The effects of friendship and antipathy networks on adolescent attitude similarity

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Friendship is seen as an important factor in influencing the peer-to-peer social relationships and attitudes during their adolescence. However, few researchers observe adolescents' antipathy networks and study the extent to which such negative relationship influences adolescents' behaviours and attitudes. In this study, I use social network analysis to estimate the influence of friendship and antipathy between adolescents by calculating Euclidean distance in network structure and compare the distance effects of these two opposite forces on their attitude similarity. The preliminary findings show that friends do not necessarily have similar attitudes towards any dimensions of life experience, but strong friendship networks provide significant support for adolescents' emotional stability, while antipathy networks enhance the tension and conflict between peer foes because of their similar attitudes on the strong sense of ego. This result implies that friends’ similarity is not as significant as studies have overwhelmingly shown as prior studies argue. Friends’ and foes’ similarity could be associated with the friendship and antipathy networks only by understanding the context of the interaction.

Keywords: friendship; antipathy; network modelling; homophily; MDS

Friendship and antipathetic relationships

Interpersonal relationships take many different forms, such as family ties, friendships, romantic relationships and professional dealings, but also antipathetic relationships; relationships of dislike. Every interpersonal relationship constitutes a unique social context, and the complex interplay of these contexts shapes the diversity of social life as well as the values, attitudes, behaviours and beliefs of individuals. During adolescence, individuals learn the needed social skills to build these interpersonal relationships through day-to-day socialisation. In the line of this research, friendship is viewed as the principled relationship among adolescents that forms their behavioural similarity. For example, according to the homophily principle, McPherson, Smith-Lovin, and Cook (2001), in their classic study on this subject, emphasised that since people tend to maintain social contacts with those who are like themselves, their attitude similarities are reinforced through their interaction. They review studies of informal network ties (friendship) in school children, college students and small urban neighbourhoods, and are convinced with systematic evidence of substantial homophily in terms of demographic and psychological characteristics, such as age, sex, education or intelligence, attitudes and aspirations.

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Other studies of homophily also provide empirical support for this argument in various fields. For example, Kupersmidt, Griesler, De Rosier, Patterson, and Davis (1995) examined friendship formation among third and fourth graders and found that as similarity in gender, race and academic achievement increased, the likelihood of befriending also increased. Adolescents engaging in similar behaviours pursue further interaction and construct close friendship networks based on shared activities. Studies on adolescent delinquent behaviours show conclusive evidence to prove that selection of friends is based on similarity of behaviour by looking at sociometric data from longitudinal research on adolescents’ substance abuse, smoking, drinking and other risk-taking behaviours (de Klepper, Sleebos, Van de Bunt, & Agneessens, 2010; Engels, Vitaro, Blokland, De Kemp, & Scholte, 2004; Fisher & Bauman, 1988; Knecht, Snijders, Baerveldt, Steglich, & Raub, 2010; Mercken, Snijders, Steglich, Vartiainen, & De Vries, 2010; Mercken, Steglich, Sinclair, Holliday, & Moore, 2012; Mundt, Mercken, & Zakletskaia, 2012).

Basically, studies of adolescent interpersonal relationships and behaviours focus, for the most part, on a single type of relationship, that of friendship, to explore the association between socialisation and adolescent behaviour (de Klepper et al., 2010; Dijkstra, Cillessen, & Borch, 2013). Friendship is used as an important and straightforward measure of the intimacy among adolescents, and studies have examined the extent to which friendship influences their values, attitudes, behaviours and beliefs (Knecht et al., 2010; Mercken, Candel, Willems, & De Vries, 2007; Mercken et al., 2010). While friendship is frequently examined in adolescent studies, multidimensional relationships should tell a different story of the association between peer relationships and adolescent behaviour. For example, in contrast with friendship, antipathy refers to a relationship based on dislike between two companions, either unilateral or mutual. As such, antipathies form a social relationship that endures over time on the basis of aversion and animosity. However, few studies explored similarities between adolescents with this negative type of relationship as well as distinctive modes of interaction. Researchers may be interested in issues about the antipathetic relationship formation (Wiseman & Duck, 1995), the relationship expectations between two antipathies (Abecassis & Hartup, 1999), the patterns of interaction (Ray & Cohen, 1997) or characteristics of adolescents’ antipathies (Card, Isaacs, & Hodges, 2000); however, socio-emotional qualities among enmities and similarities between antipathies have been not known yet (Hartup & Abecassis, 2002).

The association between antipathetic relationship and attitude homophily is the key issue mainly to be bridged in this study. The homophily principle points out that interpersonal contacts would happen more frequently between people with similar attributes (e.g. race/ethnicity, gender, age, education, occupation or social class) than between those with dissimilar attributes (McPherson et al., 2001). It implies that social distance between two persons would be determined by their attribute similarity/dissimilarity, and vice versa. In this sense, negative relationships, like antipathy, cause longer social distance between people which then is less likely to facilitate close interpersonal contact and nourish value, behavioural or attitude homophily. However, negative relationships are possibly formed between two persons who were friends, and such dramatic change of relationship from positive friendship to negative antipathy would produce chemical effect on the homophily principle based on friendship in a broad sense. For example, the homophily principle can still be applied between antipathies but on dark sides of attitude/behaviour (such as aggression, assault and battery, harassment or fraud). Hence, I explore this relatively less known field of similarities between antipathies by studying adolescents’ social network and attitudes and behaviours. That is, this study aimed at contributing to an emerging field of research on friendship and antipathy.
networks by looking from a social network perspective at the effects of these interactions on adolescent attitude similarity, the homophily principle.

In short, prior studies applied friendship networks to explain the homophily principle of adolescents’ attitude similarity; however, alternatively, I take two types of relationships (friendship and antipathy) into consideration to explore how dual social relationships form adolescents’ attitude similarity. My argument is that since friendship can foster adolescents’ attitude similarity, the extent to which the effect of antipathy on peers’ similarity should result in the opposite outcome (i.e. dark sides of attitudes). When we consider this argument, what role does the antipathy network play in influencing adolescents’ attitudes? This question is the core of this study.

Literature review

Prevalence of antipathetic relationships in adolescence

Social Bond theory (Hirschi, [1969] 2002) argues that family, friends and other members of our social networks to which we are attached affect our lives in many ways. Adolescence is one of the most critical periods of development. During this time we need strong positive social ties to feel belongingness. Hence, if a person shares common values/norms as others in their subgroup, then their behaviour/attitude would be similar and the motivation to deviate will be less possible. Hirschi ([1969] 2002, p. 17) further argues the more weakened the groups to which [the individual] belongs, the less he [she] depends on them, the more he [she] consequently depends only on himself [herself] and recognises no other rules of conduct then what are formed on his [her] private interests.

