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Authors
Kennedy, David P
Jackson, Grace L
Green, Harold D
et al.

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The Analysis of Duocentric Social Networks: A Primer

David P. Kennedy,
RAND Corporation

Grace L. Jackson,
University of California Los Angeles*

Harold D. Green,
RAND Corporation**

Thomas N. Bradbury, and
University of California Los Angeles***

Benjamin R. Karney
University of California Los Angeles***

David P. Kennedy: davidk@rand.org

Abstract

Marriages and other intimate partnerships are facilitated or constrained by the social networks within which they are embedded. To date, methods used to assess the social networks of couples have been limited to global ratings of social network characteristics or network data collected from each partner separately. In the current article, the authors offer new tools for expanding on the existing literature by describing methods of collecting and analyzing duocentric social networks, that is, the combined social networks of couples. They provide an overview of the key considerations for measuring duocentric networks, such as how and why to combine separate network interviews with partners into one shared duocentric network, the number of network members to assess, and the implications of different network operationalizations. They illustrate these considerations with analyses of social network data collected from 57 low-income married couples, presenting visualizations and quantitative measures of network composition and structure.

Keywords

couples; marriage; methodology; social networks; social support

The success or failure of an intimate partnership depends not only on characteristics of the partners but also on their *social networks*, that is, the people with whom the partners have regular interaction and the relationships among those people (Wellman, 1983). These relationships are important for several reasons. First, social networks can provide resources

Behavioral Policy Sciences Department, RAND Corporation, 1776 Main St., P.O. Box 2138, Santa Monica, CA 90407-2138
*Department of Psychology, University of California, Los Angeles, Box 95163 Franz Hall, Los Angeles, CA 90095
**Behavioral Policy Sciences, RAND Corporation, 1776 Main St., P.O. Box 2138., Santa Monica, CA 90407-2138
***Department of Psychology, University of California, Los Angeles, Box 95163 Franz Hall, Los Angeles, CA 90095

to the couple or drain resources away (Bryant & Conger, 1999). Second, when partners become close to the same people, these relationships can act as a barrier to breaking up, given that doing so may entail the loss of other valued relationships (Burger & Milardo, 1995; Kearns & Leonard, 2004). Third, network members may serve as a source of norms and standards about the acceptability of breaking up and what it takes to stay together (Felmlee, 2003).

Despite decades of research acknowledging the importance of social networks to understanding couples, progress elaborating on the interactions between couples and their social environments has been limited in several ways. Most prior studies of couples' social networks have not actually collected social network data and instead rely on global assessments of network characteristics, preventing access to features of the network of which partners may not be aware. Moreover, even when relationship and family researchers have assessed partners' social networks directly they have not typically used methods customized to couples.

These limitations have prevented scholars from testing and elaborating on long-standing theories associating marital and family outcomes with qualities of their social networks. For example, Bott (1957) proposed that gender role segregation within a couple should be strongest when partners maintain close ties with their individual networks and when their individual networks remain relatively separate. In contrast, couples who have loosely connected networks should be more likely to develop jointly shared activities as they draw on each other for social support. Similarly, the *withdrawal hypothesis* predicts that as spouses grow more dependent on each other over the course of a marriage, the individual social networks of each spouse will overlap and the total network of the couple will shrink, resulting in fewer sources of support for the couple outside the marriage (Kalmijn, 2003). Testing these hypotheses requires data on the structure of the combined social network of a couple to assess the degree of overlap between each partner's network contacts and the development of the combined network over time, but to date the field has lacked established procedures for collecting or analyzing such data. Progress in testing existing theories of how social networks affect couples requires assessing and examining the properties of *duocentric social networks*, that is, the combined network of relationships surrounding a couple (Coromina, Guia, Coenders, & Ferligoj, 2008). The goal of this article is to fill a gap in the methodological literature by describing appropriate procedures for assessing the duocentric social networks of couples in intimate partnerships.

Decisions for Gathering and Analyzing Duocentric Network Data

Generating Couple Network Data From One or Both Members of the Couple

To date, most studies that have explored the intersecting social networks of married couples have relied on data collected from only one member of the couple (e.g., Cornwell, 2012; Felmlee, 2001; Sprecher & Felmlee, 2000). However, if a study seeks to understand the shared social experiences of the dyad rather than the perspective of one member of that dyad, there are several reasons why network data should be collected from both partners. First, a couple's network includes members who are either shared ties by both partners of the dyad or ties that are primarily linked to one partner and not the other. Respondents who are asked to identify and report information about network members who are primarily connected to their partner are likely to lack sufficient knowledge to report accurately. Collecting data from each partner thus minimizes the chances that important network information will be missing or inaccurate.

Personal Versus Duocentric Networks

Another consideration is whether to analyze each partner's personal network separately or to evaluate the combined duocentric network. A strength of the duocentric-network approach is that it allows each partner's individual perceptions of the network to be aggregated into a description of the social context that exploits data from multiple network participants (Krackhardt, 1987). In the case of intimate partnerships, the duocentric-network approach allows researchers to measure each partner's separate (potentially divergent) perceptions as well as their shared (combined) perceptions of the network. Thus, although measurements of a duocentric couple network are generated from the perceptions of both partners, the combined network may reveal features that lie outside the awareness of either partner. To date, we are aware of only two other studies that have developed methods for assessing the social networks of dyads (Coromina et al., 2008; Hall, 2010). Neither of these studies asked respondents to assess the structural characteristics of their individual personal networks, and both assessed network structure only through network members named by both partners.

How Many Network Members to Assess?

Perhaps the most important consideration for assessing duocentric couple networks is the number of network members (*alters*) to collect from each partner. One key consideration in collecting personal network data is the fact that respondents must provide details about their entire perceived network, including (a) the individuals with whom they interact, (b) the characteristics of these people, (c) their relationships with these people, and, critically, (d) the relationships among them. With a large number of alters, assessing these features can result in excessive respondent burden and may affect data quality if respondents are too fatigued to provide valid and reliable information. One strategy to deal with this issue is to collect network data on only a limited number of close network ties. For example, Cornwell (2012) and Kalmijn (2003) measured social network overlap in spouses by asking each spouse to list up to five contacts.

