Title: Adolescents' and their friends' sexual behavior and intention: Selection effects of personality dimensions

Postprint

Corresponding author: Laura Baams, Department of Developmental Psychology, Utrecht University, Heidelberglaan 1, 3584CS Utrecht, The Netherlands, Email: l.baams@uu.nl, phone: +31 30 253 8272.

Geertjan Overbeek, Research Institute of Child Development and Education, University of Amsterdam, Amsterdam, The Netherlands

Daphne van de Bongardt, Utrecht Centre for Child and Adolescent Studies, Utrecht University, Utrecht, the Netherlands

Ellen Reitz, Utrecht Centre for Child and Adolescent Studies, Utrecht University, Utrecht, the Netherlands

Judith Semon Dubas, Department of Developmental Psychology, Utrecht University, Utrecht, the Netherlands

Marcel van Aken, Department of Developmental Psychology, Utrecht University, Utrecht, the Netherlands

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Abstract

Using simulation investigation for empirical network analyses (in RSiena) we examined how personality and sexual behavior and intention were related to peer processes in Dutch adolescents. Our main research questions were: (a) do adolescents cluster together in friendship networks based on personality, sexual behavior, and/or sexual intention? And (b), do adolescents influence each other in their sexual behavior and intention? Results showed that adolescents clustered together based on dissimilarity in agreeableness, and similarity in gender and sexual intention. Further, we found that adolescents with lower levels of emotional stability had friends with more similar levels of sexual intention. The limited variance and low base rates of sexual behavior and intention did not allow us to explicitly test socialization effects.

Key words: Personality; Social network analyses; Adolescents; Sexual behavior; Sexual intention

Adolescents are found to group together in friendships based on their personality characteristics (Selfhout et al., 2010). Both personality characteristics and peer influences have been related to adolescent sexual behavior and the intention to have sex (Baams, Overbeek, Dubas, & van Aken, 2013, 2014; Eysenck, 1976; Hoyle, Fejfar, & Miller, 2000; Van de Bongardt, Reitz, Sandfort, & Deković, in press). However, no research has examined how personality relates to sexual development *and* peer processes. Using a network-analytic approach we examined how personality relates to the development of sexual behavior and intention in adolescent friendship networks.

Personality and sexual behavior

Several studies, including two systematic reviews (Bogg & Roberts, 2004; Hoyle et al., 2000), indicate a consistent linkage between the Big Five personality dimensions and (risky) sexual behavior in adolescence and young adulthood. Findings show that individuals with higher levels of extraversion engaged in more sexual behaviors, reported higher rates of sexual satisfaction, more promiscuity, infidelity, and unprotected sex (Bogg & Roberts, 2004; Eysenck, 1976; Hoyle et al., 2000; Miller et al., 2004; Raynor & Levine, 2009; Schmitt, 2004). One possible explanation for this extraversion effect is that extraverts may seek more stimulation because they are suggested to have less cortical arousal (Eysenck, 1976). Further, those high on neuroticism (or low emotional stability) are found to have lower levels of promiscuity and sexual satisfaction (Eysenck, 1976)— perhaps because those high on neuroticism are thought to feel more uncomfortable with intimate (sexual) social behaviors (Eysenck, 1976). Low agreeableness is only moderately linked to high-risk encounters, number of sexual partners, and unprotected sex (Hoyle et al., 2000). Finally, conscientiousness is also moderately linked to less unprotected sex (Hoyle et al., 2000). Those high on conscientiousness are generally more organized and show more constraint, thus it could be that they are more conscious of, or prepared for, potentially risky sexual

interactions (Hoyle et al., 2000). Those low on agreeableness could also be described as high on antagonism—the negative pole of agreeableness—these individuals may have less of an interest or concern for their sexual partner's health and well-being (Hoyle et al., 2000). However, the links between these later two personality dimensions (agreeableness and conscientiousness) and sexual behavior are only moderate, and suggested explanations have not been tested.

In a recent study we found that adolescents with higher levels of extraversion, and lower levels of agreeableness engaged in more sexual behavior, and more casual and risky sexual behavior. Further, those with higher levels of emotional stability and openness, and lower levels of agreeableness, developed sexually at a faster rate (Baams et al., 2014). Further, in another recent study on the same sample as in the current study (Baams et al., 2013), we found that extraversion and emotional stability were related to higher levels of sexual intention, whereas agreeableness, conscientiousness, and openness were related to lower levels of sexual intention. Thus, findings from the past four decades showed that personality dimensions were related to the development of sexual behavior and intention. However, no study has viewed this in light of adolescent peer processes—more specifically whether personality plays a role in the formation of friendships and the influence of friends on adolescents' sexual behavior and intention.

Adolescent friendships, sexuality, and social networks

Adolescent sexual behavior has several biological and social aspects (Zimmer-Gembeck & Helfand, 2007). With the onset of physical maturation and the environment's response, adolescents' opportunities for sexual involvement increases. During this time adolescents become more interested in sexuality and sexual behavior (Graber, Petersen, and Brooks-Gunn, 1996). Adolescence is also a time when youth move from being most attached to their parents, to forming close bonds with peers (Furman, Brown, & Feiring, 1999). As

more time is spent with peers, both in school, as well as during after-school activities, the frequency of peer interactions increases (Brown, Dolcini, & Leventhal, 1997; Larson et al., 1996).

It is not surprising to find that adolescents seek out groups of like-minded or behaviorally similar peers—in domains such as sexual behavior (DiIorio et al., 2001; Prinstein, Meade, & Cohen, 2003; Udry, 1987; Van de Bongardt et al., in press). How can this similarity in behavior be explained? Previous research indicates that it may be explained in terms of peer selection and socialization effects—thus it may be due to similar individuals selecting each other as friends (*selection effects*), but also that friends become more similar to each other over time through either modeling, imitation, and/or learning (*socialization effects*) (Brechwald & Prinstein, 2011). To tease apart these effects, longitudinal analysis and the simultaneous examination of selection and socialization processes is necessary (Veenstra, Dijkstra, & Steglich, 2013).

The similarity-attraction hypothesis describes how similarity in personality traits is important for the formation of friendships (e.g., Byrne et al., 1971, 1997; Byrne & Nelson, 1965). Similarity can act as a reinforcement of one's own ideas and feelings (reinforcement-affect, Byrne, 1997). According to the reinforcement-affect model individuals are not only attracted to each other based on similarity (Byrne & Nelson, 1965), but they also look to others for validation of their beliefs (Byrne et al., 1971; Morry, 2005) and those who validate these beliefs (i.e., are similar) reinforce them (Byrne & Nelson, 1965; Clore & Byrne, 1974). First-year university students have been found to form friendships based on similarity of several Big Five personality dimensions (openness, extraversion, and agreeableness; Selfhout et al., 2010).

