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Personal Networks and Egocentric Analysis

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INTRODUCTION

Scope

Egocentric analysis is the subset of network research that, rather than examining the network as a whole, is concerned with particular nodes and those nodes' connections. In egocentric analysis, the focal node is termed 'ego' and the nodes to which it is connected, 'alters'. The researcher typically studies not only the connections between ego and alter but also those among the alters themselves. Egocentric research is wide ranging, and this chapter focuses on what is probably the largest and most influential subset of that work.

First, the chapter focuses on egocentric research using primarily one type of data. Egocentric analysts may work with sociocentric or egocentric data. When working with sociocentric data, as in data on all connections among employees in a company, the analyst typically identifies nodes of interest – such as female managers or upwardly mobile employees – and examines the nature, evolution, or consequences of the network of alters surrounding those nodes. A good analyst in such context takes into account that all nodes in the dataset are ultimately connected in a proximate network, and thus examines the data both egocentrically and sociocentrically. When working with egocentric data, as in the connections of a representative sample of Americans, the analyst typically examines the nature, evolution, or consequences of the ego network without concern that each ego may be connected to others. The most important contributions to egocentric analysis as such have been produced by researchers working with egocentric data, and these will be our focus.

Second, the chapter largely focuses on only one kind of unit. Egocentric data may be collected on individuals, organisations, websites, countries, or any kind of entity for which there is interest in focal egos. However, most of the important work has focused on people and their social ties, or what has been termed the 'personal network'. Thus, the personal network will be our focus.

In what follows, we examine the strengths and weaknesses of personal-network, egocentric analysis; assess its early contributions; and discuss its extraordinary resurgence (see McCarty et al., 2019; Perry et al., 2018; Small et al., 2021a). After briefly highlighting a few historical contributions important to today's work, we discuss the relationship between egocentric analysis and three research traditions with which it partly overlaps. We then turn attention to the most important instrument in the collection of egocentric data, the name generator, assessing its advantages and

disadvantages. Finally, we assess the recent work on egocentric analysis, which has asked new questions, adopted entirely new perspectives and relied on data well beyond the traditional egocentric dataset. We argue that, because of its unique strengths, egocentric analysis has become one of the most promising areas of growth in social network analysis.

Background

In both sociocentric and egocentric analysis, the history of current research can be traced to works in mid-20th-century anthropology, psychiatry, psychology, sociology and other fields (e.g., Mitchell, 1969), with some formative ideas dating to the late 19th century (Simmel, 1971) and even into antiquity (Aristotle, 1943). A general history of network analysis may be found in Freeman (2004) and a particular history of egocentric analysis in Small et al. (2021b). Two elements of the latter history are important to recount as they provided the conceptual foundation for today's understanding of the personal network and the methodological foundation for much of the current survey work on egocentric studies.

The first element is part of the history of anthropology. Among fieldworkers in the 1950s and 1960s working to systematise the relations and social influence they were observing, a major concern was what Mitchell (1969, p. 12) called 'anchorage', or 'the point of orientation of a social network'. The anthropologists and ethnographer-sociologists of the time were familiar with the work in sociometrics that traced network processes in classrooms and other small contexts. But when studying entire communities – such as the small cities in southern and central Africa that many of the Manchester anthropologists observed – it was impossible for the fieldworkers to trace all possible connections that might influence a person.

As Mitchell put it,

> The sociometrists normally work with a distinct group of subjects – the boys in a scout troop or the children in a classroom. But the problem for the sociologist is more difficult since he is concerned with the behaviour of individuals in a social situation which may be affected by circumstances beyond the immediate context. The person to whom the actor is orienting his behaviour may not be physically present though he would almost certainly be in the individual's personal network.
>
> (Mitchell, 1969, p. 13)

The researchers out in the field were typically concerned with far more than the behaviour in a single classroom or organisation.

> How far the links of a network need be traced depends entirely upon the field-worker's judgment of what links are significant in explaining the behaviour of the people with whom he is concerned. This implies that normally a network must be traced from some initial starting point: it must be anchored on a reference point.
>
> (Mitchell, 1969, p. 13)

He continued:

> The point of anchorage of a network is usually taken to be some specified individual whose behaviour the observer wishes to interpret … This has led to the specification of this type of network as ego-centered though the term 'personal network' may be more acceptable.
>
> (Mitchell, 1969, p. 13)

Deciding where to anchor the observation was important, and the individual was an effective starting point. Thus emerged the personal network tradition.