Therefore, the prevalence rate of friendship in a social group (like class in school) determines how bonded peers students are and then their degree of socialisation.

As to the prevalence of antipathetic relationships, the existing literature is inconsistent. For example, the proportion of adolescents who have antipathetic relationships ranges from very low to very high, depending on the method of measurement (Parker & Gamm, 2003; Witkow, Bellmore, Nishina, Juvonen, & Graham, 2005), so that it is difficult to conclude what prevalence antipathetic relationships have among adolescents. Card (2010) conducted a meta-analysis of 16 studies related to the prevalence of antipathetic relationships and found that about one-third of children are involved in antipathetic relationships (35% of adolescents with one or more peers disliking or being disliked). However, he further investigated whether there were potential sources of systematic differences in prevalence measurements across studies, and found that pool size, limited or unlimited number of peers nominated as antipathetic, and item type of coding antipathetic peers had statistically significant association with prevalence. Pool size was negatively related to prevalence, indicating that antipathetic relationships were more common within a smaller pool of peers than in a larger pool. In addition, when researchers used unlimited rather than limited choice procedures for assessing disliking, antipathetic relationships were more prevalent than expected (Card, 2010).

Item type of coding antipathetic peers was also significantly associated with the prevalence. The common measure of ‘antipathy’ is to ask respondents if there was anyone whom they disliked or like the least (Card & Hodges, 2007; Huitsing et al., 2012; Peets, Hodges, & Salmivalli, 2008). Some researchers used rosters of names to ask for limited nomination (up to 3–6) of peers they disliked (Berger & Dijkstra, 2013; Berger, Rodkin, & Dijkstra, 2011; Card & Hodges, 2003; Erath, Pettit, Dodge, & Bates, 2009; Nangle, Erdley, Zeff, Stanchfield, & Gold, 2004). Some studies used a rating scale approach by...
which participants were asked to report 'how much time you like to spend with each person' within a class boundary by using a five-point Likert-type scale from 1 (I do not like to) to 5 (I like to a lot) to assess the degree of interpersonal disliking (Betts & Stiller, 2014; Card & Hodges, 2007; Kingery & Erdley, 2007). Few studies used open-ended questions to ask participants to write down the names of peers she/he disliked and what led to becoming antipathies with them or starting to dislike them (c.f., Card & Hodges, 2007). Using more intense terms (such as enemy) to assess dislike would result in low prevalence measurements, compared to less intense terms (less like or dislike). Obviously, the measured prevalence of antipathetic relationships among adolescents varies depending on the operationalisation of antipathy.

In short, prior studies used the word ‘dislike’ or ‘like the least’ to operationalise antipathetic relationships and turned antipathy into a dichotomy variable (0 and 1) for further statistical analysis in social network modelling. Some authors even did not consistently use the same operationalisation of this negative relationship within their own studies. As expected, the measured prevalence of antipathetic relationships varies among adolescents. The studies show that this type of relationship is a common form of social interaction in adolescents’ daily lives and is highly relevant to understanding their peer relationships and delinquency or academic achievement, but it has been yet to be fully investigated with regard to its impact and effect on adolescents’ attitudes and behaviours (c.f., Card, 2010). In this study, I intend to examine antipathetic relationships to better understand the prevalence of antipathetic relationships and its impact on adolescents within a class boundary.

Attitude similarity between friends and between antipathetic peers

I have reviewed the literature about the prevalence of antipathetic relationships among adolescents in the line of adolescence and discussed its importance in the field of adolescence research. In this section, I focus on the issue of attitude similarity between friends and between antipathetic peers.

In daily life, interaction with friends plays an important role in the formation of individuals’ social values and behaviour, according to social bond theory, especially in childhood and adolescence (Corsaro & Eder, 1990). This process of social interaction facilitates similarity between friends. Such similarity between friends, then, is a common phenomenon found in salient individual attitude and behaviour dimensions and becomes the best example of interdependence between individual behaviour and social networks (e.g. Baldassarri & Bearman, 2007; Bishop, 2008; Coleman, 1961; Fararo & Sunshine, 1964; Goel, Mason, & Watts, 2010; Haynie, 2001; Sewell, Haller, & Portes, 1969).

Similarities between friends come about for many reasons. Among these reasons, the most noticeable dispute over whether such similarity between friends is due to social influence, friendship selection or both has been raised and discussed abundantly in the literature (e.g. Festinger, 1954; Hirschi, [1969] 2002; Lazarsfeld & Merton, 1954; Sutherland, 1947). Studies have been devoted to resolving this dispute about selection-or-influence effect on friends’ similarity. Some social scientists who endorse the concept of homophily (the social selection perspective) contend that people usually choose to have close connection with others like themselves (Hirschi, 1969; Lazarsfeld & Merton, 1954; McPherson et al., 2001; Miller, Lincoln, & Olson, 1981). Studies show that the phenomenon of homophily appears in similar demographic groups, such as age, sex, race/ethnicity or education, cultures and subcultures, or in groups with similar psychological characteristics, such as aspirations, attitudes and beliefs. As a result, by bonding only with
others like themselves, people then share similar information, adopt similar attitudes and engage in similar behaviour (c.f., McPherson et al., 2001).

On the other hand, some scholars take a social influence perspective, and argue that the group to which individuals belong (such as families, schools or organisations) significantly shapes and reshapes their values, attitudes and behaviours through the process of interpersonal influence. This process of interaction generates consistency in values or behaviours among their members (c.f., Festinger, 1954). Therefore, individuals, being influenced by others in their peer group or intimate circle, will assimilate those others’ attitudes, values and behaviours, resulting in the phenomenon of similarity among themselves (Festinger, 1954; Friedkin, 2001; Friedkin & Johnsen, 1990; Sherif, 1936).

Studies have applied quantitative methods to empirical data to examine whether selection or influence cause similarity among group members (e.g. Değirmencioğlu, Urberg, Tolson, & Richard, 1998; Padgett & Ansell, 1993; Snijders, Steglich, & Schweinberger, 2007). Researches study the relationship between the behaviour of individuals and that of the group members they interact with. However, on the other hand, the existing literature does not know much yet whether there is attitude similarity between antipathetic peers (Hartup & Abecassis, 2002, p. 291). Since negative relationships (e.g. antipathy) are possibly formed between two persons who were friends, and whether such dramatic change of relationship from positive friendship to negative antipathy would still follow homophily principle based on friendship in a broad sense is unclear. According to Festinger’s (1954) social comparison theory, individuals evaluate their attitudes/behaviours by comparison with significant others in their group; therefore, attitudes and behaviours of antipathies should influence that of those inevitably. I argue that such behaviour approximation effects between antipathies exist as they do between friends. To explore the degree of attitude similarity among antipathetic peers would help to shed light upon the role that antipathetic relationships play in shaping adolescents’ attitude or behavioural similarity.