Gender, too, plays an important role in friendship formation among adolescents. Selfhout and colleagues (2010) found that boys and girls cluster together in friendships—in

other words, friendship networks of adolescents are similar in gender. This has also been found in other studies (e.g., Dijkstra, Berger, & Lindenberg, 2011; Steglich, Snijders, & West, 2006). Although cross-gender friendships become more common as adolescents grow older, similarity of gender plays an important role in the formation and continuation of adolescent friendships (Hussong, 2000; Poulin & Pedersen, 2007).

Indeed, the literature shows that friendships are often formed based on similarity in certain characteristics or behaviors such as gender and age (Burk, Steglich, & Snijders, 2007), personality (Selfhout, Denissen, Branje, & Meeus, 2009), delinquency (Knecht, Snijders, Baerveldt, Steglich, & Raub, 2010), music preference (Selfhout, Branje, ter Bogt, & Meeus, 2009), and substance use (Mercken, Candel, Willems, & De Vries, 2007; Overbeek et al., 2011; Sieving, Perry, & Williams, 2000). Further, individuals select friends based on their own personality characteristics, for example, those high on extraversion are found to select more friends (Selfhout et al., 2010). Also, some personality characteristics seem more popular, for example, those high on agreeableness are selected more often as friends (Selfhout et al., 2010).

Overall, previous studies have shown that individuals select others as their friends based on their own (ego-effects), other's (alter-effects) characteristics, based on similarity in a certain behavior or characteristic, and individuals influence each other in behaviors and attitudes (influence effects). In the present study, we focus on similarity between friends in terms of their personality background and development of sexual behavior and intention and we also examine both ego and alter effects in friend selection.

Our rationale for the current study comes in three parts. First, consistent support has been found for the linkage between personality dimensions and adolescent sexual behavior and intention (e.g., Baams et al., 2013, 2014; Eysenck, 1976; Hoyle et al., 2000). Second, late adolescents are found to cluster together in friendship networks based on similarity in

personality dimensions (Selfhout et al., 2010). Thus, considering that personality dimensions are related to sexual intention and behavior, and there is selection (clustering) based on similarity in personality dimensions, this may point toward the simultaneous clustering of adolescents based on sexual intention and behavior. Third, similarity in friendships of personality and/or sexual intention and behavior may result in stronger socialization dynamics. That is similarity in personality characteristics or sexual behavior and intention may affect the selection of friends and influence by friends.

The present study

With the current study we aim to move beyond an individual development perspective by including the evidently important peer-context. To our knowledge, no study has related adolescent personality and sexual development to peer processes by examining both selection and socialization effects.

Drawing from the first three waves of a longitudinal study among Dutch adolescents, the current research addressed five major questions: Do adolescents select each other as friends based on (a) similarity in personality dimensions and/or (b) based on similarity in sexual intention and behavior? (c) Do personality dimensions and sexual intention and behavior interact in predicting the friendship network? And finally, assuming that individuals with similar characteristics are socially more attractive, and reinforce beliefs and ideas (Byrne & Nelson, 1965; Byrne et al., 1971; Selfhout et al., 2010), (d) do adolescents influence each other in their sexual behavior and intention, and (e) do these processes interact with personality dimensions? Questions a through c address selection effects and questions d through e address socialization effects.

Considering that friendships are at least partly based on personality dimensions (e.g., Selfhout et al., 2010), and that these same dimensions are related to adolescent sexual behavior and intention to have sex (e.g., Baams et al., 2013, 2014; Eysenck, 1976; Hoyle et

al., 2000), we hypothesized that adolescents would cluster together in friendships based on similarity in personality dimensions (a) and sexual behavior and intention (b). Thus, we expected both personality and sexual behavior and intention to be related to the formation of friendship networks (i.e., selection processes). Further, considering that high extraversion, and low agreeableness and emotional stability are linked to earlier, more risky, and more casual sexual behavior (Baams et al., 2014; Bogg & Roberts, 2004; Eysenck, 1976; Hoyle et al., 2000; Miller et al., 2004; Raynor & Levine, 2009; Schmitt, 2004), we hypothesized that adolescents would cluster together based on their personality dimensions in interaction with sexual behavior or intention (c) (interaction, of ego personality-effect × similarity sexual intention/behavior effect; selection processes). It should be noted that our intention was also to look at socialization effects (questions d and e), but because of limited prevalence and variance of behaviors we were unable to do so.[1]

Previous studies on the role of personality in friendships were often based on dyadic friendships, ignoring the embeddedness of these dyads in larger social networks (Carrington, Scott, & Wasserman, 2005; Selfhout et al., 2010). Thus, studying only the dyad ignores the network and network processes that affect multiple dyads within a network. For the current study we have therefore chosen to study friendships from a social network approach, considering multiple friendships (ties) between adolescents.

Method

Procedure

Participating adolescents were recruited from eight elementary and four secondary schools in several large cities and small municipalities throughout the Netherlands. Prior to the first measurement, both adolescents and their parents received letters, brochures, and flyers describing the aims of the study and describing the possibility to decline participation. 9.2% of the approached adolescents decided not to participate or was not allowed by their

parents to take part in the study.

The first wave was conducted in the Fall of 2011. Adolescents were followed up across three waves, with six-month intervals between waves. At each measurement wave, adolescents completed the questionnaire on computers at their school, during regular school hours. Researchers and trained research assistants were present to supervise the data collection at schools (i.e., introduce the project and the procedure, answer questions, and ensure maximum privacy from teachers and other students). Confidentiality of responses was guaranteed, as well as the option to stop participation at any time. Adolescents received book gift certificates of increasing value after each completed questionnaire. Permission for this study was granted by the ethics board of the Faculty of Social and Behavioural Sciences of Utrecht University, the Netherlands.

Participants

Data for this study were collected as part of the larger Project STARS (Studies on Trajectories of Adolescent Relationships and Sexuality; Deković, van Aken, ter Bogt, & van Geert, 2010), a four-wave longitudinal research project on romantic and sexual development of Dutch adolescents. For the current study the first three waves of data were available. The longitudinal sample consisted of 1297 participants (53.3% boys), and represents five age cohorts of adolescents in the last year of elementary school and first four years of secondary school (6^{th} - 10^{th} grade). Based on several statistical assumptions (see Data analyses) for the social network analyses we were able to include 380 participants (across 16-17 *included* networks). Table 1 presents the demographic characteristics and key variables for the included sample.