The second element is part of the history of survey research, where a central figure for what later would become egocentric analysis was Paul Lazarsfeld. As Small et al. (2021b, p. 8) put it,

> Probably his most important study for egocentric analysis was Katz and Lazarsfeld (1955), which attempted to understand how the political opinions of residents of Decatur, IL were affected by social influences. Rather than asking respondents in general terms whether they tended to trust others' views, the authors asked respondents to name those who had an influence on their opinions: 'Do you know anyone around here who keeps up with the news and whom you can trust to let you know what is really going on?' (1955: 140). This kind of question, which later became known as a 'name generator,' was a crucial innovation, as it allowed the authors to know exactly who had been influential.

Asking people to report the names of those who influenced them was a crucial first step. About a decade later, and working with the Detroit Area Study, Laumann did something similar but added a step, which was to ask respondents whether those they were connected to were in turn connected to one another (Laumann, 1973, pp. 264–268). This additional step allowed Laumann to construct a personal network for each survey

respondent. This work is the foundation of today's egocentric research survey tradition, where reconstructing individuals' networks, often with more than one name generator, is the most common point of departure.

THE EGOCENTRIC TRADITION

The core belief in egocentric research is that the network of people in an individual's immediate environment shapes their behaviour and well-being. Different researchers focus on different aspects of these relations. Some examine how the nature or structure of the network affect individuals. Others study how people use or activate their network, including how through consultation with or suggestion, support, or nagging from others they make decisions. Part of this work is the study of conflict and competition. Still others examine where personal networks come from and why people have the networks they do.

Egocentric researchers today hail from several different subfields with somewhat different interests. Examining those subfields in relation to egocentric research will prove useful. See Figure 31.1.

Egocentric vs Sociocentric Analysis

Egocentric analysis is ultimately a subset of network analysis, and its most important analytical connections are to sociocentric network research. Sociocentric network research has been primarily concerned with understanding the structure of the whole network, its evolution and its consequences (Brass, 1984; Wasserman & Faust, 1994). Thus, sociocentric data collection has involved selecting a bounded set of actors in a given context (e.g., a classroom, a department in a corporation, a street gang) and recording the ties between all pairs of

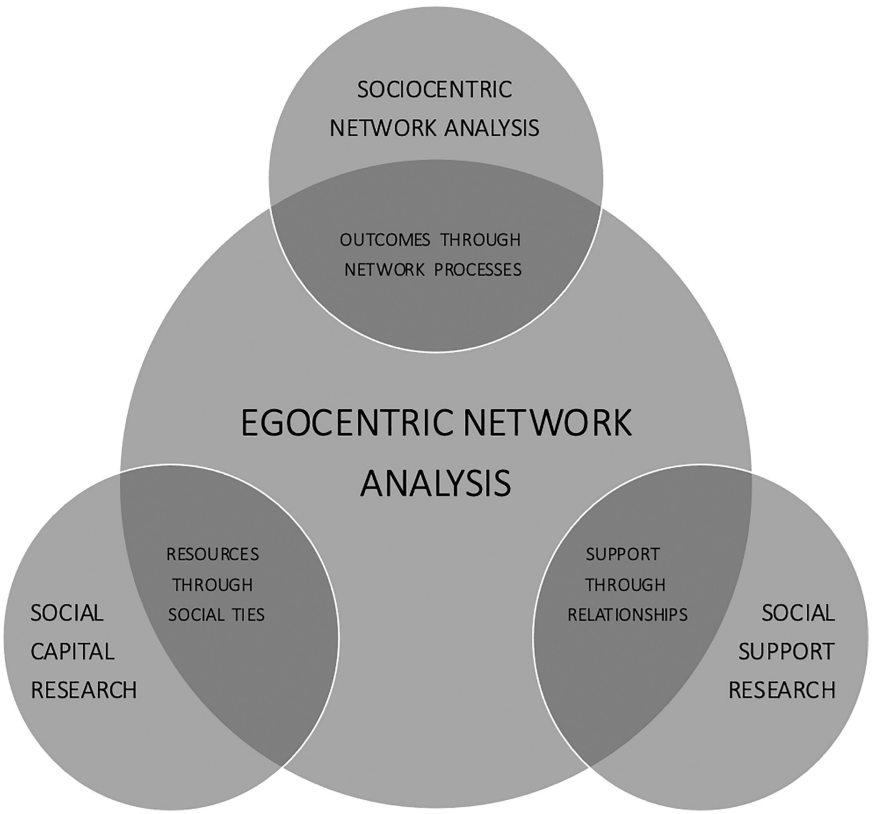

Figure 31.1 The relationship between egocentric network analysis and other research traditions

