these core social groupings, there is also considerable variation between individuals, Stiller and Dunbar (2007) suggest that this variation may be caused by differences in individual levels of cognition. By examining two measures of cognition (the capacity to remember facts about the world (memory) and the ability to take social perspective (intentionality)), it was found that while intentionality predicts support clique size, memory predicts sympathy group size. Essentially, the ability for perspective taking affects the number of core contacts an individual can maintain, with raw memory capacity placing a limitation on the wider number of friends an individual can maintain. Stiller and Dunbar (2007) also replicated earlier findings (Kinderman et al 1998) that humans appear to have an upper limit on perspective taking equivalent to fifth order

mentality (i.e. an individual can only cope with processing the mental states of 5 individuals), suggesting that this serves to limit the core support clique.

Further evidence for the social brain hypothesis and its role in human evolution comes from studies looking beyond cognitive restrictions on group size, and instead examining human communicative behaviour. Around two-thirds of conversation time in humans is of a social nature (55% of male and 66.7% of female conversation time: Dunbar et al 1997) involving personal, social and emotional information and experience. Indeed, social conversation, generally characterised as 'gossip' is thought to be one of the principle platforms upon which human society and sociality is based (Dunbar 2004). Additionally, human communication and transmission of information has been shown to be strongly biased towards social information, with messages of a social nature being transmitted more readily and with greater fidelity with regards to the original message relative to non-social messages (Mesoudi et al 2006). Similarly, information that is emotionally intense is more likely to be transmitted than information that is emotionally weak or mild, with information involving the emotions of happiness and disgust being particularly communicable (Peters et al 2009).

Having seen that cognition and evolution play an important role in the size of human groups, along with presenting some basis for structural similarities in networks across human societies and a general bias for social information in human conversation, the composition of human social networks will now be examined. As previously mentioned, relationships within social networks are not equal; some individuals will be more important within the network, while others are more peripheral. Research has shown that there is a substantial bias towards kin in the core social relationships, with Dunbar and Spoors (1995) suggesting that while kin make up 37.5% of the sympathy group, if kin were chosen at random as part of the network then they would only make up around 9% of the network; kin are over-represented in the network by a factor of approximately four. This value for kin can also be seen in the total personal network, with Roberts et al (2009) finding that genetic kin made up 38% of the total network in females.

Roberts et al (2009) found that in addition to genetic kin making up 38% of a total network, affinal kin made up approximately 19% with unrelated individuals

comprising around 44% of the network. Hill and Dunbar (2003) show that genetic kin make up 21% of the network, with affinal kin making up 4% and friends, neighbours and work colleagues forming 63%, 4% and 8% respectively (for a total of 75% of the network being non-relatives), although the average network size in Hill and Dunbar was almost double that reported by Roberts et al (2009). Hill and Dunbar also found that genetic kin have high levels of emotional closeness compared with other groups in the study. Therefore, the type of relationship that an individual has with someone has a clear impact upon their position in the social network.

In addition to variations in emotional closeness according to relationship type, Hill and Dunbar (2003) also found considerable variation in the time to last contact with people within the networks. Time to last contact can be seen to increase with geographical distance, but decrease with increased genetic relatedness, if the person was a work colleague, and as emotional closeness increases. Additionally, social networks have been seen to exhibit high levels of gender bias, with male networks containing more males and female networks containing more females (Roberts et al 2008, Dunbar & Spoors 1995). This trend towards homophily is a consistent factor of human sociality, with people being more likely to interact with those who are demographically or circumstantially similar to themselves (McPherson et al 2001).

This study aims to examine the social networks of emerging adults, focussing upon the most intimate social relationships (the support clique and sympathy group) to determine the size and composition of these networks, along with the reasons behind individual variation. One of the key indexes of individual variation that will be used in this study is personality, which will be introduced in the next section.

2.2 Personality

2.2.1 Overview

In this section, current and past theories on personality will be briefly examined, before taking a deeper look at the research focussing on one particular set of personality measures upon which part of this current thesis is based; the Five Factor Model of personality and its applications to studies on human social networks and communication.

Personality has been defined as "the characteristics of the person that account for consistent patterns of feeling, thinking and behaviour" (Pervin et al, 2005 p. 6), with theories on personality being grounded in what makes individuals distinct from one another. Due to the breadth of the definition, there are several competing and contrasting theories that have been developed by researchers taking different approaches to personality, many of which are firmly grounded in psychiatry and the treatment of pathological disorders. While none of these theories are entirely correct (or for that matter, incorrect), they are all useful measures of individual differences that can be of great assistance in determining the causation of feelings and behaviours, which have wider applications.

Pervin et al (2005) present a comprehensive overview on the varying theories available, covering seven overarching theoretical approaches, ranging from the psychodynamic approach (characterised by a classical Freudian approach in which the mind and body are in conflict; the unconscious biological desires of the body are unconsciously suppressed by the mind due to the constraints of society), to behaviourism (in which personality is viewed as a learned process, adaptive to rewards and punishments) and personality construct theory (in which personality is seen through the cognitive constructs people use to interpret the world around them along with the subjective ideas used in such interpretations). To fully describe and compare all of the competing personality theories would be far beyond the scope of this thesis, and so only one type of theory will be examined in detail: trait approaches to personality, which in contrast to the other theories of personality, have been developed with an objective focus on individual variation, and are thus of excellent utility in applied academic research.

2.2.2 Trait approaches to personality

Trait approaches to personality are based on two key research objectives: (i) the development of reliable measures of individual differences and (ii) the determination of which differences are the most important to measure (Pervin et al 2005). The key way in which trait analysts establish these two aspects of personality is by examining the lexigraphy of personality-description terms (e.g. happy, sad, reserved, suspicious) to find synonym clusters using factor analysis to determine correlations between sets of terms (Goldberg 1990). Through such methods, a starting set of

items relating to personality can be taken from a dictionary and then assessed to see their intercorrelations, allowing them to placed in larger groups relating to their specific properties. In doing so, it is possible to build up a hierarchy of traits placed into larger factors, which may themselves also be subsumed within larger categories through repeated levels of analysis.

For example, Allport and Odbert (1936) compiled a list of nearly 18,000 terms which could be related to personality, determining that of these around 4,500 could be classed as stable traits (with their definition of traits being "generalized and personalized determining tendencies - consistent and stable modes of an individual's adjustment to the environment" (Alport & Odbert 1936, p. 26 taken from Pervin et al 2005). A trait must be something that is more or less constant within an individual that should not be affected by external factors, and from these approximately 4,500 trait terms, Cattell (1946) found a set of 16 factors which he believed were independent and could be assessed in individuals via a questionnaire known as the Sixteen Personality Factor (16PF).

Subsequent research failed to replicate Cattell's 16 factors, instead finding that the scales and data that Cattell had relied on could be reduced using factor analysis into only five main factors, as reported by both Tupes and Christol (1961) and later Norman (1963). Indeed, by the end of the 1960's at least 5 independent researchers had established the presence of five factors (Digman 1990). However, the five factor model was disregarded by many due to the prevailing academic paradigm of the time (McCrae & John 1992) in which the validity of trait based approaches was strongly criticized for being poor predictors of behaviour, with implicit personality theory suggesting that personality factors tell us more about the categories people use to describe others rather than the true source of personality (Borkenau 1992).

It was not until the early 1980's that researchers returned to the Five Factor Model, reproducing and building upon the earlier research (Goldberg 1981; Digman & Takemoto-Chock 1981), after which the five factor model has gone from strength to strength and is widely used as universal model for personality, being commonly accepted as an indicator for the major dimensions of personality (Ross et al 2009). While there are other factor-based measures of personality, most notably Eysenck's three-factor model (Eysenck & Eysenck 1976) which are widely used, research has

shown that many of the various models of personality are highly correlated with one another and essentially measure many of the same things (e.g. McRae & Costa 1985). Even within the five factor model itself there has been disagreement over what to name the factors (Digman 1990), which is largely a matter of personal preference for semantics than a sign of any real disagreement over what the factors actually represent.

Despite such disagreements, there is now a consensus that the Five Factor Model comprises of the following discrete factors which allow for the memorable acronym, OCEAN: **O**penness to Experience, **C**onscientiousness, **E**xtraversion, **A**greeableness and **N**euroticism (McCrae & John, 1992).

2.2.3 The Five Factor Model: Definitions of factors and general applications

Table 2.1 provides an overview of the key aspects of what each factor is designed to measure, along with some of the characteristics of low and high scorers on the scale. Each personality factor can be viewed as a continual spectrum, from low to high scores which can be characterised by certain behavioural or attitudinal adjectives. To summarise, Openness to Experience is a measure designed to assess an individual's capacity for the seeking of new experiences and toleration for the unknown. A low scorer can be described as conventional, narrow-minded and unartistic, while a high scorer is curious, original and imaginative. Conscientiousness measures an individual's diligence, organisational ability and motivation towards goal-directed behaviour. Low scorers can be described as aimless, lazy and careless, while a high scorer is organized, hard-working and disciplined. Extraversion measures the intensity of interpersonal interaction and the need for social stimulation. Low scorers can be described as reserved, unexuberant or quiet, while a high scorer is sociable, fun-loving and optimistic. Agreeableness measures an individual's orientation towards interpersonal interaction, with a low scorer being cynical, vengeful and manipulative, while a high scorer is good natured, forgiving and helpful. Finally, Neuroticism measures an individual's emotional stability allowing for the identification of those prone to psychological distress or possessing poor coping strategies. A low scorer can be described as calm, secure and self-assured, while a high scorer is nervous, insecure and hypochondriacal.

Table 2.1: The Big Five Factors and examples of what they aim to measure. Adapted from Pervin et al's (2005) representation of Costa & McCrae (1992)

Factor	What is measured	Key characteristics of a low scorer	Key characteristics of a high scorer
Openness (O)	Proactive seeking and appreciation of experience for its own sake; toleration for and exploration of the unfamiliar	*Conventional, down-to-earth, narrow interests, unartistic, unanalytical*	*Curious, broad interests, creative, original, imaginative, untraditional*
Conscientiousness (C)	The individual's degree of organization, persistence and motivation in goal-directed behaviour. Contrasts dependable, fastidious people with those who are lackadaisical and sloppy	*Aimless, unreliable, lazy, careless, lax, negligent, weak-willed, hedonistic*	*Organized, reliable, hard-working, self-disciplined, punctual, scrupulous, neat, ambitious, persevering*
Extraversion (E)	Quantity and intensity of interpersonal interaction; activity level; need for stimulation; capacity for joy	*Reserved, sober, unexuberant, aloof, task-orientated, retiring, quiet*	*Sociable, talkative, person-loving, optimistic, fun-loving, affectionate*
Agreeableness (A)	The quality of one's interpersonal orientation along a continuum from compassion to antagonism in thoughts, feelings and actions	*Cynical, rude, suspicious, uncooperative, vengeful, ruthless, irritable, manipulative*	*Soft-hearted, good-natured, trusting, helpful, forgiving, gullible, straightforward*
Neuroticism (N)	Adjustment versus emotional instability- identifies individuals prone to psychological distress, unrealistic ideas, excessive cravings or urges and maladaptive coping responses	*Calm, relaxed, unemotional, hardy, secure, self-assured*	*Worrying, nervous, emotional, insecure, inadequate, hypochondriacal*

The particular scale Table 2.1 and the previous summary refer to is the NEO-PI-R (Revised NEO Inventory) developed by Costa and McCrae (1992), a questionnaire in which a comprehensive set of 240 statements is presented to an individual with instructions to score how applicable the statement is to them on a 5-point scale from strongly disagree to strongly agree, thereby allowing scores for each of the five-factors. Additionally, because the five factors involved are at the top of the personality trait hierarchy, each factor also contains six facets (subordinate traits which comprise each of the factors), allowing for greater analytical refinement if required by a researcher.

The NEO-PI-R is only one method of collecting and analysing Five Factor personality information, with other questionnaire-based designs including the NEO-FFI (a shortened version of the NEO-PI-R, reduced from 240 to 60 items (McCrae & Costa 2004)), the TIPI (Ten Item Personality Measure; aims to measure the Five Factors using only 10 questions (Gosling et al 2003)), and the FF-NPQ (a 60-item non-verbal questionnaire in which respondents are shown a series of illustrations and asked to rate the likelihood of themselves performing the same behaviour as the central figure of the illustration (Paunonen 2003)). However, all of the various methods available are ultimately concerned with the same Five Factors, and so findings from one study are likely to be comparable with those from a study using a different set of measures as there is a high degree of construct validity between them (i.e. they correlate with one another and are measuring the same things). Of equal importance is the fact that the Five Factor Model also corresponds to other personality measures designed to measure different aspects, such as Eysenck's PEN (with the Five Factor Model's Extraversion and Neuroticism being nearly identical to Eysenck's versions, while Agreeableness and Conscientiousness are both measured by Eysenck's Psychoticism) while Cattell's 16PF are roughly correlated with the facets of the NEO-PI-R (Pervin et al, 2005).

The Five Factor Model has also been tested in a cross-cultural and cross-linguistic capacity to determine its universality as a species-wide psychological phenomenon, with the results indicating that the Five Factors are present across a wide-range of cultures and linguistic groups (Costa & McCrae 1997). This sense of universality allows for further studies which examine whether there are cultural differences between human groups by aggregating individual scores within regions (McCrae,

Terracciano et al, 2005), with 51 cultures from regions around the world being compared and suggesting that personality traits may provide insights into cultural differences. Such global-level research is an extreme example of the universal applicability of the Five Factor Model, with general uses in research being somewhat more specific, and orientated towards correlating observed behaviours with distinct personality traits.

McCrae and John (1992) suggest that the appeal of the Five Factor Model is threefold; it integrates a wide array of personality constructs; it is comprehensive, allowing for a systematic exploration of the relations between personality and other phenomenon; and it is efficient, allowing for a global description of personality with few scores required. Based on this, the model is of great use in applied settings, in which predictions of behaviour can be made using personality traits. The Five Factor Model has thus been used in numerous manners, ranging from the large-scale cross-cultural studies mentioned previously to studies on academic achievement (Goff and Ackerman 1992), career success (Seibert & Kraimer 2001) and the diagnosis and treatment of depression (Bagby et al 1995). Of central importance to this thesis is the research that has been conducted on the relationship between personality and sociality.

2.2.4 Personality and sociability

Most studies on the relationship between personality and sociality have largely focussed on only two facets of personality; Extraversion and Neuroticism. For example, Kalish and Robbins (2006) looked at the relationship between these factors and network structure (specifically the proportional presence of certain types of strong and weak triadic relationships within an egocentric network). Similarly, Roberts et al (2008) looked at the relationship between Extraversion and Neuroticism and support clique and sympathy group sizes. However, while Kalish and Robbins found significant relationships between personality and triadic structures, Roberts et al found that, once age had been controlled for, there appeared to be no correlation between either Extraversion or Neuroticism. While one possible reason for this is the type of personality test used, with Kalish and Robbins favouring the Five Factor Model while Roberts et al used the Eysenck Personality Inventory, it

may also be that the other factors within the Five Factor Model may play a role which has been largely ignored.

In addition to social networks in the real world, there has been a growing interest in relating personality to online communication and the use of Social Networking Sites (SNSs), particularly Facebook. While technological aspects of communication are covered elsewhere in this chapter, studies have shown that personality does have a significant effect on the use of computer-mediated communication (CMC). While Ross et al (2009) found that Extraversion is positively related to the number of Facebook groups an individual is a member of (but not the number of friends on Facebook), they also found that Neuroticism is related to a greater use of posting certain types of messages, and that Openness to Experience is associated with a greater tendency to be sociable online. Similarly, Butt and Phillips (2008) have shown that personality can predict the use of mobile telephones, with Extraverts spending more time calling others, but along with individuals low in Agreeableness were less likely to value incoming calls. The relationship between personality and the usage of communication technology is therefore a fertile field for future investigation.

2.3 Technology

2.3.1 Overview

The past decade has seen an explosive growth in internet usage in the United Kindom, with the percentage of the population who regularly access the internet rising from around 30% in 2000 to approximately 80% in 2008 (data provided by the International Telecommunications Union - ITU). The UK Office for National Statistics (http://www.statistics.gov.uk/cci/nugget.asp?id=8) estimates that around 70% of all households in the UK have internet connections, of which approximately 90% are high-speed broadband connections. Access to and use of the internet is becoming increasingly ubiquitous in the UK, but has some way to go before it reaches the level of saturation that mobile phones have achieved. There are more mobile phones in the UK than there are people, with ITU figures suggesting that there were 77 million mobile phones in the UK in 2009, equating to approximately 1.25 phones per UK resident.

While technological forms of communication are becoming increasingly important for all people, this section will focus primarily upon emerging adulthood, the period of late teens to mid-20s (Arnett 2000, 2007). Individuals of this age are the first generation to have been exposed to technological forms of communication from an early age, and are regarded as being heavy users of both the internet (Subrahmanyam et al 2008) and mobile telephones (Braguglia 2008). While this section intends to deal primarily with internet-based methods of communication, mobile telephones are undoubtedly an important means of communication, particularly because in recent years mobile telephones have become more like mobile computers with access to high speed internet connections. This has allowed a shift from the traditional telecommunications model in which technology is used to connect people physically apart from one another, towards a new pattern of 'connected presence' in which it is always possible to contact someone in some way or another (Licoppe & Smoreda 2005).

Internet-based communication has been viewed as possessing four major features: the ability to remain anonymous, the capacity to ignore physical distance in communication, the absence of requirements for physical attraction required by real-world interactions, and an increasing control over the timing of interactions (McKenna & Bargh 2000). However, recent developments in communication exemplified by the growth of Social Network Sites (SNSs) have in many ways turned this view upside down, which will be explored further in the following sections.

2.3.2 Computer-Mediated Communication

The internet has led to the development of numerous different forms of computer-mediated communication (CMC) (e.g. email, instant messaging, online forums) through which conversations can be conducted and messages transmitted. While researchers have in the past tended towards regarding CMC as being improper for complex, emotional communication (Rau et al 2008), viewing it as a cold and impersonal medium in which emotions are difficult to express (Rice & Love 1987) there is a growing consensus that CMC can be highly emotional (Piazza & Bering 2009). In a comprehensive review of the role of emotion in CMC, Derks et al (2008), suggest that when compared with face-to-face interactions CMC is no less

emotionally or personally involving, and that there is actually more frequent and explicit emotional and social communication via computer technology that there are in real life interactions.

Face-to-face (F2F) interactions are exemplified by the physical presence of the individuals communicating with one another. This physical presence allows for subtle behavioural cues to be picked up and acted upon, with tone of voice, facial expression and body mannerisms all being seen as vital as what is actually being said, allowing statements that would be at risk of ambiguity on verbal cues alone to be interpreted and understood via an additional, physical dimension. The meaning of a message can be altered with a simple gesture or expression, and CMC would seem to lack this extra information. Even in a situation in which someone's voice can be heard but the person speaking cannot be seen, there is a suggestion that the lack of physical presence and visual cues ("cuelessness") leads to communication becoming unspontaneous, task-orientated and depersonalised (Rutter & Stephenson 1979). Most forms of CMC are text driven, and while some are interactive and immediate (e.g. instant messaging), others such as email can be more passive and asychronous, with a long span between replies. However, this text driven nature of CMCs has led to the development of a system of emotional symbols (emoticons) which act as surrogates for facial expression (Derkes et al 2007). Emoticons are essentially a series of symbols (often punctuation) designed to provide a visual expression of emotion in text, such as :-) used to depict a smiling face which are widely used in CMC and text messaging as a means of getting over the referential limitations of the lack of a physical presence. Acting as explicit emotional signals, emoticons add context and cues that may otherwise lead to miscommunication, allowing socioemotional information to be successfully transmitted via a textual medium (Parkinson 2008).

Intimate relationships can be developed and fostered through CMC, with males and females achieving intimacy via different strategies. Females have been seen to create intimacy with others in online communities through discussion and self-disclosure, while males tend to develop it through shared activities and experiences. Additionally, there are gender differences in user behaviour and perceptions of online communities, with males essentially doing most of the talking, with their messages being longer, sarcastic and self-promoting, while females tend to post less,

with their messages being more supportive, attenuating and less opiniated (Rau et al 2008). It has also been reported that while female-dominated online discussion groups are characterised by high levels of self-disclosure and tension reduction and/or avoidance, male groups are more factual based and impersonal (Savicki 1996). It appears as if gender differences that exist in online environments related to self-disclosure and sharing of personal information are similar to those that are found in F2F interactions (Derkes et al 2008).

Many forms of CMC are also characterised by a certain degree of anonymity. Online bulletin boards and forums usually require registration in order to post, but there is no requirement to use an actual name; rather, people are free to choose pseudonyms for their online interactions, with this sense of anonymity allowing some individuals to better express their "true-self" (Tosun & Lajunen 2010). Individuals who have difficulty interacting with people in the real world, often due to psychological or personality factors (Ross et al 2009) may find it easier to communicate with others via a non-physical medium, with for example people low in self-esteem more likely to communicate via email that those with high self-esteem, who prefer F2F interactions (Joinson 2004). Anonymity provides many positive benefits, largely through engaging individuals who may be unable to present themselves in real-world interactions, but there is a more sinister side to anonymity. The internet is a haven for "uninhibited behaviour" or "flaming", in which individuals are able to hide behind their anonymity and break social norms via aggressive or hateful behaviour in online environments (Derkes et al 2008). For example, Siegel et al (1986) ran a series of experiments looking at how the form of communication and levels of anonymity affected uninhibited behaviour, finding that in an anonymous CMC condition incidences of uninhibited behaviour (insults, swearing, name-calling) were around four times greater than in a CMC situation in which individuals could be identified by name.