Although limiting the number of network ties lowers respondent burden, restricting networks to five alters may not capture important network information. Studies of human social network size have found that the average network size is substantially larger than five, with estimates that range from around 150 (Hill & Dunbar, 2003) to much larger (McCormick, Salganik, & Zheng, 2010). Although not all of these network members are strong and close ties, studies of social networks have demonstrated the importance of weakly tied network members, who may be in a better position to link individuals to unique resources (e.g., information) than strong ties, who tend to have access to redundant resources (Granovetter, 1973). Previous studies of personal networks show that important types of network contacts are not always named immediately (Tucker et al., 2009). Moreover, studies examining the stability of network measures have consistently found that 20 alters is the minimum number required to provide unbiased measures of network structure (Golinelli et al., 2010; McCarty, Killworth, & Rennell, 2007).

How Should Duocentric Networks Be Analyzed?

The benefit of duocentric network data is that they can be analyzed with many techniques available for any social network data set (Wasserman & Faust, 1994). Many dimensions of social networks that are theoretically important can be quantified using social network analysis (SNA) techniques. For example, analysis of duocentered networks can produce precise measures of *network size*, which can represent the number of individuals who belong to the entire network or to a subset of the network. Network size has been associated with a number of important outcomes for individuals, including physical and mental health, quality of life, and mortality (Kelly, Patel, Narayan, Prabhakaran, & Cunningham, 2014), and may have similar effects on couple well-being and relationship outcomes. Also, various measures of *network composition* can be constructed by estimating proportions of network members with different characteristics. For couple and family researchers, important dimensions of network composition include the proportion of duocentric network members who are kin versus friends and the proportion who are married, single, divorced, have ever been divorced, and so on. Network composition is relevant to understanding couples because network members tend to influence each other in different ways, for example, in their health behaviors (Valente, 2010) or tendency to divorce (McDermott, Fowler, & Christakis, 2009).

Testing theories of couple networks also requires various measures of *network structure*, which can be measured on different dimensions. At the level of the entire network, several measures quantify the overall connectedness among members of the network. For example, the *density* of connections in a network is a ratio of the number of connections that exist among a group of network members to the number of all possible ties. Densely connected networks have been associated with greater flow of information within a network; establishment of norms and social sanctions against behaviors that harm the group (e.g., a business or family); and greater trust, social capital, and, at times, economic benefits among network members (Baker, 1984; Coleman, 1988; Granovetter, 2005; Widmer, 2010). Other measures of network cohesion and fragmentation include the number of *components*, that is, the number of individuals in a network who are connected to each other but disconnected from other members of the network. For research on couples, assessing components within the duocentric network may have important implications: Families with divorced members tend to be characterized by extended networks with large numbers of independent components (Widmer, 2006). A related measure of fragmentation is the number of *isolates* in the network: components consisting of single individuals with no connections to any other network members. Large numbers of isolates in a network can indicate serious deficits in social capital and has been associated with problems such as chronic homelessness (Green, Tucker, Golinelli, & Wenzel, 2013).

Measures of network structure are also available for assessing how centrally connected individual members are to the rest of the network. These measures of *centrality* precisely measure the overall quantity and connections that any specific network member has with other members of the network. Understanding the position of individuals or types of individuals within a network is important for understanding how influential certain members are. Centrality measures have been associated with couple sexual behavior (condom use and concurrent partnerships; Brown, Kennedy, Tucker, Golinelli, & Wenzel, 2013; Kennedy, Wenzel, Brown, Tucker, & Golinelli, 2013) and couple breakups (Felmlee, 2001).

In addition to quantitative measures, visualizations of duocentered networks can provide insight for developing hypotheses and interpreting results. Visualizations have long played a role in the analysis of social networks (Freeman, 2000). A useful approach for duocentric social networks is to visualize selected example networks that represent different structural and/or compositional characteristics of the sample as a whole. In one study of personal networks, this approach was used to explore how network dynamics influenced sexual behavior (Kennedy, Tucker, Greenm, Golinelli, & Ewing, 2012). Using this approach with duocentric-network data may provide insight into the impact of the shared couple network on relationship outcomes.

Should Couple Network Analysis Include or Exclude Partners?

Another consideration for constructing duocentric networks is whether to construct a network that includes or excludes the partners as part of the network. Prior discussions of personal networks have noted several conceptual and empirical reasons to include or exclude respondents in SNAs (McCarty & Wutich, 2005). The primary reason for excluding the respondent from analyses of a personal network is that the respondent is, by definition, tied to each alter and will always be extremely central to the network. Elimination of the respondent allows for greater precision in analyzing the structure of the network surrounding the respondent. Duocentric networks, on the other hand, combine personal networks from two different respondents; analyzing them with respondents included can therefore be informative. For example, the withdrawal hypothesis suggests that couples will have more independent networks at the outset of their relationships but that their networks will grow to overlap more and more over time. This would result in an increase in centrality of spouses within the duocentric network over time as they begin to share connections with more of the same network members and the emerging duocentric network has fewer members who are connected to only one spouse.

Analyzing duocentric networks without the respondents can also provide important insights, though, clarifying how structurally connected or disconnected the couple's network ties are to each other beyond their relationships with the couple. Comparing structural characteristics of duocentric networks with and without spouses can provide an empirical measure of how key the spousal relationship is to keeping the duocentric network from fragmenting into disconnected groups (Borgatti, 2006), which could provide insight into the network impact on breakups. For example, Widmer (2006) analyzed personal family network data with respondents removed and found that that postdivorce families were structurally more fragmented than other types of network configurations with more disconnected components.