actors in it. The sociocentric analyst can therefore map the whole network structure, including consequential ties that are present and those that are not. As we have discussed, many researchers use sociocentric data egocentrically. As Borgatti et al. (2013, p. 262) put it, one 'can simply extract the subgraph corresponding to any particular node's first-order neighborhood, which we can call an ego-network'. But the larger egocentric tradition has examined network structure from a different perspective that addresses some of the limitations of sociocentric data.

Whole network data on individuals have two practical and two fundamental problems. The practical one is that such data can be labour-intensive to collect because they require obtaining the connections between each pair of nodes. If individuals are involved, each person must (usually) be asked about the connections to every other person, limiting the size of networks that can be studied and the number of types of relations that can be asked about. For this reason, sociocentric datasets historically have been small (see Wasserman & Faust, 1994). The second practical problem stems from the most common solution to the first. Concerned with the limits of the small samples of yesteryear, many sociocentric analysts today who are concerned with individual behaviour use data collected from companies, often social media companies such as Twitter or Facebook. Because such data collection was not designed by social scientists, the resulting data are often limited in important ways (Grigoropoulou & Small, 2022). For example, they may lack demographic data on individuals or only partially capture an important social concept. With time, increasing data availability and the possibility of merging datasets from separate companies, some of these limitations will probably be redressed.

Nonetheless, two fundamental problems remain. One is that sociocentric data have limited external validity or statistical representativeness (Perry et al., 2018). Because they must involve one bounded set of actors, or one network, generalisation to other networks is difficult. To address this problem, a researcher could randomly select many whole networks (i.e., a sample) from a population of networks to make inferences about networks in general, but resource constraints make this approach impractical except in unusual circumstances. The second is what Laumann et al. (1989) called the 'boundary specification problem' (see Perry & Roth, 2021). Because sociocentric data must be collected on a bounded group, the analyst is forced to assume that relations to individuals outside the group play no role in the behaviour of those inside it. For many questions, that assumption is untenable. For example, an analyst with data (and only data) on all ties among all students in a school must assume that none of the teachers, or parents, or friends in nearby schools affect the network behaviour of the students. Even if an analyst had data on, say, the entire universe of Facebook users, the researcher would need to assume that people not on Facebook – and behaviour of Facebook users outside Facebook – has no impact on the network behaviour of those on Facebook. This problem characterises all sociocentric data, and the degree to which it matters depends on the questions at hand.

Egocentric data address some of these problems. Because probability sampling can be used to select ego respondents, it is possible to make inferences about a population of egos or their networks from a sample. And because researchers need not sample from a given context (such as a school), they do not face the sociocentric boundary specification problem. For example, they can study a sample of Americans and elicit their personal networks in school, at work, and in their neighbourhoods. Egocentric researchers, therefore, often study the implications of being embedded in multiple overlapping social circles (Simmel, 1955).

Egocentric data collected in this fashion have their own disadvantages. One is that all information about networks is elicited from egos, meaning that these are essentially studies of egos' perceptions of their networks, which may or may not be accurate (see Sun et al., 2021). A researcher may then contact the alters to assess the accuracy of ego's reports (see Laumann, 1973), and even to elicite alters' own alters. However, there are logistical limits to how many steps from ego an analyst can go, and the broader social structure from which egocentric networks are derived and in which they are embedded are rarely captured with such data.

Egocentric Analysis vs Social Support Research

Egocentric research shares concerns with research on social support. Both assume that people's well-being is affected by those around them (Cohen & Syme, 1985; House et al., 1988; Lin & Peek, 1999; Pearlin, 1999). Like some egocentric researchers (e.g., Wellman & Wortley, 1990), some social support researchers aim to specify which types of support are available to an individual, who provides them, and under what circumstances. And, both tend to focus on the individual.

