Gender, self-disclosure and emotional closeness in friendships: an egocentric social network
study

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Abstract

Self-disclosure plays an important role in promoting emotional closeness in friendships. Some literature points to gender differences in emotional closeness and self-disclosure but findings are mixed particularly when comparing same-gender to cross-gender friendships. Our study aims to clarify previous findings by measuring broader friendship networks and taking into account each listed friend's gender. Our sample of 215 participants (egos) listed on average 8 friends (alters) in their networks (in total 1774 friends listed). For each friend, participants indicated the alter's gender, the amount of self-disclosure they made to the alter, as measured with the McGill friendship function intimacy questionnaire, and the emotional closeness they felt with the alter. We found no gender differences in network size or gender homophily, although men and women did have gender homophilous networks (men had a larger percentage of male friends and women had a larger percentage of female friends). Multilevel mediation models demonstrated that female alters elicited greater self-disclosure with both male and female egos. Self-disclosure mediated the relationship between the gender of the alter and emotional closeness for both male and female egos such that higher self-disclosure was associated with higher emotional closeness. We discuss our findings with reference to gendered communication norms and argue for the value of considering the gender of both alters and egos in friendships.

Keywords: Egocentric network analysis; Gender; Multilevel models; Friendships; self-disclosure

Word count: 7,808

Gender, self-disclosure and emotional closeness in friendships: an egocentric social network study

Social relationships are a basic human need (e.g., Baumeister & Leary, 1995; Deci & Ryan, 2014; Sutcliffe, Dunbar, Binder, & Arrow, 2012). One important type of social relationships is friendships (Dunbar, 2018). Friendships, especially high quality friendships, have been shown to increase happiness (e.g., Demir & Davidson, 2013), physical and psychological well-being (Fehr & Harasymchuk, 2018) and decrease loneliness (e.g., R. A. Bell, 1991; DiTommaso & Spinner, 1997). The decreased loneliness that results from good friendships has been shown to have important health benefits such as reducing cognitive decline and even predicts decreased mortality (reviews in Dunbar, 2018; Holt-Lunstad, 2017, 2018; Holt-Lunstad & Smith, 2016; Holt-Lunstad, Smith, & Layton, 2010). While these benefits seem to apply across genders, much has been made in the literature about how women's and men's friendships and friendship networks may differ (e.g., Machin & Dunbar, 2013; Roberts, Wilson, Fedurek, & Dunbar, 2008). Some research suggests that women engage in more self-disclosure than men when in same-gender dyads (e.g. Papini, Farmer, Clark, Micka, & Barnett, 1990; Rubin & Shenker, 1978), but whether this is due to women's own tendency to self-disclose or their female friends' tendency to elicit disclosures has yet to be studied. Distinguishing between an individual's own disclosure and what their friend may elicit requires using a network approach, where the ego, discloser, is distinguished from the alter, person to whom the disclosure is made.

A second question that lacks examination in the existing literature is how self-disclosure may occur and serve to build closeness in cross-gender friendships. This question is becoming increasingly important as gender norms in society become more tolerant, the prevalence of cross-gender friendships may increase (Charlesworth & Banaji, 2021; Pessin, 2018; Seguin, 2007). While some research has studied cross-gender friendships, they often do not distinguish between whether the woman or the man is the ego or the alter,

and thus cannot speak to whether men or women elicit more self-disclosure or closeness. In addition, previous research has tended to focus on close or best friendships, which may not be representative of friendships in general (e.g., Bank & Hansford, 2000; Elkins & Peterson, 1993; Fuhrman, Flannagan, & Matamoros, 2009; Machin & Dunbar, 2013). Thus, the current study will add to the literature by examining the influence of the gender of the ego and the gender of the alter separately in a large sample of friendships. Specifically, we will test for differences in size and homophily of friendship networks between men and women. This is followed by an examination of gender differences in intimate self-disclosure and emotional closeness in friendships with men and women alters.

Gender differences in friendship networks

In social network analysis, egocentric friendship networks can be defined as the nominated friends (alter) that an individual (ego) lists (Wasserman & Faust, 1994). Considering the friends that a person has as a network, allows us to consider several questions. First, do women and men report the same number of friends? Second, we can examine the gender homophily of their networks. Homophily refers to similarity between individuals within a network and has long been recognised as an important organising principle of social networks (e.g., McPherson, Smith-Lovin, & Cook, 2001; Mehta & Wilson, 2020). We will consider gender homophily, in other words, do women or men have a larger percentage of same-gender friends?