Overview of the Current Study

In light of the relevance of social networks to understanding the well-being and development of couples and in light of the lack of established methods of assessing and analyzing couple networks, for the current article we have two goals. First, we illustrate the important considerations that researchers must consider when analyzing a duocentric social network. Toward this goal, in the rest of this article we provide examples of duocentric network features derived from a larger study of low-income newlywed couples in Los Angeles. One phase of this larger study explored differences in the social networks of a subsample of low-income Black and White couples (Jackson, Kennedy, Bradbury, & Karney, 2014). The goal of this phase of the study was to understand how the extended networks of low-income newlywed Black couples differed structurally from economically similar White couples. The analyses presented here draw on this data set to illustrate methodological issues relevant to assessing and analyzing duocentric social networks. Newlyweds provide an ideal starting point for testing how marriage affects the social network of a couple; couples in more established marriages would already have experienced the factors that shape their combined networks, whereas other couples would have already divorced.

Second, we demonstrate the advantages of a duocentric approach over alternatives for measuring social network characteristics of couples. To illustrate the benefits of interviewing both members of a married couple, the results presented below illustrate the characteristics of the combined duocentric networks. We also present analyses that illustrate why collecting data about more than a limited number of network contacts is important for understanding the composition of the social networks of married couples. We present different ways of analyzing these duocentered networks, that is, excluding or including the couples from the network. Throughout what follows we present example visualizations of the networks and corresponding quantitative measures of characteristics of the networks. To demonstrate the strength of these methods for generating precise measurements of aspects of couples' networks, we describe in detail two couples with contrasting network structural characteristics and present visualizations and quantitative measures of their networks while comparing these examples with descriptive statistics for the sample as a whole. We also present tests of differences between types of couples and network members to illustrate the value of these procedures for testing hypotheses.

Method

Sampling

Newlywed couples were identified via marriage license records. Eligibility criteria included (a) first marriage for each partner, (b) married less than 3 months (c) spoke fluent English, (d) living together (i.e., not be temporarily separated, nor could either partner be deployed or incarcerated), (e) were above 18, (f) wives were below 40 years of age (to allow for the transition to parenthood for all couples), and (g) both spouses self-identified as either non-Hispanic Black or non-Hispanic White. Couples were contacted first by mail and then by telephone. Those who were eligible and provided consent were included in the study.

Participants

Using these eligibility criteria, 51 Black and 50 White couples were recruited into the study for a baseline assessment. Nine months later, 86% of these couples (*N* = 87 couples) completed the Time 2 interview. Those who successfully completed a Time 2 assessment were recruited to complete the social network interview, which yielded 30 duocentric White couples' networks and 27 duocentric Black couples' networks (70% of Time 2 participants). Across the 57 couples who provided complete network interviews, the vast majority of respondents were born in the United States (98.0% of wives and 93.0% of husbands). The mean length of marriage at baseline was 4.9 months (*SD* = 2.3). Men's mean age was 29.8 years (*SD* = 6.0), and women's mean age was 28.0 years (*SD* = 4.3). Couples had a mean of 0.51 children (*SD* = 0.67), with 28 couples having at least one child in the household.

Data Collection: Personal Networks

Couples were visited in their homes by two trained interviewers. The interview content and procedures were fully explained, and informed consent was obtained from each spouse. Husbands and wives were interviewed separately, one on one, using computer-aided interviewing software called EgoWeb, designed by researchers at the RAND Corporation and the University of California, Los Angeles, for collecting personal network data. Respondents gave their answers to questions verbally, and interviewers recorded their responses into the software. Following established procedures for conducting personal network interviews (Campbell & Lee, 1991; McCarty, 2002; McCarty, Bernard, Killworth, Shelley, & Johnsen, 1997), the personal network interviews were divided into three sections: (a) questions designed to generate the names of people in the respondent's social network (alters), (b) questions about each alter (network composition), and (c) questions about the relationship between each unique pair of network alters (network structure). Interviews averaged 40 minutes.

Alter Name Generation

Questions designed to generate lists of network contacts are called *name generators* (Campbell & Lee, 1991). Different name generator methods possess different strengths and weaknesses (Bidart & Charbonneau, 2011). Because specific name generators can introduce bias in the types of network contacts named, some researchers have recommended different techniques or combinations of techniques for reducing bias while not increasing respondent burden (Marin & Hampton, 2007). These techniques include multiple name generators, soliciting a larger number of alters, asking for a fixed number of alters from each respondent, and using nonspecific probing (Brewer, Garrett, & Kulasingam, 1999; Marin & Hampton, 2007; McCarty et al., 2007).

For the current study, we chose a name generator that emphasized exploration of the types of people couples considered part of their networks and an appropriate number of alters to elicit to inform future duocentric-network studies. We initially did not know what cutoff would be meaningful for a duocentric network, in particular a duocentric network for a newlywed couple. Therefore, we asked respondents to name 40 alters each, more than the minimum number of alters required to produce unbiased measures of personal network structure (Golinelli et al., 2010). Following the nonspecific name generator used by McCarty et al. (2007), we used the following generic name generator along with nonspecific probing (Brewer 2000, 2002):

> I'd like you to name 40 people that you know and who know you. Here's the kind of person we are hoping you will name: First, they have to be adults, aged 18 years old or older—do not give me the names of children under age 18; second, these should be people you have had contact with sometime during the past year or so—either face to face, by phone, mail, or email; third, these do not have to be people you like, just people you know and who know you. Let's start by naming your spouse, and after that you can name any adults you know no matter who they are or where they live. Please give us their first and last names. Remember, all of the information you give us is confidential.

We asked respondents to give both first and last names rather than first names only or initials as is customary in personal network interviews to facilitate matching unique alters named across both spouses. If respondents did not want to give last names or did not remember last names they were given the option to give the first few initials of the last name or a nickname or description of the person. The procedures for collecting and storing alter name data we developed with the guidance of the RAND Human Subjects Protection Committee.