Nevertheless, the origins of social support research are in social psychology, while those of egocentric analysis are in structural network

research. Consequently, the two perspectives diverge when it comes to structure. The traditional social support perspective is astructural, focusing instead on individuals' perceptions of the functions of social ties and the quality and availability of support resources accessible through relationships (Cohen & Syme, 1985; Coyne & Downey, 1991). In that tradition, social support is conceived as a psychosocial resource (Thoits, 1995), one of a set of tools available in response to stressful situations (Pearlin & Aneshensel, 1986). As such, the social support tradition tends to prioritise close ties (i.e., friends, family members and romantic relationships) and the positive characteristics of relationships, largely ignoring weaker ties and those that are conflictual, burdensome, or otherwise have a negative influence.

Accordingly, the two research traditions also differ considerably with respect to what they measure. Traditional social support research measures the actual or perceived support resources available to individuals. Its support scales are designed to capture one or more latent constructs, usually perceived support from the network as a whole or from subgroups like family or friends. It does not traditionally elicit individual alters through a name generator. As a result, though it provides detailed insight into people's belief in the supportiveness of their interpersonal environments, it is unable to capture how network structure affects support processes and individual well-being.

Egocentric Analysis vs Social Capital Research

Social capital research is comprised of two distinct traditions, one concerned with communities and the other with individuals (Portes, 2000). Research on the social capital of individuals is most relevant to egocentric analysis. That social capital tradition, with origins in the work of Loury (1977), Bourdieu (1985) and Coleman (1988), argues that people secure resources from investment in their social ties (Lin, 1999; Monge & Contractor, 2003). Those resources are diverse in type, and they include high trust, norms of reciprocity or cooperation, access to valuable information and economic opportunities (Granovetter, 1973; Coleman 1988, 1990; Lin, 1999; Portes, 1998, 2000). Researchers have shown that greater access to and mobilisation of social capital is associated with better jobs, upward mobility, higher salaries and other outcomes.

Egocentric analysts and social capital researchers both see individual well-being as tied to social networks. But while traditionally the former paid attention to the structural characteristics of networks, the latter traditionally focused only on the particular resources (trust, information, etc.) contained in the networks, regardless of their structural characteristics. Today, egocentric analysts borrow liberally from the perspectives of social capital research (e.g., Hampton, 2011; Perry et al., 2021).

Two areas of overlap have come to be especially important. One is the difference between availability and use. Social capital researchers have distinguished 'access to' from 'mobilisation of' social capital (Lin, 1999). The former refers to the social capital resources people gain merely by being embedded in a particular network, as when highly successful managers, because of their connections, receive more unsolicited job offers through their acquaintances. The latter refers to the social capital resources that people secure by expressly turning to their network, as when unemployed people actively turn to those they know in search of a job. Egocentric analysts have pursued analogous lines of work. At times they examine how the characteristics of the personal network (its density, the composition of its members, etc.) are associated with well-being. Others examine the process of mobilisation itself (Small, 2021). This work includes examining which members of their network people cognitively 'activate', or think about, when turning to others for help (Sun et al., 2021).

The second area of overlap involves the design of specific instruments to elicit names for analysis. To understand these, we must first examine in closer detail the most common tool of the egocentric researcher, the name generator (Bidart & Charbonneau, 2011; Bott, 1955; McCallister & Fischer, 1982; Small, 2017). As we shall see, the name generator has been a crucial tool, but also one with several limitations, and social capital researchers have addressed some of these limitations.

ELICITING NETWORKS

The Name Generator

The name generator is the tool most often used for eliciting social networks in egocentric research. Its importance to the resulting analysis is difficult to overstate. The total number of family, friends, friends of friends, co-workers, acquaintances and distal others that could affect a person's decisions, behaviour, support, well-being, or opportunities is far larger than any instrument can elicit, as researchers have found that even the weakest of

social connections can be crucial to outcomes like finding a job or receiving social support (e.g., Granovetter, 1974; Small, 2017). Since no generator can capture all of these, the decision of which generator to employ is critical (Marin 2004; McCarty et al., 2007; Smith & Moody, 2013; Perry & Pescosolido, 2012; Perry et al., 2018; McCarty et al., 2019).