Some research on friendships has already shed light on this question. In a study by Moore (1990), participants were asked to list all the people with whom they had discussed personal topics in the past six months. The researcher found that men and women did not differ in the number of ties listed. This study however, limited the definition to only very close ties and could have included people who were not considered friends. For example, it would be common for people to discuss intimate topics with their romantic partner or family.

84 Additionally, this study does not examine the gender of these close ties. Other studies which
85 have looked at the gender of friendship alters, tends to show that people nominate
86 same-gender friends as their closest relationships. For example, Camarena and colleagues
87 (1990) asked young adolescents to report the gender of their best friend, and 97% of boys
88 and 98% of girls reported their best friend being the same gender as themselves. In a study
89 with adults, Demir and Ozdemir (2010) found that when participants were asked to list only
90 their three closest friends over 80% said that these three friends were the same-gender as
91 themselves. Finally, in a large scale online survey study, Gillespie and colleagues (2015)
92 found that both men and women reported more same-gender friendships than cross-gender
93 friendships. However, these researchers asked participants to give the number of men and
94 women friends they had as a free recall task, rather than eliciting specific friends. Our study
95 aims to improve upon this method by asking participants to give the initials of each friend
96 and then give the gender of each friend. We hope that this structured recall task will aid
97 participants in recalling all of their friends of both genders. We also aim to improve on the
98 previous studies that limit friendships to only the very closest ties (people with whom you
99 have discussed personal topics or best friends, for example) by giving only the prompt to list
100 friends and allowing participants to list up to twenty friends. Thus, we will have a more
101 complete picture of their friendship networks rather than one confined to only very close
102 relationships.

103 **Gender differences in intimate self-disclosure and emotional closeness**

104 An important element of friendship development and maintenance is intimate
105 self-disclosures (Hays, 1984). Sharing personal information with a friend can allow for the
106 friend to provide emotional support and advice, however the importance placed on
107 self-disclosure may differ between men and women. In a recent study by Pearce and
108 colleagues (Pearce, Machin, & Dunbar, 2020), the researchers found that women place

greater importance on self-disclosure in their definition of friendship than men. This difference can also be seen in the types of maintenance strategies used by men and women in their friendships. Rubin and Shenker (1978) observed that pairs of female roommates and hallmates engaged in more self-disclosure than male roommates and hallmates. Reis and colleagues (1985) extended these findings by arguing that this was due to preferences by men and women, rather than differences in capability. In a study on adolescents, girls engaged in more self-disclosure to peers than boys did (Papini, Farmer, Clark, Micka, & Barnett, 1990). In a meta-analysis covering both friends and spouses, Dindia and Allen (1992) found that women disclosed more than men, but their analyses did not distinguish between disclosures made to men or women alters.

Self-disclosures build emotional closeness in relationships (Altman & Taylor, 1973), thus differences in the amounts of self-disclosure engaged in by men and women might also lead to differences in emotional closeness. Some support for this idea has been found when examining same-gender friendship dyads. Women's friendship dyads report higher intimacy in their friendships than men's friendship dyads (e.g., Aukett, Ritchie, & Mill, 1988; Bank & Hansford, 2000). In another study where the gender of the friendship alter was taken into account, researchers found that adolescent girls reported higher emotional closeness to friends regardless of the gender of the friend (Johnson, 2004). However, at least one study has found no differences in emotional closeness in same-gender and cross-gender relationships (Johnson, Brady, McNair, & Congdon, 2007). This study, however, forced participants to think of one same-gender and one cross-gender close tie and did not distinguish between friendships or romantic relationships, thus the closeness reported in cross-gender relationships might be due to participants considering their romantic partner rather than a cross-gender friend. Our study will improve on these designs by asking participants to only consider friends, while taking into account the gender of the alter, and will examine differences across a broader friendship network rather than limiting our examination to a few close friends or a single best friend.

Alter gender differences in self-disclosure and emotional closeness

While it is important to examine gender differences in self-disclosure and emotional closeness experienced by one partner in the friendship, it is also important to examine the effects of the gender of the person who is the target of those disclosures and the emotional closeness. This is because women and men may elicit different types of behavior in a friendship. For example, Jones (1991) found that women friendship partners (alters) were more trusted than men friendship alters. Differing levels of trust, may elicit different amounts of disclosure. For example, female egos tend to focus on more emotional sharing with female alters compared to male alters (Aukett, Ritchie, & Mill, 1988). Furthermore, in the same study, male egos reported more emotional support from female alters. Thus, it seems that female alters elicit more self-disclosure and possibly more emotional closeness than male alters, but there is limited evidence for this as most studies compare either same-gender friendship dyads or cross-gender friendship dyads where the gender of the alter is not necessarily considered. Thus, in the current study, we will distinguish between whether self-disclosures are made to a female or male alter and whether there are differences in the emotional closeness felt with a female or male alter.