While anonymity exists relative to an individual's real world persona, CMC also allows for the creation of an entirely new identity, with one of the key ways in which this can happen being through the use of an online "avatar". While an individual's physical body is clearly restricted to what one is born with, an online avatar can be in any form desired, and is highly malleable. Importantly however, the choice of avatar used has been seen to influence other's perceptions of the avatar's owner (Nowak &

Rauh 2008); even without a physical presence, people will judge other's credibility based on the image they choose to represent themselves with.

In general, many forms of CMC are characterised by the ability to communicate with people who you may have never met in real life, and can act as substitutions for real world interactions. However, there is a growing set of CMCs which may in fact do the opposite, acting as extensions of real world relationships (Tosun & Lajunen 2010). The next section will deal with one of the most prominent of these, Social Network Sites.

2.3.3 Social Network Sites

Social Network Sites (SNSs) are online environments which allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within a system (boyd & Ellison 2007 *sic*). They are online spaces in which meaningful and valuable relationships can be maintained, in which social networks can be built and validated with information being shared between individuals (Kwon & Wen 2010). While there have been many different SNSs since the first (SixDegrees.com) was created in 1997 (boyd & Ellison 2007), arguably the most prevalent SNS today is Facebook, which has an estimated 500 million active users (users who have logged on in the past 30 days, source Facebook statistics: http://www.facebook.com/press/info.php?statistics). Emerging adults are particularly high users of SNSs, with studies suggesting that around 90% of students in America use Facebook regularly (Wiley & Sisson 2006 cited in Pempek et al 2009; Ellison et al 2007), and while there are at present no publications looking at data from the UK, there is little reason to suspect that the prevalence of Facebook in UK universities should not be similar.

SNSs go beyond many other forms of CMC as they provide a way of connecting with real world acquaintances, and are actively built upon the theme of an individual's actual social network in which real world relationships are extended to a virtual environment, with Facebook in particular acting as a means of taking offline relationships online (Ellison et al 2007). Facebook users have been shown to spend more time searching the site for people with whom they already have an offline

connection than they do searching for strangers with whom to form new connections (Lampe et al 2006). Facebook provides a variety of means for searching for people with whom one may already be acquainted with, and is even able to suggest people to add as 'friends' on the basis of a profile, with other's being suggested on the basis of going to the same school, or attending the same university. Because of this functional priority of extending real life relationships into an online environment, the personal information and user profiles found on SNSs have been found to be remarkably accurate with regards to how well they portray the user, with user-assessed and observer ratings of certain characteristics being very similar (Back et al 2010). Because there will be a greater likelihood of users actually knowing their contacts in real life on an SNS compared with other types of CMC, presenting an accurate portrayal of themselves is therefore more important as they are already known personally by their contacts and friends online; there is little reason to fake aspects of identity because it will be obvious to real life contacts that the profile is a misrepresentation of the real person.

SNS are therefore a means of keeping in contact with friends you already know, rather than making new acquaintances. However, there is evidence to suggest that the number of contacts that university students maintain on Facebook is very high relative to the personal network size found in real life of around 150 individuals (Dunbar 1992, Hill & Dunbar 2003). Pempek et al (2009) report that the average number of friends students have on Facebook is 358, with females having more friends (401) than males (269). This suggests that SNS and other forms of CMC may assist in relaxing constraints in the number of relationships that can be maintained, and the fact that relationships are stored by the SNS and that it is possible to communicate with all your contacts simply by posting a message on your own profile may facilitate mass communication to a large number of people. However, there is also evidence that suggests that the number of friends that a user has on Facebook can have an influence on others perceptions. By examining the effect of altering the number of friends on an otherwise identical profile on other's perceptions of the user's social attractiveness, physical attractiveness and extraversion, Tong et al (2008) found that the peak levels of social and physical attractiveness were for a profile which had 302 friends, and that profiles with numbers of friends that exceeded this threshold were actually perceived as less

attractive. This suggests that others are critical of the true number of relationships that an individual can actually maintain, which may be linked to real world experiences of relationships and the limitations in human sociality.

It must also be acknowledged that SNSs provide far more than just an avenue to socially connect with others; they are also a media-rich environment in which photos, videos and music can be uploaded and shared with other users and in which User Created Content (UCC) is highly important. While sites specifically designed for the sharing of media socially (e.g. Youtube, Flickr) exist, there is an increasing convergence between social media and social network sites (Kin et al 2010) with the prediction being that these boundaries will eventually disappear entirely. SNSs will no longer be used primarily to validate and maintain social bonds and to communicate with friends, but increasingly used as a means of sharing media.

Assessing how emerging adults use technology in communication with both their most intimate social relations, along with how they make use of such technology in general is among the various aims of this study. The specific research questions that will be used to examine this, along with those for the other principle aim of this study (an examination of social network size, composition and structure) are introduced in the next section.

2.4 Research Questions and Hypotheses to Test

Restating the objectives outlined in the introduction, the principle aims of this study are:

i) To determine the general properties of social networks in emerging adults, focussing on how large the networks are, who is placed within the networks, and how the networks are structured

ii) To determine both patterns of communication within the network and the use of technological forms of communication in general

General patterns, along with reasons for individual differences related to age, sex and personality were examined. To this end, a series of research questions were developed, each with a set of null hypotheses used in confirmatory analysis. While

the research questions will not be explicitly returned to during this thesis, the results of the hypothesis testing are presented in the results section (Chapter 4).

Question 1 – What is the average size of the support clique and sympathy group size, and do sex, age and personality have any effect on variation in network size?

H1a Sex has no effect on network size

H1b Age has no effect on network size

H1c Personality has no effect on network size

Question 2 - What is the average composition of the support clique and sympathy group, and does the type of relationship have an effect on network membership?

H2a All types of relationships are equally represented with the network

H2b All types of relationship are equally emotionally close

H2c The length of a relationship has no effect on emotional closeness

Question 3 - Is variation in social network composition dependent upon sex, age and personality?

H3a Sex has no effect on social network composition

H3b Age has no effect on social network composition

H3c Personality has no effect on social network composition

Question 4 - What is the density of the sympathy group, and are certain members of the group better connected than others?

H4a All relationship types have an equally prominent role within the sympathy group

H4b The emotional closeness of a relationship has no effect on network centrality

Question 5 – How often is contact made with members of the sympathy group? Does the time to last contact depend on the geographical distance, emotional closeness or personality?

H5a Geographical distance has no effect on time to last contact

H5b Emotional closeness has no effect on time to last contact

H5c Personality has no effect on time to last contact

Question 6 - What is the form of communication with members of the sympathy group, and does this depend on emotional closeness, relation type and geographic distance?

H6a Emotional closeness has no effect on the form of last contact

H6b The type of relationship has no effect on the form of last contact

H6c Geographical distance has no effect on the form of last contact

Question 7 – What are the usage patterns of technological forms of communication, and do age, sex and personality play a role in individual variation?

H7a Sex has no effect on variation in technology usage

H7b Age has no effect on variation in technology usage

H7c Personality has no effect on variation in technology usage

3 Methods

Research data were collected by means of a questionnaire issued to student participants. In order to maximise the response rate and incentivise commitment to the completion of the questionnaire, respondents were offered the chance to take part in a lottery prize draw for financial rewards of up to £100, and were also offered feedback on various aspects of the questionnaire. This was deemed necessary due to the length of the questionnaire (approximately 30 minutes to one hour, dependent on how many contacts the respondent listed), and because the snowballing methods found useful in similar social network research (Dunbar & Spoors 1995, Hill & Dunbar 2003, Roberts et al 2009) were deemed to be both inappropriate and not possible. Snowballing methods involve the distribution of questionnaires to personal acquaintances and relying on personal obligation to both complete and pass on the questionnaire to other, and were not used in this study as the respondents should (a) ideally not know each other to prevent overlapping data and (b) be unknown to the researcher due to their largely undergraduate status.

It is well established that the length of a questionnaire can have a significant bearing on both its uptake and completion (Burchell & Marsh 1992), but the nature of social network questionnaires means that they must be long in order to obtain sufficient personal information for analysis. While Dunbar and Spoors (1995) managed to condense a social network questionnaire into just 5 minutes, the data collected in their survey was restricted to 4 questions covering the names of people they live with, have contact with at varying frequencies, relied on for help, and the size of their extended biological family. This current study is similar, but asks for a great deal more information from the respondents and is therefore more in line with other studies (such as Hill & Dunbar, Roberts et al 2009) in which a longer questionnaire was required.

Participants were recruited via advertising (a section in a mass email by the Durham Student Union President, an email sent out to all third year students on a particular Anthropology module, and posters placed in prominent positions in colleges and departments) and directly by *ad libitum* distributions at the Durham Science Site.

Care was taken to ensure the anonymity of respondents by assigning an anonymous code to each questionnaire, and keeping their personal information (name, contact details) separately. This research was approved by the Department of Anthropology Ethics Committee on the 25th February 2010.

The full questionnaire can be found in Appendix A, and was divided into 5 main components:

Section A – Personal Information

Section B – Use of Technology

Section C – About Your Personality

Section D - Who do you know, and how do you know them

Section E – Social Network Construction

3.1 A - Personal Information

This section of the questionnaire contained general personal and demographic information, including contact information (name and email address to allow for feedback on the findings of the study and the results of the prize draw lottery), data monitoring information to ensure a wide range of students were covered by the research (name of college, subject, degree type, year of study, nationality, ethnicity, country of birth and out of term time town of residence), and the age and sex of the participant.

Of the above information, only age and sex were directly used in the data analysis presented in this thesis.

3.2 B – Use of Technology

This section of the questionnaire was designed to measure participants' engagement with technology that can be used for social communication. While many studies looking at technology have also examined respondents attitudes towards, motivation for using, and knowledge of technology in communication (e.g. Spitzberg 2006, Ross et al 2009), often using a set of questions based on multiple option Likert scales, to do so would beyond the scope of this study, and would further increase the

length of the questionnaire. Instead, this study implemented a series at questions designed solely for examining the general usage patterns of technology, adapting the methodology used by Pierce (2009), looking at whether or not they used a certain form of communication technology, and if so, how long they spent on an average day using it. Respondents were also asked how many contacts they had on a particular communication type if applicable (e.g. Pempek et al 2009).

The forms of communication and usage patterns examined this study were mobile phones, social network sites and instant messaging, along with general ownership and usage of the internet for non social purposes and whether any online games were played.

3.3 C - Personality

In order to investigate the effects of personality on emotional social networks, the questionnaire contained a segment containing a set of psychometric questions aimed at determining personality type. As the literature review outlined, there are a great many personality and psychometric tests available, such as Eysenck's measure of Psychoticism, Extroversion and Neuroticism (the PEN) and Costa and McCrae's Big Five Model. The test chosen for this study was the 50-item IPIP representation of the NEO-PI-R (Revised NEO Personality Inventory, Costa & McCrae 1992).

The IPIP (International Personal Item Pool) is "A Scientific Collaboratory for the Development of Advanced Measures of Personality and Other Individual Differences", and is a website devoted to the furtherance of open-source and public domain personality tests set up partly in response to most psychometric tests being the subject of stringent copyright laws. A comprehensive review of the requirements for the IPIP can be found both on the IPIP homepage (http://ipip.ori.org/newRationale.htm) and in press (Goldberg et al 2006), but the main reasons for the existence of the IPIP relate to the restrictions publishers place on copyrighted personality scales:

1 The publishers of copyrighted personality tests require researchers to purchase their tests in a set format, and prohibit any amendments to the test or the presentation of just portions of the test.

2 Publishers prohibit the publication of their personality tests on the internet or by any other means than their printed materials.

3 Publishers may withhold the scoring keys for the personality tests, requiring the tests to be sent back to them to be scored for an additional fee.

4 Publishers have a vested, financial interest in driving a static market for their tried and tested products, and seek further validity rather than innovation.

The IPIP offers a set of 2,413 items which can be combined and recombined in 269 scales based on a variety of different published personality measures. These items are chosen on the basis of their correlation with an existing scale, and in the case of the scale chosen for this research the IPIP representation correlates highly with the published NEO-PI-R scale (between 0.85 and 0.92 correlation when corrected for unreliability; Buchanan et al 2005).

There were 4 main criteria for the choice of the personality scale used in this study:

1 The test had to be short (approximately 10 minutes) due to the time constraints of participants completing the questionnaire
2 The test had to be one which could be incorporated into the questionnaire format, and not rely on proprietary answer sheets
3 The test had to be easy to score without the need for sending back to a publisher or complicated analysis
4 The test had to be present in the established literature, and be known as a valid method for assessing personality traits.

The IPIP construct of the NEO-PI-R meets and exceeds all of these criteria, as it is a short 50-item test taking approximately 10 minutes to complete (compared to the published NEO-PI-R which is a 240 item test which takes between 30-40 minutes to complete) but nevertheless has a strong correlation to the NEO-PI-R (Buchanan et al 2005). The IPIP scale can also be used in any format that a researcher wants, with the questions able to be reordered without recourse to the publisher making it an excellent choice for incorporation into a questionnaire study.

The personality test in the questionnaire was designed by using the 50 items listed in Buchanan et al (2005) and the IPIP website (http://ipip.ori.org/newNEODomainsKey.htm). These 50 items consist of 10 basic

statements for each trait, and are scored using a 5-point scale judging the accuracy of that statement as it relates the participant where:

1- Very Inaccuarate
2- Moderately Inaccurate
3- Neither Accurate nor Inaccurate
4- Moderately Accurate
5- Very Accurate

Of these 10 questions per trait, 5 were scored according to the 1-5 scale, while the remaining 5 were reverse coded (that is, a score of 5 becomes a score of 1, a score of 2 becomes a score of 4 and vice versa). This means that each trait will allow a maximum score of 50 (Table 3.1).

Table 3.1: Number of questions and codings per factor

Trait	+ Coded Questions	- Coded Questions	Total Questions
Openness to Experience	5	5	10
Conscientiousness	5	5	10
Extraversion	5	5	10
Agreeableness	5	5	10
Neuroticism	5	5	10

In order to ensure that the personality test was properly completed and to decrease the possibility of respondents simply going through the test without thought, the statements were set up in a recurring order of mixed positive and reversed codings (Table 3.2).

Based on the suggestions for administration on the IPIP webpage (http://ipip.ori.org/newIPIPinstructions.htm), the instructions for completion of the personality section of the questionnaire are as follows:

"Describe yourself as you generally are now, not as you wish to be in the future. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence. Indicate for each statement whether it is 1. Very Inaccurate, 2. Moderately Inaccurate, 3. Neither Accurate Nor Inaccurate, 4. Moderately Accurate, or 5. Very Accurate as a description of you."

This allows for a comprehensive overview of the Five Factor Model of personality in a short space of time, therefore allowing the scores of the personality factors to be used in analysis.

Table 3.2: Order of personality questions presented in the questionnaire

Trait	Coding
Neuroticism	+
Extraversion	-
Openness	+
Agreeableness	-
Conscientiousness	+
Neuroticism	-
Extraversion	+
Openness	-
Agreeableness	+
Conscientiousness	-

3.4 D – Who do you know and how do you know them

In order to elicit the details of their core social relationships (the support clique and sympathy group) from respondents, a name generating statement was used that amalgamated the statements used in previous research. To isolate the support clique, Dunbar & Spoors (1995) asked respondents who they would look to for help in a time of crisis. The sympathy group meanwhile was established by Buys and Larson (1979) by asking whose death would lead you personally devastated. While other researchers have used alternative methods to elicit the same information, often relying upon the time to last contact to establish these core groups, with Stiller and Dunbar (2007) using contacts within a month to delineate the sympathy group and within a week being used to determine the support clique (Hill & Dunbar 2003), this study chose to avoid such time-sensitive questions, relying instead on an emotive statements to ensure that those close relationships which may fall outside the time limits were recognised.

The statement used to obtain the core relationships was:

"In this section, I would like you to think about the people you are emotionally closest to: who do you go to for advice; who can you always rely on to support you and help you out financially; who you feel you can express yourself to without having to worry about anything; those people whose loss would be strongly felt"

No attempt was made at this point to isolate the support clique from the sympathy group (this will be covered in the next section), therefore due to the hierarchical nature of social groupings, in which the support clique is by definition included within the sympathy group, the above statement may appear at first to contain too much information. However, while this statement was largely designed to get respondents to list the sympathy group as the larger social grouping level, the information included in the statement that relates to the support clique was designed to get respondents to think further about their relationships with others, and to potentially establish an internal hierarchy of who they feel closest too.

In a notable change to previous similar work conducted on egocentric networks, there was no question regarding the emotional closeness level of the individual listed (e.g. 1-10 Likert scale, with 1 being the least emotionally close and 10 being the most emotionally close (Hill & Dunbar 2003)). Emotional closeness is at the forefront of this study, but using a scalar construction for the closest relationships in which all individuals are, by virtue of being elicited by the name generator question at the highest levels of emotional closeness, was deemed to be limited and restrictive. Instead, a different measure of gauging emotional closeness was used (see 3.5.1).

In order to obtain information on the nature of the relationship with each of their contacts, along with details of how they are communicated with, respondents were instructed to provide a variety of information about the relationship. Following the basic methodology of Hill and Dunbar (2003) and Roberts et al (2009), respondents were provided with a datasheet on which they were instructed to enter the following information for each individual contact (Table 3.3).

Table 3.3: Data collected on the members of the egocentric network

Age	In years and months if known
Relationship type	**G**enetic **K**in, **A**ffinal **K**in, **P**artner or **F**riend)
Sex	(**M**ale/**F**emale)
Description	A written description of the relationship e.g. mother, best friend, boyfriend)
Time known	The number of years and months this person has been known for
Distance	How far away does this person live- Same **H**ouse, Same **T**own, An**O**ther town, Another **C**ountry; if another town/country respondents were asked to specify which
Last Face-to-Face	**T**oday <24 hours, **Y**esterday <3 days, **W**eek < 7 days, **M**onth <1 month, **Ye**ar <1 year, **O**ther – any other time, with the date to be entered in MMYY format
Last non-Face-to-Face contact type	Tele**P**hone call, **T**ext message, **E**mail message, **S**ocial networking site (along with the name of the specific site), **L**etter, **O**ther (along with the name of the type of contact)
Last contact time	Using the same coding as the Last Face-to-Face question
Duration	Number of minutes the last contact lasted for
Reason	A short written description of the reason for contact
Private	Was the last contact between only the respondent and the individuals listed, or was it shared with others
Preference	The preferred way of contacting the individual listed using the same coding as the Last contact type question

3.4.1 Data Processing

Following data collection, a number of data processing and preparation measures were taken:

i) *Identification of a new relationship type: University Friend*

During data collection, it became clear that there was an additional relationship type that needed to be included; University Friend. It was possible to determine a friend from university from a more general friend on the basis of the description of the relationship (e.g. Uni mate; housemate), the time known (with university friends being determined as friends with which the duration of the relationship had not exceeded the time the respondent had been at university), and from the data collected on distance

(with university friends being friends who lived in the same house or town as the respondent). By combining these measures, it is believed that University Friends could be identified with a high degree of accuracy.

ii) *Establishing hometown*

Many of the respondents treated their outside of term address as their point of reference for the distance of contacts, often using their own home town as the indicator of relationship distance. This led to a situation in which people that were actually living many miles away from the university being listed as people the respondent lived with, while contacts who were at the same university being treated as living far away. There was an additional problem with university contacts own home town being used as the measure of how far away they lived. This situation was resolved by using the university town as the point of reference, and on the basis of the other data provided for the relationship, data were transformed so as to give the full picture of social contacts during term time.

iii) *Geographical Distance*

As the respondents were asked to name the either the country or the town of residence of their contacts, it was possible to establish geographical distance between the respondent and their contact. Geographical distance was determined using an online route finder (Multimap) in the case of UK or Irish locations, treating Durham as the point of origin and the town/city of residence of the person, using the 'quickest' route option. The distance obtained by this method was then rounded to the nearest 10 miles (e.g. 23.65 becomes 20 miles, 26.35 becomes 30 miles). For people in other countries, as the town of residence was not recorded the geographic centre of the country was used as the destination point, with the length of a connecting line in Google Earth being used as the distance (again, rounded to the nearest 10 miles).

iv) *Age and Time Known*

The data provided by respondents on their contacts' age and the time they have known the contact for was converted from years into months (e.g. age 21 years 3 months transformed to 255).

3.5 E – Social Network Construction

This section of the questionnaire was designed to fulfil a dual purpose; to determine how emotionally close the respondent was to each of the contacts they listed, and to establish the relationships between the contacts themselves in order to build up an egocentric network of emotional relations.

3.5.1 Emotional Closeness

In order to establish the emotional closeness between the respondent and their contacts, the questionnaire presented a graphic representation of concentric circles, with instructions to think of themselves as the central point. Adapting Pressman et al (2005) and Roberts (November 2009, personal communication), the image contained an inner circle, a middle circle and an outer region, and respondents were instructed to write the initials of their contacts on the diagram according to how emotionally close they felt to the contact, with the inner circle representing the closest relationships. Respondents were instructed to add more layers of the network by adding more circles, however only one respondent actually did so. Because of this, the data on which circle a contact belonged in was simplified to make a distinction between the members of the inner circle with whom the closest emotional closeness levels were with, and which were deemed to correspond to the support clique found in the literature. Similarly, the whole network was determined to be the sympathy group, with all individuals included regardless of which circle they were placed in (Figure 3.1).

Rather than just a tiered scale of inner versus outer circles of emotional closeness, respondents were actively instructed to position the initials of their contacts relative to one another; the closer the relationship, the closer to the central point. Based on this information, emotional closeness rankings were developed for each contact in each network, with the closest individual scoring 1. Due to the nature of ranking, while all networks would have individuals who would score 1, larger networks would have a higher maximum rank score; there can only be as many ranks as there people in that network. To solve this problem, emotional closeness rank scores were standardised by dividing the rank by the size of the network, creating a value

between 0 and 1, thereby reducing the impact of the size of network on emotional closeness scores.