The difficulty of selecting a name generator is magnified by the fact that there are many different types of possible relations an instrument could elicit. The most common types have involved: affect, or alters to whom ego has a particular feeling such as closeness, intimacy, or affinity (e.g., 'who are you close to?'); resource, or alters who provide a particular good or service (e.g., 'who would you borrow money from?'); interaction, or alters who are encountered in a particular period or context (e.g., 'who did you talk to in the last 24 hours?'); roles, or alters who play a given role in ego's life (e.g., 'who are your co-workers?'); and content, or alters who possess a given characteristic of interest (e.g., 'who do you know who is politically conservative?'). Any decision requires excluding a major part of the personal network. As a result, some have argued strongly that addressing such problems calls for multiple generators (Fischer, 1982), but network data can be time consuming to elicit, and the amount of time to reconstruct a total network increases exponentially with the number of names elicited. Thus, most researchers have selected one name generator.

In doing so, researchers have usually followed one of two strategies. Those following a *focused* approach identify a specific research aim and design an elicitation instrument geared to that end. For example, they select an instrument based on the type of relation most relevant to their question, such as the alters ego turned to for information about jobs (Granovetter, 1974) or those whom ego turned to when needing someone to talk to (Small, 2017). In general, focused name generators are powerful when closely aligned with theory but are limited with respect to the scope of research questions that can be answered. Those following an *expansive* approach seek a general name generator that allows for more flexible analysis and the inclusion of weaker and more diverse ties. For example, they might ask respondents to name those they are 'very' and 'somewhat close to' (Wellman et al., 2005). Such strategies tend to produce larger networks.

Regardless of whether their approach is focused or expansive, designers of a name generator have had to confront that ego must be relied on to report on the relation to alters (see Hammer, 1984; Brewer, 2000). Two of the most important challenges are comprehension and recall (see Small & Cook, 2021). 'Comprehension' here refers not only to whether people understand the instrument but also to how they interpret it. For example, in a study of General Social Survey's name generator instrument, Bailey and Marsden (1999) found that when asked whom they talked to about 'important matters', 'many respondents did not find the notion of important matters to be straightforward' (1999, p. 298). Moreover, different people believed the instrument to be eliciting different things, such as who was important to them and whom they talked to regularly. A very different but analogous problem emerges in the context of online surveys, which have become an increasingly popular way of eliciting personal networks. The online format allows for many different ways of presenting an instrument, and the way it is presented has been shown to affect what people report. For example, Vehovar et al. (2008) show that the number of alters reported by a name generator is sensitive to the number of boxes presented on the screen for people to input the elicited names (see also Coromina & Coenders, 2006). Researchers would do well to understand exactly how respondents interpret a given instrument.

The second problem is recall, which can result in both error and bias. Forgetting to name relevant alters is a nontrivial problem, affecting about 20 percent of alters even in more intimate core networks in test-retest conditions in a recent study (Brewer, 2000). Research suggests that people are biased towards recalling more salient alters, such as those they are closest to, those they see or talk to regularly, and those they have known the longest (Brewer, 2000). Forgetting has also been shown to be more prevalent in larger networks that are less densely connected (Bell et al., 2007; Brewer, 2000; Marin, 2004), and when the exchange or interaction relation is less specific and more ambiguous (Bell et al., 2007). Moreover, recall errors can truncate network size and inflate network density, as well as bias aggregated measures of tie strength or function towards more intimacy, support and frequent interaction (Brewer & Webster, 1999; Marin, 2004; see also Campbell & Lee, 1991). (More on this topic below.)

The most commonly used instrument to elicit a personal network is the 'important matters' name generator from the General Social Survey (GSS). In 1985, the GSS adopted a single name generator from Fischer's (1982) Northern California Community Study (Burt, 1984; Marsden, 1987; McPherson et al., 2006), 'From time to time, most people discuss important personal matters with other people. Looking back over the last six months, who are the people with whom you have discussed an important personal matter?' The idea was to use an expansive, rather than focused,

instrument that might have wide application; the resulting network was termed the 'core discussion network'. Its inclusion on the GSS quickly made this name generator a mainstay of research on personal social networks. While the important matters generator was believed to elicit a set of supportive, stable, emotionally close alters that might be predictive of a variety of outcomes, a significant body of research has challenged this assumption (Bearman & Parigi, 2004; Brashears, 2014; Small, 2013, 2017). For example, Small's (2013) research suggests that about half of the important matters network is comprised of alters who are not important to ego, and that people tend to seek discussants who are available when they need to talk or who are relevant to the topics they want to talk about. Moreover, researchers have found that the expansiveness of the instrument has undermined its predictive power. For example, studies attempting to predict health outcomes on its basis have found the instrument weak, particularly in comparison with an instrument that asks whom respondents talk to specifically about health matters (Perry & Pescosolido, 2010; York Cornwell & Waite, 2012).