Do self-disclosures promote different levels of emotional closeness in men's and women's friendships?

From studies on self-disclosure (Collins & Miller, 1994) and on social penetration theory (Altman & Taylor, 1973), we know that self-disclosure promotes liking another person and emotional closeness in that relationship. In studies on same-gender dyads of friends, researchers have observed no differences in how global levels of intimacy and self-disclosure predicts friendship quality (Bank & Hansford, 2000; Hays, 1984; Jones, 1991). In one study, where researchers looked at the topics of self-disclosure on a more granular level, they found that in female friendship dyads only discussing the most intimate topics increased emotional

161 closeness, while in male friendship dyads, self-disclosure on any topic would increase
162 emotional closeness (Rubin & Shenker, 1978). Based on the differences in levels of
163 self-disclosure in female friendship dyads, these findings may be due to the fact that women
164 often disclose information about themselves, while men do so less often. Thus, any sharing in
165 a male friendship dyad would be considered important, while the relative frequency with
166 which women share personal information means that only the most personal disclosures will
167 have an impact on disclosure. However, these studies are limited in that they only examine
168 the relationship between self-disclosure and emotional closeness in same-gender dyads. Our
169 study will examine this relationship while taking into account the gender of both the ego and
170 the alter in the friendship.

171 **Current study**

172 In the current study we asked participants to list up to 20 friends by entering their
173 initials into text boxes. Then for each friend, we asked about their gender, intimate
174 self-disclosures that the ego made to that alter, and the emotional closeness that the ego felt
175 towards that alter. In each question the initials of the alter were entered to aid participants'
176 recall. This design helps to improve upon previous studies by measuring a larger number of
177 friends, asking specifically about gender, self-disclosure, and emotional closeness in each
178 relationship separately, and limiting our definition of close ties specifically to friends rather
179 than confounding them with kin or romantic ties. We analyse the data using multilevel
180 modelling whereby alters are nested within egos. We make no specific predictions about
181 differences in the size of friendship networks. While we expect homophily based on gender,
182 we do not expect differences in gender homophily between men's and women's networks
183 because there is not enough support in the literature to justify a prediction. We do expect
184 that female egos will engage in more self-disclosure and feel more emotional closeness in
185 friendships based on previous literature. We also predict that female alters will be associated

with more self-disclosure and emotional closeness from egos of both genders. Finally, we will conduct a mediation analysis to test whether differences in emotional closeness between genders are mediated by self-disclosure. We pre-registered the prediction that women would be more intimate with same-gender friends than men would be, and that this would account for potentially observed emotional closeness differences between men and women.

Methods

Participants

The participants were recruited via posts on social media (Facebook, Reddit and Twitter) by the second author (between 02/02/2020 and 18/02/2020). A total of 372 individuals started a survey on [Qualtrics](#) and 236 participants completed it. The sample size target was determined by the research time allocated to the second author for the project. Our minimum target, preregistered sample size was 100 based on similar social network designs (e.g., Pollet, Roberts, & Dunbar, 2011). There were 59 men and 161 women, and 16 who identified as neither male nor female. ($M = 26.64$ years, $SD = 9.67$ years, range: 18 to 66 years). For the analysis, we restricted the sample to respondents who identified as either male or female and listing at least 1 alter ($N = 216$, 58 men, 158 women, $M = 26.87$ years, $SD = 9.98$ years). The majority of participants reported being in a romantic relationship at the time of the study ($N = 116$; $N_{\text{Single}} = 88$, $N_{\text{other/prefer\_not\_to\_say}} = 12$) and self-identified as heterosexual ($N = 140$, $N_{\sim\text{Lesbian, Gay, Bisexual}\sim} = 60$, $N_{\text{other/prefer\_not\_to\_say}} = 12$).

Procedure

After providing informed consent, participants completed an online survey. Participants first provided some basic sociodemographic data, including age and gender. They then completed a network generator where they could list up to 20 friends (alters).

Next, they indicated who in this network was male and who was female, and who they identified as neither male nor female ('other,' with the option to list a gender identity). Following these attributions of gender, the participants indicated how they met, a rating on emotional closeness (0-10), the McGill Friendship Functions Intimacy questionnaire for this alter. After completion they were thanked and debriefed. The procedure was approved by the local ethics committee where the survey was carried out.