In waves 1, 2, and 3 the number of participants was 1230, 1200, and 1095, respectively. Because of the transition or graduation of 6^{th} and 10^{th} graders after T2, and some changes in class-composition, some of our participants could not complete subsequent

questionnaires at their school. Despite various invitations by mail or phone to complete these questionnaires at home, it was not possible to retain all baseline participants in the study. For our included sample we had 380 participants at T1, 376 at T2, and 381 at T3. These participants were from three 7st grade classes, eleven 8th grade classes, and three 10th grade classes, across four secondary schools. Overall, our included networks did not differ from the excluded networks in sexual behavior or intention (*p*s > 0.5). They did, however differ in level of personality dimensions (*p*s < .05). Adolescents in the included networks scored higher on agreeableness (M_{incl} = 5.74, M_{excl} = 5.58), conscientiousness (M_{incl} = 4.44, M_{excl} = 4.29), and openness (M_{incl} = 4.67, M_{excl} = 4.86) compared to adolescents in the excluded networks.

Materials

Personality dimensions. Personality dimensions were assessed with the Quick Big Five (Vermulst, 2005). This instrument includes six items for every big five personality dimension. Internal reliability for every dimension was reasonable to good; extraversion, α = .79, agreeableness; α = .82; conscientiousness, α = .84; emotional stability, α = .77; and openness, α = .61. Adolescents were presented with the items and asked to rate the degree to which the characteristic applied to them on a 7-point scale (1 = *does not apply to me at all* and 7 = *applies to me fully*). An example item is “Talkative” for extraversion, “Helpful” for agreeableness, “Careful” for conscientiousness, “Irritable” for emotional stability (re-coded), and “Creative” for openness.

Sexual behavior. To assess adolescents’ sexual behavior we combined two items, the first on kissing (“Have you ever kissed anyone?”) and the second on sexual behavior (“Have you ever had sex with someone? By sex we mean everything from petting to sexual intercourse”). For both items, adolescents could indicate whether they had experience with

the behavior (0 = no, 1 = yes). We combined these two items resulting in three categories (0 = no experience, 1 = kissed, 2 = had sex).

Sexual intention. Adolescents who reported not having had sex, received the following question: “Would you want to have sex in the next school year?”. Adolescents were asked to rate their answer on a 5-point scale (1 = *yes, definitely* and 5 = *no, definitely not*)—adapted from Beadnell et al. (2007). Scores were reversed, so that a higher score indicated a stronger intention to have sex.

Friendship nominations. At each wave, adolescents were asked to name who their best friends were in their class (k = 53) (in the Netherlands, students are placed in a class with whom they follow all of their courses). Adolescents could name as many friends as they wanted. On average, from one measurement wave to the next (T1 to T2 and T2 to T3), 29.44 (range 2 to 53) friendship dyads (ties) were formed, 36.09 (range 15 to 89) existing friendship ties were discontinued, and 51.09 (range 18 to 112) friendship ties remained stable.

Data analyses

To simultaneously examine selection and socialization processes, we used the simulation investigation for empirical network analyses (SIENA) software as an extension in R (RSiena; Snijders, 2001; Ripley, Snijders, & Preciado, 2013). We used the changes in friendship ties (from T1 to T2, and from T2 to T3) to estimate selection effects in friendship networks across these time intervals (see Figure 1 for an example of network changes). Finally, their personality at T1, and sexual behavior and intention over time were used to estimate selection, socialization, and interacting effects over each of the time intervals.

Assumptions. There are several important considerations of the data on friendship networks, covariates and behaviors. First, we needed to assess drop-out of participants from one measurement wave to the next. In addition, although some students did not drop-out of the study they were moved to a class that did not fully participate, leading to either (a)

nominations of students as friends who did not participate or (b) leading to a loss of selections as friends. Total attrition in the current study (from T1 to T3) was low (16%), however, class composition changes made it difficult and in some cases impossible to track students in their original class (network). Similar to drop-out in participants, we saw some irregularities in the report of sexual behavior and intention (due to drop-out some classes seemed to decrease in overall sexual behavior or intention—we therefore excluded these networks).

Second, an assumption of RSiena pertains to the relative stability of the friendship network. Although changes between observations are necessary for the data to be informative, too many changes do not allow the study of a gradually changing network (Veenstra et al., 2013). The Jaccard index can be used to infer the fraction of stable friendship nominations. If the Jaccard index is very low this may indicate that the changes in the networks are too large—then the SIENA method is less useful (Snijders, Van de Bunt & Steglich, 2010). It is recommended to exclude networks (classes) that are relatively unstable in friendship networks—this is represented in a Jaccard lower than 0.3 (Veenstra et al., 2013). Together with the exclusion of regressing classes this lead to the exclusion of 35 classes for sexual intention and 36 for sexual behavior—resulting in a final selection of classes for personality (k = 17), sexual intention (k = 17), and sexual behavior (k = 16) on which the analyses were performed. Our included networks had an average Jaccard of .439 (range .310-.600).

Analyses. The output in RSiena gives two types of parameters: network effects and covariate effects. First, the network effects, namely (a) density, the number of outgoing ties; (b) reciprocity, the extent to which friendship nominations are mutual or reciprocated; and (c) transitivity, the tendency for two adolescents who share a third friend, to become friends as well. Second, covariates are divided into constant and varying covariates. As constant

covariates we included gender (0 = male, 1 = female) and personality dimensions at T1 (Big Five). For every covariate we estimated three parameters: the attribute ego parameter (EgoX, the effect of the covariate on selecting friends); the attribute alter parameter (AltX, the effect of the covariate on being selected as a friend), and finally the attribute similarity parameter (SimX, the tendency for adolescents to select friends that have similar levels of the covariate).

Following the constant covariates, we also included varying covariates for sexual intention and sexual behavior separately. Here, RSiena estimates change in these covariates from T1 to T2, and from T2 to T3. Unfortunately, the prevalence of sexual behavior and intention and variance was too low to estimate socialization (of sexual intention and behavior) effects. Thus, we included sexual intention and behavior as varying covariates in our selection models. Finally, to assess the interaction of personality dimensions and sexual intention and behavior on friendship networks we included EgoX × SimX interactions for adolescents' personality dimensions and similarity of sexual intention and behavior separately.