The Name Interpreter

In most egocentric data collection, name generators are followed by 'name interpreters', or questions about the characteristics or attributes of the alters named. Name interpreters can capture demographic traits (e.g., alter's gender, education, employment status, etc.) or the relational characteristics described earlier, such as affect, role and interaction relations. As such, they can dramatically improve the power of name generators. For example, rather than limiting the generator to a particular type of relation, the researcher might use a very general name generator and follow up by asking about the specific relations to those alters named. Interpreters capture essential and influential characteristics of alters, such as how the ego and alter are connected. The flexibility in use of name interpreters means that the resulting measures can be predictive of a broad range of outcomes.

Name interpreters require proxy reporting about alters and subjective assessments of relationships that may be biased (Blair et al., 1991; Epley, 2008). The accuracy of proxy reporting depends on the nature of the relationship between ego and alter; more accurate reports have been found for closer alters contacted more frequently (Reysen et al., 2014; Shelley et al., 2006; Triplett, 2013). Reporting accuracy also depends on the nature of the information being elicited. Reports of status characteristics, such as education or marital status, have typically been more reliable than those of attitudes, beliefs or private information (Nelson et al., 1994; Kitts, 2003; Laumann, 1969). Research on abortion, miscarriage, HIV status and related sensitive topics suggests that private or stigmatising information is often shared selectively with like-minded or sympathetic members of social networks (Cowan, 2014; Shelley et al. 1995; Shelley et al., 2006), and that proxy reports of such information tend to be biased towards ego's own worldview (Goel et al., 2010). Conversely, when asked to identify the views of someone whose perspective differs from their own, people often rely on stereotypes (Epley & Caruso, 2008; Goel et al., 2010). Such issues call for caution in the interpretation of name generators.

The Network

A crucial step in egocentric network research is the elicitation of ties between alters, a process that allows for the calculation of structural measures of networks. Most often alter–alter ties are recorded by asking about one type of relationship between every pair of alters (e.g., 'Do [NAME1] and [NAME2] know each other well?'). If a large number of alters is produced, the process can be time consuming (Manfreda et al., 2004). There have been several solutions. Often, the researcher is interested in only a small number of alters. For example, the average number of alters produced by the GSS 'important maters' name generator is three, with a maximum of six or seven. Other times, researchers employ information previously elicited from name interpreters. For example, if two alters have previously been reported as siblings of ego, the researcher does not then ask whether those two alters know each other. Such solutions can be implemented in person or programmed into online survey software. As a third alternative, respondents have been presented personal network maps where they can draw lines between visually depicted alters. Finally, some research suggests that selecting a random subset of alters for enquiry – rather than all alters named – can produce high-quality estimates of structural measures (McCarty et al., 2007; Peng et al., 2022).

Position and Resource Generators

While the name generator is a powerful tool for egocentric analysis, it has important limitations

for those interested in social capital. One is that, unless it is unusually expansive, it can ignore weak ties known by both social capital and network researchers to be valuable in the context of upward mobility (Granovetter, 1974). One alternative is the *position generator*, which asks respondents whether they know someone in a set of occupations (Lin & Dumin, 1986; Lin, 2002). A typical position generator presents a list of around twenty occupations, ranging in prestige from lower blue-collar (e.g., labourer, server/bartender) to upper white-collar (e.g., lawyer, small business owner). Respondents who know someone in a given occupation are asked a series of follow-up questions (akin to name interpreters) about the alter. These data are used to construct measures of highest accessed prestige and the number and prestige range of positions accessed. Lin developed the position generator to be 'content free', meaning the measures can be used for any substantive application of social capital theory and in cross-national research (Lin et al., 2001; Van der Gaag & Webber, 2008).