Collection of Raw Network Composition and Structure Data

We then asked couples to answer a series of questions about each alter. We asked respondents whether the alters were their own or their spouse's family member, their friend or their spouse's friend, a coworker, neighbor, and so on. We allowed for more than one of these options to be selected for any particular alter (e.g., one alter could be rated by a respondent as both his or her own and the spouse's friend). For relatives, we asked how the alter was specifically related to the respondent (e.g., mother/father, brother/sister). We asked a series of questions about the relationship between the respondent and the alter including how well they knew the alter ("Very well," "Pretty well," or "Not well") and a series of questions about demographic characteristics of the alter (e.g., marital status, if they had children under 18, their employment status).

To measure network structure, we asked respondents to assess the relationship between each unique pair of network alters with the following prompt:

> Going back to the list of 40 people that you mentioned earlier, I am going to ask you about pairs of these people and whether they have had contact with each other sometime during the past year or so—either face to face, by phone, or email. For each pair, I want to know if the two people have had any contact.

If the two alters had contact with each other in the past year, we also asked how well they knew each other ("Very well," "Pretty well," or "Not well").

Construction of Duocentric Networks

The first step in our analysis process was to develop procedures for combining two separate personal networks into one duocentric network. To identify matching alters, the text of the alter names for each couple was sorted in a spreadsheet to identify names that either matched exactly or were potential matches. After potential matches were identified, other characteristics of the nominated alters were reviewed to confirm the match. Characteristics of the alters that helped to confirm or disconfirm a match included corresponding relationship type (e.g., a husband's father and a wife's father-in-law) and answers to demographic questions (e.g., marital status, employment status). Around one fourth of all nominated alters matched across interviews of married couples. Two thirds of these matching nominations were exact text matches of first and last names. Of the remaining one third of nonexact text matches, around 90% were extremely close text matches (e.g., only one letter difference), and 8% were easily identified as the same person (e.g., one nomination used a shortened first name such as "Mike" instead of "Michael," one spouse used the first three initials of the last name, while the other used the full last name). Only 2% of nominations required reference to demographic variables. One percent of matching nominations were in fact different people named by the one spouse (e.g., one nomination was an "uncle" and the other was a "nephew"). For more information about analytic procedures for matching alters without both first and last names, see Green, Hoover, Wagner, Ryan, and Ssegujja (2014).

Once we identified matching alters, we created a unique identifier and merged it into the duocentric data set as one person. For alters with data from both spouses we calculated a set of maximum, minimum, and average responses for the two spouses. For all of the analyses presented in this study, we used only the maximum values. For example, if a husband thought that two alters knew each other "Pretty well" but the wife thought that they knew each other "Very well," we used the wife's evaluation for the combined couple network data. To further explore agreement between spouses in their evaluation of characteristics of the same alters, we compared husbands and wives' responses to relationship and demographic questions as well as their ratings of the relationship strength of pairs of alters with kappa statistics (Cohen, 1960).

Measures: Network Composition and Structure

We constructed a variety of measures to illustrate the benefits of the duocentric approach to understanding couple network dynamics. We calculated measures of network composition and structure for each network in addition to calculating the means and standard deviations of these measures for the sample as a whole. To estimate how interconnected the entire duocentric networks were for each couple, we calculated overall *network density*, defined as the proportion of total possible ties that are existing ties. We also calculated a measure of *network overlap*, defined as the number of alters nominated by both spouses. To measure how central the spouses were in their own duocentric networks and how central network members who were primarily connected to either the husband or wife, we calculated *degree centrality* for each network member, which is defined as the number of direct connections the network member had with all other network members. For duocentric networks with alters only, we again calculated *network density* and two other measures of network structure that are possible to calculate only with spouses removed from the networks: (a) *number of components*, defined as the number of groups of connected network members who are either directly or indirectly connected to each other but disconnected from all other members of the network, and (b) *number of isolates*, defined as the number of network alters who do not have any connections to other alters (by definition, the number of components containing only a single individual).

To illustrate the value of these measures for producing substantive insights, we compared measures for different types of couples and for husbands and wives. To extend findings from a study that used these measures to compare duocentric networks of Black and White couples (Jackson et al., 2014), we present tests of differences between Black and White couples on overall structural measures (density, amount of overlap, number of components, and number of isolates). To illustrate the value of structural measures at the individual level, we conducted tests of differences between husbands and wives on their own centrality and the centrality of alters who were primarily tied to either the husband or wife. These comparisons of alter centrality address a hypothesis by Bott (1957) suggesting that wives' networks are more interconnected than husbands'. For tests of network characteristics, we conducted the nonparametric Wilcoxon signed-rank test to account for the small sample size. We conducted a *t* test to compare the average centrality of husband-only and wife-only alters.

To examine how the number of alters requested in the interviews affected the characteristics of the alters named, we analyzed the compositional and structural characteristics of alters on the basis of the order in which they were named on the respondent's list of alters. Each alter was assigned a number that corresponded to the order in which a respondent named them on his or her list. The number ranged from one to 40. We grouped together alters in blocks of five: Alters 1 through 5, 6 through 10, 11 through 15, and so on. We then calculated the overall proportion of alters in these blocks who were considered to be a respondent's own family member or friend, a family member or friend of a spouse, or a neighbor or coworker. In addition, for each block of five alters we calculated mean responses to a series of questions measuring the strength of the relationship between the respondent and the alters. Questions included how well the respondent knew the alter (three items: "Very well," "Pretty well," or "Not well at all"), how frequently they had contact (seven items ranging from *every day* to *once a year*), whether the alter provided emotional support (yes or no), and an overall rating of relationship quality (three items: "Good," "Neutral," "Bad"). Responses were converted to ordinal measures, and standardized means for each block were calculated by dividing the block mean by the overall mean. We also calculated the average centrality of the alters named in each block to the overall network by calculating their average degree centrality (i.e., the average number of ties each of these alters had with other alters).