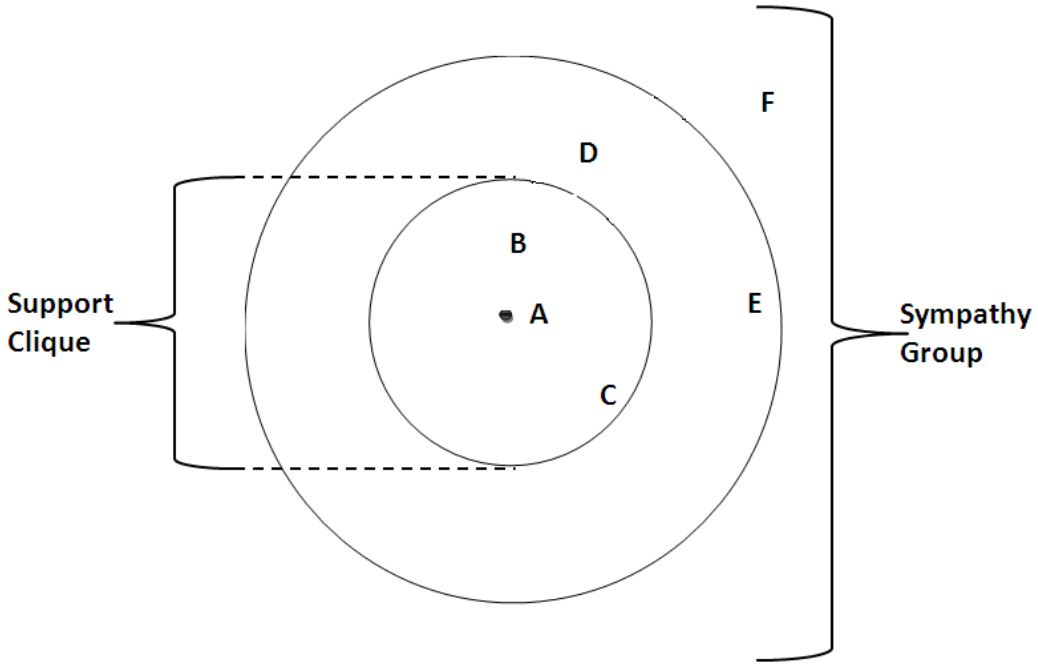


Figure 3.1: Example of how the sympathy group and support clique were determined. Individuals A-F are all placed within the sympathy group, while A-C are the only members of the sympathy group. Emotional rankings were determined by the distance of the initials from the central point; here, the relationship A is the closest, while F is the least close.

3.5.2 Relationships Between Contacts

In order to determine the nature of the relationships between the respondents' contacts, the respondent was requested to draw connecting lines between the initials they had placed on the diagram. Rather than just asking who knows who within the network, respondents were asked to use different coloured lines to indicate 3 different types of relationship:

Black Line – Good/close friends

Blue Line - Know each other and are friendly

Red Line - Know each other and are not friendly

By doing so, it was possible to determine the strong, weak, negative and absent relationships between the respondent's contacts, thus allowing for analysis of the relationships and interactions within the network itself.

3.5.3 Network Analysis Methods

Due to the egocentric nature of the data collected in this study, the focal individual (the questionnaire respondent) will be referred to as *ego*, and the individuals that were listed as contacts in the questionnaire will now be referred to as *alters*. It must also be stated that for the purposes of the social network analyses, connections to ego were removed from the social networks. The reason for this is because ego will, by definition, be connected to all other alters due to the nature of the data collection methodology. Instead, it is better to exclude ego from the network analysis to get a better understanding of the relationships between the alters of the network, particularly in the case of density estimates in which the connections between ego and the alters would dramatically increase the density (Sharkey, 1980).

The data collected in Section E of the questionnaire were used to create a set of social network matrices for each ego's social network using a combination of social network analysis software (UCINET 6) and general purpose spreadsheets (Microsoft Excel). The matrices used were adjacency matrices, and contain information on the relationships between the alters within the social network.

The relationships between alters were entered into the matrix, with the assumption that the data collected was undirected (i.e. an assumption was made that a relationship between 2 individuals will be symmetrical and reciprocal; if ego listed alter A and alter B as friends, the relationship A-B = B-A), meaning that the matrices were symmetrical above and below the x=y boundary. As the data collected allowed for the identification of different types of relationships between alters (close friends, know each other and are friendly, know each other and are not friendly), the relationships between alters can be treated as valued data as the strength of the relationship is known to a broad extent. Because of this, relationships between alters were scored according to the type of relationship: a close friendship/association = 2; know each other and are friendly = 1; no relationship = 0; know each other and are unfriendly = -1.

As valued data are often difficult to analyze (Scott 2000), the relationships were also dichotomized (with any relationship score >=1 converted to 1 and any score <1 converted to 0). Therefore a complete set of matrices included both a valued and dichotomized matrix for each ego, as illustrated in Table 3.4.

Table 3.4: Example of network data for (i) valued data (ii) dichotomized data

(i) Valued Data

	A	B	C	D	E	F
A	-	2	1	0	2	2
B	2	-	-1	2	1	1
C	1	-1	-	0	-1	2
D	0	2	0	-	2	-1
E	2	1	-1	2	-	1
F	2	1	2	-1	1	-

(ii) Dichomotized Data

	A	B	C	D	E	F
A	-	1	1	0	1	1
B	1	-	0	1	1	1
C	1	0	-	0	0	1
D	0	1	0	-	1	0
E	1	1	0	1	-	1
F	1	1	1	0	1	-

Based upon these relational data, analysis at an individual and at the entire network level was undertaken, looking at both the valued data and the dichotomized data. Due to the emotional content of the valued data, network information based on such data were referred to as emotional network data, while the dichotomized data were referred to as simply network data.

3.5.3.1 Network Density

Used in SNA to describe the general level of linkage among the points of a graph (Scott 2000), density is a measure of how connected all the individuals within a social network are. In the case of undirected data, as used in the current study, density (*D)* can be established using the formula:

$$\boldsymbol{D = \frac{l}{n(n-1)/2}}$$

where *n* is the number of individuals within the network and *l* is the number of connections between individuals. Essentially, it is a ratio of the actual number of relationships found with a network and the total possible number of relationships that exist, and is expressed as a value from 0 (no connections between any alters in the network) to 1 (a complete network; all possible connections between alters are present).

Using the network matrix examples found in Table 3.4, this would mean that given a network containing 6 people, the maximum number of undirected connections possible would be 15 (6*(6-1)/2). In the dichotomized data, 10 undirected relationships can be seen, giving an overall network density of

$$D = \frac{10}{15} = 0.67$$

This indicates that within this network, ~2/3rds of all possible connections are present.

For the emotional network density, the maximum value of a connection was used as a multiplier in analysis (Scott 2000). Using the same example as above, with a network of 6 people, using the value of the strongest connection would mean that the maximum value for a network in which all individuals were good/close friends would be 30 ((6*(6-1)/2)*2). For the valued data found in Table 3.4, the actual value of the undirected connections between individuals is 13, giving an overall emotional network density of:

$$D = \frac{13}{30} = 0.43$$

Therefore, using the valued data in which a negative relationship actually subtracts density, while a weak connection halves the density, a different value for density can be developed which takes the differing strengths of relationships into account.

3.5.3.2 Local Centrality

Used in SNA as a means of determining who the most important people within a network are, local centrality measures look at the number of connections that an individual alter has within a network. Based upon work by Freeman (1979) this can be done in absolute terms (simply counting the number of connections that each alter has, giving a value for degree of connection) and in relative terms (dividing the degree of connection by the number of total connections that may be possible with other alters in the network) using the formula:

$$\boldsymbol{d = \frac{l}{n-1}}$$

where *l* is the number of connections to other alters and *n* is the number of alters in the network) to give a value from 0 (no connections with other alters in the network) and 1 (connections with all other alters in the network).

In the matrix data example found in Table 3.4, individual **A** would have a relative centrality score of:

$$d = \frac{4}{6-1} = 0.8$$

A is therefore connected to 80% of the other individuals within the network.

As with network density, the valued data was also used to establish the emotional strength of the relationship which individuals have with others within the network (emotional centrality), again using the maximum value emotional connections as a numerator. **A** would have a score of

$$d = \frac{7}{(6-1)*2} = 0.7$$

A is therefore emotionally connected at the highest level to 70% of the network.

These values of relative centrality were used to place individuals within the network in rank order, with the highest centrality values being attributed the highest rank order. Using the matrix data from Table 3.4 as an example, this would mean that relative and rank order values for both centrality and emotional centrality for the individuals would be as presented in Table 3.5.

Table 3.5: Relative and rank centrality and emotional centrality values for the matrix example found in Table 3.4

	Relative Centrality	Rank Centrality	Relative Emotional Centrality	Rank Emotional Centrality
A	0.8	1	0.7	1
B	0.8	1	0.5	2
C	0.4	5	0.1	6
D	0.4	5	0.3	5
E	0.8	1	0.5	2
F	0.8	1	0.5	2

As with emotional closeness rank, because maximum rank is dependent on the size of the network, with all networks having individuals ranked 1 while higher ranks would only exist in large networks, rank centrality and rank emotional centrality were standardised by dividing the rank by the network size to create a number from 0 to 1. Using the example data, A, B, E and F would all have a standardised

centrality rank of (1/6 =) 0.167, while C and D would have a rank of (5/6=) 0.83, with these standardised values being used in analysis. Thus lower scores represent a higher level of network centrality.

3.6 Methods for Statistical Analysis

Data analysis was conducted using SPSS for Windows 15.0.1.1(2007).

Kolmogorov-Smirnov tests were used to determine whether the data was normally distributed, and while the age of respondents and the scores in the personality tests were found to be normally distributed (Kolmogorov-Smirnov, $P > 0.05$), several of the measures of technology usage were found to deviate from a normal distribution (Kolmogorov-Smirnov, $P < 0.05$). Additionally, because many of the measures used in analysis were based upon ranking orders, parametric measures were deemed inappropriate in certain cases. Finally, due to the small sample size found in this study (N = 37) and the even smaller samples when sex comparisons were used (Male N = 11, Female N = 26), non-parametric methods of analysis were favoured.

The non-parametric methods of analysis used in this study are:

Mann-Whitney U-test: Used to compare 2 independent samples (e.g. sex differences in network size)

Kruskal-Wallis test: Used to compare multiple independent samples (e.g. differences in emotional closeness in different types of relationships)

Spearman rank correlation: Used to test dependence between 2 measures (e.g. age against personality)

Chi-Square: Used to determine whether frequencies conform to a theoretically equal distribution (e.g. proportion of males within a male network)

There was however a need to resort to parametric tests in the form of stepwise regression models to determine the multivariate relation with a dependent variable for which no non-parametric option was available. However, as the data that were analysed using such parametric regressions did have a normal distribution (albeit often based upon rank orders), the models developed here should be regarded as analytically robust.

4 Results

In total, 37 questionnaires were returned, with 11 male and 26 female respondents with a mean age of 22.38 ± 4.44 years (22.19 ± 4.56 female; 22.82 ± 4.33 male) and a range of 18-36 years. The respondents came from a diverse academic background, with 16 postgraduates and 21 undergraduates at various stages in their degrees, representing a broad range of subjects (anthropology, archaeology, biology, chemistry, criminology, ecology, languages, law, mathematics, natural sciences, physics, primary education, psychology). Additionally, the respondents came from a wide range of nationalities, with 28 British respondents and 9 respondents of varying nationalities indicative of the multicultural and multinational setting of a modern British university. Considering that 143 questionnaires were physically distributed, this means a response rate of around 25%, but this rate could be seen to be far lower as all students of the university were actively recruited via an email sent via a Student Union newsletter, while all third year undergraduates doing a course in the Anthropology department were also contacted.

Of the 37 questionnaires, the emotional closeness and connections between contacts were not provided by one respondent who felt that they would be unable to discriminate the emotional closeness of themselves and their contacts or the nature of relationships between their contacts, while another respondent did provide the information, but it was illegible. While emotional closeness and the network connections from these 2 respondents were therefore not available, they were included in the study as they did provide information on who their contacts were and how they contacted them. Therefore, for emotional closeness and network measurements, the sample size is 35, while for all other measurements the sample size was 37.

This section is divided into two main parts, with the first examining the network properties of the respondents emotional networks, and the latter examining patterns of communication within the network along with the general usage of technological forms of communication.

4.1 Network Properties

4.1.1 Network size

The mean total network size found in this study (hereafter referred to as the sympathy group) was 13.08 ± 7.28 for all respondents (N=37), with the size ranging from 3 to 31 individuals, while the average size of the individuals placed within the inner circle of the network diagram (hereafter referred to as the support clique) was 6.44 ± 3.22 individuals (N=36 individuals), ranging from 1 to 13 individuals. Figure 4.1 shows the distribution of network sizes for the sympathy group and the support clique, with the support clique being strongly bimodal, with peaks at 3 and 8.

Sex differences in network size

A significant gender difference was found in the size of the sympathy group, with female networks averaging 14.31 ± 7.06 individuals (N=26) and males averaging 10.18 ± 8.32 (Mann-Whitney U test, z = -2.116, P = 0.034). The support clique also exhibited significant gender differences in size, with female support clique size averaging 7.27 ± 3.08 (N=26) individuals and males' averaging 4.3 ± 3.09 (N=10) individuals (Mann-Whitney U test, z = -2.565, P = 0.01). Therefore, the null hypothesis (H1a: Sex has no effect on network size) can be rejected; there are significant differences in the sizes of male and female networks, with female networks approximating 1.5 times larger than males (Figure 4.2).

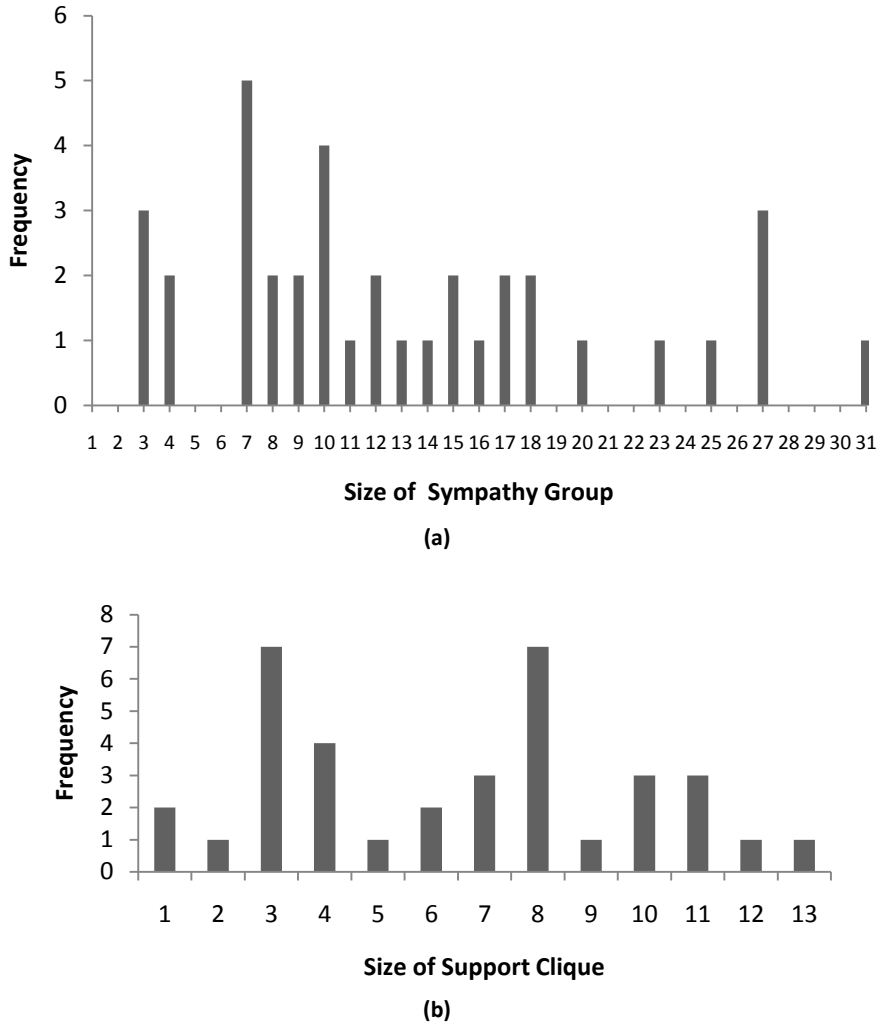


Figure 4.1: Frequency distribution of (a) sympathy group sizes and (b) support clique sizes

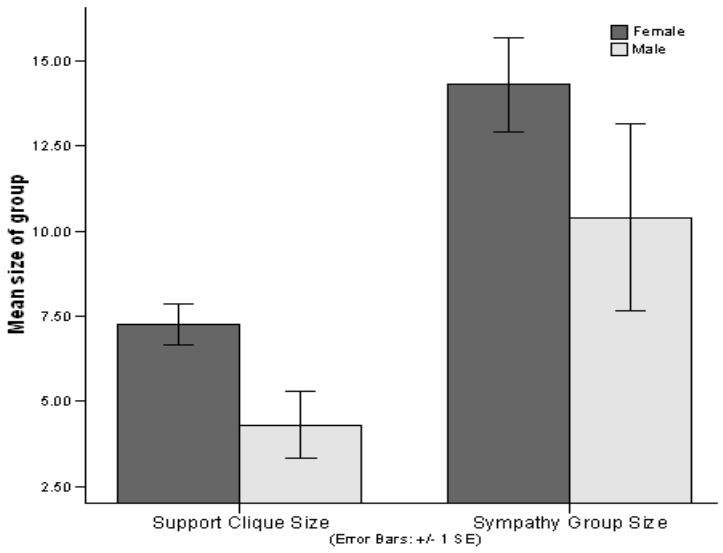


Figure 4.2: Sex differences in support clique and sympathy group size

Age differences in network size

Figure 4.3 illustrates the relationship between age and network size. Age was found to be negatively correlated with both sympathy group size and support clique size, but these correlations only approached significance for sympathy group size (Spearman's rho, *rs* = -0.306, *N* = 37, *P* = 0.066) and not significant for support clique size (Spearman's rho, *rs* = -0.254, *N* = 36, *P* = 0.134). This indicates a trend towards smaller network sizes with age, but that the relationship between age and network size is non-significant, therefore the null hypothesis (H1b: Age has no effect on network size) can be accepted.

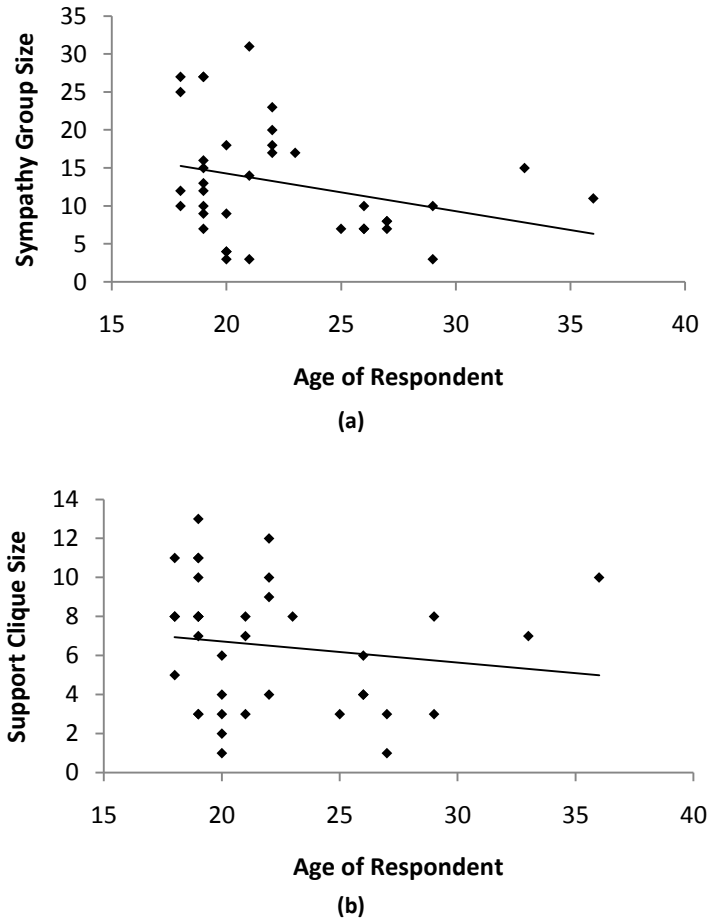


Figure 4.3: The relationship between age and (a) sympathy group size and (b) support clique size

Personality and Network Size

Before testing the relationship between personality and network size, a general overview on personality scores and the relationships between personality and age and sex will be presented. Table 4.1 provides the results of the personality test scores, presenting the average scores for the entire sample as well as by sex along

with the results of the statistical analyses of sex differences in personality. While there are certain consistent differences between the average scores for males and females, with a pattern of higher scores for females in all 5 of the personality factors, only one of these was found to be significant; Conscientiousness.