We estimated the effects for every network (class) separately, after which we used the meta-analysis procedure provided in RSiena to analyze the average parameter estimates and standard errors across the networks (Snijders & Baerveldt, 2003).[2] We then used a Fisher's combination procedure with two one-sided tests to test the significance of each parameter (Hedges & Olkin, 1985). When combining a small number of networks, the Fisher's combination procedure is preferred (Ripley et al., 2013). For this test, the null hypothesis is that a parameter estimate is zero in all networks. A right- and left-sided test is used—in the right-sided test the null hypothesis is that a parameter is zero or less than zero in all networks, with the alternative hypothesis being that the parameter is greater than zero in at least one network. In the left-sided test the null hypothesis is that a parameter is zero or greater than

zero in all networks, with the alternative hypothesis being that the parameter is less than zero in at least one network (Ripley et al., 2013).

Results

Preliminary analyses

Pearson correlations between personality dimensions and sexual intention and behavior for the included sample showed that extraversion was related to higher levels of sexual intention (*r*s .10 to .15; *p*s .05 to .008) while conscientiousness was related to lower levels of sexual intention (*r*s -.12 to -.19, *p*s .02 to < .001). For sexual behavior we found fewer significant results, only extraversion (*r* = .24 to .28, *p*s < .001) was related to higher levels of sexual behavior (see Table 2).

In Figure 1 we present a friendship network and its changes over time (from T1 to T3). The first network was observed during the first semester of the school year. It shows that many friendships are reported (there are several outgoing and reciprocated ties), but also that there are only two adolescents who select and are selected by many friends (the two circles in the center of the network). By the end of the school year (T2), more friendships have been formed (the network has become more dense) and there are now four adolescents with many incoming and outgoing ties. The friendship network at T3, just after the summer holidays when many classes change in composition, again shows a less dense network, with fewer nominations and selections compared to T2. At all three measurement occasions there is an indication of a gender similarity effect, where boys (white circles) and girls (black circles) tend to cluster together.

Personality model

To answer our first research question of whether friendship networks were based on personality dimensions, we examined the network effects and covariate effects of gender and personality dimensions (see Table 3). The significant parameter for density showed that the

networks tended to be non-random: Adolescents had the tendency to be selective in their nominations of friends. Further, there was reciprocity in friendships, and friends of friends became friends (transitive triplets). As expected, we also found a significant gender effect of similarity—boys tended to cluster with boys and girls tended to cluster with girls.

Concerning the results of the personality effects we found that adolescents with higher levels of conscientiousness, openness, and emotional stability tended to select more friends (EgoX). Further, we did not find that adolescents with certain personality characteristics were selected more often as best friends than others (AltX). Finally, we found that adolescents tended to have dissimilar levels of agreeableness in their friendships (SimX).

Sexual behavior model

To answer our second research question on whether adolescents clustered together based on sexual behavior we ran a model with networks effects and covariate effects of gender and sexual behavior (see Table 4). The results showed that adolescents did not select more friends based on their sexual behavior (EgoX). However, adolescents with lower levels of sexual behavior were selected more often as friends (AltX), but did not cluster together based on similarity of sexual behavior (SimX).

To answer our third research question on whether the selection effects of sexual behavior and personality would interact, we included interactions between personality dimensions and similarity in sexual behavior (EgoX × SimX)—no significant interactions were found (ps > .05), indicating that the level of personality dimensions was not related to the selection of friends who were similar in sexual behavior.

Sexual intention model

To answer our second research question on whether adolescents clustered together based on sexual intention we ran a model with networks effects and covariate effects of gender and sexual intention (see Table 5). The results showed that adolescents with higher

levels of sexual intention selected fewer friends (EgoX), were less often selected as friends (AltX), and clustered together in friendship networks based on similar levels of sexual intention (SimX).

To answer our third research question on whether the selection effects of sexual intention and personality would interact we estimated interactions between personality dimensions and similarity in sexual intention (EgoX × SimX). We found a significant negative interaction effect of sexual intention and the personality dimension emotional stability (see Figure 2), such that adolescents with lower levels of emotional stability had friends with more similar levels of sexual intention (estimate = -0.36, *SE* = 0.15, right Fisher's p = .995, left Fisher's p = .006). We did not find interaction effects for the other personality dimensions and sexual intention (ps > .05).

To probe the negative interaction between EgoX emotional stability × SimX sexual intention, we constructed ego-alter selection tables for each category of sexual intention for the lowest and highest level of emotional stability (see Table 6). This was done with the following equation: *y*' = b1(emo_V - emo_av) + b2(vi - SI_av) + b3(vj - SI_av) + b4(1 - abs(vi-vj)/ran_v - sim_av) + b5((emo_V – emo_av) * (1 - abs(vi-vj)/ran_v - sim_av)) where b1 is the emotional stability EgoX estimate, b2 is the sexual intention EgoX estimate, b3 is the sexual intention AltX estimate, b4 is the sexual intention SimX estimate, and b5 is the interaction estimate of EgoX emotional stability × SimX sexual intention. Emo_V is the level of emotional stability (either *1* or *7* for this purpose), emo_av is the mean of emotional stability, vi is the sexual intention of the adolescent, vj is friends' sexual intention, SI_av is the mean of sexual intention, ran_v is the range of sexual intention minus *1*, and sim_av is the average similarity of sexual intention. This equation (see Ripley et al., 2012 for more details) produces two alter-ego selection tables (see Table 6)—one for low and one for high emotional stability of which the extreme values are plotted in Figure 2.

The negative interaction between EgoX emotional stability × SimX sexual intention indicates that adolescents with lower levels of emotional stability had friends with more similar levels of sexual intention. Figure 2 shows that although low emotionally stable adolescents generally tend to not select friends (negative values), when they do select friends they are more likely to select friends similar to them with respect to sexual intention. More specifically, among low emotionally stable adolescents, those with a low sexual intention level (grey bars) are more likely to select friends with a low level of sexual intention (=1). In contrast, those with a high sexual intention level (black bars) are more likely to select friends with a high sexual intention level (=5). Among high emotionally stable adolescents we see a different pattern. Adolescents with a low sexual intention level (grey bars) prefer friends who have a high sexual intention (=5), whereas those with a high sexual intention (black bars) prefer friends with a low level of sexual intention (=1).

Discussion

In the current study we aimed to examine personality, sexual intention and behavior, and their link to adolescent peer processes. Our hypotheses pertained to selection and socialization processes—who are selected as friends, and how does socialization affect sexual behavior? Our hypotheses were partly confirmed. We found that high conscientious, open, and emotionally stable adolescents selected more friends, and that those with higher sexual intention selected fewer friends. Also, those with higher levels of sexual intention and girls were selected less often as friends. Further, we found that adolescents clustered together in friendships based on similarity in gender, and sexual intention, but dissimilarity in agreeableness. We did not find any selection effects of sexual behavior. Finally, including an interaction between sexual intention and behavior and the personality dimensions, we found that adolescents with lower levels of emotional stability had friends with more similar levels of sexual intention.