Visualizations

We created visualizations of the couples' duocentric networks using standard SNA visualization techniques (Freeman, 2000). Graphs were produced with the gplot function within the "SNA" package of the statistical software R using the Fruchterman–Reingold force-directed placement algorithm. After calculating descriptive statistics for the entire sample, we chose two couples with above- and below-average structural measures to illustrate the range of structural characteristics in the sample. We present visualizations of these couples' networks in addition to providing their network measures to demonstrate their contrasting structural characteristics.

Results

Analysis of Duocentric Networks

The data in Table 1 and Figure 1 describe the duocentric networks formed by combining individual spouse personal networks. In Table 1 we provide overall means and standard deviations for the entire sample in addition to descriptive statistics for two sets of example spouses. The panels in the left-hand column of Figure 1 present visualizations of these example duocentric networks. The diagrams depict the connections (lines, or "edges") among the alters (shapes connected by lines, or "nodes") named by each of the four respondents. The panels in the top row present visualizations of Example 1 couple (E1), and those in the bottom row present data from Example 2 couple (E2). The two examples reveal variation in network overlap between spouses. There are many more commonly named network members (colored gray) for the E2 spouses than the E1 spouses. The E2 spouses named 19 network members in common—around half the networks of both spouses—whereas the E1 spouses named only one network member in common. The distribution of differently shaded nodes in the figures demonstrates the differences in social network overlap between the two couples. The nodes in E1 are separated into two halves: (a) those who are the husbands' alters (black nodes) and (b) those who are the wife's alters (white nodes), with the one commonly named alter on the border. In contrast, the spouses in E2 are surrounded by commonly named (gray) nodes, and these nodes are highly connected to nodes named by only one spouse. The E1 overlap proportion and density are below average, and the E2 couple overlap proportion and density are above average. The husbands and the E2 wife are similar to each other and to the average in terms of their overall number of connections throughout the network. The E1 wife has a higher than average centrality score.

Evaluating variability in these measures illustrates their value for testing hypotheses. As reported by Jackson et al. (2014), Black couples had significantly lower network overlap (M=.08, SD=.06) than White couples (M=.21, SD=.10, Z=−4.92, p<.0001). Additional analyses showed that Black couples also had significantly less dense duocentric networks (M=.17, SD=.09) than White couples (M=.20, SD=.06, Z=−2.11, p=.02). Comparisons of the centrality of different types of alters reveal that there was no significant difference between the centrality of husbands (M = 58.96, SD = 5.74) and wives (M = 57.51, SD =7.80, Z = 1.12, p=.13). However, alters who were primarily associated with husbands were significantly more central (M = 12.07, SD = 9.64) than alters primarily associated with wives (M = 10.40, SD = 8.60, t = 4.75, p<.0001). This fails to support the hypothesis that wives' networks are more highly interconnected than husbands' networks in their combined spousal networks and suggests the association is reversed.

For those network members named in common, there was variation in the amount of agreement between spouses on the characteristics of alters and relationships between alters. For example, spouses tended to agree (measured with κ) on which alters were family members (own family=.86, in-law=.89), demographic characteristics (e.g., gender=.97, marital status=. 88), and whether alters knew each other (.72). They agreed less on other characteristics, such as which alters were friends (e.g., own friend=.65, spouse's friend=.51, friend of both=.42) and whether commonly named pairs of alters had a good, bad, or neutral relationship (.59). This demonstrates that the perspective of both members of the couple is important depending on which network characteristics are being measured.

Network Composition as a Function of Number of Alters Named

Figures 2 and 3 display the distribution of the characteristics of alters based on when they were named in the listing of network members. Figure 2 depicts proportions of six different types of relationship categories (i.e., friends, family, neighbor, etc.), and Figure 3 shows the standardized averages of four different relationship strength measures and one measure of network centrality. These figures demonstrate that the first five alters named—that is, those alters who were most salient to respondents as they listed their network contacts—were structurally and compositionally distinct from the rest of the network. Figure 2 shows that the first five alters were more likely to be family (χ^2 =96.28, p<.0001) and less likely to be friends (χ^2 =55.95, p<.0001) than subsequent alters. Around 40% of the first five alters named were family members, the most frequently named type of alter in this group. Overall, the proportion of family members named declines gradually until the 21–25 block of alters, where it levels out to around 20%. The category of respondents' own friends is the second most frequently named type of alter in the first block (around 30%) but then becomes the dominant type of alter named (around or greater than 50%) in subsequent blocks. The other categories depicted in Figure 2 are named in more consistent proportions across alter blocks.

Figure 3 shows that the relationship between spouses and their first five alters differ from their relationships with subsequent alters. With the exception of overall relationship quality, each measure of relationship strength follows roughly the same pattern: They are above average among the first five alters, decline gradually with each subsequent block of alters, are around average for alters between Alters 16 and 25, and subsequently decline to below average. Compared to subsequently named alters, the first five alters have a significantly higher average on how well respondents know them (t =13.76, p<.001), how frequently they are in contact with them (t =12.85, p<.001), and how emotionally close they are (t =7.41, p<.001). The average amount of connection to the network also follows a similar pattern, and those named in the first five alters are more central than any alters named subsequently (t =12.51, p<.001).

Overall, Figures 2 and 3 suggest that studies of the social networks of couples should elicit more than five alters in order to capture the structural and compositional diversity of these networks. The people respondents named early in their lists differ from those named later in the list. Thus, limiting data collection about a couple's network to a small number of network members is likely to produce networks that look different (i.e., more family members, fewer friends, much stronger relationships, more central relationships) than networks with larger numbers of network members. However, we also found that the types of network alters named were similar from Alter No. 25 to Alter No. 40, and these alters had weaker relationships with the respondent and the rest of the network. This suggests that duocentric network studies that elicit around 20–25 alters should capture sufficient diversity in these networks. This recommendation corresponds with the conclusions of studies suggesting that unbiased measures of network structure can be produced with personal networks of size 20 or greater.