Table 4.1: Personality scores, sex differences and significance tests (significant results in bold)

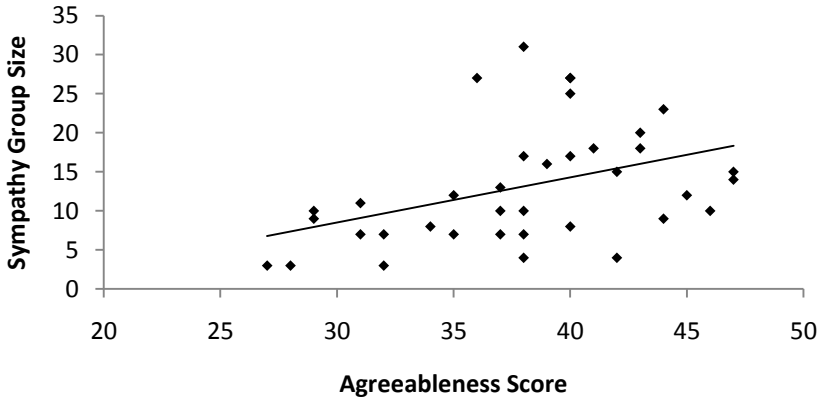
Personality Trait	Minimum	Maximum	Mean	Female Mean	Male Mean	Mann-Whitney U	
						Z	*P*
Openness to Experience	23	49	36.46	37.12	34.91	-0.816	0.415
Conscientiousness	16	46	34.49	35.73	31.55	**-1.980**	**0.048**
Extraversion	11	47	33.46	34.50	31.00	-1.232	0.218
Agreeableness	27	47	37.92	38.73	36.00	-1.533	0.125
Neuroticism	11	47	26.78	26.85	26.64	-0.283	0.777

Age was also found to have some interaction with personality, with a moderate but highly significant correlation between age and Openness to Experience (Spearman Rho, $rs = 0.445$, $N = 37$, $P = 0.006$). However, there was no correlation between age and Conscientiousness ($rs = -0.016$, $N = 37$, $P = 0.924$), Extraversion ($rs = -0.082$, $N = 37$, $P = 0.629$), Agreeableness ($rs = -0.205$, $N = 37$, $P = 0.224$) and Neuroticism ($rs = -0.077$, $N = 37$, $P = 0.649$). Therefore, personality was found to be relatively independent of both sex and age, with only small, albeit significant, relationships.

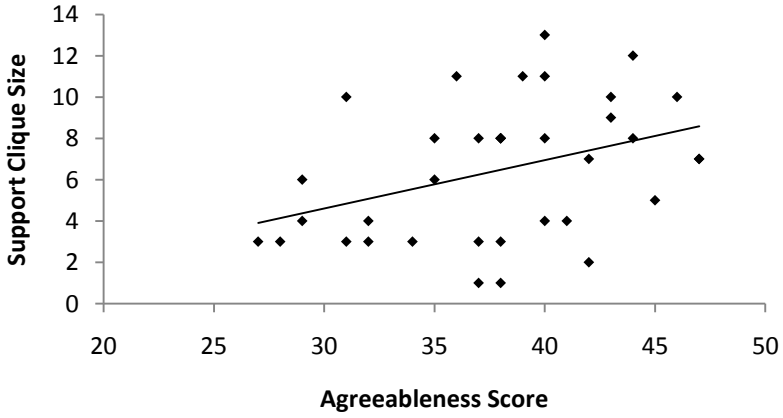
Agreeableness was found to have a moderately positive and highly significant correlation (Spearman Rho, $rs = 0.487$, $N = 37$, $P = 0.002$) with sympathy group size. A similar pattern emerged for support clique size, with Agreeableness again having a significant correlation (Spearman Rho, $rs = 0.384$, $N = 36$, $P = 0.021$) while Extraversion approached significance (Spearman Rho, $rs = 0.286$, $N = 36$, $P = 0.091$). The relationship between Agreeableness and network size is illustrated in Figure 4.4. All other Big Five personality traits were found to have very little effect on either sympathy group size or support clique size (Table 4.2). Therefore, the null hypothesis (H1c: personality has no effect on network size) can be rejected; Agreeableness correlates with and can potentially predict both support clique size and sympathy group size.

Table 4.2: Spearman rank correlations between personality and sympathy group and support clique size (significant results in bold)

	Sympathy group		Support clique	
Trait	**Spearman's rho *rs***	***P***	**Spearman's rho *rs***	***P***
Openness to Experience	-0.079	0.643	-0.010	0.953
Conscientiousness	0.058	0.733	0.142	0.409
Extraversion	0.154	0.363	0.286	0.091
Agreeableness	**0.487**	**0.002***	**0.384**	**0.021***
Neuroticism	-0.089	0.599	0.001	0.997



(a)



(b)

Figure 4.4: The relationship between Agreeableness and (a) sympathy group size (b) support clique size

Combined effects of sex, age and personality

With the above results indicating that age, sex and personality all play a potential role in network size, regression models were developed to determine which are the most reliable predictors with the strongest effects on the size of the support clique (Table 4.3) and sympathy group (Table 4.4)

Table 4.3: Linear Regression Model - Stepwise method for dependent variable support clique size (Adjusted R square = 0.140, $F(1,34) = 6.698$, $P = 0.014$)

		Beta	T	P
Constant			12.022	<0.001
Included Variables				
	Sex	-0.406	-2.588	0.014
Excluded variables				
	Age	-0.129	-0.819	0.419
	Agreeableness	0.300	1.919	0.064

Table 4.4: Linear Regression Model - Stepwise method for dependent variable support clique size (Adjusted R square = 0.145, $F(1,35) = 7.125$, $P = 0.011$)

		Beta	T	P
Constant			-1.062	0.295
Included Variables				
	Agreeableness	0.411	2.669	0.11
Excluded variables				
	Age	-0.220	-1.424	0.164
	Sex	0.165	-1.042	0.305

From these models, sex can be seen to be the best predictor for size of the support clique, with Agreeableness approaching significance, while age has no effect. Therefore, the individuals who have the largest support cliques are females who are highly agreeable. For sympathy group size, the only reliable, significant predictor was Agreeableness, indicating that the individuals who have the largest sympathy group size are those who are most Agreeable, independent of sex or age.

Network Scaling

From the values for sympathy group size and support clique size, a scaling factor was calculated to see the proportional differences in size between the sympathy group and support clique based on the formula:

$$\text{Scaling Factor} = \frac{\text{sympathy group size}}{\text{support clique size}}$$

The average scaling factor was 2.3, with a range of 1 to 7, and while there was a difference in female (2.14, N=26) and male (2.71, N=10) scaling factors, this was not significant (Mann-Whitney U test, z = -0.707, P = 0.479). In contrast with the expectations from other studies which found a scaling factor of between three to

four, this study found that the sympathy group size was, on average only 2.3 times larger than support clique size.

4.1.2 Network Composition

Relationship types within social networks

Of the five relationship types used in this study (Affinal Kin, Friend, Genetic Kin, Partner and University Friend) there was considerable variation in their prevalence within sympathy groups. While genetic kin were found in all of the networks, the other relationship types were less universal, with affinal kin being present in only 13.5% of the networks. There was also considerable variation in the number of members of each relationship type found across the sympathy groups which was found to be significant ($\chi^2(4)$, 227.3, P <0.001), and therefore a difference in the mean proportion of each relationship type within a network (Table 4.5).

Table 4.5: Prevalence, number and proportion of relationship types within sympathy groups

Relationship Type	Prevalence in Networks (%)	Total Number in Networks	Total Number in Networks (%)	Average Number in a Network
Affinal Kin	13.5	12	2.48	0.32
Friend	89.2	177	36.57	4.78
Genetic Kin	100	142	29.34	3.84
Partner	62.2	24	4.96	0.65
University Friend	56.8	129	26.65	3.49

By rounding the average values of each relationship type within the sympathy groups to the nearest whole number, the data show that, in an average sympathy group of 13 people, there would be no affinal kin, five friends, four genetic relatives, a single partner and three university friends. The majority of the members of an average sympathy group are therefore friends of some description, with genetic relatives being less numerous, while romantic partners are by definition restricted to only one individual within a network.

An examination of the closer emotional relationships (the support clique) suggests that relationship type also plays a role in inclusion at this level of the network.

Genetic kin are included in almost all of the support cliques (around 95%), and make up the highest percentage of all relationship types within the support clique (approximately 42%). The total number of each relationship found within the networks was found to be significantly different ($\chi^2(4)$, 118, P <0.001), leading to a difference in the average number of each relationship type within the network (Table 4.6).

Table 4.6: Prevalence, number and proportion of relationship types within the support clique and membership in both the support clique and sympathy group.

Relationship Type	Prevalence in Networks (%)	Total Number in Networks	Total Number in Networks (%)	Average Number in a Network	Membership within both sympathy and support groups (%)
Affinal Kin	11.11	5	2.15	0.14	41.67
Friend	72.22	65	28.02	1.81	36.72
Genetic Kin	94.44	98	42.24	2.72	69.01
Partner	52.78	19	8.19	0.53	79.17
University Friend	36.11	45	19.40	1.25	34.88

By rounding the average number of each relationship type within the support clique to the nearest whole number, the data shows that in an average network of between six and seven people, there would be no affinal kin, two friends, three genetic relatives, a single partner, and a single university friend. In contrast to the sympathy group, the largest group in the support clique is genetic relatives, with friends becoming less numerous at the closest level of a social network.

Due to the hierarchical nature of social networks, members of the support clique will also be present within the sympathy group. An examination of membership in both the support clique and sympathy group shows that the majority of genetic kin and partners are placed within the support clique, while less than half of affinal kin, friends and university friends can be found in the support clique (Figure 4.5).

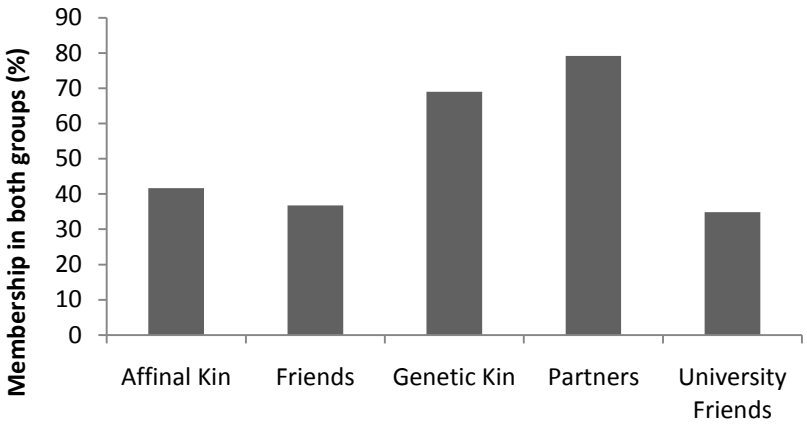


Figure 4.5: Membership in both the support clique and sympathy group by relationship type

Figure 4.6 shows the relative percentage of each relationship type within the support clique and sympathy groups, and it can be seen that while friends and university friends make up relatively fewer of the members of the support clique, genetic kin and romantic partners are overrepresented in the support clique, with genetic kin becoming the most numerous relationship type within the support clique. This suggests that even within an emotionally-elicited network, there are some relationship types which are closer than others, thus the null hypothesis (H2a: All types of relationships are equally represented within the network) can be rejected.

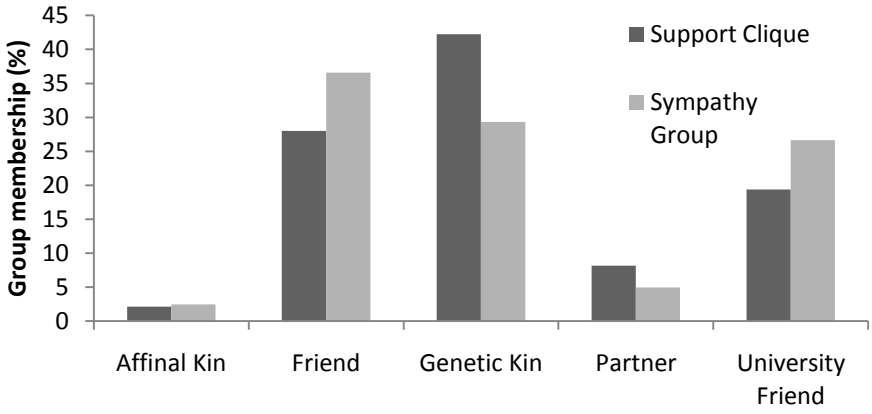


Figure 4.6: Percentage of total support clique and sympathy group membership by relationship type

Emotional Closeness and Relationship Type

Further proof of the differences between the relationship types can be seen by examining the relative emotional closeness ranks of each type. Emotional closeness rank was found to vary significantly by relationship type (Kruskal-Wallis, H (4) = 45.852, P <0.001), with the average emotional closeness ranks being displayed in Table 4.7 and Figure 4.7:

Table 4.7: Relative emotional closeness rank by relationship type (NB- lower values are emotionally closest)

Relationship Type	Mean Relative Emotional Closeness Rank	SD
Affinal Kin	0.64	0.30
Friend	0.56	0.26
Genetic Kin	0.44	0.31
Partner	0.31	0.29
University Friend	0.63	0.24

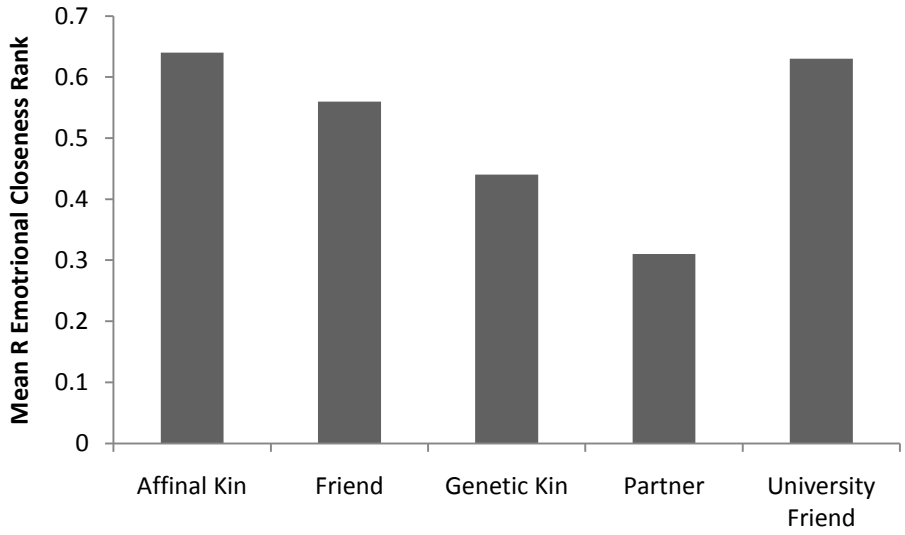


Figure 4.7: Mean relative emotional closeness by relationship type (NB - lower values are emotionally closer)

The nature of the relationship between an individual and members of their social network is important, and that emotional closeness depends upon this relationship type. Thus, the null hypothesis (H2b: All types of relationships are equally emotionally close) can be rejected, as there appears to be an emotional premium

based on romantic association and genetic relatedness, with the other relationship types characterised by a lower level of emotional closeness.

Length of Friendships and Emotional Closeness

Genetic and Affinal kin were excluded from analyses based on the duration of a relationship because this will be extrinsic to the respondents' ability to control relationships; kin will have been known for as long as all parties have coexisted. Partners were also excluded because there should be only one romantic relationship, which would be expected to be emotionally close regardless of the length of the relationship.

An examination of the mean duration of friendships (Friends and University Friends) reveals that University Friends have been known by the respondents for a shorter time (N = 129, mean 14.23 ± 13.74 months) than other friends (N=177, mean 89 ± 52.26 months), with this difference being found to be significantly significant (Mann-Whitney U, z = -13.205, P = <0.001). A significant correlation was found between the relative emotional closeness and the time a contact has been known for (Spearman Rho, rs = -0.134, N = 273, P = 0.026), indicating that there is an emotional premium placed on longer term relationships over existing ones; the longer a friendship has existed, the more emotionally close the relationship. The previous section has shown that relationship type plays an important role in emotional closeness with friends being relatively emotionally closer than university friends, with this difference most likely due to the difference in time for which friendships have existed relative to university friendships. Therefore, the null hypothesis (H2c: the length of a relationship has no effect on emotional closeness) can be rejected, as relationships which have existed for a longer time are emotionally closer than those which are more recent (Figure 4.8).

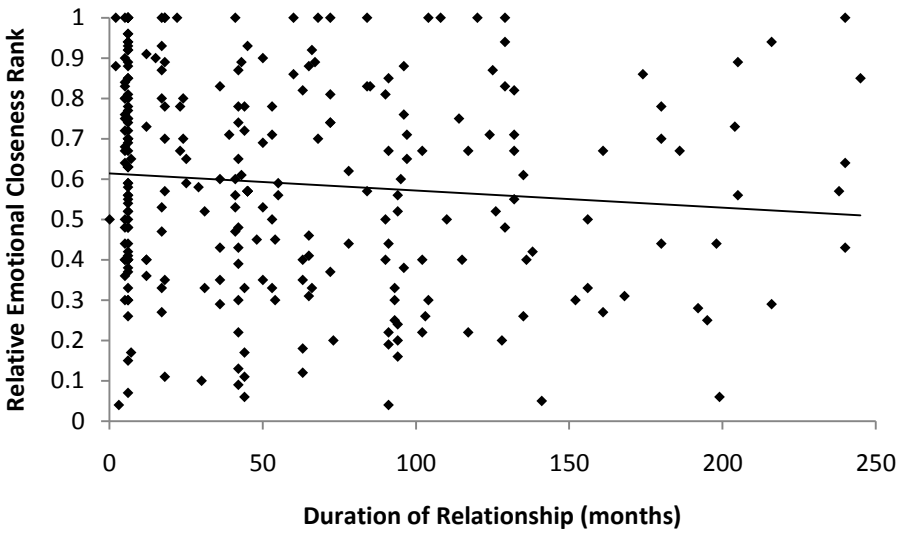


Figure 4.8: The relationship between the duration of a relationship and emotional closeness

Network Sex-Homophily

Sympathy groups were found to be significantly mediated by sex with a trend towards sex-based homophily. Female networks were found to have more relationships with females than they did with males (67% vs 33%), while males had more relationships with males than females (60% vs 40%) ($\chi^2(1)$, 25.64, P <0.001) (Table 4.8).

Table 4.8: Sex composition in male and female sympathy groups

Sex of Respondent	**Number of female contacts**		**Number of male contacts**		**Total**
	Observed	Expected	Observed	Expected	
Female	248	225	123	146	371
Male	45	68	67	44	112
Total	293	293	190	190	483

Data for the support clique shows that this sex biased homophily exists even within the closest relationships, with other females making up 67% of a female support clique, while males comprise 54% of males support cliques ($\chi^2(1)$, 6.456, P <0.011) (Table 4.9).

Table 4.9: Sex composition of male and female support cliques

Sex of Respondent	Number of female contacts		Number of male contacts		Total
	Observed	Expected	Observed	Expected	
Female	127	120	62	69	189
Male	20	27	23	16	43
Total	147	147	85	85	232

Females make up a larger proportion of a female network than males do within a male network, indicating that female relationships amongst females are more prevalent and important than male relationships with other males. Therefore, the null hypothesis (H3a: sex has no effect on social network composition) can be rejected; there is a clear and significant gender bias within both the sympathy group and the support clique (Figure 4.9).

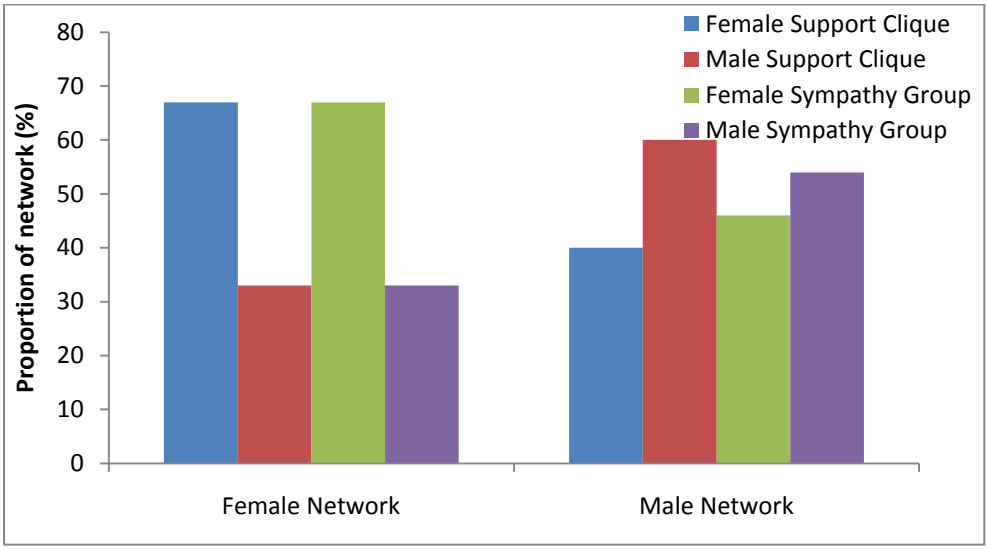


Figure 4.9: Sex composition of support clique and sympathy group by sex of respondent

Network Age-based Homophily

From looking at the average age of individuals within the network, there is a significant trend towards this age increasing with the age of the respondent (Spearman Rho, rs = 0.523, N = 481, P <0.001). Once genetic and affinal kin are removed, leaving only individuals within the network whom the respondent is friends or romantically associated with, this relationship becomes extremely strong

(Spearman Rho, *rs* = 0.847, *N* = 330, *P* <0.001), indicating that non-kin relationships are strongly mediated by age; respondents socialize with people close to their own age. The null hypothesis (H3b: age has no effect on social network composition) can therefore be rejected; the respondents age is significantly positively correlated with the age of their contacts, particularly once only friendships and partners are included.