The focus of this study is on adolescents’ social relationships in relation to their attitude and behaviour similarity, the homophily principle. It is hypothesised that similarity among friends would facilitate and be facilitated by their intimate friendship. This homophily principle is derived from social bond theory that strong positive social ties form belongingness and assimilate attitudes and behaviours and social comparison theory that one compares his/her acts with significant others’ in response to group regulation.

According to social bond theory and social comparison theory, positive and tight social relationships, like friendship, facilitate harmony among group members and then foster consistent attitudes and behaviours. Therefore, the following hypotheses in this study are tested.

Hypothesis 1: The closer friendship a pair of adolescents in a group has, the more similar their attitudes are.

Hypothesis 2: The stronger antipathy a pair of adolescents in a group has, the more dissimilar their attitudes are.

Here, I considered two opposite relationship networks to compare the different effects of the friendship network and the joint network structure on peers’ attitude similarity. Since the association between friendship and adolescents’ attitude similarity has been studied abundantly in the literature, this study extends this research interest by taking a dual relationship condition (friendship and antipathy) into consideration. Hence, not only is the friendship network structure considered, but also the antipathy network and the joint network structures are analysed.
Methodology

Setting

To examine the association between the principle of attitude homophily and dual social relationships (friendship and antipathy) among adolescents, I use a data-set collected on a sample of nine classes from different high schools participating in an ongoing longitudinal study in Taiwan. Classroom friend and foe nominations along with general questions about their school life were collected since 7th grade during 2008 and 2011 under the project of ‘Luminous Shine and Dark Shadow: The Duality of Late Adolescents to Early Adult’s Friendship Networks’ conducted by Institute of Sociology, Academia Sinica, Taiwan. There were two questionnaires used for this survey; the network questionnaire was used for collecting the information about friend and foe nominations, while the general questionnaire was used for collecting information about the adolescents’ background, socioeconomic status, family relationships, social values, academic performance, experience of school life and so on. The survey waves were conducted three times each semester; therefore, 18 total waves of data were collected. In the network questionnaire, there was no limit to the number of nominations of either friends or foes. The times when the network questionnaire was administered totalled seven in a row for the same class samples of nine classes (S1–S9 in Table 1). Noticeably, friendship and antipathetic network surveys were conducted through all 18 waves, while the general questionnaire was surveyed at waves 4, 7, 11, 14 and 16 only (Table 1). These nine sample classes are located in southern Taiwan, six in Tainan City and the other three in Chiayi County. Tainan City is one of five metropolitan cities in Taiwan while Chiayi County is a relatively remote area. Therefore, the effect of demographic variation on this study could be minimised, although these samples do not represent all areas of Taiwan (Figure 1).

I used the first survey containing both network data and the attitude data from wave 4 to explore the possible association between multidimensional relationships and individual attitudes. The main reason to adopt this strategy of analysis is to observe adolescents’ attitudes at a given time and examine the extent to which the structure of adolescents’ relationship networks is associated with their attitude homophily.

Table 1. Waves and samples of conducting the project of ‘Luminous Shine and Dark Shadow’.

| Wave | Class | 1 | 2 | 3 | 4a | 5 | 6 | 7a | 8 | 9 | 10 | 11a | 12 | 13 | 14a | 15 | 16a | 17 | 18 |
|------|-------|---|---|---|----|---|---|----|---|---|----|-----|---|---|-----|---|-----|---|----|
| S1   | x     | x | x | x | x  | x | x | x  | x | x |     |      |   |     |      |   |     |   |    |
| S2   | x     | x | x | x | x  | x | x | x  | x | x |     |      |   |     |      |   |     |   |    |
| S3   | x     | x | x | x | x  | x | x | x  | x | x |     |      |   |     |      |   |     |   |    |
| S4   | x     | x | x | x | x  | x | x | x  | x | x |     |      |   |     |      |   |     |   |    |
| S5   | x     | x | x | x | x  | x | x | x  | x | x |     |      |   |     |      |   |     |   |    |
| S6   | x     | x | x | x | x  | x | x | x  | x | x |     |      |   |     |      |   |     |   |    |
| S7   | x     | x | x | x | x  | x | x | x  | x | x |     |      |   |     |      |   |     |   |    |
| S8   | x     | x | x | x | x  | x | x | x  | x | x |     |      |   |     |      |   |     |   |    |
| S9   | x     | x | x | x | x  | x | x | x  | x | x |     |      |   |     |      |   |     |   |    |
| S10  |       | x | x | x | x  | x | x | x  | x | x |     |      |   |     |      |   |     |   |    |
| S11  |       | x | x | x | x  | x | x | x  | x | x |     |      |   |     |      |   |     |   |    |
| S12  |       | x | x | x | x  | x | x | x  | x | x |     |      |   |     |      |   |     |   |    |

Notes: Mark ‘x’ stands for which sample class participated in which wave of the project
aThe friendship and antipathetic network surveys were conducted through 18 waves while the general questionnaire was surveyed at waves 4, 7, 11, 14 and 16 only.
The detailed descriptive statistics of the data I used is shown in Tables 2 and 3 and Figure 2. The information of 405 sample students from 9 classes was analysed in this preliminary study (Table 2). The average class size was 45 (range from 33 to 51), and the average number of friend nominations from the nine sample classes was 6.579, ranging from 5.532 to 7.796. These results show that the number of friend nominations among these sample classes was similar, even though the classes were not all of the same size. The data showed that foe nominations were few, ranging from 2 (0.76% of total edges in S6) to 79 (20.36% of total edges in S1). Obviously, all sample classes, except S1, had less than 10% of antipathetic ties among classmates. One reason why this type of relationships is underinvestigated may be due to that the difficulty of collecting data on adolescents’ antipathetic network (Güroğlu, Haselager, Lieshout, & Scholte, 2009).

For the measurement of adolescents’ attitudes, I selected 10 variables for analysis (Table 3). All measures used either a four- or a five-point Likert-type ordinal scale and were examined by the gender difference after controlling for class size. The first attitude measurement was the question of ‘Have you been happy recently?’ This was measured with a four-point Likert-type scale from 1 (very unhappy) to 4 (very happy). The average value...
was 2.904, showing the respondents were slightly unhappy, and female adolescents (2.991) were relatively happier than their gender counterparts (2.843) \((t = 2.529; p < 0.05)\).

The second attitude measurement was the question, ‘How do you evaluate your current health condition?’ It was a five-point Likert-type scale from 1 (very horrible) to 5 (excellent). The frequency of each rating scale is shown in Table 3. The average value was 3.566 and there was no statistically significant difference between male adolescents (3.592) and female adolescents (3.528).