Analysis of Duocentric Networks Without Spouses

The panels in the right-hand column of Figure 1 depict the duocentric networks with the wives and husbands removed as nodes. Comparing duocentric networks both with and without spouses provides insight into how much the structure of the duocentric network is dependent on the couple. For example, the nonspouse duocentric graph for E1 separates into 19 components, higher than the average of 7.7 components for the sample as a whole. The resulting network is also less densely connected (.08) than the average (.15). The E2 couple network, in contrast, appears very similar whether or not the spouses are included. Even without the spouses, the network continues to consist of one large component with all network members connected to each other either directly or indirectly and is more densely connected (.24) than the sample average. A comparison of the two examples reveals that the E1 duocentric network can be more accurately described as several different subnetworks tied together through their common relationship with one or the other spouse, whereas the E2 network is highly connected independent of the spouses. This comparison can provide important insight into the varying social pressures these couples may face should they confront marital conflict or decisions about ending a relationship. Consistent with the findings from prior analyses of the duocentric data (Jackson et al., 2014), the alter-only duocentric networks of Black couples had significantly more structural fracturing compared to the White couple networks. Black couples had significantly more components (M=9.07, SD=6.05) and isolates (M=6.52, SD=5.90) than White couples (M=6.47, SD=4.57; M=4.10, SD=3.80, Z=1.8, p=.04; Z=1.93, p=.03).

Discussion

Although social network researchers have been developing theory and methods for measuring social networks for decades (Borgatti, Mehra, Brass, & Labianca, 2009), to date there has been a lack of attention to the specific challenges associated with measuring the networks of couples. In addition, there has been a long history of theoretical work regarding the networks of couples, but these theories have been tested only with methods that either indirectly measure social networks or measure them in limited ways. We argue that the duocentric approach to measuring social networks of intimate partners can provide more appropriate empirical data for testing theories of the impact of social networks on couples. The duocentric approach provides more flexibility than global assessments for constructing a variety of precise measurements and visualizations.

We believe that the history of research regarding Bott's (1957) hypothesis illustrates the limitations of non-duocentric approaches to testing theories of the social networks of couples. There have been many attempts to test Bott's theories of how networks influence gender role segregation with indirect or limited network methods, but these tests have resulted in inconclusive or contradictory findings (Rogler & Procidano, 1986). Our findings illustrate the value of duocentric methods for producing precise measurements of key concepts hypothesized by Bott, such as network overlap in the combined networks of husbands and wives and the amount of interconnections among different types of network members. We were able to demonstrate that these measurements can be used to test hypothesized associations between gender and network structure by showing that network members who were primarily tied to husbands had more network connections (higher centrality) than those tied to wives.

In this article we have provided an overview of some key considerations that should be addressed when developing measures of duocentric social networks and have presented an approach to addressing each of these considerations. First, we addressed the question of how to collect social network data from couples, specifically whether to collect social network data from each member of a couple or just one. We conclude that collecting data from each member of a couple is essential to providing comprehensive couple-level social network data because the duocentric network provided insight into the structure of a couple's network that could not be derived from either of the individual spouse interviews. Duocentric networks provide overall network measures, such as overall connectivity and amount of overlap in the couple's network, and measures of how connected individual network members, such as the spouses, are to the entire network. These measures are informative for description of couples' networks and can be included as variables in models to account for dyadic processes and outcomes.

For example, measures generated from duocentric networks can provide data for tests of hypotheses that have related social networks to longitudinal outcomes for couples, such as a breakup or divorce. Drawing on the cross-sectional measurements available here, we demonstrated that the cohesiveness of newlywed duocentric networks varies across couples and that Black and White couples differed from each other significantly. Extending these measurements over time could provide data to test theories such as the withdrawal hypothesis (Kalmijn, 2003), according to which couples become more dependent on each other over time as they develop shared network ties and disconnect from network members tied to only one spouse. Also, related to this theory is the *constraint model*, which hypothesizes that a couple's shared social network can operate as a barrier to leaving the relationship (Levinger, 1979). Longitudinal assessments of duocentric couple networks could provide data to determine whether these theories are supported by evidence and whether the structural differences have consequences for relationship outcomes for Black and White low-income newlywed couples (e.g., different rates of divorce).

The duocentric networks formed from combining these different perspectives also demonstrate that there is important variation in the perspectives of husbands and wives about who belongs to their primary social circles. Husbands and wives also varied on how much they agreed on different characteristics of alters they named in common. Therefore, it appears that relying on one spouse or the other to provide couple-level data would produce network data biased toward the perspective of one spouse. The construction of duocentric measures of network structure from both members of a couple reinforces the value of these methods over alternatives. Because these measures are based on connections among a combination of network members tied to husbands, wives, or both, neither spouse is likely to have a full understanding of the structural characteristics of their networks. Therefore, replication of these methods with common approaches that collect data from one spouse only is impossible.

Another issue addressed here was the implications of different numbers of alters solicited for the types of alters named by respondents. Our findings suggest that the alters named early in a list of network members differ from subsequently named alters in their relationships with respondents and their relationships to each other. We do not recommend repeating our elicitation of 40 alters per couple: Sufficient diversity seems to have been reached with around 20–25 alters. Although the first five alters named are clearly more central to the lives of spouses, we recommend also collecting data on weaker ties to better understand the overall network diversity.