We had expected that the developmental tendency to engage in more or less sexual behavior, that is associated with individuals' personality traits, would be further stimulated by socialization in friend-networks. However, given the low prevalence of sexual behavior and variance of this behavior we were unable to test the hypothesis on socialization of sexual behavior and intention.[3]

Personality effects

In the personality models, our results differed somewhat from a previous study by Selfhout and colleagues (2010). They found that those similar in openness, extraversion, and agreeableness tended to cluster together in friendship networks. In contrast to their findings on late adolescents and young adults we found that adolescents who are dissimilar in agreeableness tended to cluster together in friendship networks, we found no other similarity effects of personality. Further, whereas Selfhout and colleagues found that those high on extraversion selected more friends, we found that that those high on conscientiousness, openness, and emotional stability tended to select more friends. Finally, Selfhout and colleagues found that those high on agreeableness were selected more as friends. In contrast to their findings we found no alter effects of personality, meaning that personality characteristics did not determine whether adolescents were selected more as friends.

There are several possible explanations for these differences in personality effects. First, the different findings could be explained by differences in sample composition. The study by Selfhout and colleagues (2010) was done among just-acquainted first-year university students. In contrast, our study included adolescents of heterogeneous age groups and in longer-term friendships. In the Netherlands secondary schools form classes of individuals based on school year and educational track. Thus, adolescents will spend at least a whole school year and most of the day with the same classmates, often forming friendships that persist throughout the rest of their time in school. Our data collection was timed in the

Fall and Spring, when adolescents had spent a minimum of 2-3 months with their classmates and many would have already known each other from previous years or schools—thus there is considerable variability in the duration of friendships within the studied networks. This enabled them to form close bonds, that are perhaps less dependent on first impressions such as the ties that were investigated in the study by Selfhout and colleagues (2010).

Second, in our study adolescents will have had more time to express their personality in the classroom network. The positioning of adolescents with different personality characteristics may change over time and within one class (i.e., who is most popular? what characteristics are appreciated?). The continuation of friendships may therefore be dependent on different personality characteristics than the initiation of friendships. For future research it may be beneficial to focus on how the impact of personality differs in friendship with different characteristics: stage of formation and quality.

Finally, it is important to mention the need for replication of these findings. Although the above-mentioned differences in age and level of acquaintance between our study and the study by Selfhout and colleagues (2010) may explain the differences in findings, it would be important to replicate this research by investigating both younger and older adolescents. In this way, one could then investigate how differences in age and level of acquaintance can impact selection effects in friendship networks.

Sexual intention and behavior effects

The current study is the first to show how sexual intention and behavior develop in friendship networks, and how these interact with personality. From our previous study we already knew that higher levels of extraversion and lower levels of agreeableness were related to more sexual behavior, and more casual and risky sexual behavior (Baams et al., 2014). In the current study we also found that for the included sample, lower levels of agreeableness were related to higher levels of sexual intention, but the effects of extraversion

were more strongly present in relation to sexual behavior than in relation to sexual intention. This may be explained by the relatively sexually inexperienced sample in our study which caused some statistical issues with the socialization analyses. However, the relations with sexual intention moderately showed the expected linkage: higher levels of extraversion were related to higher sexual intention, whereas higher levels of agreeableness were related to lower levels of sexual intention.

Our study adds to previous findings by showing that sexual intention is related to peer processes—adolescents with higher levels of sexual intention are selected less often as friends and select fewer friends. Further, adolescents are found to cluster together based on similarity in sexual intention. We also found that adolescents with lower levels of emotional stability were more likely to have friends with similar levels of sexual intention. With the current analyses we were not able to examine whether this is an socialization or selection effect. However, it does indicate a role of personality. Low emotionally stable adolescents may be more likely to adopt their friends' attitudes toward sex, or feel more comfortable around friends with similar intentions. From previous (cross-sectional and longitudinal) research we know that mid adolescents with low levels of emotional stability develop at a slower rate sexually (Baams et al., 2014), engage in less promiscuous behaviors, and report lower levels of sexual satisfaction (Eysenck, 1976). It may be that those with low levels of emotional stability feel more uncomfortable with social behaviors—including sexual behavior (Eysenck, 1976) and therefore seek friends who have similar intentions to start engaging in these behaviors..

We did not find selection-effects for sexual behavior, indicating that sexual behavior and intention function differently in friendship networks. There are several explanations for this. First, it is possible that our relatively young sample (mean age is 13.85), is not as sexually developed such that friends or others do not affect the initiation of behaviors—

perhaps they are simply not "ready" to start engaging in sexual behavior. Second, the adolescents in the current sample often knew each other, or had at least met each other before entering the networks or before participating in our study. It could be the case that over time the attitudes and behaviors of others may weaken in influence. This could be because they are not as novel, but also because there are other more interesting or powerful "role-models" (Byrne, Clore, & Smeaton, 1986; Kenrick & Gutierres, 1980). These other "role-models" could be other adolescents, but also media sources (e.g., celebrities; L'Engle, Brown, & Kenneavy, 2006). Perhaps then, the peer group is not limited to the classroom setting, but instead has an extended presence in schools, communities, and through media.

One important contextual factor, that we did not examine in the current research, is whether having a romantic partner in the friendship network was linked to either the size of the network or to sexual intentions and behavior. For many adolescents, partners may fulfill some of the functions of friendships. In a serious relationship, adolescents may become closer to their partner and distance themselves from the friendship network (Laursen & Williams, 1997) and perhaps this change is even more apparent when their sexual intention and behavior increases. This suggestion is consistent with our finding that those with greater sexual intentions select fewer friends. Also, the friendship network may not be as interested in those who prefer to spend their time with their partner. For future research we would suggest expanding the network, and including questions about whether the romantic partner is part of the friendship network.

Gender and network effects

Considering that gender is an important indicator of friendship networks (e.g., Hussong, 2000; Poulin & Pedersen, 2007) and that several studies have previously found that similarity in gender is an important characteristic of friendships (e.g., Burk et al., 2007; Dijkstra et al., 2011; Kupersmidt, DeRosier, & Patterson, 1995; Selfhout et al., 2010; Steglich

et al., 2006), we examined these effects in the tested models. Confirming previous research we also found that boys tended to cluster with boys, and girls with girls (e.g., Dijkstra et al., 2011; Kupersmidt et al., 1995; Selfhout et al., 2010; Steglich et al., 2006). Further, we found that (in two out of three models) boys were selected more often than girls, thus seeming more popular. This finding is not readily explained, but similar to previous research (Pearson, Steglich, & Snijders, 2006).