The third attitude measurement was the question, ‘Do you agree or disagree with this description of yourself: I cannot solve certain problems that have happened to me.’ Responses were measured on a five-point Likert-type scale from 1 (definitely disagree) to 5 (definitely agree). The average value was 2.518 and female adolescents’ average value (2.604) was slightly higher than male adolescents’ average value (2.457), but the difference was not statistically significant.

The fourth attitude measurement was the question, ‘Do you agree or disagree with this description of yourself: I always treat myself with an optimistic and positive attitude.’ Responses were measured on the same scale as previous attitude measurement. The average value was 3.799 and there was no statistically significant different gender difference. In general, the respondents showed that they kept an optimistic and positive attitude towards themselves.

The fifth attitude measurement was the question, ‘How much are you satisfied with your relationships with friends?’ These responses were measured with a four-point Likert-type scale from 1 (very unsatisfied) to 4 (very satisfied). The average value was 3.070 and there was no statistically significant gender difference. These results showed that the respondents were quite satisfied with their relationships with their friends in general.

The sixth attitude measurement was the question, ‘How much are you satisfied with your relationship with your class mentor?’ Responses were rated on the same scale as the previous attitude measurement. The average value was 3.014 and there was no statistically significant gender difference.

The seventh attitude measurement was the question, ‘Do you agree or disagree with this description of yourself: I can do whatever I would like to do.’ Responses were measured on the same as previous attitude measurements. The average value was 1.928 and the difference between female adolescents (1.840) and male adolescents (1.990) was statistically significant \((t = -2.081; p < 0.05)\). This result showed that male adolescents felt more freedom to do what they would like to do, compared to their gender counterparts.
| Var                      | Scale | 1       | 2       | 3       | 4       | 5       | %       |
|--------------------------|-------|---------|---------|---------|---------|---------|---------|
|                         |       | All     | Male    | Female  | All     | Male    | Female  | All     | Male    | Female  | All     | Male    | Female  | %       |
| v1. Happy†               |       | 2.15    | 2.33    | 1.89    | 19.92   | 22.67   | 16.04   | 63.28   | 63.33   | 63.21   | 14.65   | 11.67   | 18.87   | 100     |
| v2. Health               |       | 0.00    | 0.00    | 0.00    | 4.18    | 4.11    | 4.29    | 44.02   | 43.15   | 45.24   | 43.83   | 42.12   | 43.81   | 8.96    |
| v3. Problem solving      |       | 21.29   | 24.67   | 16.51   | 21.29   | 21.67   | 20.75   | 45.51   | 41.00   | 51.89   | 8.20    | 8.67    | 7.55    | 3.71    |
| v4. Optimist             |       | 0.78    | 0.67    | 0.94    | 6.27    | 6.38    | 6.13    | 28.82   | 26.85   | 31.60   | 40.59   | 42.95   | 3726    | 23.53   |
| v5. Peer relationship    |       | 0.78    | 1.00    | 0.47    | 9.78    | 9.33    | 10.43   | 71.04   | 72.33   | 69.19   | 18.40   | 17.33   | 19.91   | 100     |
| v6. Relationship with mentor |     | 0.98    | 1.33    | 0.47    | 10.74   | 12.67   | 8.02    | 74.22   | 71.00   | 78.77   | 14.06   | 15.00   | 12.74   | 100     |
| v7. Wannabe*             |       | 31.51   | 30.43   | 33.02   | 50.10   | 48.83   | 51.89   | 14.09   | 14.38   | 13.68   | 2.74    | 4.01    | 0.94    | 1.57    |
| v8. Take full control of life* | | 2.15    | 1.00    | 3.77    | 7.42    | 6.67    | 8.49    | 33.59   | 30.33   | 38.21   | 34.77   | 36.00   | 33.02   | 22.07   |
| v9. Fight for rights***  |       | 32.68   | 22.33   | 47.39   | 42.27   | 44.67   | 38.86   | 22.50   | 29.67   | 12.32   | 2.54    | 3.33    | 1.42    | 100     |
| v10. Strength & offensiveness* | | 25.24   | 20.33   | 32.23   | 41.68   | 44.00   | 38.39   | 27.20   | 29.67   | 23.70   | 5.87    | 6.00    | 5.69    | 100     |

Notes: The number in cells is the percentage of each scale. The t-test was applied to examine if there is statistically significant difference between female respondents and male respondents after controlling class size; †p < 0.10; *p < 0.05; **p < 0.01; ***p < 0.001.
The eighth attitude measurement was the question, ‘Do you agree or disagree with this description of yourself: I have full control of my life.’ These responses were also measured on a five-point Likert-type from 1 (definitely disagree) to 5 (definitely agree). The average value was 3.672 and male adolescents (3.793) tended to agree that they can control their life, compared to their gender counterparts (3.500), a statistically significant difference of...
In general, the respondents had high score in this measurement, showing they had confidence in their ability to control their own lives.

The ninth attitude measurement was the question, ‘Do you agree or disagree with the statement: Sometimes I have to take aggressive and violent action to fight for my rights.’ Responses were measured with a four-point Likert-type scale from 1 (definitely disagree) to 4 (definitely agree). The average value was 1.949 and male adolescents (2.140) showed a stronger tendency towards this statement than their gender counterparts (1.678), a statistically significant difference of \( t = -6.715; p < 0.0001 \).

The last attitude measurement was the question, ‘Do you agree or disagree with the statement: People tend to respect those people who are strong and offensive.’ Responses were measured on a four-point Likert-type scale from 1 (definitely disagree) to 4 (definitely agree). The average value was 2.137 and male adolescents had stronger tendency to agree with this statement than female adolescents did. This result showed that male adolescents tended to agree that they could have an advantage over others by taking aggressive physical actions.

These 10 items for measuring adolescents’ attitudes covered the domains of their school lives from mental health to social relationships, and values. To examine the association between adolescent attitude similarity and their social network structure, I present the detail descriptive statistics for each variable to demonstrate the diversity among the respondents. The data show that the female adolescents were slightly happier than the male adolescents, while the male adolescents had a greater tendency to show their masculinity in terms of physical behaviour and egocentrism, compared to their gender counterparts. In the next section, I elaborated on the network structure based on friend and foe nominations and examine the extent to which friendship and antipathetic networks are associated with the similarity of peers’ attitudes and behaviours.

**Modelling**

Prior research studying the theme of network structure has focused on the presence of relational ties between egos that form the network structure and the network characteristics, such as dyads, triads and larger cliques, or more complex sub-structures, such as reciprocity, transitivity and similarity (c.f., Steglich, Snijders, & Pearson, 2010). This study attempted to extend the application of individual network characteristics to a single index of network distance, so that this aggregated measure is able to contain all information from a bunch of characteristics of network structure, including dyad- and triad-structure, path or cluster, to represent the relationship between every pair of nodes in the network. In this way, the information about the presence or absence of ties between egos is considered and included into social network analysis simultaneously.