Materials

Friendship network generator. For the purpose of this research, we are particularly interested in friendships. We therefore used a role-relation name generator (Marin & Hampton, 2007; Van der Poel, 1993). Participants were instructed to list up to 20 people who they consider friends (*Please list in the boxes below the initials of the people in your life you consider to be your friends (one friend per box). Click the arrow at the bottom of the page when you have completed your list*). Our strategy was to allow participants to define friends, rather than providing an explicit definition. The reason for this choice is that friends can be 'multiplex ties' (Verbrugge, 1979), they can, for example, be kin or colleagues. Providing an explicit definition, or for example making it clear that participants could count kin, might influence how men versus women list friends. In total 1,792 friends were listed, 16 individuals listed 20 people in their friendship network (7.4%), suggesting that the upper bound of 20 did not impact the generation of friends for the vast majority of our respondents. On average participants listed eight alters.

Alter attributes. Participants indicated who in their network was a man, woman, or other, with the option to include a description. Given that our focus is on men and women, we excluded alters who were not identified as either men or women (18 alters (1%), excluded for alter level analyses). This led to a working sample of 215 participants with 1774 alters ($N_{\text{men}} = 709$, $N_{\text{women}} = 1,065$). Respondents also indicated how they met this friend

and how long they have been friends for (1: Less than 1 year, 2: 1-2 years, 3: 3-5 years, 4 :
More than 5 years (modal category)). These variables are not discussed here. The purpose of
these questions was to reinforce the notion that participants should consider friends. Due to
time constraints we did not ask participants to list other attributes of alters, such as whether
they were kin or not (e.g., Roberts, Dunbar, Pollet, & Kuppens, 2009), or to indicate
alter-alter ties, i.e. does this alter know this other alter.

Emotional closeness rating. We opted for a single item measure of emotional
closeness (*On a scale of 0-10, how close would you say you and ‘INITIALS of FRIEND’*
are?), a widely used approach (e.g., Hill & Dunbar, 2003; Korchmaros & Kenny, 2001, 2006).
Moreover, such a measure of emotional closeness has been argued to be the most reliable
indicator of tie strength, in comparison to other indicators such as the duration of the
relationship, or contact frequency (e.g., Marsden & Campbell, 1984).

Self-disclosure. We used the Intimacy subscale from The McGill Friendship
Functions questionnaire (Mendelson & Aboud, 1999) to assess self-disclosure. The McGill
Friendship Functions questionnaire consists of 30 items, assessing 6 functions (Stimulating
companionship, Help, Intimacy, Reliable Alliance, Self-Validation and Emotional Security)
with 5 items each. It is a widely used scale to assess the multidimensional function of these
friendships (e.g., Buote et al., 2007; Demir & Özdemir, 2010) it has demonstrated very good
reliabilities (all α 's $> .83$, Mendelson & Aboud, 1999). For our purpose, and in part due to
time constraints, we only used the intimacy scale which measures levels of self-disclosure in a
friendship (original $\alpha = .9$, Mendelson & Aboud, 1999). Sample items include: “*‘INITIALS*
OF FRIEND’ is someone I can tell private things to”, and “*‘INITIALS OF FRIEND’ is*
someone I can tell secrets to”. All items were answered on a 9-point Likert scale (0 = Never
to 8 = Always). Given the multilevel structure, we calculated the reliability via multilevel
confirmatory factor analysis (Geldhof, Preacher, & Zyphur, 2014). The measure
demonstrated excellent reliability both between- and within-participants ($\omega_{between} = .96$;

$\omega_{within} = .93$).

Data analysis

All the analyses were conducted in R 4.1.1 (R Development Core Team, 2008). The data, code, and analysis document are available from the [Open Science Framework](#). The project and all analyses, including additional checks and analyses, are fully reported on the [OSF](#). We divided our results section into exploratory and confirmatory analyses. We used ‘*egor*’ (Krenz, 2020) to calculate the E-I indices for gender to capture preference for the same gender in the friendship network (Krackhardt & Stern, 1988). These indices range from -1 to 1, whereby 1 indicates ‘perfect’ heterophily and -1 ‘perfect’ homophily. We examine the effect of ego’s and alter gender on self-disclosure via multilevel regression models. These models had a random slope for the gender of the alter nested in Ego’s ID variable and a random intercept. The p values were generated via the Satterthwaite approximation (*lmerTest*, Kuznetsova & Brockhoff, 2012; Kuznetsova, Brockhoff, & Christensen, 2017). We used Bayesian multilevel regression models to generate the estimates used in the plots (Buerkner, 2015). These were based on four chains, with 4,000 iterations each (for more details see [OSF page](#)). The multilevel mediation models were tested via the ‘*bmlm*’ package using again 4 chains with 4,000 iterations each (Vuorre, 2017, see [OSF](#)).

