Beyond the Dyadic Perspective:

10 Reasons for Using Social Network Analysis in Intergroup Contact Research

Ralf Wölfer and Miles Hewstone

University of Oxford, Department of Experimental Psychology

Author Note

Ralf Wölfer and Miles Hewstone, Department of Experimental Psychology, University of Oxford, United Kingdom.

Correspondence concerning this article should be addressed to Ralf Wölfer, Department of Experimental Psychology, University of Oxford, South Parks Road, Oxford OX1 3UD, United Kingdom. Email: ralf.woelfer@psy.ox.ac.uk

Abstract

This paper presents 10 reasons why Social Network Analysis, a novel but still surprisingly under-used approach in social psychology, can advance the analysis of intergroup contact. Although intergroup contact has been shown to improve intergroup relations, conventional methods leave some questions unanswered regarding the underlying social mechanisms that facilitate social cohesion between different groups in increasingly diverse societies. We will, therefore, explain the largely unknown conceptual and methodological advantages of Social Network Analysis for studying intergroup contact in naturally existing groups, which are likely to help contact researchers to gain a better understanding of intergroup relations and guide attempts to overcome segregation, prejudice, discrimination, and intergroup conflict.

Keywords: intergroup contact, social network analysis, diversity

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"*We are caught in an inescapable network of mutuality, tied in a single garment of destiny. Whatever affects one directly, affects all indirectly.*" – Martin Luther King

As figuratively expressed by Martin Luther King, all individuals are part of a social network that has a direct and indirect effect on their attitudes, beliefs, and behaviors. In modern societies, this social network becomes more diverse – containing people from various groups that differ, for example, by ethnicity or religious background – but may at the same time also become more segregated (Nightingale, 2012), which represents a potential breeding ground for prejudice, discrimination, and intergroup conflict. While research on intergroup contact has provided compelling evidence *that* outgroup contact improves intergroup relations (Pettigrew & Tropp, 2006), more research is needed in order to gain a better understanding of *how* to promote social cohesion and outgroup contact between different groups within increasingly diverse social networks.

Social network analysis (SNA) has reached a level of conceptual and analytic refinement that makes it a valuable tool for studying intergroup contact in naturally-existing social structures and, thereby, has the potential to explore means for promoting social integration in diverse contexts. Yet, despite some promising developments (e.g., Munniksma, Stark, Verkuyten, Flache, & Veenstra, 2013), SNA remains an under-used approach for studying the social-psychological dimension of intergroup contact (e.g., associations with prejudice, trust, threat, discrimination, or collective actions), partly because of the largely unknown advantages it offers. Therefore, after a brief general introduction to SNA, this paper presents 10 reasons why this approach merits closer consideration from contact researchers and social psychologists in general. For each reason, we will conceptually demonstrate how

SNA helps to advance the analysis of intergroup processes beyond the contributions of traditional analyses. We will, however, not digress into the statistical details behind this technique; a detailed introduction regarding the technical background, generation, and application of network statistics can be found elsewhere (cf., Wasserman & Faust, 1994; Wölfer, Faber, & Hewstone, 2015).

Brief Introduction to Social Network Analysis

In essence, SNA is a scientific approach that structures network members and analyzes the extent to which this structure explains something about the network members (Borgatti, Mehra, Brass, & Labianca, 2009). In its basic form, a social network includes two elements: nodes and ties. Nodes are the subjects of a network and can include individuals such as students or coworkers but also non-living subjects such as institutions or cities, while ties are the connections between nodes in a social network and can be based on affiliations, similarities, or interactions. SNA is an umbrella term for different relational statistics, which can be differentiated broadly into complete networks, ego networks, and snowball networks (see Table S1 in the supporting information for an overview). Of these 'network families', complete networks and snowball networks are of particular value for intergroup contact researcher and the focus of this paper, because they enable investigation of the structural patterns within the overall social network.

Insert Figure 1 about here

A complete social network, as illustrated in Figure 1, contains a quantity of nodes, which can send and receive ties within a well-defined network boundary. In turn, a snowball network is elicited in sequential assessment steps by starting to assess participants' ties to other network members on a larger scale (i.e., a whole community), then these network members' ties, and so on, which produces—due to the principle of transitivity (i.e., friends of my friends are my friends)—a nearly complete but boundary-relaxed network. In this way, both types of social networks contain reciprocal information, which is needed in order to

calculate the majority of network parameters. This network information is usually assessed with the help of a nomination procedure in questionnaires, where participants are asked to nominate others regarding the association of interest by using an open-end ("Who are your best friends?") or limited nomination procedure ("Who are your 10 best friends?"), which both produce comparably valid and informative network data (Friederickson & Furnham, 1998), especially in smaller complete and snowball networks. However, network ties can also be assessed with observations, interviews, documentary analyses, or any other method that allows capturing some kind of interconnection.