Similar to previous research, we found that friendships were characterized by reciprocity and transitivity (Holland & Leinhardt, 1970; Van de Bunt, Van Duijn, & Snijders, 1999; Selfhout et al., 2010). Not only were friendships reciprocated (across time), they were also dynamic—characterized by processes such as forming triadic relationships (i.e., transitivity). Further, our negative density showed that as in most social network studies, networks tend to be non-random. As such, it describes the tendency of adolescents to selectively nominate friends (Snijders et al., 2010).

Taken together, these effects confirm that our analyses had sufficient power to find effects and that our null findings concerning sexual intention and behavior are not a function of an overall problem with the sample.

Limitations

The current study is the first large longitudinal study that uses a network-analytic approach to examine personality and development of sexual behavior and intention among adolescents, and their relation to adolescents' social peer context. Despite the additions of the current study to the fields of personality, peer socialization, and adolescent sexuality research, there are some limitations to note. The first limitations are methodological ones—our data did not meet the requirements to reliably run socialization models to assess socialization effects. This prevented us from investigating our last two research questions on socialization effects. Second, the network stability across waves was low for the majority of

networks possibly because so many students switched classes. For future research we would recommend monitoring expected class composition change (Veenstra et al., 2013). Some large-scale studies on peer processes have included an entire community to examine peer processes (e.g., Van Zalk, Van Zalk, Kerr, 2011), enabling researchers to examine effects of adolescents inside and outside of the school. This would enable adolescents to select friends who may be more important or influential in their lives, but not currently a student at their school. Third, although using a meta-analytic approach enabled us to model different estimates across the networks, using more homogeneous networks (e.g., similar in age) may enable researchers to directly replicate findings from one model to another, or recognize that inconsistent effects are not confounded by large between-network heterogeneity.

Fourth, the low levels of sexual behavior and intention may have affected our findings. Although previous studies with similar levels of skewness in the data and similar number of participants tested in the models were able to detect network effects (bullying behavior: Caravita, Sijtsema, Rambaran, & Gini, 2014; substance use: Mathys, Burk, & Cillessen, 2013; direct aggression: Rulison, Gest, & Loken, 2013), coupled with the fact that we used a meta-analytic approach to account for potential differences between networks, the effects we report here may have been suppressed due to heterogeneity in networks. Thus, having the same amount of networks that are more homogeneous may be more informative.

Fifth, our measures of sexual behavior and intention were one-item self-report instruments that may not fully capture the complexity of sexual development in adolescence. High quality survey instruments and qualitative methods such as interviews are necessary to better understand the complex mechanisms behind sexual development. Finally, the sample in the current study has a predominantly Dutch or Western ethnic background and heterosexual orientation (85.5%). Despite the size of our sample, ethnicity and sexual orientation are likely key factors in sexual development (Diamond, Savin-Williams, & Dubé,

1999; Zimmer-Gembeck & Helfand, 2008), and thus may play a role in selection and socialization effects of sexual behavior. Among more diverse groups we would be able to examine the effects of ethnicity and sexual orientation both in sexual development and peer processes.

Future research

Our limitations point toward several suggestions for future research. First, given the low levels of sexual experience in the current sample, it would be important to follow a group of adolescents over a longer time period in order to trace their sexual debut and development or alternatively, it may be important to follow adolescents who are more experienced sexually. Second, it would be important to replicate the current study—perhaps with more nuanced questions about sexual behavior and the context in which this occurs. We would then be able to examine the effects of sexual development on peer processes and the influence of peers on adolescents' sexual development in more detail. Third, it would also be important to incorporate other individual characteristics that would predict sexual development such as pubertal development and physical attractiveness.

Fourth, in the current study we found an interaction of emotional stability and sexual intention, perhaps in future research factors such as the mechanism by which these factors interact would expand on these findings. Fifth, in the current study we only had information on adolescents' best friends in their class, not the quality or importance of these specific friendships (Ojanen, Sijtsema, Hawley, & Little, 2010; Way & Greene, 2006). By adding in factors like these, or by increasing the size of the networks, we would be able to weigh the impact of different friends and their behavior on adolescents.

Conclusions

With the current study we showed that adolescents cluster together in friendships based on similarity in personality and sexual intention. Further, those adolescents who are

more emotionally unstable were more likely to have friends with similar levels of sexual intention. Our findings confirm the commonly found links between personality dimensions and sexual behavior and intention in that those high on extraversion and low on conscientiousness engaged in more sexual behavior and had lower levels of sexual intention. We were able to extend these findings by showing the relation to peer processes. This study is one of the first to illustrate that even among the sexually inexperienced, adolescents are beginning to form friendships based on their sexual intention.

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Footnotes

[1] When running the influence models we came across large estimates and standard errors, preventing the model to converge or resulting in uninterpretable estimates and standard errors. This occurred in a logistic regression model (sex vs. no sex, kissed vs not kissed) but also with the three category sexual behavior measure (kissing and sex). Considering our already limited sample of networks for the selection models we decided to not test the influence-models, and to limit the analyses to the selection models, including sexual intention and sexual behavior as varying covariates.

[2] In RSiena, several networks can be combined to inspect the overall effects. There are three methods for doing so: 1) combining the different networks into one large network, 2) combining the different networks into a multi-group project, and 3) using a meta-analytic approach. Using a meta-analytic approach offers several advantages. Option 1 and 2 assume that the parameters of the actor-based models for the included networks are the same (Ripley et al., 2013). The meta-analytic approach can be used without assuming that the parameters are the same but still using the same model specification. Although option 1 and 2 may have higher power, option 3 is safer in that it does not require the parameters to be the same (Ripley et al., 2013). Given the expected differences between networks in age and sexual behavior and intention we preferred the meta-analytic approach (option 3).

[3] From the low baseline levels of sexual behavior and intention in the current sample, and the limited amount of development over time, one can infer that peer socialization does not play a role in the sexual domain, at least in the specific age range covered in our study. It is important, however, to consider this a preliminary answer—the limited variance and low base rates did not allow us to explicitly test any socialization effects.