We also demonstrated that duocentric networks can be operationalized in different ways to provide different types of insights about couple network structure. We recommend including or excluding spouses from duocentric networks on the basis of specific research questions. For example, understanding the centrality of spouses in their combined network requires duocentric networks that include spouses. On the other hand, measuring how the structure of a duocentric network may constrain the couple from leaving the relationship would require measuring duocentric network structure without couples to reveal how dependent the broader network is on the presence of the relationship. Similar network data construction has shown that postdivorce families are structurally more fractured (Widmer, 2006). We found that some of the couples in our sample, in particular Black couples, were more likely to have disconnected networks, suggesting that their networks were already showing similarities to postdivorce networks. Future studies can help determine whether this is in fact an indication of divorce vulnerability or whether a “withdraw” process shapes a more integrated and connected network for these couples over time.

A comprehensive overview of potential measures of network composition and structure was beyond the scope of this brief overview; however, we have provided procedures for collecting raw network data from couples and constructing duocentric networks that can be analyzed with any compositional or structural measure available for sociocentric (Wasserman & Faust, 1994) or personal networks (McCarty, 2002). This study addressed only a small number of basic ways to generate data for measurements of network structure and composition and explored only a few different operationalizations of duocentric networks. There are many other ways to measure network characteristics of duocentric networks and structural positions of spouses in these networks, such as using different alter name generators, asking different questions about characteristics of network alters, using different wording in relationship evaluation questions, dichotomizing relationship questions in different ways, and so on. We provided one extended example, but our procedures can be easily modified to address different research questions more precisely. The statistical tests we conducted were basic and based on a small sample and were primarily conducted to demonstrate the value of the duocentric approach. The primary weakness of our procedures is the challenge of producing network data that include all relevant aspects of couple’s networks while minimizing respondent burden. We argue that the challenge to overcoming respondent burden when collecting duocentric network data is worth the effort because of the measurement precision and flexibility our approach provides.

The duocentric approach to collecting and measuring the social networks of couples provides a flexible and comprehensive analytic tool for addressing theoretical questions about intimate relationships and social networks. These questions have been relevant to couple researchers for decades, but they have not yet been fully addressed because of the limitations of previous methods. We believe that use of the duocentric approach to test existing theories and produce new empirically based exploratory analyses will provide the foundation for researchers to generate new theories about couples and the social networks in which they are embedded.

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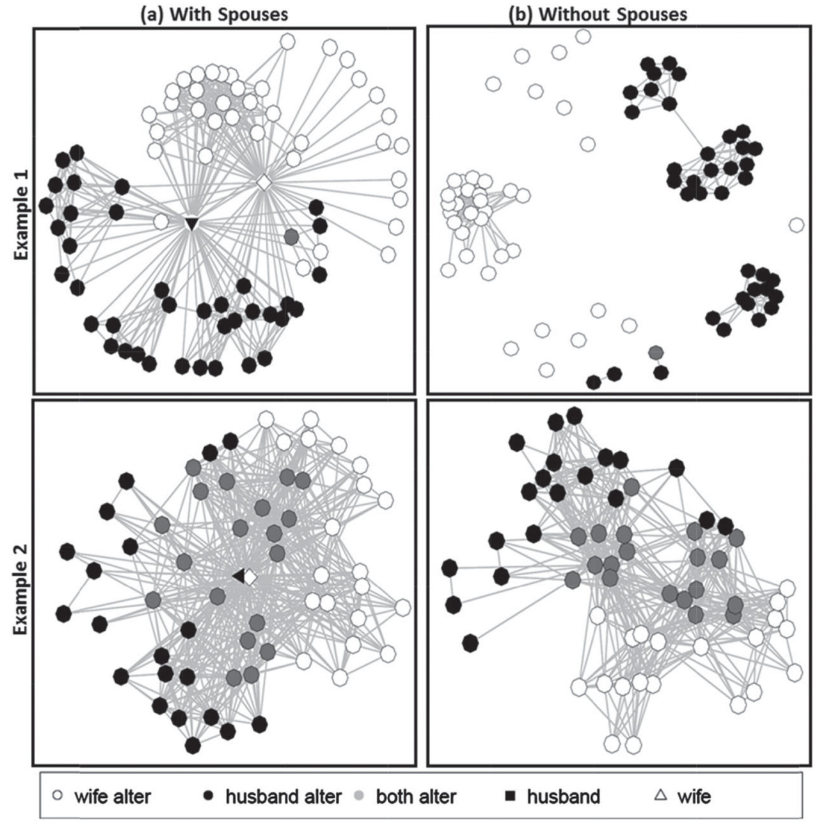

Figure 1.

Two Examples of Visualizations of Duocentric Spousal Networks.

Note: The panels depict duocentric networks formed by combining the personal networks of husbands and wives, one couple on each row. Each visualization features all of the network contacts named by either the wife or the husband, as well as whether either spouse indicated that two network contacts had interacted in the past year. The panels in Column (a) include spouses as network members, and the panels in Column (b) do not include spouses as network members. White circular-shaped nodes represent network contacts who were only named by wives, black circular-shaped nodes indicate network contacts only named by husbands, and gray circular-shaped nodes represent network contacts named by both wives and husbands. Black diamond-shaped nodes represent husbands and white triangle-shaped nodes represent wives. Graphs were produced with the gplot function within the “SNA” package of the statistical software R using the Fruchterman–Reingold force-directed placement algorithm.