Most social networks are friendship networks, which are of particular interest for contact researchers given the importance of intergroup friendships (Davies, Tropp, Aron, Pettigrew, & Wright, 2011). The relevant literature has revealed two main mechanisms that explain the formation of friendship networks: (a) *homophily*, which describes the tendency of network members to become befriended with similar others (cf., Byrne, 1971; McPherson, Smith-Lovin, & Cook, 2001), and (b) *propinquity*, which describes the tendency of network members to become befriended with others who are physically close. Interestingly, research suggests that propinquity seems to be more important than homophily (Echols & Graham, 2013), which might initially sound like an unromantic explanation for the formation of friendships, because it is not something interesting in another person that attracts us, but rather their proximity-based availability. For the field of intergroup contact, however, this finding is quite promising, because it suggests that if we are able to bring people into contact with each other, they tend to become friends. And because this friendship opportunity (propinquity) seems to be stronger than individual characteristics (homophily), even people from different groups can come together in diverse social networks. To this end, however, it is of vital importance to explicitly consider individuals' social networks in order to adequately analyze, better understand, and successfully improve intergroup relations in diverse contexts.

In the following section, we will explain the usefulness of SNA in further detail by outlining 10 reasons that clarify how this perspective can advance the analysis of intergroup contact.

10 Reasons for Using Social Network Analysis in Contact Research

1. SNA considers the tie as smallest analytic level

Unlike conventional psychological research perspectives, the basic analytic unit in SNA is not the individual person, but the network tie that connects different individuals. What might sound trivial has crucial consequences. Indirectly, the tie-perspective enables many of the following advantages described below; directly, it increases the analytic power and precision. Given that individual network members usually have more than one tie (e.g., more than one friendship relation), the number of analytic units is higher than individual-based measures. In Figure 1, network member #30, for example, nominates network members #24, 28, 29, and 48 as friends. This more comprehensive amount of relational data also increases the precision of intergroup contact data, because SNA analyzes specific connections instead of a single contact score. Although, the most common tie format is a binary one (i.e., presence or absence of ties), it is equally possible to measure the strength of friendship relations using an ordinal- or interval-scaled tie format similar to traditional contact variables.

2. SNA considers reciprocity for measuring intergroup friendships

The optimal and most effective form of intergroup contact is intergroup friendship (Davies et al., 2011). Consequently, it is particularly relevant to study this type of contact. When using conventional survey methods, however, participants can easily claim that they are befriended with outgroup members; but only with the help of network data, can researchers actually cross-check whether the nominated friend agrees with the nominating person or not. For example, only two of the four nominated friends of network member #30 in Figure 1 reciprocate the received tie (#28 and 29). Disentangling a unidirectional friendship perception from a mutually existing friendship relationship allows researchers to accurately capture qualitative differences of intergroup relations. And by focusing on reciprocal ties, social

network researchers respond positively to Baumeister, Vohs and Funder's (2007) critique that psychology has overly relied on self-reports despite evidence from research and everyday observation that "*people have not always done what they say they have done*" (p. 397). Although some recent studies have begun to use this particular advantage of SNA (e.g., Wölfer, Schmid, Hewstone, & van Zalk, 2016), a promising future research direction would be to further explore the effects between uni- versus bidirectional outgroup ties on individuals' intergroup relations.

3. SNA considers indirect contact links

Contact research consistently demonstrates that not only direct outgroup contact, but also extended contact (i.e., amount of outgroup contact that someone's ingroup friends have) improves intergroup relations (Wright, Aron, McLaughlin-Volpe, & Ropp, 1997; for a review, see Vezzali, Hewstone, Capozza, Giovannini, & Wölfer, 2014). While participants are likely to accurately report their own direct outgroup contact (Hewstone, Judd & Sharp, 2011), they have difficulties in accurately reporting the outgroup contact experienced by their ingroup friends. SNA, however, can help to decompose the measurement of extended contact into two separate analytic steps including (a) the identification of participants' reciprocally connected ingroup friends and (b) the assessment of these friends' intergroup contact. For example, network member #59 in Figure 1 has no direct outgroup friends, but his/her reciprocally connected friend #58 is, in turn, befriended with network member #32, which allows #59 the indirect experience of outgroup contact. In a recent study, we utilized the above described two-step approach for measuring extended contact in a large-scale sample of over 10,000 European students, which revealed the expected effects and, thus, validated a more precise extended contact parameter that reaches beyond the dyadic perspective of traditional methods Wölfer et al., 2016).