Effects of personality on network composition

Given the relationship found in this study between personality and network size, the effect of personality on network composition was determined by examining the proportion and absolute number of kin and non-kin (friends) within the sympathy group. The number of kin and non-kin within the sympathy group was found to be correlated with network size (friends, Spearman Rho, *rs* = 0.966, *N* =37, *P* <0.001; kin, Spearman Rho, *rs* = 0.527, *N* = 37, *P* = 0.001), with network size also being strongly correlated with the relative proportion of friends within the network (Spearman Rho, *rs* = 0.753, *N* = 37, *P* < 0.001). There was also a weak correlation between the number of kin and friends within the network (Spearman Rho, *rs* = 0.326, *N* = 37, *P* = 0.049), indicating that while larger networks contain more of both kin and non-kin, non-kin will be more abundant.

As with network size, Agreeableness was found to have a significant correlation with the number of friends within the network (Spearman Rho, *rs* = 0.501, N = 37, P = 0.002), as well as the proportion of friends versus kin and partners within the network (Spearman Rho, *rs* = 0.510, *N* = 37, *P* = 0.001) (Figure 4.10), with all other personality factors having no significant relationship with either the absolute or relative proportion of friends to kin within a network (absolute number of friends: Openness to Experience, Spearman rho, *rs* = -0.48, *N* = 37, *P* = 0.777; Conscientiousness, Spearman Rho, *rs* = 0.67, *N* = 37, *P* = 0.692; Extraversion, Spearman Rho, *rs* = 0.215, *N* = 37, *P* = 0.202; Neuroticism, Spearman Rho, *rs* = -0.170, *N* = 37, *P* = 0.314. Relative proportion of friends to kin: Openness to Experience, Spearman rho, *rs* = -0.005, *N* = 37, *P* = 0.976; Conscientiousness, Spearman Rho, *rs* = 0.121, *N* = 37, *P* = 0.475; Extraversion, Spearman Rho, *rs* = 0.241, *N* = 37, *P* = 0.151; Neuroticism, Spearman Rho, *rs* = -0.205, *N* = 37, *P* = 0.224).

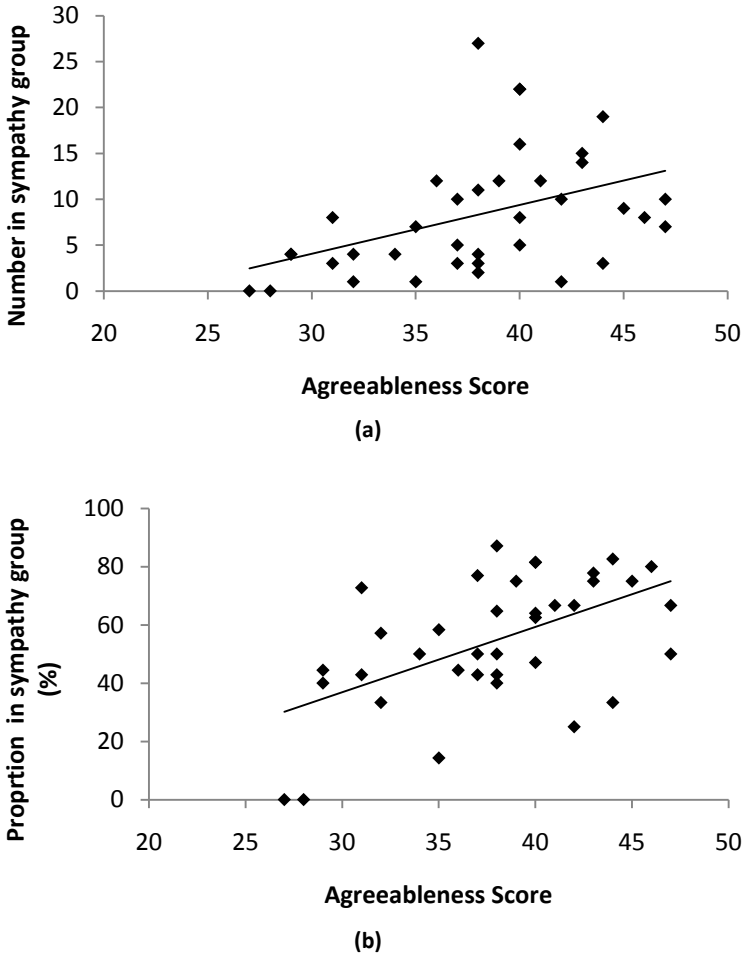


Figure 4.10: The relationship between Agreeableness and (a) absolute number of friends in sympathy groups (b) proportion of friends in sympathy groups

For the absolute number of kin, none of the personality factors were found to have any significant correlation (Openness to Experience, Spearman Rho, *rs* = -0.168, *N* = 37, *P* = 0.319; Conscientiousness, Spearman Rho, *rs* = 0.043, *N* = 37, *P* = 0.800; Extraversion, Spearman Rho, *rs* = 0.002, *N* = 37, *P* = 0.992; Agreeableness, Spearman Rho, *rs* = 0.169, *N* = 37, *P* = 0.317; Neuroticism, Spearman Rho, *rs* = 0.041, *N* = 37, *P* = 0.811). This indicates that much of the variation in network size, along with the associated correlation with Agreeableness is a result of an increasing number of friends within the sympathy group, with personality having no relationship to kin membership within the network. Given that family has a natural extrinsic limitation that is beyond the control of any one individual (i.e. it is impossible to *choose* to have more family members, beyond having children yourself), it is perhaps not surprising that personality has no effect on the number of kin within the sympathy group. However, it is possible to choose the relationships

you have with friends, with more Agreeable individuals being found to have both a higher number of friends and a higher proportion of friends to kin, therefore the null hypothesis (H3c: personality has no effect on social network composition) can be rejected, as personality can be seen to have an effect on social network composition.

4.1.3 Network Structure

Network Density

The average network density found in this study was 0.43 ± 0.26, indicating that within an average sympathy group, fewer than half of all possible connections between members of the group were found. The average emotional network density (see methods section 3.5.3.1 for an explanation of emotional network density) relying upon the valued data was found to be lower than the binary either/or network density measures at 0.32 ± 0.21 with this difference being found to be significant (Wilcoxon signed ranks test, Z = -4.937, P <0.001). If all of the connections that existed between individuals were the same (i.e. close friends), then there should be no differences between the 2 measures. The difference between density and emotional density found here indicates that many of the connections between members of the networks were characterised by lower levels of emotional closeness (weaker attachments to one another; they know and like each other rather than being close friends), thereby reducing the emotional density of the network. This will be explored in greater detail in the next section looking at centrality rank.

Network density and emotional density were found to be highly correlated (Spearmans rho, rs = 0.960, N = 35, P <0.001, Figure 4.11), indicating that the pattern of relationships between group members characterised by weaker ties is consistent throughout the networks. Due to the strength of this relationship, only network density will be used in subsequent analyses as including the emotional density would be largely redundant.

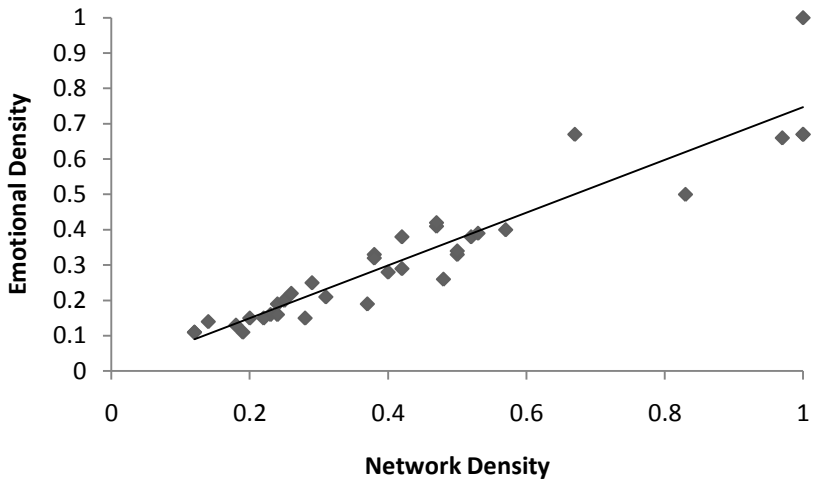


Figure 4.11: The relationship between network density and emotional network density

Network density was seen to be significantly negatively correlated with the size of the network (Spearmans rho, *rs* = -0.669, *N* = 35, *P* <0.001, Figure 4.12). Smaller networks are characterised by greater levels of structural embeddedness in which members of the group are more likely to be connected to one another than larger ones. The number of connections required for a network to achieve completion increases exponentially with size, with the smallest networks of 3 people seen requiring only 3 connections to achieve complete density, while the largest networks for which density was available for (27 people) would require 351 connections. It is therefore clear that network density is a function of network size, with larger networks being less completely connected than smaller networks.

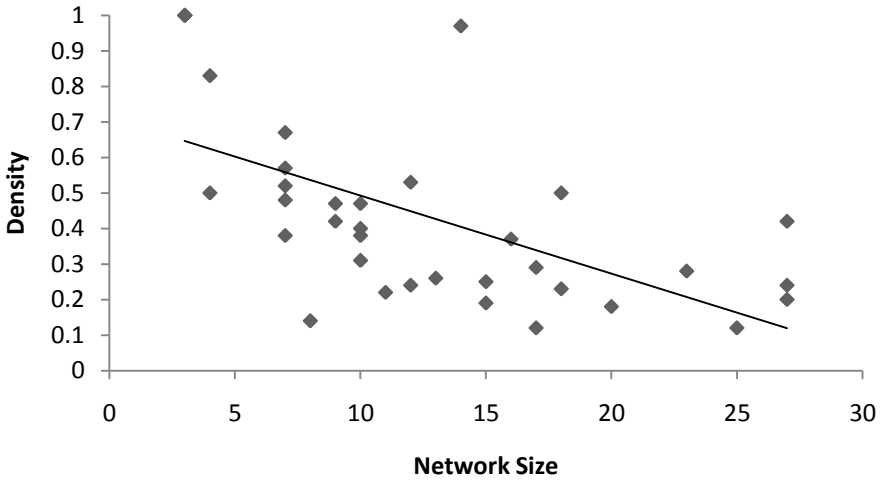


Figure 4.12: The relationship between network density and network size

Centrality Measures

Centrality rank was found to be significantly and strongly correlated with emotional centrality rank (Spearmans rho *rs* = 0.858, *N* = 444, P <0.001, Figure 4.13) (see methods section 3.5.3.2 for an explanation of emotional centrality rank). However, the correlation is not perfect, indicating that there is some divergence between the number of people an individual knows within the network, and the strength of the relationships with these people. This difference between centrality rank and emotional centrality rank was found to be significant (Wilcoxon signed-ranks test, *Z* = -3.078, *P* <0.001).

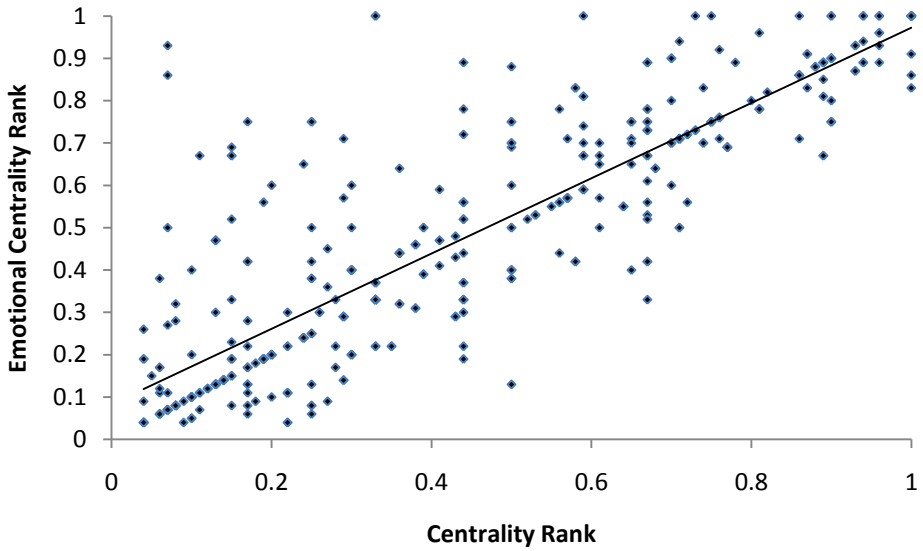


Figure 4.13: The relationship between centrality rank and emotional centrality rank (NB- lower values indicate greater centrality)

Centrality and Relationship Type

By examining the effect of relationship type on centrality rank, significant difference were found in both the centrality rank of different relationship types (Kruskal-Wallis, *H* (4) = 31.716, *P* = <0.001) and mean emotional centrality rank (Kruskal-Wallis, *H*(4) = 45.697, *P* <0.001). The centrality scores for each relationship type can be found in Table 4.10.

Table 4.10: Centrality and emotional centrality rank by relationship type (NB lower values indicate greater centrality)

Relationship Type	N	Mean Centrality Rank	SD	Mean Emotional Centrality Rank	SD	Centrality Rank – Emotional Centrality Rank
Affinal Kin	12	0.22	0.17	0.20	0.11	0.02
Friend	157	0.53	0.28	0.58	0.28	-0.05
Genetic Kin	136	0.37	0.25	0.37	0.26	0
Partner	23	0.35	0.32	0.52	0.35	-0.17
University Friend	116	0.43	0.31	0.47	0.31	-0.04

While the results for affinal kin are most likely spurious due to the low number reported in the networks, results for the other relationship types indicate that partners are the best connected members of emotional networks, followed by genetically related family members, with university and friends being less well connected. However, by looking at the emotional centrality rank scores, which contain valued data on the strength of the relationships, we can see that that while the overall pattern is similar, the average ranks scores are different from the centrality scores, with partners in particular becoming less central.

By subtracting emotional centrality rank from the centrality rank (Table 4.10), it is possible to determine the extent to which certain types of relationships may have stronger emotional connections with other members of the network, with a score of 0 indicating that centrality rank and emotional centrality rank are equal. While for family (affinal kin and genetic kin), the value is positive or zero, indicating that on average their emotional rank was higher or identical to their centrality rank, for friends, university friends and partners in particular, these values are negative; their emotional centrality rank was higher than their centrality rank. This indicates that the connections that these relationship types with others within the network are characterised by weak or even negative ties (i.e. they know each and are friendly, or know each other and are not friendly), relative to the stronger emotional ties found in family member's relationships with others within the network.

The large difference in centrality rank and emotional centrality rank found in romantic partners is undoubtedly due to the fact that, while a partner may *know* a large number of people within their partner's sympathy group, these are not people with who they are emotionally close to themselves; there may therefore be relatively little overlap between partners' sympathy groups. Genetic and affinal kin on the other hand should be expected to know, and be emotionally close to, at the very least the other family members within the sympathy group, hence their emotional centrality rank is lower or identical to their centrality rank.

Therefore, the null hypothesis (H4a: all relationship types have an equally prominent role within a social network) can be rejected as relationship type can be seen to have an effect on an individual's centrality rank within a network.

Emotional closeness and centrality

An examination of the relationships between the emotional closeness rank and the centrality rank of individuals within the networks, finds a significant correlation (Spearman rho $rs = 0.362$, $N = 444$, $P = <0.001$). Fig 4.14 below plots centrality rank against emotional closeness rank, and while the figure shows a great deal of scattering, a relationship between emotional closeness rank and centrality rank is nevertheless present. This indicates that the closer the emotional relationship between the respondent and the contact, the greater the role of that contact within the network, signified by more connections with other individuals within the network. Therefore, the null hypothesis (H4b: the emotional closeness of a relationship has no effect on network centrality) can be rejected. Considering that some of the most emotionally close relationships are with genetic kin, who are also among the most central figures, while friends are generally both less emotionally close and less central, this result confirms the earlier findings of this study.

Figure 4.14: The relationship between emotional closeness rank and centrality rank (NB- lower values indicate greater emotional closeness and centrality)

4.2 Patterns of communication

4.2.1 Geographical distance

The data indicate that respondents' emotional networks are geographically dispersed. Table 4.11 shows the number of contacts found at each measure of distance, with nearly 2/3rds of the sympathy group living in another town in the UK, or another country:

Table 4.11: Number and proportion of sympathy group by geographic distance

Distance Type	N	% of Total
Same House	41	8.5
Same Town	135	27.9
Other Town	207	42.8
Other Country	100	20.7
TOTAL	483	100

The average distance to a contact was found to be 730.6 ± 2012.8 miles, with the average distance to a contact living in a different town in the UK being 240.1 ± 106.8 miles away. The average distance to a contact living in a different country was 3028.9 ± 3594 miles. Contacts living in the same house clearly have a distance of 0 miles, and while there will be some distance between people living in the same town,

this distance would be negligible and so for the purposes of this study they were classed as 0.

The large average distance is attributable to the origins of the study participants, with a range of nationalities covered by the study, from as close to the UK as Ireland, and as far away as New Zealand. As an indication of this, respondents with UK nationality have an average distance to a contact of approximately 290 miles, while respondents with different nationalities have an average distance of over five times greater at approximately 1905 miles. Figure 4.15 shows the average distance to a contact by respondents' nationality.

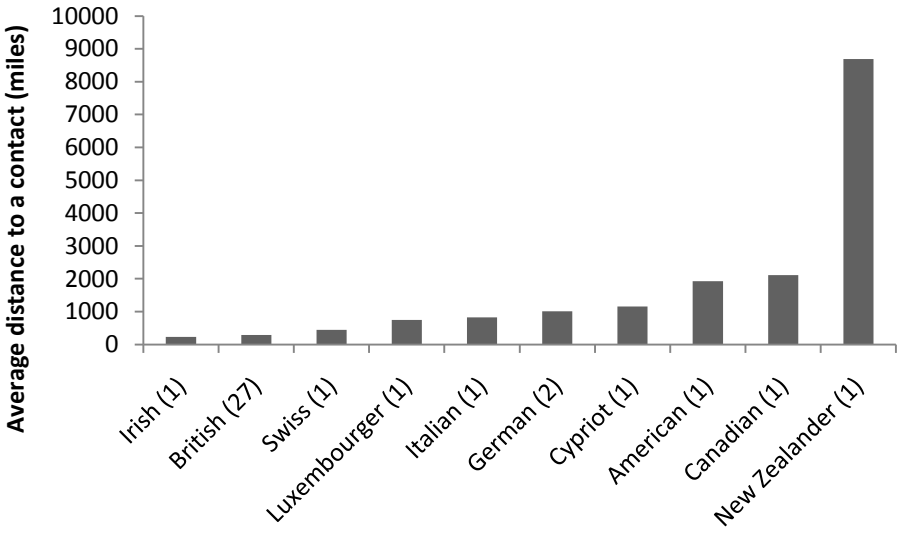


Figure 4.15: Average distance to a contact in the sympathy group by respondents' nationality

Due to the great variation in the absolute distance to a contact in miles, along with the large number of 0 distances as a result of people living in the same house/town as the respondent, subsequent analyses will only be conducted using the categorical distance variables of whether the person lives in the same house, same town, another town, or another country.

Geographical Distance and Time to Last Contact

By converting the categorical data on time to last contact into an ordinal scale (in which a contact made within 24 hours scores 1, and a contact more than a year ago becomes 6), it was possible to obtain a median score for when last contact occurred relative to where the contact lived, along with a modal value for the most common

time to last contact (Table 4.12). Figure 4.16 provides examples of the mean values of time to last contact for illustrative purposes only.

Table 4.12: Time to last contact, F2F and non-F2F contact by geographic distance (NB- scores correspond to an ordinal scale where: 1 < 24 hours; 2 = between 1 and 3 days; 3 = within one week; 4 = within one month; 5 = within one year; 6 > one year)

Distance	Time to Last Contact of Any Type		Time to Last-Face-to-Face Contact		Time to Last Non-Face-to-Face Contact	
	Median	Mode	Median	Mode	Median	Mode
Same House	1	1	1	1	2	1
Same Town	1	1	1	1	2	1
Another Town	2	2	5	5	3	2
Another Country	3	3	5	5	3	3

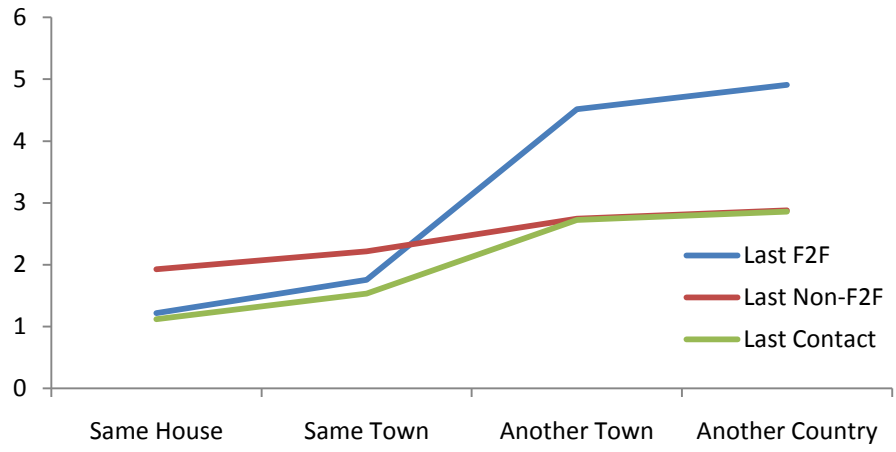


Figure 4.16: Mean time to last contact by geographic distance (NB- scores correspond to the same scale used in Table 4.12). This graph is for illustrative purposes only to allow a greater discrimination between the time to last contact than is offered by median or modal values, although due to the ordinal nature of the data inferences cannot be made based on the magnitude of differences.