Results

Descriptive statistics, correlations, and t -tests

Tables 1 and 2 contain the descriptive statistics and correlations. Respondents listed on average eight friends, of which approximately three were male and five were female. At participant level, self-disclosure scores were strongly and positively associated with emotional closeness ratings.

Table 1

Descriptive statistics (N=215)

Variable	Mean	SD
Age	26.902	9.985
Emotional Closeness	6.953	1.373
Self-disclosure	6.398	1.291
Friends N	8.326	4.960
Male Friends N	3.298	2.998
Female Friends N	4.953	3.786
E-I index	-0.357	0.491

Men and women did not differ in the reported number of friends ($t(91.63) = 0.22$, $p = .825$). Participants listed significantly more female than male friends overall ($t(214) = 5.155$, $p < .0001$, Cohen's $d = 0.352$) but note that there was roughly a 3:1 ratio of women to men.

Exploratory analyses of gender homophily (E-I index).

Male egos listed 313 male alters and 163 female alters. Female egos listed 396 male alters and 902 female alters. We examined Ego's gender homophily via the E-I index (Krackhardt & Stern, 1988), whereby a negative value indicates homophily and a positive value indicates heterophily (Table 1).

The overall friendship network demonstrated moderate homophily ($M = -.357$, $SD = .491$, 95 %CI: -0.423 to -0.291), i.e. participants were more likely to nominate their own gender than the opposite gender as friends. Women ($M = -.386$) were not significantly more homophilous than men in their friendships ($M = -.276$, $t(86.32) = 1.34$, $p = .184$, Cohen's $d = .225$).

Table 2

Correlation matrix between Egocentric variables (N= 215), corrected for multiple testing using Holm's (1979) procedure

Variable	Emotion	Self-disclosure	Friends	Female Friends	Male Friends	E-I
Emotional Closeness	1.00					
Self-disclosure	0.72***	1.00				
Friends N	-0.03	-0.06	1.00			
Female Friends N	-0.12	-0.13	0.64***	1.00		
Male Friends N	0.05	0.02	0.79***	0.05	1.00	
E-I index	-0.10	-0.04	-0.03	0.17	-0.19	1.00

Note: *** $p < .001$; ** $p < .01$; * $p < .05$.

Exploratory multilevel regressions

Self-disclosure. Multilevel regression models for self-disclosure suggested that female friends elicited greater self-disclosure ratings than male friends did (Table 3: Model 1; Figure 1). A simulation approach with 10,000 simulations, following Gelman and Hill (2006), suggested that this effect was robust. There was also a tendency for female participants to report greater self-disclosure than male participants (Table 3: Model 1; Figure 2) but this effect was not robust after running 10,000 simulations (Median effect: 0.369, 95% CI -0.0004 to 0.732). There was no support for an interaction effect between gender of ego and gender of alter on self-disclosure (Table 3: Model 3). The interaction was also not supported after running 10,000 simulations. (Median effect: -0.114, 95% CI:-0.524 to 0.296).

Emotional closeness. Multilevel regression models for emotional closeness did not show support for main effects of gender of the alter or an interaction effect for gender of alter and gender of ego (Table 4: Model 1, Model 3). There was some suggestion for a main effect

Table 3

Hierarchical multilevel regression models (fixed effects) for Self-disclosure

	Self-disclosure		
	Model 1	Model 2	Model 3
Gender Alter	0.384****	0.354***	0.434*
Gender Ego		0.367 [†]	0.518
Gender Alter * Gender Ego			−0.111
Constant	5.763****	5.543****	5.441****
<i>N</i>	1,774	1,774	1,774
Log Likelihood	−3,581.142	−3,580.024	−3,580.530
AIC	7,174.283	7,174.047	7,177.060
BIC	7,207.169	7,212.414	7,220.908

[†]p < .1; *p < .05; **p < .01; ***p < .001; ****p < .0001

Figure 1. Alter effect from Table 3; Model 1. 95% confidence intervals based on estimates from Bayesian multilevel regression model.