4. SNA considers latent social-psychological entities

In friendship networks, individuals cluster together in groups. This means that specific groups of network members have a higher than random probability of being connected. These substructures represent important socialization contexts; for example, as peer groups they are specifically relevant for the development of adolescents and early adults (Poteat, 2007) and it is plausible to assume that the outgroup contact within a peer group might be more important than the outgroup contact outside of a peer group, even if the latter is experienced directly. In Figure 1, for example, network members #4, 5, 6, and 8 form a cluster of network members that is characterized by specifically strong interrelationships. Apart from visible clusters like the above-mentioned one, the group structure is latent and has to be identified analytically. This can be realized with SNA, which determines – comparably to a cluster analysis – substructures with elements that have stronger relationships within than outside the cluster. While much has been done in the field of peer group research, this progress has not been translated to intergroup contact so far, which makes it a fruitful future research direction.

5. SNA considers contextual network characteristics

Intergroup contact does not happen in a vacuum, but is affected by contextual characteristics of the entire social network, which determine the structural opportunities for experiencing direct and extended outgroup contact. In this regard, relevant contextual network characteristics are density, network reciprocity, and centralization. *Density* reflects the overall connectedness within a network, indicated by the total number of ties among all network members. *Network reciprocity* specifies the total number of mutual relationships within the social network. And *centralization* measures the extent to which network members vary in terms of their importance, ranging from equally-powered to hierarchical networks. The social network in Figure 1, for example, is characterized by a marginally dense, relatively reciprocal, and equally-powered contextual network structure, forming a specific structural contact environment. So far, little is known regarding the role of contextual network characteristics,

but it is likely that the network structure mediates the effect between diversity and contact opportunities. That is, diversity affects the network structure (i.e., due to homophily higher diversity decreases density and reciprocity and increases centralization), while the network structure, in turn, affects contact opportunities in diverse networks (i.e., lower density and reciprocity and higher centralization decrease intergroup interactions).

6. SNA considers available contact opportunities

Relatedly, intergroup contact is not only affected by structural contact opportunities, but also by the pure availability of outgroup members; that is, the diversity of the social network. While traditional methods allow researchers to capture important diversity measures, such as the relative proportion of majority and minority members within the context of interest, SNA offers many additional, uniquely informative diversity parameters. More specifically, SNA allows researchers to determine precisely network members' available contact opportunities within their direct circle of friends, within their peer group, and within their broader network environment by measuring the available outgroup members within two linking steps, three linking steps, four linking steps and so on. In Figure 1, network members #1 or 2 have no direct outgroup friends, similar to many other network members, but unlike, for example, network member #52 who can reach an outgroup member in two steps, they need at least four steps, which represents a qualitative difference regarding their available contact opportunities. In a similar vein, SNA also helps researchers to capture diversity attitudes (i.e., social norms of ingroup members towards outgroup members) by measuring ingroup members' average outgroup contact. The effect of outgroup contact in the broader network environment, as a function of the number of linking steps from ego or ingroup members' outgroup contact, remains an open research question for future studies.

7. SNA considers contact capacity

A less structural and more psychological potential for intergroup contact experiences is the idea of 'contact capacity', which is hypothesized to be affected by the level of social

saturation. Based on Baumeister and Leary (1995), individuals have a need to belong that has been shown to represent a fundamental human motivation. Therefore, the need for social contact behaves – just like the need to eat and sleep – in a curvilinear fashion. That is, after a certain level of saturation, individuals will avoid further saturation. Translated to contact research, individuals with a large number of friends are less willing to form further friendships, independently of ingroup or outgroup friends. While traditional survey methods provide a rather vague quantity of individuals' amount of social contact, SNA allows researchers to specify individuals' social contact by precisely measuring their social network integration with the help of different network centrality parameters (Freeman, 1979), such as the *degree* (i.e., number of connections) or *closeness* (i.e., distance to all network members). In this respect, network member #55 in Figure 1 should have a lower likelihood of forming an outgroup tie to #49 compared to network member #50, while controlling for other relevant psychological processes (e.g., extraversion, sociability). Although not differentiated between in- versus outgroup contact, research on ego networks has successfully examined individuals' contact capacity for a quarter of a century (Dunbar, 1993), but its important replication with the use of a broad set of centrality parameters in (nearly) complete networks is still awaited.