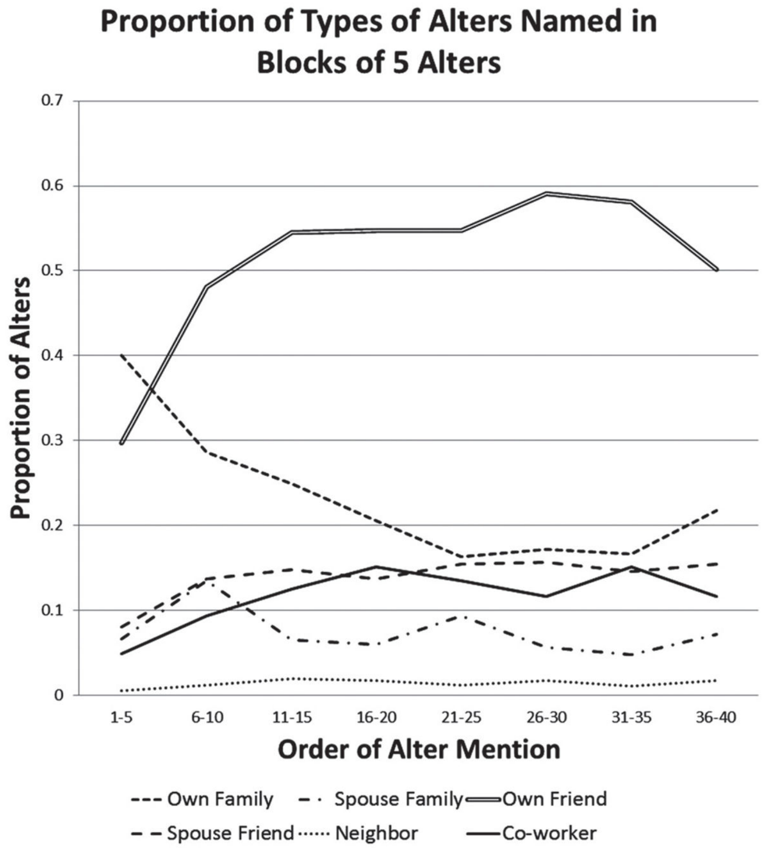

Figure 2.

Line Graphs Depicting the Types of Alters (Network Contacts) Named by Respondents Based on the Order in Which They Named Them.

Note: Proportions represent amount of alters named in sets of five. Respondents' own family members were named most frequently (around 40%) in the first set of five followed by the respondent's own friends (around 30%). The proportion of the respondents' own family members declines steadily until the block of alters named 21st through 25th, whereas the proportion of alters named who were the respondent's own friends increases to over 50% in the block of alters named 11th through 15th and remains over 50% for all subsequent blocks of alters. Alters named in the first set of five were more likely to be classified as "own family" (χ^2 =96.28, p<.0001) and less likely to be classified as "own friend" (χ^2 =55.95, p<.0001) compared to subsequently named alters.

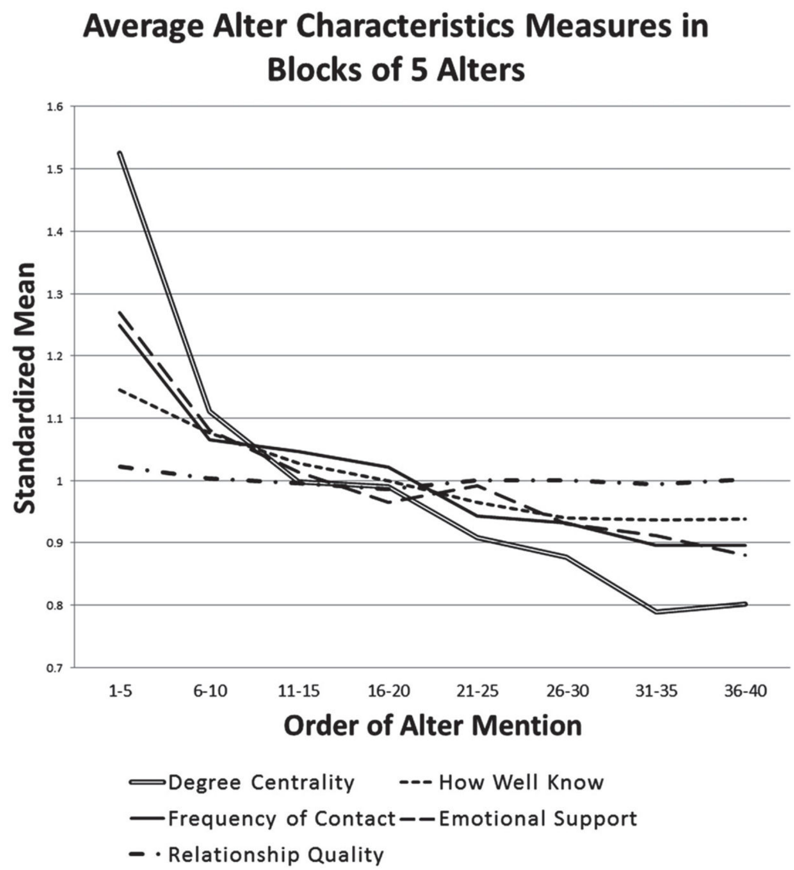

Figure 3.

Line Graphs Depicting Standardized Means of Five Characteristics of Alters Named by Respondents Based on the Order in Which They Were Named.

Note: Structural centrality and relationship strength are especially high for the first five alters and then decline for subsequent blocks of alters. Alters named among the first five had significantly higher degree centrality (t =12.51, p<.0001) than subsequently named alters. Respondents also rated their first five alters higher on each measure of relationship strength, including how well they were known (t =13.76, p<.001), frequency of contact (t =12.85, p<.001), and emotional support (t =7.14, p<.001), but they did not rate them as significantly different in relationship quality (t =1.48, p<.14).

Table 1

Network Statistics for Example Spouses and Whole Sample (*n* =57)

Network measures	Example 1	Example 2	*M*	*SD*
Duocentric networks				
Network connectedness	0.12	0.30	0.19	0.07
Network overlap	.01	.31	.15	.11
Husband network connections	56	57	58.96	5.74
Wife network connections	65	59	57.51	7.80
Husband alter average number of connections	8.31	15.30	10.58	8.57[a]
Wife alter average number of connections	8.21	11.40	9.35	7.55[a]
Duocentric networks, alters only				
Network connectedness	0.08	0.24	0.15	0.07
Disconnected network subgroups	19	1	7.70	5.43
Disconnected network members	14	0	5.22	5.00

[a]Significant difference in mean degree centrality for wife and husband nominated alters, excluding alters nominated by both husbands and wives ($t = 4.75$, $p < .0001$).