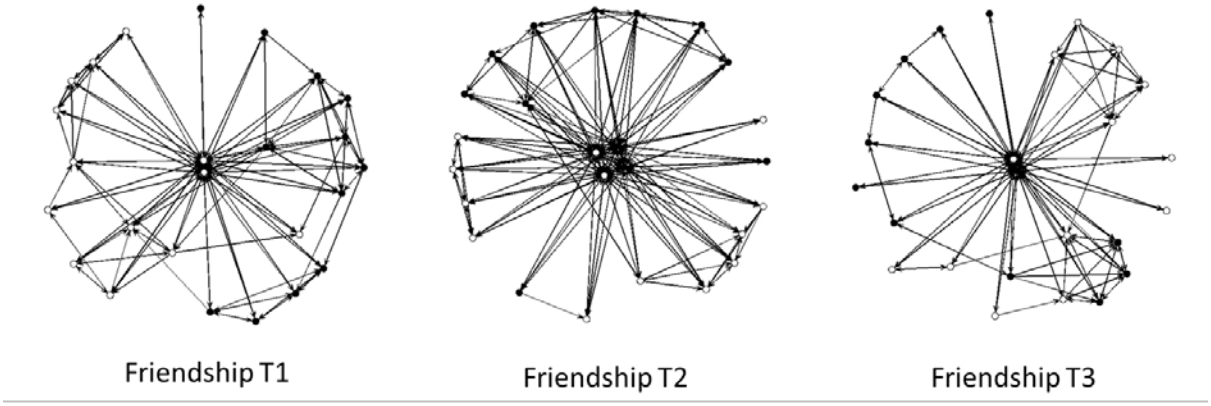

Figure 1. Three observations of one friendship network over time. White circles represent male students, black circles represent female students. Reciprocated friendships are represented by a double-headed arrow, otherwise an arrow indicates the direction of nomination. This network is a class in the 8th grade (year 2 in the Dutch secondary school system).

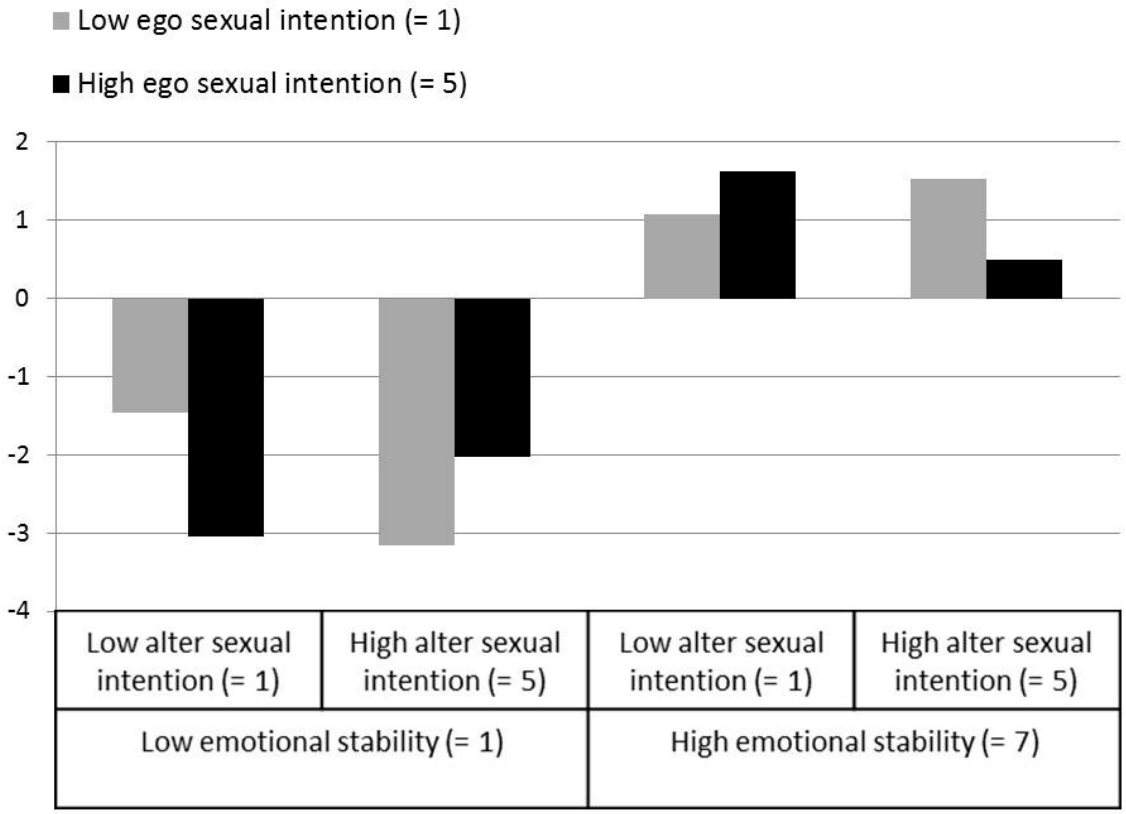

Figure 2. The contribution of emotional stability (EgoX, low and high) and sexual intention levels (low and high; EgoX and AltX) to the log odds that friendship ties will change (see Ripley et al., 2012 for further details on how to obtain these values). Positive values indicate an increase in log odds of a friendship tie, and negative values indicate a decrease in the log odds of a friendship tie.

Table 1

Demographics and Key Variables for Included Networks

	M (*SD*) / %
Age	13.85 (1.09)
Gender (boys)	44.8
Ethnic background (Western or Dutch)	85.5
Sexual behavior T1	
% kissed	23.4
% had sex	8.6
Sexual behavior T2	
% kissed	26.2
% had sex	11.4
Sexual behavior T3	
% kissed	25.6
% had sex	15.5
Sexual intention (range 1-5)	
Sexual intention T1 (*M, SD*)	1.66 (0.89)
Sexual intention T2 (*M, SD*)	1.74 (0.96)
Sexual intention T3 (*M, SD*)	1.93 (1.05)
Personality dimensions (range 1-7)	
Extraversion	4.47 (1.17)
Agreeableness	5.74 (0.60)
Conscientiousness	4.44 (1.12)
Emotional stability	4.49 (1.05)
Openness	4.86 (0.90)

Note. For the kissing and sexual experience items, adolescents could indicate whether they had experience with the behavior. We combined these two items resulting in three categories (0 = no experience, 1 = kissed, 2 = had sex). Here, percentages for category 1 and 2 are presented. For sexual intention higher scores indicate more intention to have sex in the next school year. For sexual intention, 17 networks were included, for sexual behavior, 16 networks were included.