This study manipulates and extends Friedkin’s (2001) social influence network theory to estimate the network distance between peers related both as friends and as foes. Friedkin’s (2001) theory mathematically formalises the process of dynamic change within a given network that produces the equilibrium interpersonal distance from an initial ego. Social influence network theory emphasises that the equilibrium similarity between any pair of nodes’ structural distance in a network is determined by three key factors: the initial network position between any two egos, the susceptibility of individual egos to the influence of others and the influences of the group egos on any individuals. These concepts of social influence network theory are developed from combinatorial theories of consensus formation and group decision-making, including
French’s formal theory of social power (French, 1956; Harary, 1959) and de Groot’s & Steg (2007) consensus formation model, and they are closely related to the rational choice model of group decisions by Lehrer and Wagner (1981), Davis’ (1973) social decision scheme model, and Graesser’s (1991) information integration model. Based on these so-called combinatorial theories, the model of social influence network theory integrates work in various disciplines and is formally consistent with Anderson’s (1981) weighted averaging model of information integration that describes an influence process in a group.

The original model of social influence network theory is formulated as

\[
y^{(t+1)}_{ij} = a_i \left( w_{i1} y^{(t)}_{i1} + w_{i2} y^{(t)}_{i2} + \ldots + w_{iN} y^{(t)}_{iN} \right) + (1 - a_i) y^{(1)}_{ij},
\]

where \( t = 1, 2, \ldots \) and each of the \( N \) egos in the group \( i = 1, 2, \ldots, N \). The similarity between two egos’ structural positions at time \( t \) is \( y^{(t)}_{ij} \) and their initial network positions are represented by \( y^{(1)}_{ij} \). The set of influences of the group egos on individual \( i \) is \{\( w_{i1}, w_{i2}, \ldots, w_{iN} \}\}, where \( 0 \leq w_{ij} \) and \( \sum w_{ij} = 1 \). The susceptibility of ego \( i \) to the influence of others is \( a_i \), where \( 0 \leq a_i \leq 1 \) and \( a_i = 1 - w_{ii} = \sum_{j \neq i} w_{ij} \). Hence, a person’s susceptibility is equal to the aggregate weight of the interpersonal influences on him or her. Equation (1) can be reduced to

\[
y^{(t+1)} = AWy + (I - A)y^{(1)},
\]

where \( A = \text{diag}(a_1, a_2, \ldots, a_N) \) is an \( N \times N \) matrix of the egos’ susceptibilities to interpersonal influence and \( W = [w_{ij}] \) is an \( N \times N \) matrix of interpersonal influences.

The algorithm of the influence of any ego \( j \) on a given ego \( i \) in a network, \( w_{ij} \), is composed of two parts: ego \( i \)’s susceptibility to interpersonal influence \( a_i \) and percentage of friendship/antipathy probability between egos \( j \) and \( i \) (\( C_{ij} \)) out of aggregated friendship/antipathy probability \( (\sum_{k \neq i} C_{ik}) \) as represented in Equation (3).

\[
w_{ij} = (1 - w_{ii}) \times \frac{C_{ij}}{\sum_{k \neq i} C_{ik}} = a_i \times \frac{C_{ij}}{\sum_{k \neq i} C_{ik}}.
\]

Therefore, we need to estimate the friendship/antipathy probability of any two egos \( i \) and \( j \) (\( C_{ij} \)). The algorithm of \( C_{ij} \) is shown in Equation (4). In Equation (4) the friendship/antipathy probability \( C_{ij} \) is obtained from logistic regression \( \hat{z}_{ij} \) in Equation (5) in which nine network structural characteristics are concerned as explanatory variables.

\[
C_{ij} = P(r_{ij} = 1|x_1, x_2, \ldots, x_H) = \frac{1}{1 + e^{-\hat{z}_{ij}}},
\]

\[
\hat{z}_{ij} = b_0 + \sum_{h=1}^{H} b_h x_h + u,
\]

where \( \hat{z}_{ij} \) means the estimated value of \( Z_{ij} \) (coded ‘1’ if ego \( i \) is nominated any other ego \( j \) as friend (or foe) in the friendship (or antipathetic) network, otherwise ‘0’). \( H \) denotes the total number of explanatory variables; here I select nine network structural characteristics to estimate \( \hat{z}_{ij} \). They are as follows:

1. \( x_1 \): the level of outdegree of actor \( i \), a count of the number of ties from \( i \).
2. \( x_2 \): the level of indegree of actor \( i \), a count of the number of ties to \( i \).
3. \( x_3 \): reciprocity, the occurrence of a tie from \( j \) to \( i \).
(4) \( x_4 \): similarity, the number of actors who are connected to \( i \) and \( j \) (\( i \leftarrow k \rightarrow j \)).
(5) \( x_5 \): similarity, the number of actors to whom \( i \) and \( j \) are connected (\( i \rightarrow k \leftarrow j \)).
(6) \( x_6 \): transitivity, the number of actors to whom \( i \) is connected and from whom \( j \) receives a connection (\( i \rightarrow k \rightarrow j \)).
(7) \( x_7 \): circularity, the number of actors from whom \( i \) receives a connection and to whom \( j \) sends a connection (\( i \leftarrow k \leftarrow j \)).
(8) \( x_8 \): the level of outdegree of actor \( j \), a count of the number of connections from \( j \).
(9) \( x_9 \): the level of indegree of actor \( j \), a count of the number of connections to \( j \).

As we can see from Equation (5), the influence of a given group ego \( j \) on any individual \( i \) is estimated from the network structure, i.e. outdegrees and indegrees of \( i \) and \( j \), reciprocity, similarity, transitivity and circularity. That is, a greater number of mutual friends/foes in various network structures indicate closer structural positions of a pair of any \( i \) and \( j \) and stronger mutual influence between them.

These selected network structural characteristics illustrate that a greater number of mutual friends/foes (either nominate or nominated) between any two egos in a network reflect closer structural positions. To further quantify and visualise the similarity of two egos’ structural network positions, the multidimensional scaling (MDS) method is applied to indicate their locations in the multidimensional social space based on the information of interpersonal influence (\( w_{ij} \)) and each one’s susceptibility to the influence of others (\( a_i \)). MDS is a way to find \( N \) points representing \( N \) objects (nodes) geometrically, so that the interpoint distances correspond in some sense to experimental similarities between objects (Kruskal, 1964).