The above table and graph show that time to last contact was in general strongly mediated by geographical distance; the time to last contact increase with geographical distance (Kruskal-Wallis, $H(3) = 138.187$, $P = <0.001$). The median time to last contact of any type with individuals living in the same house or town was less than 24 hours, with this time increasing to between 2-3 days for individuals living in a different town in the UK, and to within a week with individuals living in another country. An examination of the time to last face-to-face contact showed marked differences by distance, with the last contact for people living in the same

house or town being within 24 hours, while for people living further afield in different towns or countries, this time increases to within a year, with these differences being found to be significant (Kruskal-Wallis, $H(3) = 299.119$, $P = <0.001$). A similar significant pattern emerges for the time to last non-face-to-face contact, with people living in the same house being contacted within a day to 3 days, while for all other contacts the average to last non-face-to-face contact was within a week, with the score increasing with distance (Kruskal-Wallis, $H(3) = 31.347$, $P = <0.001$).

As time to last face-to-face contact is strongly mediated by geographical distance, with the difference between the time to last contact for people living close and those living far away being far greater than for non-face-to-face contact which can be conducted with little regards for geographical distance. This undoubtedly has an effect on the time to last contact, but the role of emotional closeness must also be taken into consideration.

Distance was found to be related to emotional closeness, with significant differences in relative emotional closeness rank by distance type (Kruskal-Wallis, $H(3) = 18.013$, $P <0.001$) (Figure 4.17):

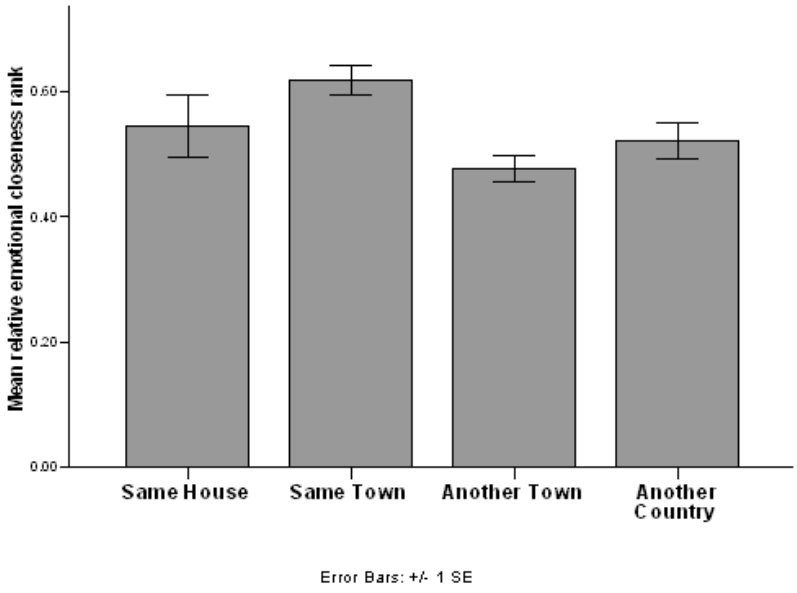


Figure 4.17: Relative emotional closeness by geographic distance

The relationship between distance and emotional closeness is undoubtedly affected by the types of relationships that are held with the people living close or far away.

Table 4.13 shows the proportion of each relationship type found within each geographical distance category. University friends are almost universally associated with living in the same house or town (92.4%), while genetic kin are almost universally associated with living in another town or country (96.5%). Romantic partners have a more general geographical distribution, nearly half of all partners live in the same house as the respondent (41.67%), while affinal kin are all found in different towns or countries.

Table 4.13: Proportion of each relationship type found within the sympathy group by geographic distance

Geographic Distance	**Proportion of Relationship Type (%)**				
	Affinal Kin	**Friend**	**Genetic Kin**	**Partner**	**University Friend**
Same House	0	2.27	2.11	41.67	18.6
Same Town	0	18.75	1.41	20.83	73.64
Another Town	33.3	50	73.94	25	3.1
Another Country	66.67	28.98	22.54	12.5	4.65
TOTAL	100	100	100	100	100

Given that the type of relationship has a significant effect on emotional closeness, the relationship between emotional closeness and distance can be therefore explained by the types of relationships that exist at the various geographical distances; the highest levels of levels of emotional closeness in different towns and countries relates to the presence of genetic kin and friends, while the lowest levels of emotional closeness found in relationships with people living in the same town can be explained by the greater presence of university friends. While it is somewhat surprising that the relationships with people living in the same house fall within the middle range, this is likely due to the combined presence of both romantic partners, with whom relationships are emotionally close, and university friends, with whom relationships are less close.

Predictive Models for Time to Last Contact

Emotional closeness was found to be weakly but significantly correlated with the time to last non-face-to-face contact (Spearman Rho, *rs* = 0.218, *N* = 444, *P* = <0.001), suggesting that contact is made more frequently with people with whom a relationship is emotionally closer. However, emotional closeness was found to be only approach significance for both time to last face-to-face contact (Spearman Rho, *rs* =-0.088, *N* = 444, *P* = 0.063) and time to last contact of any type (Spearman Rho, *rs* = 0.080, *N* = 444, *P* = 0.091). The distance to the contact was found to have a significant relationship with the time to all forms of contact (time to last contact of any type: Spearman Rho, *rs* = 0.496, *N* = 444, *P* <0.001; time to last non-face-to-face contact (Spearman Rho, *rs* = 0.245, *N* = 444, *P* <0.001); time to last face-to-face contact (Spearman Rho, *rs* = 0.753, *N* = 444, *P* <0.001)). This indicates that the closer a contact is geographically, the more frequent both face-to-face and non-face-to-face contact will occur.

In order to test the relationship between the personality factors and time to last contact, stepwise regression models were developed that would also take into account emotional closeness and geographical distance, using the time to last contact of any type (Table 4.14), time to last non-face to face contact (Table 4.15) and time to last face to face contact (Table 4.16) as dependent variables:

i) Time to last contact of any type

Table 4.14: Linear Regression Model - Stepwise method for dependent variable time to last contact of any type (Adjusted R Square = 0.246, *F*(3,439) = 48.951, *P* <0.001

		Beta	T	P
Constant			2.047	<0.041
Included Variables				
	Distance	0.495	11.714	<0.001
	Relative emotional closeness rank	0.170	4.078	<0.001
	Extraversion	-0.148	-3.522	<0.001
Excluded variables				
	Openness to Experience	-0.040	-0.936	0.350
	Agreeableness	0.59	1.410	0.159
	Conscientiousness	-0.072	-1.735	0.083
	Neuroticism	0.068	1.363	0.174

These results indicate that the time to last contact of any type is dependent will increase with geographical distance and as the emotional closeness rank of the contact increases, but will decrease with higher levels of Extraversion.

ii) Time to last Non-Face-to-Face Contact

Table 4.15: Linear Regression Model - Stepwise method for dependent variable time to last non-F2F contact (Adjusted R Square = 0.201, $F(5,432) = 23.032$, $P < 0.001$

		Beta	T	P
Constant			2.634	0.009
Included Variables				
	Distance	0.335	7.561	<0.001
	Relative emotional closeness rank	0.274	6.329	<0.001
	Extraversion	-0.259	-5.949	<0.001
	Conscientiousness	-0.130	-3.015	0.003
	Agreeableness	0.107	2.475	0.014
Excluded variables				
	Openness to Experience	-0.063	-1.395	0.164
	Neuroticism	0.032	0.605	0.546

These results indicate that the time to last non-face-to-face contact will increase as both emotional closeness rank geographic distance increase, while it will decrease with higher levels of Extraversion and Conscientiousness. Agreeableness was also found to play have an effect on the time to last non-face-to-face contact, with higher scores in Agreeableness leading to an increased time to last contact, which may be the result of more Agreeable individuals having larger social networks; due to more people within the network, they may not be able to contact them as frequently as those with lower Agreeableness scores and who have smaller networks. Therefore, in addition to geographical and emotional considerations, the personality of the respondent also plays a major role in when remote contact occurs with people within their emotional networks.

iii) Time to last Face-to-Face Contact

Table 4.16: Linear Regression Model - Stepwise method for dependent variable time to last F2F contact (Adjusted R square = 0.595, *F*(2,440) = 325.192, *P* <0.001

		Beta	T	P
Constant			0.073	.942
Included Variables				
	Distance	0.785	25.489	<0.001
	Extraversion	-0.117	-3.800	<0.001
Excluded variables				
	Relative emotional closeness rank	-0.035	-1.158	0.248
	Openness to Experience	00.35	-1.109	0.268
	Conscientiousness	-0.015	-0.478	0.633
	Agreeableness	0.025	0.825	0.410
	Neuroticism	0.005	0.135	0.892

These results indicate that the major consideration when looking at face-to-face contact is the geographical distance to the contact, with the time to last face-to-face encounter increasing with distance. However, as with the time to last non-face-to-face contact, personality also plays a role, with higher levels of Extraversion leading to a decrease in the time to last face-to-face contact. While relative emotional closeness can be seen to have no effect on the time of last face-to-face contact, this is attributed to the fact that the contacts with who the respondent has the most emotional connection with are in fact those who live furthest away (in another town or country), and are therefore people with whom face-to-face contact is less likely to occur. Meanwhile, individuals living in close proximity to the respondent (same house or town) are likely to be those with whom the emotional connection is less intense, but are conversely those with whom face-to-face contact is most likely.

Therefore, all three of the hypotheses relating to the time to last contact (H5a: geographical distance has no effect on time to last contact; H5b: emotional closeness has no effect on time to last contact; H5c: personality has no effect on time to last contact) can be rejected; the time to last contact of any type and the time to non-face-to-face contact can be explained by emotional closeness, geographic distance and personality, while the time to last face-to-face contact can be explained by geographic distance and personality, with emotional closeness having no significant effect.

4.2.2 Patterns of Non-Face-to-Face Communication

Table 4.17 shows the number of instances of each type of communication used in this study, along with the mean duration of each communication type. A significant difference was found in the mean duration of contact and the communication type (Kruskal-Wallis, $F(5) = 161.996$, $P < 0.001$), with letters being the most time-consuming form of communication, and text messages being the fastest. The form of communication therefore plays an important role in how long a communication event lasts for. A significant difference was also seen in the relative emotional closeness ranks of the people contacted via the various methods (Kruskal-Wallis, $H(5) = 29.531$, $P < 0.001$), with those contacted by telephone being emotionally closest to the respondent, and those contacted by letters being the least emotionally close, with email, social network site and text messaging all being similar for emotional closeness rank. Therefore, the strength of an emotional relationship can be seen to have an effect on the form of communication used, and the null hypothesis (H6a: emotional closeness has no effect on the form of last contact) can be rejected.

Table 4.17: Number and proportion of communication types, duration of contact and emotional closeness

Type of Last Communication	N	%	Mean Duration of Contact	Mean Emotional Closeness Rank
Email	58	12.55	13.87	0.55
Letter	9	1.95	35.83	0.77
Telephone Call	149	32.25	22.22	0.43
Social Networking Site	119	25.76	12.09	0.57
Text Message	127	27.49	4.28	0.58
Total	462	100	88.29	-

The type of relationship was also found to have a significant effect on the form of last communication ($\chi^2(16)$, 181.158, $P < 0.001$). Table 4.18 shows the absolute and relative proportions of communication types by relationship type.

Table 4.18: Number and proportion of communication types by relationship type

		Affinal Kin	Friend	Genetic Kin	Partner	University Friend	Total
Email	**N**	2	31	15	4	3	58
	%	18.18	20.12	11.03	18.18	2.42	
Letter	**N**	0	2	7	0	0	9
	%	0	1.18	5.15	0	0	
Telephone Call	**N**	6	33	87	7	16	149
	%	54.55	19.53	63.97	31.82	12.9	
Social Networking Site	**N**	2	65	14	1	37	119
	%	18.18	38.46	10.29	4.55	29.84	
Text Message	**N**	1	35	13	10	68	127
	%	9.09	20.71	9.56	45.45	54.84	
Total	**N**	12	177	142	24	124	462
	%	100	100	100	100	100	

There are certain preferences in the form of communication by relationship type, with for example, 64% of all contacts with genetic kin being a telephone call, and 55% of all contacts with university friends being text messages. After excluding letters from the data as they were so seldom used as a form of communication, and combining email, SNS and text message communication into a single category of text and computer mediated communication (CMC), there can be seen to be a great difference in telephone versus CMC by relationship type (Figure 4.18).

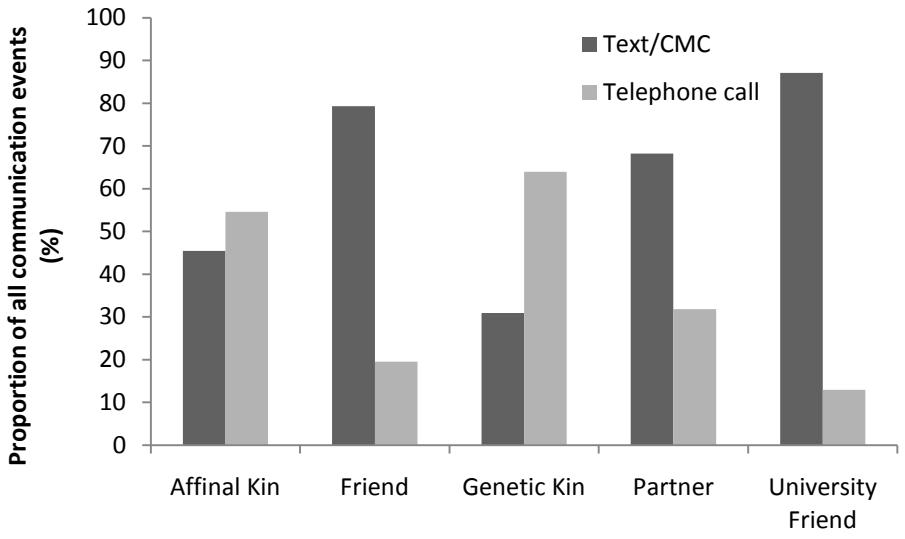


Figure 4.18: Proportion of communication events that are text/CMC or telephone call by relationship type

Nearly 90% of communications with university friends and around 80% of communication with other friends can be seen to be text or CMC based, with communication involving romantic partners also being strongly text/CMC based (approximately 70%). For genetic and affinal kin however, telephone calls make up the majority of communication events. Therefore, the null hypothesis (H6b: the type of relationship has no effect on the form of last contact) can be rejected, as different relationship types are contacted via different means.

There was also seen to be a significant differences between geographical distance and the form of last contact ($\chi^2(12)$, 112.841, P <0.001). Fig 4.19 shows the relative proportion of each form of contact for each geographic distance category, from which it can be seen that as geographic distance increases, the relative proportion of text message decreases, while contact by email and telephone increases, although the proportion of contact made by telephone decreased again with contacts in another country. The proportion of contact made by SNSs was similar at all geographic distances, while letters were only found in contacts with people living in another town. This indicates that there is a connection between how people are contacted and how far way they live.

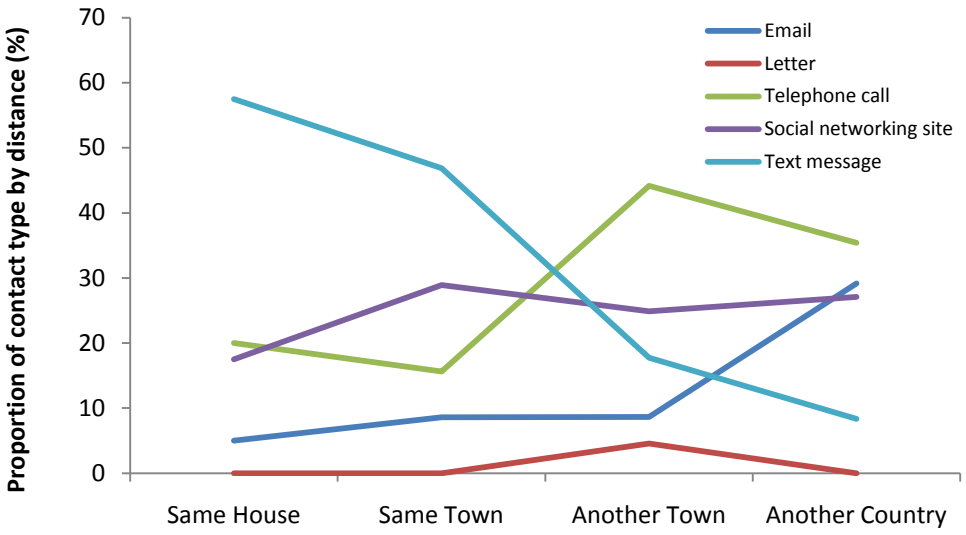


Figure 4.19: Relative proportion of contact made using each communication type by geographic distance

Therefore, the null hypothesis (H6c: geographic distance has no effect on the form of last contact) can be rejected as contact is made in different ways depending upon how far away the contact lives.

4.3 TECHNOLOGY

Usage patterns

All of the respondents owned mobile phones (37/37), all but one had access to the internet at home (36/37), nearly all used social network sites (34/37), while just over half used instant messaging services (20/37). Table 4.19 presents information on the average number of contacts and time spent engaging in technological forms of communication, for all data and by sex. While there is a clear difference in the values for male and female use of communication technology, with females having consistently higher number of contacts and time spent engaging in social communication, none of these differences were found to be significant (Mann-Whitney U, P >0.05 in all cases), most likely due to females also having a larger standard deviation and range than males. Therefore, the null hypothesis (H7a: sex has no effect on variation in technology usage) can be accepted.

Table 4.19: Usage patterns of technology in communication

	All		Female		Male	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
How many contacts on your mobile phone?	102.14	61.65	109.28	68.97	84.30	34.34
How long do you spend talking on your mobile per day? (minutes)	24.57	41.34	31.23	47.80	8.82	7.15
How long do you spend texting per day? (minutes)	25.90	33.83	31.00	38.00	14.32	18.09
How many SNS contacts?	313.97	173.71	322.41	186.29	293.33	146.22
How long do you use SNSs per day? (minutes)	63.46	54.62	69.57	60.28	50.68	39.81
How long do you use IMs per day? (minutes)	32.37	43.66	41.35	48.35	9.29	11.70
How long do you browse the internet for non-social reasons per day? (minutes)	137.61	97.14	149.67	108.05	109.09	59.28

Age was however found to be significantly correlated with several of the measures (Table 4.20). These data suggest that there is a negative correlation between both the time spent using technological forms of communication and the number of contacts that an individual has through technologically-mediated communication. Older individuals use technology in a different manner to younger individuals, exemplified by a trend towards spending less time communicating with others on mobile telephones and social network sites, and having fewer contacts on social network sites, although age was not found to be significantly correlated with the number of contacts on a mobile phone, or time spent using instant messaging services or browsing the internet for non-social reasons. Therefore, the null hypothesis (H7b: age has no effect on variation in technology usage) can be rejected.

Table 4.20: Spearman rank correlations between age and technology usage (N=37, significant values in bold)

	Spearman Rho ***rs***	***P***
How many contacts on your mobile phone?	-0.241	0.164
How long do you spend talking on your mobile per day?	**-0.407**	**0.014**
How long do you spend texting per day?	**-0.344**	**0.037**
How many contacts on this SNS	**-0.515**	**0.003**
How many hours do you use SNSs per day	**-0.418**	**0.014**
How many hours do you use IMs per day	-0.254	0.221
How many hours do you browse the internet for non-social reasons	0.229	0.173

From an examination of the relationship between different types of technological communication and time spent per day using them, it was found that usage patterns in one form is correlated with the use of other forms. Table 4.21 provides a correlation matrix of the data collected on the use of communication technologies, from which we can see that while the time spent using instant messaging services or browsing the internet are unrelated to other forms of communication, there are some significant and highly significant correlations. Mobile phone use was found to be highly correlated with social network site use, indicating that those who are most sociable in one medium are also likely to be most sociable in another.

Table 4.21: Correlation matrix for the relationship between the different measures of technology usage (significant values are in bold)

	How many contacts on your mobile phone?		**How long do you spend texting per day?**		**How long do you spend talking on your mobile per day?**		**How many contacts on this SNS?**		**How many hours do you use SNSs per day**		**How many hours do you use IMs per day**		**How many hours do you browse the internet for non-social reasons**	
			Rs	*P*	*Rho*	*P*	*Rho*	*P*	*Rho*	*P*	*Rho*	*P*	*Rho*	*P*
How many contacts on your mobile phone?	-	-	**0.452**	**0.007**	0.210	0.225	**0.647**	**<0.001**	0.286	0.113	0.154	0.482	-0.126	0.470
How long do you spend texting per day?	-	-	-	-	**0.746**	**<0.001**	**0.645**	**<0.001**	**0.387**	**0.026**	0.236	0.266	-0.20	0.906
How long do you spend talking on your mobile per day?	-	-	-	-	-	-	**0.435**	**0.014**	**0.399**	**0.019**	0.145	0.489	-0.083	0.624
How many contacts on this SNS	-	-	-	-	-	-	-	-	**0.445**	**0.014**	-0.035	0.882	-0.075	0.687
How many hours do you use SNSs per day	-	-	-	-	-	-	-	-	-	-	0.271	0.210	0.191	0.279
How many hours do you use IMs per day	-	-	-	-	-	--	-	-	-	-	-	-	0.233	0.262

Personality and Technology Use

Table 4.22 provides results for a series of correlations between the five personality factors and the seven indicators of technology use. Significant relationships were found in only two measures, with Extraversion being correlated with the number of contacts on a Social Network Site (Spearman Rho, *rs* = 0.520, *N* = 31, *P* = 0.003), and Openness to Experience being negatively correlated with time spent using Social Network Sites (Spearman Rho, *rs* = -0.485, *N* = 34, *P* = 0.004). Taken at face value, these results suggest that personality does play a role in how people communicate using technology, with those higher in Extraversion having more online contacts, while those high in Openness to Experience spend less time communicating with others online. However, due to the number of different tests run to compare personality and technology usage (5*7 = 35), it is possible that these results could have come about by chance alone. Additionally, the interaction between age and technology usage, along with the association between age and personality may mean that it is in fact age, not personality which has led to these results.