Table 2

Pearson Correlations Between Personality Dimensions and Sexual Intention and Behavior for the Overall Sample and the Included Sample

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
					Overall sample						
1. Extraversion	--										
2. Agreeableness	.09**	--									
3. Conscientiousness	-.12**	.33**	--								
4. Emotional stability	.45***	-.06*	-.08**	--							
5. Openness	.03	.50***	.23***	-.23***	--						
6. Sexual intention T1	.13***	-.12***	-.19***	.06	-.08**	--					
7. Sexual intention T2	.12**	-.15***	-.19***	.10**	-.09**	.64***	--				
8. Sexual intention T3	.15***	-.16***	-.18***	.11**	-.06	.58***	.70***	--			
9. Sexual behavior T1	.23***	-.07*	-.10***	.10**	-.01	.42***	.42***	.40***	--		
10. Sexual behavior T2	.24***	-.05	-.09**	.07*	-.02	.40***	.40***	.37***	.77***	--	
11. Sexual behavior T3	.26***	-.06	-.07*	.11***	-.01	.41***	.44***	.39***	.71***	.80***	--
					Included sample						
1. Extraversion	--										
2. Agreeableness	.15**	--									
3. Conscientiousness	-.03	.29***	--								
4. Emotional stability	.32***	.05	.03	--							
5. Openness	.14**	.39***	.19***	-.15**	--						
6. Sexual intention T1	.10*	-.02	-.12*	.00	-.01	--					
7. Sexual intention T2	.06	-.09	-.19***	.06	-.02	.63***	--				
8. Sexual intention T3	.15**	-.10	-.17**	.11	-.00	.54***	.74***	--			
9. Sexual behavior T1	.26***	.09	.05	.06	.06	.37***	.29***	.32***	--		
10. Sexual behavior T2	.24***	.06	-.01	.05	.02	.41***	.32***	.37***	.84**	--	
11. Sexual behavior T3	.28***	.05	-.02	.10	.01	.37***	.38***	.35***	.74***	.79***	--

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3

Meta Analysis of Effects of Personality Dimensions on Friendship Selection (17 Networks)

			Fisher's combination test *p*-value	
Parameters	*b*	*SE*	Left one-sided	Right one-sided
Network effects				
Density	**-2.55**	1.14	< .001	1
Reciprocity	**1.33**	0.11	1	< .001
Transitivity	**0.34**	0.03	1	< .001
Ego effects				
Gender (1 = female)	-0.06	0.13	.070	.306
Extraversion	-0.06	0.03	.085	.924
Agreeableness	-0.04	0.08	.161	.635
Conscientiousness	**0.10**	0.06	.783	.002
Openness	**0.06**	0.10	.280	.006
Emotional stability	**0.07**	0.05	.922	.020
Alter effects				
Gender (1 = female)	-0.03	0.13	.070	.306
Extraversion	0.00	0.03	.371	.561
Agreeableness	-0.02	0.06	.367	.729
Conscientiousness	-0.04	0.03	.108	.850
Openness	0.02	0.04	.730	.388
Emotional stability	0.03	0.04	.881	.111
Similarity effects				
Gender (1 = female)	**0.90**	.11	1	< .001
Extraversion	0.28	0.15	.896	.056
Agreeableness	**-0.30**	0.19	.036	.818
Conscientiousness	0.07	0.21	.521	.114
Openness	0.05	0.14	.596	.477
Emotional stability	-0.04	0.14	.606	.491

Note. Bold estimates are significant (right- or left-one sided *p*-value < .05). *b* = unstandardized coefficients according to the Snijders–Baerveldt method (2003); *SE* = standard error.

Table 4

Meta Analysis of Ego, Alter, and Similarity Effects of Sexual Behavior on Friendship Selection (16 Networks)

			Fisher's combination test *p*-value	
Parameters	*b*	*SE*	Left one-sided	Right one-sided
Network effects				
Density	**-2.31**	0.11	< .001	1
Reciprocity	**1.16**	0.09	1	< .001
Transitivity	**0.33**	0.03	1	< .001
Ego effects				
Gender (1 = female)	0.01	0.12	.319	.070
Sexual behavior	-0.07	0.10	.064	.580
Alter effects				
Gender (1 = female)	**-0.11**	0.11	.008	.683
Sexual behavior	0.00	0.07	.417	.636
Similarity effects				
Gender (1 = female)	**0.83**	0.94	1	< .001
Sexual behavior	0.10	0.08	.899	.383

Note. Bold estimates are significant (right- or left-one sided *p*-value < .05). We also ran this model excluding the older adolescents resulting in three classes of 6th graders, this did not alter the results. *b* = unstandardized coefficients according to the Snijders–Baerveldt method (2003). *SE* = standard error.

Table 5

Meta Analysis of Ego, Alter, and Similarity Effects of Sexual Intention on Friendship Selection (17 Networks)

			Fisher's combination test *p*-value	
Parameters	*b*	*SE*	Left one-sided	Right one-sided
Network effects				
Density	**2.41**	0.12	< .001	1
Reciprocity	**1.21**	0.10	1	< .001
Transitivity	**0.34**	0.03	1	< .001
Ego effects				
Gender (1 = female)	-0.02	0.12	.321	.152
Sexual intention	**-0.08**	0.07	.002	.291
Alter effects				
Gender (1 = female)	**-0.16**	0.10	.005	.911
Sexual intention	**-0.03**	0.06	.011	.344
Similarity effects				
Gender (1 = female)	**0.87**	0.10	1	< .001
Sexual intention	**0.10**	.19	.310	.012

Note. Bold estimates are significant (right- or left-one sided *p*-value < .05). We also ran this model excluding the older adolescents (3 classes of 6th graders), this did not alter the results. *b* = unstandardized coefficients according to the Snijders–Baerveldt method (2003). *SE* = standard error.

Table 6

Alter-Ego Selection Tables of Sexual Intention for Low and High Emotionally Stable Adolescents

Low emotional stability (=1)					
	Sexual intention of friend				
	1	2	3	4	5
Sexual intention of adolescent					
1	**-1.46**	-1.88	-2.30	-2.73	**-3.15**
2	-1.85	-1.60	-2.02	-2.44	-2.87
3	-2.25	-2.00	-1.74	-2.16	-2.59
4	-2.65	-2.40	-2.14	-1.88	-2.30
5	**-3.05**	-2.79	-2.54	-2.28	**-2.02**
High emotional stability (=7)					
	1	2	3	4	5
1	**1.07**	1.18	1.30	1.42	**1.53**
2	1.21	0.93	1.04	1.16	1.27
3	1.35	1.07	0.79	0.90	1.02
4	1.49	1.21	0.93	0.64	0.76
5	**1.63**	1.35	1.07	0.78	**0.50**

Note. Values in bold are presented in Figure 2. Positive values indicate an increase in log odds of a friendship tie, and negative values indicate a decrease in the log odds of a friendship tie.