Hence, based on the data of respondents’ friend and foe nominations, I was able to convert the nomination data into a friendship and an antipathetic network structure for each of the nine sample classes. The basic descriptive network statistics are presented in Table 2. Using the algorithm of network distance described above, I calculate the network distance between each pair of adolescents in a class. Therefore, each adolescent had a value denoting a geographic distance between her or him and each of her or his classmates. As a result, three types of network distances were obtained from friendship network, antipathetic network and a combination of friendship and antipathy network, respectively. That is, a shorter the network distance between two adolescents in the friendship network indicates a proportionately close and positive relationship, while a short network distance between two adolescents in the antipathetic network indicates a more adversarial or unfriendly relationship. Last, the network distance in the joint network was adjusted by the network distance in friendship network and antipathy network where friend nomination is coded as \(+1\), foe nomination coded as \(-1\) and the rest as \(0\). In other words, dual relationships of friendship and antipathy between adolescents are considered into the model simultaneously as an index of adjusted network distance.

**Analyses**

Before explaining the research model, I will briefly discuss the descriptive statistics. First of all, the average network distances in the three types of relationship networks are presented in Table 4. Generally speaking, the average network distance in the joint networks was slightly longer than that in the friendship network across all nine sample classes, which means the social distance between people would be overestimated when only considering one type of relationship. In addition, the average network distance
between pairs of adolescents in the antipathetic network was longer than that in the other two networks (0.970 and 0.965).

Next, I presented the research models derived from measurements of the adolescents’ attitudes. To analyse the association between network distance and adolescents’ attitudes, I used Ordinal Logistic Regression models calculated from measurement of adolescents’ attitudes towards an ordinal scale (Powers & Xie, 2008) and the results are presented in Table 5.

Attitude measurement consists of three dimensions:

1. Quality of life (v1. Happy, v2. Health, v3. Problem solving and v4. Optimist in Table 5)
2. Social relationships (v5. Peer relationship and v6. Relationship with mentor in Table 5)
3. Autonomy (v7. Wannabe, v8. Take full control of life, v9. Fight for rights and v10. Strength and offensiveness)

In addition, there are three models in Table 5 using network distances from Model 1: the joint network, Model 2: friendship network and Model 3: antipathetic network, respectively, as a major independent variable along with control variables for gender effects of ego and alter (male as reference group) and ego’s and alter’s individual attitude measurement on adolescents’ attitude for the same dependent variable. The dependent variable is the difference in attitude measures between pairs of adolescents. Hence, the models show the association between network distance and adolescents’ attitude similarity; that is, the extent to which the similarity of any pairs of adolescents’ attitude would be associated with the network distance in friendship, antipathy and the joint relationship, respectively.

### Quality of life

For the dimension of quality of life, column of v1. Happy in Table 5 consists of three network distance models. It shows that network distance in the joint network was statistically significant, which means that the longer the joint network distances between a pair of students, the more similar their feeling of happiness was in life. In other words, close friends might have different degrees of a complementary approach to friendship that leads one to support the other when she or he feels down. A similar result was found in the friendship network model: close friends were not necessary to keep the same feeling of
Table 5. Ordinal regression models of attitude measurement.

| Quality of life | Social relationships | Autonomy |
|----------------|----------------------|----------|
| v1. Happy       | v2. Health           | v3. Problem solving | v4. Optimist | v5. Peer relationship | v6. Relation ship with mentor | v7. Wannabe | v8. Take full control of life | v9. Fight for rights | v10. Strength & offensiveness |
| Model 1: Joint relationships | | | | | | | | | |
| Network distance | 0.179 (0.036)*** | 0.237 (0.036)*** | 0.061 (0.034)* | -0.149 (0.035)*** | -0.136 (0.037)*** | -0.130 (0.037)*** | 0.017 (0.036) | 0.019 (0.034) | 0.043 (0.035) | 0.225 (0.035)*** |
| Gender-ego      | -0.134 (0.037)*** | 0.041 (0.036) | 0.112 (0.035)*** | -0.093 (0.036)*** | -0.165 (0.037)*** | 0.184 (0.038)*** | 0.055 (0.036) | -0.025 (0.035) | -0.053 (0.087) | -0.142 (0.035)*** |
| Gender-alter    | -0.129 (0.037)*** | 0.051 (0.037) | 0.109 (0.035)*** | -0.096 (0.036)*** | -0.168 (0.037)*** | 0.191 (0.038)*** | 0.055 (0.037) | -0.026 (0.035) | -0.053 (0.087) | -0.142 (0.035)*** |
| Attitude-ego    | 0.303 (0.024)***   | -0.210 (0.022)*** | 0.011 (0.015) | 0.251 (0.017)*** | -0.143 (0.028)*** | -0.083 (0.030)**  | -0.467 (0.019)*** | 0.161 (0.016)**  | -0.395 (0.021)*** | -0.271 (0.018)*** |
| Attitude-alter  | 0.313 (0.024)***   | -0.207 (0.022)*** | 0.011 (0.015) | 0.251 (0.017)*** | -0.136 (0.028)*** | -0.077 (0.030)*   | -0.468 (0.019)*** | 0.162 (0.016)**  | -0.394 (0.021)*** | -0.272 (0.018)*** |
| AIC             | 32992.85           | 33464.21     | 41663.51       | 39143.59           | 29505.91           | 28437.03           | 35212.85           | 40167.78           | 35457.20           | 38277.14           |
| Model 2: Friendship | | | | | | | | | |
| Network distance | 0.196 (0.036)*** | 0.244 (0.036)*** | 0.066 (0.034)* | -0.141 (0.035)*** | -0.147 (0.037)*** | -0.130 (0.037)*** | 0.014 (0.036) | 0.020 (0.034) | 0.044 (0.035) | 0.232 (0.036)*** |
| Gender-ego      | -0.134 (0.037)*** | 0.041 (0.037) | 0.113 (0.035)*** | -0.092 (0.036)*** | -0.164 (0.037)*** | 0.185 (0.038)*** | 0.055 (0.037) | -0.024 (0.035) | -0.053 (0.087) | -0.143 (0.035)*** |
| Gender-alter    | -0.128 (0.037)*** | 0.049 (0.037) | 0.110 (0.035)*** | -0.095 (0.036)*** | -0.167 (0.037)*** | 0.192 (0.038)*** | 0.054 (0.037) | -0.025 (0.035) | -0.056 (0.087) | -0.142 (0.035)*** |
| Attitude-ego    | 0.384 (0.024)***   | -0.299 (0.022)*** | 0.011 (0.015) | 0.252 (0.017)*** | -0.142 (0.028)*** | -0.083 (0.030)**  | -0.467 (0.019)*** | 0.160 (0.016)**  | -0.395 (0.021)*** | -0.272 (0.018)*** |
| Attitude-alter  | 0.315 (0.023)***   | -0.206 (0.022)*** | 0.011 (0.015) | 0.253 (0.017)*** | -0.136 (0.028)*** | -0.077 (0.030)*   | -0.467 (0.019)*** | 0.161 (0.016)**  | -0.393 (0.021)*** | -0.272 (0.018)*** |
| AIC             | 32836.93           | 33296.52     | 41480.33       | 39893.61           | 29835.37           | 28315.09           | 35093.13           | 39986.26           | 35304.16           | 38104.30           |
| Model 3: Antipathy | | | | | | | | | |
| Network distance | 0.023 (0.016) | -0.003 (0.016) | 0.068 (0.015)*** | 0.036 (0.016)* | -0.047 (0.016)*** | 0.150 (0.017)*** | -0.117 (0.016)*** | -0.061 (0.016)*** | -0.108 (0.016)*** | -0.065 (0.016)*** |
| Gender-ego      | -0.193 (0.034)*** | 0.007 (0.033) | 0.104 (0.032)*** | -0.158 (0.033)*** | -0.251 (0.034)*** | 0.345 (0.035)*** | 0.078 (0.033) | -0.035 (0.032) | 0.043 (0.044) | -0.147 (0.032)*** |
| Gender-alter    | -0.187 (0.034)*** | 0.027 (0.033) | 0.099 (0.032)*** | -0.161 (0.033)*** | -0.261 (0.034)*** | 0.360 (0.035)*** | 0.074 (0.033) | -0.036 (0.032) | 0.042 (0.044) | -0.149 (0.032)*** |
| Attitude-ego    | 0.324 (0.023)***   | -0.120 (0.021)*** | 0.017 (0.015) | 0.198 (0.017)*** | -0.166 (0.028)*** | 0.115 (0.028)*** | -0.424 (0.019)*** | 0.159 (0.015)**  | -0.278 (0.020)**  | -0.222 (0.018)*** |
| Attitude-alter  | 0.329 (0.023)***   | -0.102 (0.021)*** | 0.017 (0.015) | 0.200 (0.017)*** | -0.157 (0.028)*** | 0.127 (0.028)*** | -0.422 (0.019)*** | 0.160 (0.015)**  | -0.277 (0.020)**  | -0.222 (0.018)*** |
| AIC             | 34869.56           | 35706.48     | 43515.95       | 41217.22           | 30650.66           | 30695.53           | 37262.05           | 42643.87           | 37542.61           | 39715.18           |