309 of the gender of ego: women tended to report higher emotional closeness to alters than men
310 did (Table 4: model 2). Running 10,000 simulations, there was no strong support for such an
311 effect (Median effect: 0.340, 95% CI: -.031 to .711) . The interaction was also not supported
312 after running 10,000 simulations. (Median effect: 0.165, 95% CI:-0.280 to 0.609).

Table 4

Hierarchical multilevel regression models (fixed effects) for emotional closeness

	Emotional closeness		
	Model 1	Model 2	Model 3
Gender Alter	0.121	0.088	−0.035
Gender Ego		0.341 [†]	0.111
Gender Alter * Gender Ego			0.168
Constant	6.750****	6.553****	6.710****
<i>N</i>	1,774	1,774	1,774
Log Likelihood	−3,734.429	−3,733.596	−3,733.884
AIC	7,480.857	7,481.191	7,483.767
BIC	7,513.743	7,519.558	7,527.615

[†]p < .1; *p < .05; **p < .01; ***p < .001; ****p < .0001

Figure 2. Ego effect from Table 3: Model 2. 95% confidence intervals based on estimates from Bayesian multilevel regression model.

313 Multilevel mediation: Is the effect of the gender of the alter on emotional 314 closeness mediated via self-disclosure?

315 We separated these analyses by gender of the respondent. Note that the multilevel
316 models already suggested no support for our prediction, men did not report greater
317 self-disclosure with male friends, but rather with female friends. That being said, it is
318 possible that the mediation effect of gender on emotional closeness, via self-disclosure, is
319 greater for women than it is for men.

Men. The mediation model for men is summarised in Figure 3. The model showed support for the a, b, and mediation ('me') paths. Self-disclosure was more likely to occur with female friends than male friends, this increased self-disclosure in turn accounted for greater emotional closeness. The standard deviations on all paths suggest that substantial heterogeneity between male respondents exists in the estimates of these effects, i.e. there is substantial between-participant variation in the size of these effects.

Women. The mediation model for women is summarised in Figure 4. The model showed support for the a, b, and mediation ('me') paths. Again, self-disclosure was more likely to occur with female friends than male friends. This increased self-disclosure in turn is positively associated with greater emotional closeness. As with the male model, there is substantial between-participant variation in the size of these effects.

Synthesis. If anything the mediation effect is estimated to be somewhat stronger in men than in women, which runs counter our initial prediction. Yet, the mediated effect estimates and confidence intervals strongly overlap (Men: 0.4, 95% CI [0.078, 0.71]; Women: 0.28, 95% CI [0.067, 0.49]). We therefore conclude that these patterns do not meaningfully differ between male and female egos.

Male Ego

Figure 3. Mediation model for men, me = average mediated effect, c = total effect, $cov(a, b)$ = covariance of the varying a and b parameters, SD = standard deviations of the Gaussian distributions of the subject-level varying effects, Square brackets indicate 95% confidence intervals based on estimates from Bayesian multilevel regression model. Gender refers to gender of the friend (male = reference category).

Female Ego

Figure 4. Mediation model for women, me = average mediated effect, c = total effect, cov(a, b) = covariance of the varying a and b parameters, SD = standard deviations of the Gaussian distributions of the subject-level varying effects, Square brackets indicate 95% confidence intervals based on estimates from Bayesian multilevel regression model. Gender refers to gender of the friend (male = reference category).

Discussion

The current study sheds new light on women's and men's friendship networks and the ways in which they cultivate emotional closeness with male and female alters. We first examined men's and women's friendship networks for differences in size and homophily and found no significant differences, although women's and men's friendship networks tend to contain more same gender friends than cross-gender friends. Thus, men have a higher percentage of male friends and women a higher percentage of female friends, but the ratio of same to cross-gender friends does not differ significantly between male and female egos. Second, we examined levels of self-disclosure and emotional closeness looking for differences between genders of both egos and alters. Self-disclosure was more likely to occur with female alters than male alters, but this effect did not depend on the gender of ego. Thus, both male and female egos tended to disclose more to women. We found no other differences in self-disclosure or emotional closeness between genders. Finally, we tested whether self-disclosure would mediate the relationship between gender and emotional closeness. We found that for both male and female egos, women alters are associated with greater self-disclosure which then is associated with greater emotional closeness. Therefore, women alters seem to function similarly in their friendships with both male and female egos; they bring forth greater self-disclosure which is associated with greater emotional closeness.