The null hypothesis (H7c: personality has no effect on variation in technology usage) can therefore be rejected as personality does have a limited effect on certain aspects of technological communication, although these results are far from conclusive.

Table 4.22: Spearman rank correlations between personality and usage of technology in communication

	How many contacts on your mobile phone?		**How long do you spend texting per day?**		**How long do you spend talking on your mobile per day?**		**How many contacts on this SNS**		**How many hours do you use SNSs per day**		**How many hours do you use IMs per day**		**How many hours do you browse the internet for non-social reasons**	
	Rs	P	*Rs*	*P*	*Rho*	*P*	*Rho*	*P*	*Rho*	*P*	*Rho*	*P*	*Rho*	*P*
Openness to Experience	-0.102	0.559	-0.264	0.119	-0.170	0.314	-0.332	0.068	**-0.485**	**0.004**	-0.096	0.649	0.263	0.116
Conscientiousness	0.250	0.147	0.225	0.186	0.007	0.968	0.196	0.291	-0.028	0.877	-0.045	0.831	0.184	0.276
Extraversion	0.148	0.398	0.253	0.137	0.219	0.192	**0.520**	**0.003**	0.231	0.190	0.336	0.101	-0.113	0.506
Agreeableness	0.146	0.404	0.299	0.077	0.213	0.206	0.106	0.571	0.199	0.260	0.139	0.508	0.163	0.334
Neuroticism	-0.119	0.495	0.076	0.660	0.163	0.335	-0.320	0.079	-0.158	0.372	0.154	0.461	0.018	0.916

5 Discussion

This study aimed to investigate the general patterns of sociality and communication within emerging adults, with a focus upon understanding the role of age, sex and personality in individual variation. The results of this study indicate that personality has a role in determining the size of an individual's sympathy group, the time to last contact and the use of technological forms of communication. Meanwhile, age was found to be unrelated to social network size, but had an effect on who was found within the network (characterised by a trend towards associating with people of a similar age), and the use of technological forms of communication. The sex of an individual was found to have an effect on sympathy group size, and network composition, with female networks containing more females, and male networks containing more males. Additionally, this study found that certain types of relationships were more important than others, with genetic kin being particularly prevalent and important within the networks.

This chapter aims to provide an overview of the results obtained by this study, placing them within the wider academic context and providing a rationale of what the results may mean. The first section will provide a general discussion of the results of this study, focussing upon the network properties, patterns of communication within the social networks, and the general use of technology in communication. The next section is intended to provide a critique of the study itself, assessing methodological and sampling issues that arose from the research. The following section will provide a brief assessment of the directions that future research should take, while the last section will present the major conclusions of this study.

5.1 General Discussion

This section is divided into three parts, with the first looking at the results of the social network aspects of the study, the next examining the results of communication

within these networks, and the last dealing with the results of the general usage of technology for communication.

5.1.1 Social Network Properties

This study found that, while there were certain commonalities within the emotional social networks of emerging adults, there were also a wide range of differences which can be attributed to the individual properties of the respondent's age, sex and personality.

The average size of support cliques (6.44) and sympathy groups (13.08) reported in this study confirm sizes reported in the literature (e.g. Dunbar & Spoors 1995, Hill and Dunbar 2003, Stiller & Dunbar 2007), indicating that the novel methodology used to elicit the support clique via a visual representation of an individual's social network was has led to similar estimates to those of previous studies. Importantly, this also indicates that people conceive their social relations in a manner consistent with the established literature on the hierarchical nature of social networks, and that the support clique and sympathy groups are more than just theoretical constructs, but are rather an intrinsic part of an individual's self-conception of their own social environment. By allowing individuals to place their close contacts position within a network, without direct prompting of who should be placed within the support clique as found in other studies (e.g. Dunbar & Spoors 1995), this study has shown that it is possible to obtain similar information by using a simple and interactive methodology. In a departure from what was expected on the basis of the established literature, this study found that network scaling was not of the order of three to four, but rather, between two and three.

While previous studies have found only weak or non-significant differences in the size of male and female emotional social networks (Dunbar & Spoors 1995, Stiller and Dunbar 2007), or have forgone the issue of gender entirely (Hill & Dunbar 2003, Roberts et al 2009), this study has found that there are large and very significant gender differences in both the support clique and sympathy group, with females having networks that are approximately 1.5 times larger than males. While this could be the result of the sample size in this study, particularly the low number of males, it

could also be that gender is more important in social network size than has previously been acknowledged in the literature. Meanwhile, age was found in to have little effect on network size, which may be an effect of the relatively homogenous age range of students in this study, but as previous studies have also found little or no interaction between age and network size (Hill & Dunbar 2003, McPherson et al 2006) it is likely that age is not an important factor in social network size.

The most significant finding of this study with regards to social network size was the relationships with personality, but not in the way that the literature would suggest. Extraversion and Neuroticism have commonly been regarded as having a strong role in sociability, but in this study were found to have no effect on social network size, mirroring the findings of Roberts et al (2008). Additionally, while it is theoretically possible for an individual to be both highly extraverted and highly neurotic, the results of this study indicate that there is a strong dependence between the two factors; in real life situations, Extraversion and Neuroticism are not independent, with neuroticism decreasing as extraversion increases.

This study found a positive relationship between a previously overlooked personality factor, Agreeableness, which also has a strong connection with sociability, and both support clique and sympathy group size, with Agreeableness being particularly related to sympathy group size. The increase in network size associated with higher levels of Agreeableness related to social network composition, characterised by both an increase in the number of non-kin and an increase in the proportion of non-kin to kin within the network; individuals who are high in Agreeableness have more friends within their networks than individuals with low Agreeableness, but were not seen to have any more kin within their networks. One possible reason for this could be that individuals with higher levels of Agreeableness simply spent more time completing the questionnaire than those with lower levels. Agreeableness is associated with prosocial characteristics such as altruism or compliance to the needs of others (Graziano et al 2007), meaning they may have devoted more time to the questionnaire, and would therefore have more contacts. This would lead to an artificial correlation between network size and Agreeableness, rendering the findings of little use. This conclusion can however be disregarded as research has shown that

Agreeableness is linked to performance in theory of mind tasks (Nettle & Liddle 2008).

Nettle and Liddle (2008) replicated the perspective-taking experiments used by Stiller and Dunbar (2007) to establish a link with network size, finding that Agreeableness was related to performance in social-cognitive tasks. This suggests that Agreeableness has a significant role in social cognition, and given the established connection between social cognition and network size, it is not surprising that this study provides confirmation of the role that Agreeableness plays in social network size. The relationship between Agreeableness and social network size has been briefly reported before in a study looking at the relationship between personality, well-being and emotional intelligence (Austin et al 2005). This present study however is believed to be the first to measure Agreeableness against the anthropological constructs of the support and sympathy groups. As Agreeableness can therefore be seen to be a reliable predictor of the size of support cliques and sympathy groups, future researchers looking at entire social networks (rather than the innermost layers found in this study) would be advised to include Agreeableness in order to test this relationship further.

While the other four personality factors were found to play no role in social network composition, this study found that there was a general trend towards both age and sex-based homophily within the networks; the respondents tended to associate with others who were similar to themselves in age, while female networks contained more females than males, and male networks contained more males than females. While the relationship between the age of the respondent and the ages of those they considered to be friends will be limited by the social environment of both university and pre-university life, in which individuals are placed into age groups and socialise within those groups, the fact that social networks display such a strong gender-bias indicates that there is a strong preference for relationships with others of the same sex. Homophily is an important characteristic of social relationships in humans, with a relationship being more likely to exist between similar rather than dissimilar people (e.g. McPherson et al 2001). The results of this study confirm that relationships are based to some extent on the demographic similarities between people.

The findings of gender-bias in social relationships in this study are similar to those found in previous research (Dunbar and Spoors 1995), although this study has found that female-female relationships appear to be more important than male-male relationships. Considering that female-female relationships in the Hominoid primates are often regarded as of little consequence due to the male philopatry universal amongst the Hominoids, with scant evidence for non-kin female bonding with the exception of bonobos (Parish 1991), the increasing importance in female-female relations could be considered a human adaptation.

This study also confirmed the importance of kin in human social networks, with genetic relatives being prominent in both the support clique and sympathy group (ubiquitous in the case of sympathy groups), and also, with the exception of romantic partners, the group with the closest emotional relationships with the respondent. While this could be due to the length of the relationship, as an extension of the results for friendships indicating that the longer a relationship has been in existence, the closer the relationship is, for family it is more likely that the emotional closeness is due to the special role of family in the life of an emerging adult. Family have been shown to be an important source of support for young people during the transition outside the family home (Holdsworth 2004). Furthermore, previous studies have reported that during the transition to university, the emotional ties with family members increases (Kenny 1987, Roberts & Dunbar *unpublished material*), and while this study lacks a longitudinal basis and hence changes during transition cannot be ascertained, it is likely that the emotional closeness to family will have increased while the respondents have been at university.

The role of family members within an individual's social network can also be seen through the relative centrality ranking reported in this study. While the results indicate that affinal kin were the most central figures, knowing the greatest proportion of other members of a social network, the low prevalence of affinal kin suggests this is undoubtedly a sampling error and should be excluded. Genetic kin however were among the most centrally positioned members of the respondents' social networks, with only romantic partners being more central. This prominence within the network is due to the fact that, unlike the other relationship types used in this study, family members will know each other; if the respondent listed all of their

immediate family (parents, siblings, grandparents etc), then all of these contacts would be connected as they have a tangible relationship that exists external to the respondent. Meanwhile, although romantic partners were found to be even more central than genetic kin, they had much lower emotional centrality scores. This indicates that, while partners will know many people within the social network, they are not emotionally close to these people; they are the friends and family of the respondent, and while they have an acquaintance with these people, they are not the people who the partner themselves would include in their own emotional social networks.

Similarly, while university friends were found to be more central than other friends, this is most likely the result of them being part of the same friendship group with specific boundaries (e.g. same college, same university course), and therefore if the respondent listed several of their university friends as members of their sympathy group, they are all likely to know each other.

The values for network density reported in this study indicate that even within the emotionally close inner layers of an individual's social network, on average less than half (43%) of all possible connections are present, but also that the likelihood of individuals knowing each other is related to the size of the network; smaller networks require fewer total connections than large networks in order to become 'complete' (all members of the network connected to all other members). While this average network density may appear to be low given the emotionally close nature of this study, it actually conforms well to other research examining network density. Walker et al (1994) suggest that the densities of active and intimate networks range between 0.3 and 0.5, while Wellman (1979) found after asking respondents to report the connections between the 6 people they felt emotionally closest to outside the family that the average density was 0.33. Indeed, theoretical models developed suggest that the maximum density that is likely to be found in any human aggregation is 0.5 (Mayhew and Levinger 1976), and while the social networks found in this study are not just *any* aggregations, but rather the emotionally close relationships of key individuals, that the average does not exceed 0.5 even within these networks supports the validity of their claim. Although the emotional density

value was lower at 0.32, signifying the prevalence of weaker emotional ties within the network, this value was still within the bounds of 0.3-0.5.

5.1.2 Communication within Social Networks

Given the geographical dispersion of the emotional social networks found in this study, and that emotional closeness was found to increase with geographical distance, the respondents appeared unable to physically meet up frequently with some of their closest acquaintances. They were however able to contact them in various ways, meaning that even those people who they hadn't seen recently, in some cases for more than a year, were still communicated with. Indeed, the results suggest that the time to last non-face-to-face contact was in general less than a week, indicating that the time to last contact found in this study conforms to one of the proposed criteria for membership in the support and sympathy group; contact with a week (Stiller & Dunbar 2007) and within a month (Dunbar & Spoors 1995). However, this also means than many of the contacts listed by the respondents would fall outside these thresholds for inclusion within the social network. An outcome of this is that social networks elicited by emotional statements rather than time to last contact may give a truer indication of who the most important relationships are with, by including those people with whom a close connection exists, but for various reasons have not been contacted with the frequency that may be desired, most likely due to geographical constraints.

While the findings relating to time to last contact and emotional closeness and geographic distance were in line with predictions, with distance being the major factor in the time to last face-to-face, and emotional closeness and distance being major factors in the time to last non-face-to-face contact, the role of personality in time to last contact is an important finding. Extraversion has been proposed as important factor in interpersonal relationships, characterised by more frequent contacts (Roberts et al 2008), and this study confirms the role of Extraversion in social communication; individuals who are more Extraverted can be seen to have more frequent contact with their close acquaintances, both in person and otherwise. This study has also found that Conscientiousness plays a role in the time to last non-face-to-face contact, characterised by a decreasing time to last contact with higher

levels of Conscientiousness. This indicates that more Conscientious and Extraverted individuals may expend more effort in maintaining their ties with others, with Extraversion being particularly important in this maintenance. Agreeableness was also found to play a role in the time to last non-face-to-face contact, with higher scores in Agreeableness leading to an increasing time to last contact. This relationship was attributed to those who are more Agreeable having larger social networks, and therefore that larger networks may constrain the frequency of contact with members in the network.

This study also found that, in addition to the individual variation in the time to last contact characterised by emotional closeness, geographic distance and personality factors, the form of last communication can be related to the type of relationship, the relative emotional closeness of the relationship and the geographical distance, which were themselves found to be related; some of the closest relationships were found with genetic kin living in another town and country. Telephone calls were associated with the closest relationships, with nearly two-thirds of contact with genetic kin being a telephone call. Meanwhile, CMC and text messaging were most prevalent in relationships with friends, university friends and romantic partners, with text messaging being especially prevalent in contact with people living in the same house or town. Given that over half of all communication events found in this study with University friends were in the form of a text message, and that the average length of contact via text message was much lower than all other forms, it is likely that texts are favoured for pragmatic reasons. Communication with people who live further away, yet are more emotionally close to someone (i.e. genetic kin) is very different to that with people who live close, yet are less important through both emotional closeness and position within the network.

5.1.3 Use of technological communication

The findings of this study confirm that emerging adults are heavy users of technological forms of communication, with all respondents owning mobile phones, and most using social network sites. Additionally, the strong intercorrelation between the various measures of technological usage suggests that individuals who are heavy users of mobile telephones will also be heavy users of CMC; a general

propensity towards sociality may exist, which mediates the usages of all forms of communication. The number of contacts that the respondents reported having online on social network sites (313) is similar to the figure of 358 reported by Pempek et al (2009), and also to the optimal number of friends on Facebook for other's perceptions of attractiveness (Tong et al 2008). It is also close to the social network sizes reported by McCarty et al (2001). However, the average number of contacts the respondents reported on their mobile phones was far lower (102 people), meaning that their contacts on social network sites may not actually be people who they have a strong relationship with. It is debatable as to whether all of these contacts are actually friends, particularly considering the cognitive and time constraints on social network size (Dunbar 1992, 1993), and given that social network sites actively suggest contacts to add as friends based on a shared history or background, and that is very simple to just add a friend, it is likely that many of the 300 contacts reported are only marginally known by the respondent.

The results also show that emerging adults spend a great deal of time communicating using technology, with the combined figures suggesting that, on average, a respondent spends nearly two and a half hours per day texting, calling, Facebooking and instant messaging, with an additional two and a quarter hours spent browsing the internet for non-social reasons. Assuming a 16-hour daily activity budget, nearly a third of an emerging adult's day is spent engaging with technology, with over half of this time dedicated to communication. Emerging adults spent approximately 15% of their time communicating using technology, and considering that the most social primates spend up to 20% of their time grooming (Dunbar 1991), and that the respondents must also physically interact with others during the day, can be seen to a highly sociable group.

While this study found that there were sex differences in the use of technological forms of communication, with females consistently having more contacts and spending more time communicating, none of these were found to be significant. While Pempek et al (2009) reported that females had significantly more friends on Facebook than males, other studies have shown that gender plays little role in the use of technology, with males and females reaching convergence particularly among the young (Wilska 2003). It is likely that there is little gender difference in the usage of

mobile phones and computer-mediated communication, with all emerging adults, regardless of sex being exposed to technological forms of communication from a young age. While sex may play a role in what is actually communicated (Rau et al 2008), this is likely to be in line with sex differences observed in general human conversational behaviour (Derkes et al 2008, Dunbar et al 1997). Furthermore, recent research has shown that, despite the widely held belief to the contrary, males and females actually talk about the same amount as each other, at around 16,000 words per day (Mehl et al 2007), which may explain the general lack of sex differences found in this study.

Age meanwhile was found to be related to several measures of technological communication, with a general trend towards reduced number of contacts and time spent using SNSs and mobile phones as age increases. Rather than this being the result of older individuals using technology less frequently than when they themselves were younger, this is more likely to the result of them having never used technology to the same degree as younger people; the oldest respondent in this study was twice as old as the youngest, and so it is likely that their exposure to technology would have been very different. This may indicate that as the younger individuals in this study mature, they will still be heavy users of technological forms of communication.

The relationship between personality and technological communication found in this study suggests that personality has little effect on how people use technology in interpersonal communication. The only significant correlations were found with higher levels of Extraversion being associated with more online contacts, and Openness to Experience being negatively related to the time spent using SNSs. These results contradict existing research suggesting that Extraversion has no effect on the number of contacts on Facebook (Ross et al 2009), and while previous studies (Butt & Phillips 2008) report that Extraversion is particularly linked with greater use of mobile phones, this study found no relation between personality and mobile phone usage. However, several studies have explicitly outlined the inconsistent nature of the results of research on personality and the use of technology (Swickert et al 2002, Ross et al 2009), with findings of studies either failing to be replicated, or even contradicted by subsequent research. Therefore, while there is likely to be a

connection between personality and the use of technological forms of communication, no study, including this one, has reliably indentified the extent of this connection. This is quite possibly, as Ross et al (2009) suggest, that the Five Factor Model of personality is too broad, and may not fully represent other forms of individual variation such as shyness, narcissism or even motivational factors, which may be more important in understanding the use of internet and mobile telephones. Indeed, motivation and technological competencies are expected to play a major role in the use of CMC in particular (Spitzberg 2006), and the results of this study simply add to the confusion and inconsistencies surrounding personality and technological communication.

5.2 Methodological Review

5.2.1 Study Population, Response Rates and Questionnaire Design Implications

The study sample was drawn from a population with a male:female ratio of approximately 1:1, and with an undergraduate:postgraduate ration of 1:0.25 (source- Durham University Student Planning and Assessment: http://www.dur.ac.uk/spa/statistics/). This study can therefore be seen to have an overrepresentation of female respondents, with a ratio of 1 female for every 0.42 males; there were less than half as many males in the study as there should have been if the sample population was representative of the population it was drawn from. While every effort was made to ensure an equal distribution of the sexes in the study, with questionnaires handed out *ad libitum* to an equal number of males and females, the questionnaires that were returned were predominantly from females.

Meanwhile, postgraduate students were also overrepresented by nearly three times greater relative to the university ratio, with a ratio of 1 undergraduate for every 0.75 postgraduates. It was often not possible to establish the academic level of an individual to whom a questionnaire was handed out to, meaning that it is possible that relatively more questionnaires were handed out to postgraduates than would be expected by the population ratio. It is however also likely that postgraduates were

more willing to assist in another's research project as they were more aware of the research process themselves, leading to a increased response rate amongst postgraduates relative to undergraduates.

143 questionnaires were physically distributed, suggesting that the prospective participants were either (a) interested in the topic of the study or (b) interested in the offer of a financial reward. However, only a small percentage of these questionnaires were actually returned (37/143 = 25.8%), a very low response rate when compared to similar studies (e.g. 91% (Dunbar & Spoors 1995); 80% (Roberts et al 2009); 59% (Roberts et al 2008)). Several of the participants included notes with their completed questionnaire indicating that they had enjoyed the process, and it was clear that those who had completed and returned the questionnaires had devoted significant time and effort to filling in the various sections. The fact that the response rate was so low can most likely be attributed to this time and effort required to complete the questionnaire, as a large amount of information was required of the participants. It is possible that a large proportion of the 106 individuals who took a copy of the questionnaire but did not return it may have done so with the intention of completing it, but were deterred by the length of the questionnaire, a factor which has been found in numerous studies as a major factor in response rates (e.g. Jepson et al 2005, Galesic & Bosnjak 2009).

Additionally, the questionnaire could be regarded as complicated, particularly with the coding required for Section D, in which respondents were asked to list their close relationships and how they contact them, along with recalling when they were last in contact with them. The cognitive ease and clarity of a questionnaire has been shown to be positively related to the completion of a questionnaire (Subar et al 2001), with a longer questionnaire designed to be cognitively easier to process having the same response rate as one that is more complex, but half as long. The questionnaire used in this study could have been simplified, and reached a larger number of respondents if it was digitised and placed on an online questionnaire repository (e.g. http://surverymonkey.com). However, due to the requirement of the connections between an individual's contacts to be listed, and no realistic method for doing this via an online survey generator, only physical copies of the questionnaire could be distributed.