Notes: Standardised coefficients present in cells with standard errors (in parentheses). 
\*p < 0.10; \*\*p < 0.05; \*\*\*p < 0.01.
happiness. Second, male adolescents showed more a consistent degree of happiness with life than female adolescents. Young female adolescents were often more sensitive than their gender counterparts. Compared to the network distance based on friendship only, the joint friendship and antipathy network distance had less association with the variation in pairs’ feeling of happiness. Last, the negative network distance did not have any significant association with the variation in pairs’ feeling of happiness.

As to the column of v2. Health, there were positive association between network distance in the joint and friendship networks and peers’ similarity of health condition. That is, the longer the joint and friendship network distances between pairs of nodes were, the more similar their health condition was likely to be. On the contrary, the antipathy network distance did not have significant association with the variation in their health condition. Compared with self-evaluated health condition and the similarity of pairs’ evaluation across all three models, we found when students gave the lower score to their health condition, their health conditions were more similar, which means in general students’ health conditions are scored low, reflecting they were under a certain degree of pressure together.

Column of v3. Problem solving shows that each of the three modes of network distance had a positive association with the similarity of adolescents’ attitudes towards solving problems, but the effects of the joint \( (b = 0.061, p < 0.01) \) and friendship \( (b = 0.066, p < 0.01) \) network distances were relatively weaker. In other words, adolescents close together in a friendship network tended to have different attitudes towards whether they could solve problems by themselves. This result may be explained by friendships who provided support from one stronger individual to another individual who felt helpless to solve problems. More support for this explanation comes from the antipathy network model \( (b = 0.068, p < 0.001) \), in which longer network distance between a pair of students was associated with more similar attitudes. It means that the more one dislikes the other, the less likely these two students have the same attitude towards their capability to solving problems in daily life. Besides, we found that female adolescents had similar attitudes towards their capability to solving problems alone.

Last, column of v4. Optimist shows that the shorter the joint and friendship network distances between a pair of students, the more similar their attitude was towards the statement, ‘I’m an optimist.’ That is, friends tended to have similar attitudes towards optimism. Also, male adolescents had more consistent attitudes towards this statement than females. In general, optimistic adolescents tended to be more friendly with other individuals having optimistic attitudes than with those who were not optimistic.

In short, the association between network distance in three models of social relationships and students’ attitude towards quality of life was statistically significant. Friends did not have similar attitude towards happiness and health condition but tended to complement and support one another’s affection, either mental or physical health. Also, close friends tended to have similar attitude towards optimism while attitudes towards optimism among antipathetic peers were various. These findings in the dimension of quality of life partly rejected hypothesis 1 that close friends have similar attitudes.

**Social relationships**

Column of v5. Peer relationship shows the association between three network distance models and the attitude measurement, ‘How much are you satisfied with your relationships with friends?’ Here, the shorter the joint and friendship network distance between a pair of students, the more similar was the satisfaction with their relationships with peers. Besides,
male adolescents had higher consistent degree of satisfaction with their relationships with peers than females. Antipathy network distance had a slight but significant association with the similarity of adolescents’ satisfaction with peer relationships. It implies that friends have a more stable peer relationship with others than peer foes.

Column of v6. Relationship with mentor shows the attitude measurement, ‘How much are you satisfied with the relationship with your class mentor?’ The shorter the joint and friendship network distance between pairs of students was, the more similar were their relationships with their mentors. In addition, female adolescents had more consistent relationships with their mentors than males. Last, the closer the antipathy network distance between pairs of nodes was, the more different was their relationship with the mentor. In other words, friends tend to have attitudes towards their class mentor different from those of their peer foes.

In terms of the association between peers’ social network distance and dimension of social relationships, I found that friends tend to adopt similar attitude towards their peer relationships and maintain the relationship with their class mentor, compared to their peer foes. This finding can be understood under the context of conflict and competition between foes in the class, so that one would dislike someone whom one’s foe might like to be close with. It cannot reject hypothesis 1 that the closer friendship a pair of adolescents in a group has, the more similar their attitudes are.

**Autonomy**

When we look at column of v7. Wannabe in Table 5, there was not any statistically significant association between the joint and friendship network distances and the similarity of adolescents’ attitudes towards the statement, ‘I can do whatever I would like to do.’ However, the antipathy network model shows that the shorter the antipathy network distance between a pair of students, the more similar was their attitude towards the statement, ‘I do whatever I want.’ It implies that students would show stronger attitude of enormous ego when facing their peer foes in the class. In addition, we found that female adolescents had a more consistent and lower tendency towards the statement, ‘I do whatever I want’ than males. Gender effect was significant on this attitude which reflects girl students tend to be more conservative to express their autonomy of doing things as they want to do.