Gender and friendship network size

On average, women and men in our study listed eight friends. There was no gender difference in network size. This finding is similar to findings by Moore (1990) although their research had a more limited definition of close ties and people in that study on average reported only three close ties. It seems that using the prompt to list friends, rather than defining what we meant by the term, allowed participants to generate a larger list of contacts. We therefore suggest that our friendship prompt, likely elicits the sympathy group

(e.g., Buys & Larson, 1979). According to Dunbar's theory of hierarchical human social organisation, social networks are structured in layers, decreasing in emotional closeness with a 'natural' upper limit at 150 (e.g., Dunbar, 1993, 2016; Dunbar & Spoor, 1995; Hill & Dunbar, 2003; Roberts, Dunbar, Pollet, & Kuppens, 2009; Zhou, Sornette, Hill, & Dunbar, 2005). The inner layers are known as the support clique, with a size of around 3-5 individuals, and the sympathy group, with a size of around 12-15 individuals. The sympathy group is what one would colloquially call close friends, and one would typically have contact with these individuals at least once a month. Our friendship network estimate is around eight individuals on average, which suggests that our measure aligns with the sympathy group. This is somewhat lower than some of the published literature but it should be noted that other designs explicitly ask about kin ties (e.g., Roberts, Dunbar, Pollet, & Kuppens, 2009).

Also as in previous studies, we did observe gender homophily in women's and men's friendship networks. In other words, men had more male friends than female friends in their networks, and women had more female friends than male friends in their networks. Men's friendship networks were 66% male and women's networks were 69% female. The level of gender homophily between male and female egos did not differ. When pooling the data, egos were more likely to nominate women alters, but note that we have sampled more women than men as egos and networks are gender homophilous (roughly a 3:1 ratio). Our finding of gender homophily is supported by other studies that used a more restrictive definition of friendship and also found that friendships tend to be gender homophilous (Camarena, Sarigiani, & Petersen, 1990; Demir & Özdemir, 2010). In another study without a structured recall task where participants were simply asked to give the number of men or women friends they had, the researchers also found gender homophily (Gillespie, Lever, Frederick, & Royce, 2015). Thus, although women and men do not differ in the number of friends they listed or the ratio of same-gender to cross-gender friends, women do tend to have more women friends and men tend to have more men friends.

Self-disclosure and emotional closeness and gender

While much previous research conducted in the 1980's and 1990's comparing men's friendships and women's friendships or same gender friendships to cross-gender friendships has reported different levels of self-disclosure and emotional closeness in friendships (Aukett, Ritchie, & Mill, 1988; Bank & Hansford, 2000; Dindia & Allen, 1992; Papini, Farmer, Clark, Micka, & Barnett, 1990), we found no significant differences, using robust statistical tests, between levels of self-disclosure or emotional closeness between female and male egos. There are several possible explanations for this difference in findings. First of all, more recent studies have not reported differences between men and women in levels of self-disclosure and emotional closeness (Howe, Aquan-Assee, Bukowski, Lehoux, & Rinaldi, 2001; Johnson, Brady, McNair, & Congdon, 2007). As gender norms become less strict, women and men may be able to engage in less gendered patterns of behaviour (e.g., Charlesworth & Banaji, 2021). Two studies which considered men's and women's adherence to masculine and feminine gender norms provide evidence for this idea. These studies found that femininity was correlated with emotional closeness in friendships and this attenuated gender differences between men and women (Fischer & Narus, 1981; Williams, 1985). Thus, as gender norms shift, men may be able to engage in more self-disclosure and to experience more emotional closeness in their friendships. A second explanation for the discrepancy is that we had a large sample and used multilevel analyses of a larger pool of friends listed. Our large sample may have helped us observe more within gender variability than cross-gender variability, which would attenuate any gender differences between the variables (D. B. Wright, 1998). Finally, the modal friendship length reported by our participants was five years or more. Perhaps, in very stable, long-term friendships both men and women attain high levels of self-disclosure and emotional closeness. Future studies should measure gender and length of friendship as continuous, rather than categorical variables in order to better understand the role that these variables play in self-disclosure and emotional closeness in friendships.

Associations between alter gender, self-disclosure and emotional closeness

Our main finding in this study was that women alters were associated with more self-disclosure than men alters which in turn was associated with greater emotional closeness. This relationship held for both male and female egos. Thus, it seems that with both men and women, female alters are associated with more sharing of personal information. This finding is consistent with research on how women are expected to be more supportive than men in relationships (e.g., Holmstrom, Burleson, & Jones, 2005). Women alters also tend to be more trusted than men alters, thus women may provide a relational context in which disclosing personal information about oneself feels safe and is expected to be supported. Women may create this safe relational space because they have been found to have both a greater ability for and motivation to process messages requesting social support (Burleson et al., 2011). Men on the other hand have been socialized to view emotional support as a feminine trait and thus may provide less emotional support to avoid being viewed as feminine (Burleson, Holmstrom, & Gilstrap, 2005). Indeed, in this study, the researchers found that men who adhered strongly to masculine gender norms viewed other men who provided emotional support as non-normative and were themselves less likely to respond to requests for support in a person-centered way. These interpersonal gendered scripts provide models that guide behaviors in friendships and thus may have resulted in the differences we observed in self-disclosure to women alters.