The result of the low response rate was that the sample size of this study is also low. The sample size could have been increased by distributing more questionnaires (i.e. to get a sample of 100 students, 400 questionnaires would need to be distributed given a response rate of approximately 25%). However, due to the term-based nature of student's (particularly undergraduates) residency at university, there was a time constraint as there would be no students available to distribute questionnaires to. Additionally, because of the constraints of the study design regarding the time to last contact with others, if questionnaires were distributed immediately after they returned from vacation, the data would be confounded by the fact that the students would most likely be moving back with their parents, seeing old friends and acquaintances that they would otherwise not have met during term time. In order to make sure that the data were consistent and valid, a decision was made to not hand out further questionnaires until a certain span of time had passed after the start of a new term (one month) to allow for the effects of vacation to be minimised. This delay meant that the distribution of new questionnaires coincided with both exam time and the submission of dissertations, and there was a very low level of interest in taking part in the study. These logistical constraints added to the low sample size.

The small sample size found in this study has implications for the results of the statistical analysis of data. The requirement of utilising non-parametric statistical tests due to the non-normal distribution of several of the variables, which may have been normalised given a larger sample size, is in itself of little consequence as non-parametric tests approximate well with their parametric alternatives (Martin & Bateson 1993, Agresti & Finlay 2008) especially considering that non-parametric tests were preferred due to the rank-derived nature of many of the measures.

The small sample size (N=37) means that the data analyses are at risk of both Type I and Type II errors. Atypical results from just a few respondents could lead to inaccuracies in the statistical tests, leading to either a false acceptance or rejection of the null hypothesis. This will be particularly important with regards to analyses based on sex, as here the sample becomes even lower (11 for males, 26 for females), meaning that if, for example, the male respondents in this study had unusually small social networks, any analysis based on their responses will be unrepresentative of the

wider population; if male networks were actually very similar in size to female networks in general, then this study would have made a Type I error by rejecting the null hypothesis that sex plays no role in social network size. Meanwhile, if there was a significant difference in the wider population which the sample in this study failed to express, the null hypothesis would be accepted leading to a Type II error. As Type II errors are more likely to be related to a small sample size (Agresti & Finlay 2008), caution needs to be taken when interpreting the results of this study in which the null hypothesis has been accepted.

5.1.2 Methodological issues

A number of issues were determined which could lead to problems with the interpretation of the results of this study. The first of these is that this study made no distinction between contact initiated by the respondent themselves, and contact initiated by others; the questionnaire simply asked "What was the most recent non-face-to-face contact". While it is hoped that the communication events reported by the respondents will indeed be ones that they themselves initiated, it is likely that this study also includes contacts made by others, therefore the data collected may be inconsistent.

Additionally, although the respondents were requested to photocopy additional sheets if they required them to list the members of their emotional networks, only one of the respondents did so. There was therefore an artificial limit on network size as the questionnaire only contained space for 27 contacts. The fact that several of the respondents completely filled all available space (giving them a network size of 27) could mean that if additional space was provided their network size would increase.

A further issue related to the time to last contact with the members of the social network. While the time categories allowed for a high degree of specificity at the shortest times to last contact, the time gap between two of the categories (one month and one year) allowed for a range of between 30-335 days. An individual who had been seen or contacted within two months would be placed in the same category as one who had been contacted nearly a year ago. Geographical distance also suffered

from the same issues of categorical generalisation, with someone who lived in another country that is geographically close to the UK (e.g. Ireland, France) being placed in the same category as someone who lived at the most extreme distances (e.g. New Zealand, America).

Finally, the values used in the social network analysis section for the different emotional ties between members of the network were arbitrarily assigned, with values of 2 for close relationship, 1 for a friendly relationship, and -1 for an unfriendly relationship. While the use of valued data in social network analysis is largely at the researcher's discretion (Scott 2000), a different set of values could have led to a different set of results (i.e. if it was determined that an unfriendly relationship should be scored more negatively, at -2, it would have a stronger effect on the emotional centrality rankings and density scores for the networks). However, while the values may have changed, the pattern should stay the same, such that the general conclusions would remain unchanged.

Despite the issues and limitations raised in this section, it is believed that this thesis represents an innovative and valid approach to studies on human social networks and communication, with the limitations and caveats outlined above detracting little from the methodological validity and results obtained by this study.

5.3 Directions for Future Research

Due to the small sample size, and the relatively homogenous sample population (university students at a single UK institution), this study should be regarded as both preliminary and exploratory in nature. However, several of the findings have unveiled previously unstudied aspects of the relationship between personality and social network size. The general focus of previous studies has been on only two facets of the Five Factor (or equivalent) models of personality, Extraversion and Neuroticism, yet this study has found that a previously overlooked factor, Agreeableness is the only one that related to network size. Future research should aim to not only corroborate these findings within a wider range of subjects, but also see if the relationship between Agreeableness and the sympathy group size also extends to an entire personal social network, not just at the innermost layers.

Additionally, the methodology used to elicit the relative emotional closeness to and connections between members of the network via a graphical representation was found to be highly useful. Rather than using a more simple Likert-like valued scale, in which the emotional closeness of relationships are assigned an arbitrary value, respondents were allowed to fully rank their social contacts according to how emotionally close the relationship is relative to the other relationships within the network. This methodology was found to be both highly practical and informative, and it is believed that the use of relative rather than absolute scores for emotional closeness is a valuable measure that should be used in future studies.

5.4 Conclusions

This study aimed to examine the general patterns of the emotional social networks of emerging adults, communication within these networks, and the use of technology in communication, while also assessing the role of sex, age and personality on individual variation.

The results of this study indicate that the support clique and sympathy group sizes of emerging adults (6.44 ± 3.22 and 13.08 ±7.28 respectively) are similar to those found in other populations, and that variation in the size of egocentric social networks can be attributed to sex differences (with females having larger networks than males), and personality; individuals who scored higher on Agreeableness were found to have more friends within their social networks, leading to an increase in sympathy group size. Additionally, a general trend towards sex-biased homophily was found in both the support and sympathy groups, with females networks containing more females, and male networks containing more males.

This study also found that the average network density of emerging adults' sympathy groups was at the upper limits of expected network densities found in the real world, indicating that the members of their social networks were strongly tied to one another. Partners and genetic kin in particular were found to have strong central positions within the sympathy group, indicating that they know a larger proportion of the network relative to friends, and that this greater level of centrality may be related to their emotional closeness to the respondent.

Additionally, the social networks of emerging adults were found to be highly geographically dispersed, and that the geographical distance to a contact has an effect on the time to last contact. While geographic distance was found to restrict the frequency of face-to-face contact, it had a less important effect on the time to last non-face-to-face contact. In general, non-face-to-face contact occurred more frequently with people with a greater emotional connection, with the personality of the respondent also having an important role in the time to last contact characterised by higher Extraversion scores being associated with a decreasing time to last contact (including face-to-face contact), Conscientiousness associated with a decreasing time to last non-face-to-face contact only, while higher levels of Agreeableness were associated with an increasing time to last non-face-to-face contact.

Finally, this study found that emerging adults are heavy users of technology for communication, and that the form of communication (e.g. text message, telephone call) is affected by the emotional closeness and type of a relationship, and the distance to a contact. While this study found no significant sex differences in usage patterns of communication technology, age was found to be negatively correlated with a number of indexes of usage, with personality being found to play a potential, but as yet unclear role. It was also found that those individuals who made greater use of one form of technology were also likely to make use of others, indicating that there is a general propensity to communicate, and that individuals will communicate using any means available to them.

Appendix A – The questionnaire distributed to research participants

Social Relationships and Networks Questionnaire – Consent Form

Peter Tomlin – Durham Anthropology Department

peter.tomlin@durham.ac.uk; 07968 448074

The main goal of this study is to explore the emotional social networks (who do you feel you have the closest relationships with) of Durham University students. By creating a list of the people you feel closest too, along with how you contact them and why, I aim to explore social network composition and structure. With the new opportunities that the internet and smart phones offer to contact others, I am also interested in finding out how you use these technologies. This research is conducted as part of my MSc in Biological Anthropology, and your assistance is greatly appreciated.

This questionnaire is broken down into 5 sections:

Section A: Personal Information

Section B: Use of Technology

Section C: About Your Personality

Section D: Who do you know, and how do you know them

Section E: Social Network Construction

The information you provide in this questionnaire will be treated with the utmost confidentiality, and you will be anonymised in any outputs of this research.

In return for your assistance in this project, you have the chance to win one of the following prizes:

1st	**£100**
2nd	**£50**
3rd	**£25**
4-10th	**£10**

By signing the declaration below, you are agreeing to the terms listed above and consent to be a participant in this study

Name:…… **Date:……**

Information about you:

Please indicate below which outputs you would like to receive for your participation:

A summary of the research findings once completed	☐
Participation in the lottery prize-draw	☐

Section A – Personal Information

Name	
Email address	
*Sex	
*Age	
College	
*Degree type (BA, BSc etc)	
*Subject	
*Year of Study	
Country of Birth	
Nationality	
Ethnicity	
Out of Term Town of Residence	

Please note that for the purposes of anonymity this information will be kept separate from the rest of the questionnaire data. Only fields marked with * will be used for data analysis; the remaining fields are designed to ensure that a range of students are covered in the study.

Section B – Use of Technology

Do you own a mobile phone? If yes, please also enter the number of contacts in your mobile address book.	-	**Y / N**
If yes above, how long do spend (a) texting and (b) talking on your mobile phone on an average day?		**(a)** **(b)**
Do you have access to a computer with an internet connection at home?	-	**Y/N**
Do you use any social networking sites (Facebook, Myspace etc)? Please list all sites you use and the number of contacts for each	-	**Y / N**
How many hours do you spend using social network sites on an average day?	-	
Do you use any instant messaging services (e.g. MSN, Yahoo Messenger)? Please list all services you use	-	**Y / N**
How many hours do you spend using instant messaging services on an average day?	-	
How many hours do you spend browsing/using the internet for non-social reasons on an average day?	-	
Do you play any online games (e.g. World of Warcraft, Team Fortress 2)? If yes, please list all the games you play, along with how much time you spend playing on an average day.	-	**Y / N**

Section C – About Your Personality

Describe yourself as you generally are now, not as you wish to be in the future. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence. Indicate for each statement whether it is 1. Very Inaccurate, 2. Moderately Inaccurate, 3. Neither Accurate Nor Inaccurate, 4. Moderately Accurate, or 5. Very Accurate as a description of you.

	Score: **1 – Very Inaccurate** **2- Moderately Inaccurate** **3- Neither Accurate nor Inaccurate** **4- Moderately Accurate** **5 – Very Accurate**				
	1	**2**	**3**	**4**	**5**
Often feel blue					
Have little to say					
Believe in the importance of art					
Have a sharp tongue					
Am always prepared					
Rarely get irritated					
Feel comfortable around people					
Am not interested in abstract ideas					
Have a good word for everyone					
Shirk my duties					
Dislke myself					
Keep in the background					
Have a vivid imagination					
Cut others to pieces					
Pay attention to details					
Seldom feel blue					
Make friends easily					
Do not like art					
Believe that others have good intentions					
Don't see things through					
Am often down in the dumps					
Would describe my experiences as somewhat dull					
Tend to vote for liberal political parties					
Suspect hidden motives in others					
Get chores done right away					

	Score: **1 – Very Inaccurate** **2- Moderately Inaccurate** **3- Neither Accurate nor Inaccurate** **4- Moderately Accurate** **5 – Very Accurate**				
	1	**2**	**3**	**4**	**5**
Feel comfortable with myself					
Am skilled in handling social situations					
Avoid political discussions					
Respect others					
Do just enough work to get by					
Have frequent mood swings					
Don't like to draw attention to myself					
Carry the conversation to a higher level					
Get back at others.					
Carry out my plans.					
Am not easily bothered by things					
Am the life of the party					
Do not enjoy going to art museums					
Accept people as they are					
Find it difficult to get down to work					
Panic easily					
Don't talk a lot					
Enjoy hearing new ideas					
Insult people					
Make plans and stick to them					
Am very pleased with myself					
Know how to captivate people					
Tend to vote for conservative political candidates					
Make people feel at ease					
Waste my time.					

Section D – Who do you know, and how do you know them?

In this section, I would like you to think about the people you are emotionally closest to: who do you go to for advice; who can you always rely on to support you and help you out financially; who you feel you can express yourself to without having to worry about anything; those people whose loss would be strongly felt. Using the information key below, please enter the details of these people into the table provided.

Initials – The initials of the person you are close to – if initials are the same, use initials of first name and first 2 letters of surname (e.g. Robert Smith – RS, Rachel Simpson – RSi)

Age – The age of this person, in years and months (if known)

Relationship – In the **Type** column, please enter the type of relationship you have with this person:
GK – related to you by blood
AK – related to you by marriage
F - friend
P- in a romantic relationship with (e.g. boyfriend, girlfriend, spouse)

In the **Sex** column, enter the sex of the person (M – male; F – female)
In the **Description** column, enter a description of the relationship (e.g. housemate, father, girlfriend, best friend)

Time Known – The number of years and months that you have known this person for (e.g. 2 years 4 months)
If you have known the person all your life, enter *****

Distance – How far away does this person live from you:
H – Lives in the same house as you
T – Lives in the same town as you
O – Lives in another town (please specify which town in the space provided)
C – Lives in another country (please specify which country in the space provided)

Last F2F – When was the last time you met this person face to face:
T – Today (last 24 hours)
Y – Less than 3 days ago
W – Less than a week ago
M – Less than a month ago
Ye – Less than a year ago
O – Other (please specify a date in MMYY format in the space provided)

Last Contact Type– What was the most recent non-face-to-face contact with this person:
P – Telephone call
T – Text message
E – Email message
S – Social networking site (e.g. Facebook, Myspace – please specify which in the space provided)
L - Letter
O – Other (please write the method in the space provided)

Last Contact Time – When did the above take place (please use the same coding as the **Last F2F** question

Duration – How long did the most recent contact last for in minutes (e.g. how long did you talk on the phone for, how long did you spend writing/reading an email)

Reason – What was the reason for the last contact (e.g. arrange a meeting, catching up, gossiping)

Private? - Was the last contact private (only you and this person able to see what was communicated e.g. private message on Facebook) or was it public (available for others to listen to/read e.g. posting on someone's Facebook wall, sending a group text/email)

Preference – What is your preferred way of contacting with this person (please use the same coding as the **Last Contact Type** question)

Initials	Age		Relationship			Time Known		Distance		Last F2F		Last Contact Type		Last Contact Time		Duration	Reason	Private?	Preference	
	Y	M	Type	Sex	Description	Y	M		Other		Other		Other		Other					Other
JG	*36*	*1*	*P*	*F*	*Girlfriend*	*1*	*9*	*H*		*T*		*P*		*T*		*1*	*Meeting up*	*Y*	*T*	
WB	*26*	*3*	*F*	*M*	*Best Friend*	*16*	*2*	*O*	*Bristol*	*Y*		*P*		*W*		*15*	*Catching up*	*Y*	*P*	
PT	*55*	*2*	*GK*	*M*	*Father*	*	*	*O*	*Cheltenham*	*M*		*P*		*M*		*5*	*Advice*	*Y*	*P*	

Please photocopy or contact me at peter.tomlin@durham.ac.uk if you require additional sheets.

Initials	Age		Relationship			Time Known		Distance		Last F2F		Last Contact Type		Last Contact Time		Duration	Reason	Private?	Preference	
	Y	M	Type	Sex	Description	Y	M		Other		Other		Other		Other					Other

Initials	Age		Relationship			Time Known		Distance		Last F2F		Last Contact Type		Last Contact Time		Duration	Reason	Private?	Preference	
	Y	M	Type	Sex	Description	Y	M		Other		Other		Other		Other					Other

Section E – Your Social Network

In this section, I would like you to consider how the people you listed in Section D relate to both yourself and each other. On the following page, there is a diagram of concentric circles, with a black circle in the middle. This black circle represents you, with the surrounding circles representing how emotionally close you feel to a person relative to the others you listed (with everyone inside the first circle being those you feel closest too, those inside the second circle being those you feel less close to, and those outside the second circle being those you feel least close to). I have provided 3 levels of emotional closeness, but if you believe that you need to add more in order to fully depict your social network, please add them in. Mark people's positions using their initials on the chart, and circle the initials of family members.

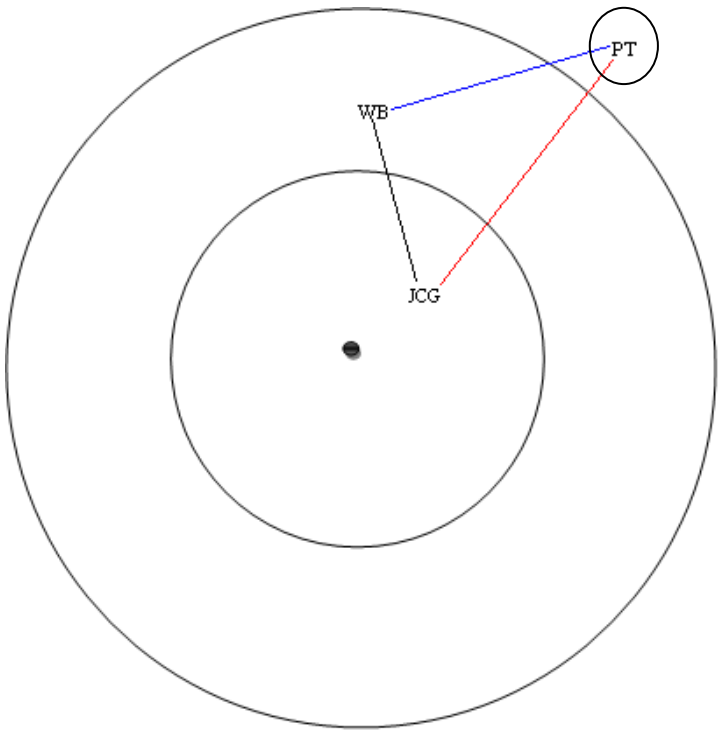
I would also to find out how these people are socially related to one another. By drawing lines between the initials you have marked on the diagram, please indicate whether they:

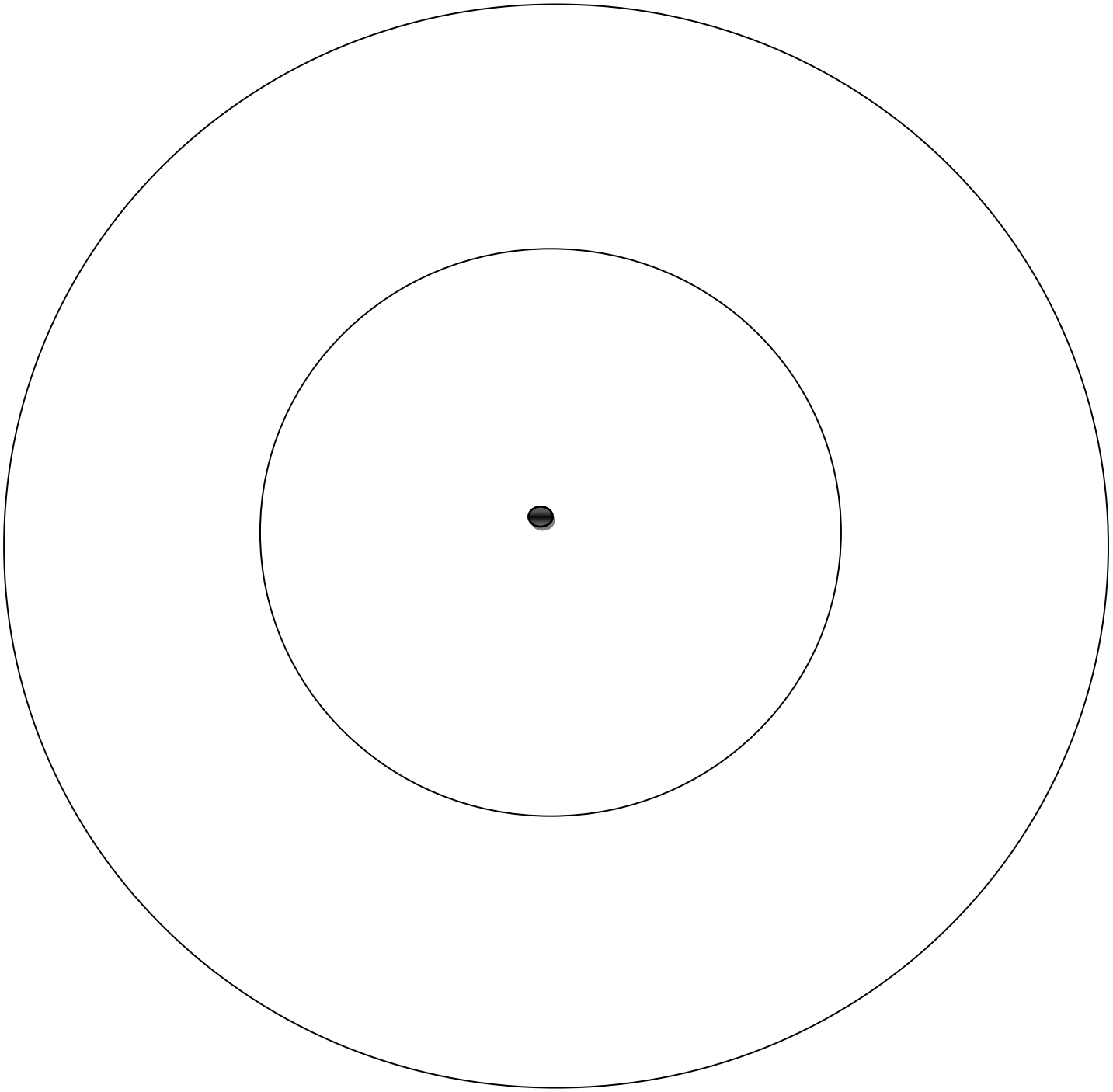
Are good/close friends – A plain black line

Know each other, and are friendly with each other – A blue line

Know each other, and are not friendly with each other – A red line

NB – If you do not have the appropriately coloured pens, please use a different scheme and write a key on the form.





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