8. SNA considers multiple forms of connections

While the beneficial effect of positive outgroup contact for intergroup relations has been convincingly demonstrated (Pettigrew & Tropp, 2006), negative outgroup contact has been almost completely neglected in contact research. This is surprising given that positive *and* negative contact evidently affect intergroup relations (Graf, Paolini, & Rubin, 2014). Although most social networks focus on positive ties, it is equally possible to structure the same individuals using negative ties (Wölfer & Hewstone, 2015). With the help of multiple social network analysis, both types of contact can be studied simultaneously by considering positive and negative ties among the same individuals within the same social network. In this way, SNA is able to provide a more detailed picture of intergroup contact in comparison to

traditional methods. Current research starts to tap into this network application for simultaneously studying both positive and negative intergroup contact (Wölfer, Jaspers, Blaylock, Wigoder, Hughes, & Hewstone, under review), but requires further refinement and advancement in future research.

9. SNA considers less biased data

Assessing self-reports inevitably produces certain response tendencies. In particular, the tendency to give socially desirable responses is likely to result in over-reported positive outgroup contact and under-reported negative outgroup contact (Wölfer et al., under review). In contrast, although network nominations assessed in surveys are in their raw format (e.g., before considering the reciprocity between nominator and nominee) also self-reports, SNA allows a less-biased assessment of intergroup contact, because it places no emphasis on network members' group memberships at the time of data collection. Thus respondents, for example, list their positive or their negative ties, but they are not asked any questions about their own or others' ethnic identity; thus in no way do they monitor and edit their responses for socially desirability. After eliciting a social network, relevant sociodemographic data that were assessed in separate questionnaire items and define the in- and outgroup of interest (e.g., ethnicity, religious community, or sexual orientation) can be integrated and analyzed. A social network, as illustrated in Figure 1, initially just includes colorless boxes that merely illustrate a structure. Only in a second step, do researchers include other information about the network members in order to make sense of this social network and, thereby, disentangle the assessment of individuals contact and their group membership. Given the current lack of research in this respect, the field will benefit from future studies that empirically compare harmonized measures of self-reported versus network-based contact parameters.

10. SNA considers contact dynamics

Longitudinal research is of vital importance in the field of intergroup contact, because (a) individuals' circle of friends is – in contrast to the cross-sectional snap-shot in Figure 1 – a

flexible system, (b) contact affects intergroup relations longitudinally by triggering underlying psychological processes that stimulate attitude change over time, and (c) contact and intergroup relations co-develop. SNA allows researchers to consider the dynamics of networks and behavior with stochastic actor-based models (Snijders, 2001). This powerful statistical approach estimates the tendency of network members to create a tie to someone in their local network environment (network dynamics) or to change their behavior over time (behavioral dynamics), while these outcomes can, in turn, be predicted based on network (i.e., outgroup connections) or behavioral (i.e., self-reported intergroup attitudes) variables. In this way, longitudinal SNA enables researchers to differentiate selection effects (i.e., extent to which individual characteristics influence the network structure) from socialization effects (i.e., extent to which the network structure influences individual characteristics), which contributes to an explanation of the causal mechanisms between the individual and its environment. Notwithstanding many successful applications of stochastic actor-based models in the last decade and the necessity of studying intergroup contact experiences longitudinally, contact researchers are making surprisingly little use of this powerful statistical possibility.

Shortcomings when Using Social Network Analysis

Despite our enthusiasm, we have to acknowledge that SNA is, like every method, characterized by important limitations that researchers need to be aware of. These shortcomings, however, vary between different network approaches, so that researchers can, depending on their particular research focus, choose different network approaches with specific strengths and weaknesses. Complete networks are restricted to a network boundary (e.g., school or workplace), which captures only a specific part of the population to which we want to generalize our findings. Moreover, this network approach is particularly sensitive to missing data, because non-participating individuals produce not only a lack of data but can also change the structure of the social network dramatically. Thus, whenever social psychologists are interested in other contact experiences beyond the institutional context that

defines the network boundary or struggle to have high response rates, an alternative or additional assessment method is provided by snowball networks or ego networks. Snowball methods do not completely overcome but, rather, reduce the problems caused by limitations in complete networks. On the downside, this network approach requires much effort during the data collection and makes it impossible to ensure participants' anonymity given that their nominations need to be contacted. Finally, while ego networks reach beyond structural network boundaries, are as robust to missing data as traditional methods, and allow assessment of anonymized data, they remain subjective reports and offer limited opportunities for investigating structural patterns that contact researchers are particularly interested in (e.g., reciprocity, indirect links).