The column of v8. Take full control of life represents the attitude measurement, ‘Do you agree or disagree with this description of yourself: I have full control of my life.’ The result shows that there was no statistically significant association between the joint or friendship network distance and the similarity of adolescents’ attitudes towards this statement. However, the shorter the antipathy network distance between a pair of students, the more similar their attitude was towards whether they had full control of their life. This result implies that adolescents in an antipathetic relationship tend to show a high sense of autonomy.

Column of v9. Fight for rights in Table 5 shows that there was no statistically significant association between the joint and friendship network distances and the similarity of adolescents’ attitudes towards the statement, ‘Sometimes I have to take aggressive and violent action to fight for my rights.’ However, in the antipathy network model, shorter antipathy network distances between pairs of nodes were associated with more similar attitudes towards this statement. Last, the column of v10. Strength & offensiveness shows the analysis of the attitude measurement, ‘Do you agree or disagree with the statement below: People tend to respect those people who are strong and...
offensive.’ It shows that the longer the joint and friendship network distances between a pair of students, the more similar their attitude was towards this statement. Consistently, the shorter the antipathy network distance between a pair of nodes, the more similar their attitudes were towards this statement. Male adolescents showed more consistent attitudes towards this statement.

According to the findings from the last four columns in Table 5, indicating to the dimension of adolescent autonomy, we found that peer foes tend to be more offensive and autonomic which might be associated with the conflicts between them, compared to friends. It rejected hypothesis 2 that the stronger the antipathy a pair of adolescents in a group have, the more dissimilar their attitudes are.

**Discussion**

The association between friendship and adolescents’ attitude similarity has been studied abundantly in the literature. Most work in this area has focused on adolescents’ delinquency and academic performance to emphasise the influence of friendship on behaviours. This study extended such research interest by taking two types of relationships (friendship and antipathy) into consideration. Not only is the friendship network structure considered here, but also the antipathy network and the joint network structure are analysed. My argument is that if friendship can increase adolescents’ attitude similarity, the effect of antipathy on peers’ attitude similarity should be decreased. If we consider this argument, what role does the antipathy network play in influencing adolescents’ attitudes or behaviours? This is the core question of my work here. In addition, prior studies applied friendship networks to explain the phenomenon of adolescents’ attitude similarity, but I analyse two contrasting relationship networks to compare the different effects of the friendship network and the joint network structure on peers’ attitude similarity.

In order to explore the different effects of relationship network structures on adolescents’ attitude similarity, I do not follow the traditional method of using the presence or absence of network ties as the only indicator, but instead, used aggregate features of network structure incorporated into an index of network distance to measure how close an ego is to a given alter within a network. Technical discussion is presented in Methodology section in detail and the main idea of manipulating this aggregated network features to measure network distance in social relationships is to operationalise relationship between people by Euclidean distance. The results of the association between network distance and adolescents’ attitude similarity are presented in the analysis section. The discussion of the findings is presented in the context of adolescents’ attitude towards quality of life, social relationships and autonomy.

Results of the measurement of adolescents’ attitudes towards quality of life show that the joint network distance and friendship network distance were significantly associated with happiness and health. However, the longer the distance in the friendship or joint network was, the more similar the attitudes of a pair of adolescents. This result implies that there were different attitudes between any two adolescents who had closer network distance in the friendship network. In other words, friends’ subjective sense of their quality of life was not consistent with the principle of homophily. I would argue that the important factor here is not adolescents’ similarity in their subjective sense of their quality of life, but on the complementary support they are able to offer each other when a friend is in need. Furthermore, similarity between friends in optimistic and positive attitude was supported. This association corresponds to the happiness and health conditions because optimistic and positive people tend to be with those who are also optimistic and positive so that they
can get support and share life experiences when they face difficulties, challenges or happy occasions.

The results of the measurement of social relationships were consistent across the three models of network distance. That is, adolescents tend to be satisfied with their relationships with their friends. This result shows that similarity in attitude towards satisfaction with friends should be seen as a universal phenomenon in which the closer the adolescents were to their friends, the more satisfied they were with their friends, regardless of the concurrent presence of foe relationships. Also, if an adolescent had a stronger antipathetic attitude towards his or her peer foes, he or she would appreciate friends’ companionship more.

The results of the measurement of attitude towards autonomy in life and social values show that both the joint and friendship network distances were not statistically significantly associated with attitude similarity, but the antipathetic network distance was. These four attitude measurements, related to power, control, fighting and aggression, were used to examine how adolescents view themselves and what social values they hold. These measurements of attitude were strongly and inversely associated with the antipathy network distance. In other words, adolescents tended to show their attitudes of strength, power and aggression when facing their peer foes. Therefore, attitude homophily in autonomy and such social values is fostered between adolescents in antipathetic relationships.

In short, there was no consistent evidence showing friends’ homophily in attitudes towards quality of life, social relationships or autonomy in this study. The preliminary findings show that strong friendship networks provide significant support for adolescents’ emotional stability, while antipathy networks enhance the tension and conflict between any pairs of adolescents with antipathetic ties because of their similar attitudes towards the strong sense of ego. This result implies that friends’ homophily is not as significant as studies have overwhelmingly shown. Friends’ and foes’ homophily could be associated with the friendship and antipathy networks only by understanding the context of the interaction.

Gender differences in adolescents’ attitude similarity were found in different areas, and homophily based on the social attribute of gender was supported in this study. Male adolescents had more consistent attitudes towards happiness, satisfaction with friendships, optimism and respect for strong and aggressive people. On the other hand, female adolescents had more consistent attitudes towards relationships with their class mentors and the difficulty to solving problem alone. These results seem to support the gender stereotypes that males are less emotional, admire power and strength, and tend to have more consistent relationships with friends, while females are more emotionally sensitive and are closer to adults who are able to instruct, advise and direct.

This study addressed the association between social network distance and adolescents’ attitude homophily by looking at dual relationships and determined that adolescents’ attitude homophily can be understood in terms of different measures of attitude (quality of life, social relationships and autonomy) as well as different social relationships (friendship networks, antipathy networks and the joint networks). In other words, homophily may not be a universal phenomenon in this stage of life. Since this study was conducted using cross-sectional rather than longitudinal data, these results may be limited to this particular cohort. Even so, based on the preliminary findings from this study, I will be able to gain further insight into this topic by following up on longitudinal changes in adolescents’ network structures and attitudes. Now that the study of antipathy networks has begun, this study contributes to our understanding of the effect of antipathetic relationships on adolescents’ attitudes and behaviours.
Disclosure statement
No potential conflict of interest was reported by the author.

Notes on contributor
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