In the second part of our model, in accordance with research on social penetration theory, we found that self-disclosure was positively associated with emotional closeness. Sharing personal things with others can strengthen social relationships and hence increase emotional closeness. The degree to which one can call upon individuals in times of physical and emotional need, which requires self-disclosure, seems a crucial mechanism for differentiating between social ties (e.g., Dunbar, 2018; Dunbar & Spoor, 1995). Indeed, in Hays' (1984) work on friendship development in freshman college students, he found that

sharing personal information was more important for developing friendship closeness than the amount of time friends spend together and this did not differ between male and female dyads. Other researchers have also found that self-disclosure positively predicts emotional closeness regardless of the gender of the friends in the study (Bank & Hansford, 2000; Jones, 1991; Rubin & Shenker, 1978). Thus, the relationship between sharing personal information with a friend and feeling close to them appears to be invariant from the gender of the ego or alter in the friendship.

Strengths, limitations and future directions

A key strength of the present study was that we used a network generator to examine friendships, rather than focussing on a single best friend (e.g., Machin & Dunbar, 2013). Thus, we were able to measure a wider range of friendships than previous studies which focus solely on close ties. A strength is also that we used multilevel methods, rather than pooling data to the participant level so that we were able to control for individual differences while also examining the specific characteristics of each friendship from each individual.

However, our study also comes with several limitations. First, our study was cross-sectional and given that we relied on a single measurement in time, it is unclear whether we accurately captured the friendship network of our participants (e.g., D. C. Bell, Belli-McQueen, & Haider, 2007; Kogovšek & Ferligoj, 2005). Additionally, our sample was an online convenience sample and thus is likely not representative of the wider population, and we note that we have an imbalance in the number of male and female respondents. In addition, while we applied multilevel mediation models, it should be borne in mind that our data are correlational. Therefore we cannot infer causality (e.g., Pearl, 2009). Future research could aim to model changes in the social network and how they relate to changes in self-disclosure and emotional closeness, which will allow for a better inference of the potential causal relationships between these variables. However, previous research on social

penetration theory and friendships, in particular, provides strong support for our model where we use self-disclosure to predict emotional closeness. Moreover, it would be worthwhile to capture other characteristics of the friends such as length of friendship, adherence to gender norms (e.g., Reeder, 2003), other roles (e.g., kin, romantic partner), and communication styles, though this would substantially add to the burden of completing the social network survey. It is possible that having a romantic partner could influence the relationship between self-disclosure and emotional closeness differently between men and women. Finally, there is substantial variation in how many individuals were listed. While we believe this question likely elicited the sympathy group (e.g., Roberts, Wilson, Fedurek, & Dunbar, 2008), it is possible that some participants listed members from their support clique only. The variation due in size could be due in part to different interpretations of friendship or stable individual differences (e.g., Malcolm, Saxton, McCarty, Roberts, & Pollet, 2021; Molho, Roberts, de Vries, & Pollet, 2016; Roberts, Wilson, Fedurek, & Dunbar, 2008; Stiller & Dunbar, 2007). Future research would benefit from trying multiple ways of eliciting a friendship network and/or capturing likely sources of individual differences in how many friends are elicited via these methods.

Conclusion

The current study improves upon past research on gender and friendship in that we take into account the gender of both the ego and alter in the relationship. We also expanded our definition of friendship, so that we captured a wider sample of relationships than previous studies which limited the definition to only very close relationships (not distinguishing between friend and romantic relationships) and those which limited the number of friends on which participants could report. We hope that our study will motivate researchers to consider the effects of the gender of both alters and egos in the future. As Wright (1988) cautions, changing gender norms and definitions of gender, for example the

489 increase in the number of people who identify as transmen, transwomen, nonbinary, or
490 agender, should make us reflect on the utility of comparing same and cross-gender
491 friendships. Indeed, future studies should consider the impact of gender norms and how
492 participants' level of adherence to those norms may shape their interpersonal interactions.

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