Conclusion

SNA is not an all-purpose tool for every open research question in the field of intergroup contact or social psychology. However, if researchers consider the specific strengths and weaknesses of different 'network families' and tailor the applied network approach to their research question, this powerful approach provides unique advantages to contact researchers for analyzing naturally-existing social structures. SNA should not replace well-established methods in this field, but rather be considered a helpful, additional technique, which offers the potential to gain a better understanding of intergroup relations in diverse contexts and, thereby, helps to shed light on the question of how to overcome segregation, prejudice, discrimination, and intergroup conflict.

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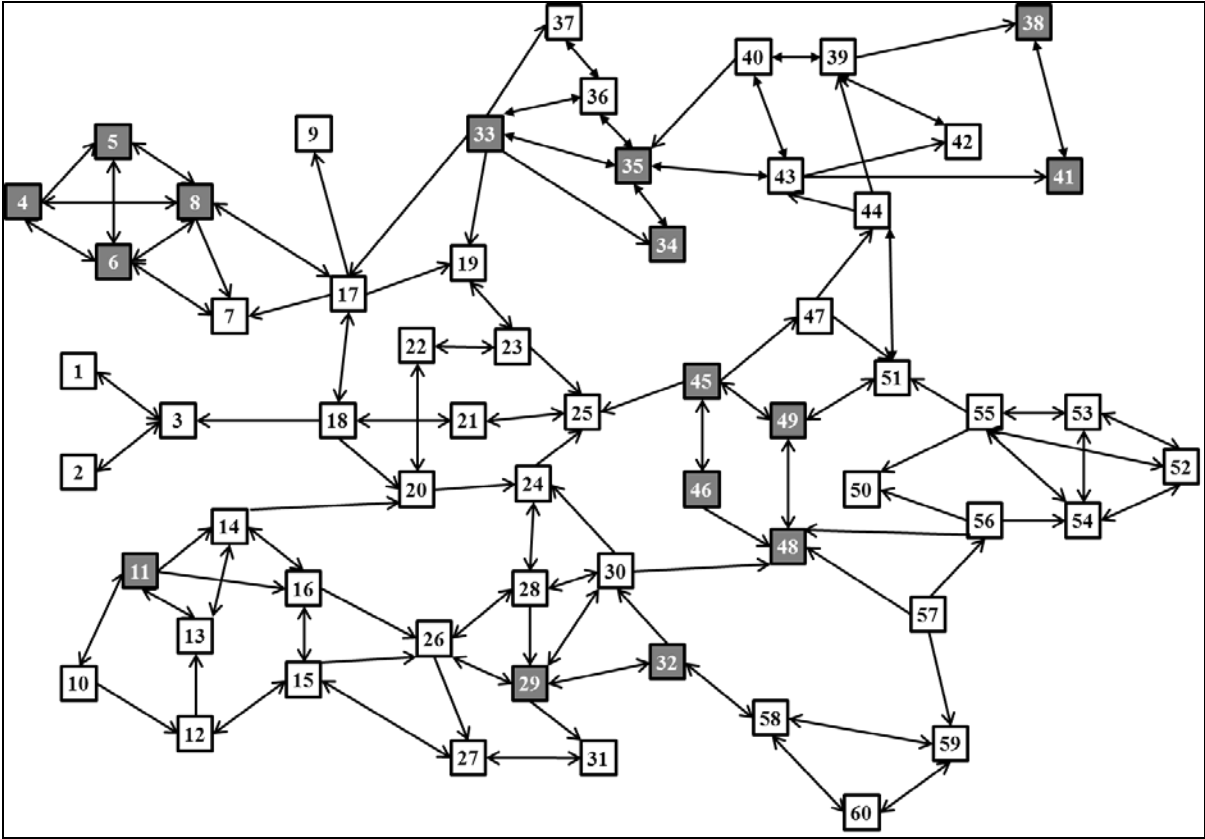
Figures

Figure 1. Social network with boxes representing nodes (white: majority members; grey:

minority members) and lines representing network ties (arrows indicate a nominated member)