Like position generators, *resource generators* are designed to explicitly assess the diversity of distinct kinds of social capital accessible through personal social networks (Van der Gaag & Snijders, 2005). However, in this case, specific resources are measured directly rather than inferring access to resources through alters' occupational prestige. The organisation and administration of the resource generator is like the position generator except that social resources are presented instead of occupations (e.g., 'Do you know anyone who knows how to fix problems with computers?'). If yes, the respondent is asked about their relationship to that alter (typically acquaintance, friend, or family member) to operationalise ability to leverage the resources for their own goals. The resources are then scaled into latent classes of social capital (e.g., political and financial skills social capital; Van der Gaag & Snijders, 2005).

Position and resource generators are very useful for testing theories of social capital, which are an important component of the social network perspective. However, access to social capital (either through alters' occupations or specific knowledge or skills) is only a subset of the range of network functions and mechanisms captured through name generators and of interest to ego-network researchers, making these more restrictive approaches. For example, position generators are less useful for capturing expressive (as opposed to material or instrumental) resources and those that do not depend on labour market participation (Van der Gaag et al., 2008); the efficacy of emotional support is unlikely to be affected by occupation. More broadly, these instruments are narrowly concerned with resource exchange, and thus ignore everything else (e.g., norms and values, misinformation, infectious diseases) that flow through social ties. As such, the egocentric network approach and its primary methodological tools – name generators and interpreters – have proven more flexible and versatile for testing a diverse range of network theories.

NEW DIRECTIONS

The last decade or two have seen a rapid expansion of egocentric network analysis, with multiple conferences, special issues of journals (e.g., *Network Science*; Perry et al., 2020) and multiple volumes (Perry et al., 2018; McCarty et al., 2019; Small et al., 2021a) devoted exclusively to egocentric analysis. In what follows we discuss a sampling of the topics this new work has covered (see also Small et al., 2021a, Part IV).

Strength

The notion of tie strength has long been a feature of the study of personal networks. It played a major role in Granovetter's (1973) argument that weak ties are more likely to be bridges; it was instrumental to what proponents of the GSS name generator believed they captured when asking with whom people discussed important matters (Burt, 1984; Marsden, 1987); and it was thought to be the most supportive type of relation (but see Thoits, 2011; Small, 2017). In recent years, scholars have unpacked both the idea of strength and its implications.

Several have sought to more precisely define 'strength'. Granovetter (1973, p. 1361) had defined 'the strength of a tie [as] a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie', thereby suggesting that exchange, interactional and affective features combined to characterise an alter as close (see Krackhardt, 1992). A key part of this view is that strength can be understood in a single dimension, typically operationalised as either frequency of interaction or closeness (see Brashears & Quintane, 2018). Granovetter had also offered the oft-repeated rule of thumb that weak ties – which are more likely to be bridges – provide information, while strong ties provide support (Granovetter, 1983).

But Aral and Van Alstyne (2011) showed that this expectation about weak ties was simplistic – weak ties may provide information that is more novel but they also provide less of it, such that there is a trade-off between diversity and bandwidth. Information flow is greater through strong ties; information is more novel through weak ones. Small (2017) showed that the rule of thumb's expectation about strong ties often does not hold – weak ties are effective sources of support, as people are more likely to trust them than expected. Brashears and Quintane (2018), focused again on information transmission, argued expressly that strength contains at least two separate dimensions, '*capacity*, the ability of a tie to transfer information … and *frequency*, the inverse of the average length of time between uses of a tie' (2018, p. 105). The authors show that the two properties, plus *redundancy*, or 'the extent to which the two participants in a tie share common third-parties' (2018, p. 105), separately help account for access to new information. Focused on support, but from a very different perspective, Offer and Fischer (2018) upend the idea that people to whom individuals are close constitute supportive, positive relations. Studying who in their personal networks people find 'difficult', they show that close family members are significantly more likely to be in that category. The work contributes to new research examining negative ties. Collectively, this body of work has questioned the notion of strength as an all-purpose category and more carefully unpacks the dynamics through which information, support and other interpersonal processes operate.

Mobilisation

As we discussed, social capital researchers had identified 'access to' and 'mobilisation of' social capital as different processes (Lin, 1999). The study of mobilisation, however, has been part of several bodies of work, which have examined the same notion using different terms, including 'help-seeking behaviour' and the 'activation of social ties' (e.g., Pescosolido, 1992; Smith, 2005; Small, 2017, 2021; Smith et al., 2020). This work has shared a focus on understanding how people decide whether to turn to others, and whom to turn to, when needing information, support, a service, a good, or some other social resource.

Some of the work has centred specifically on the mobilisation decision. Researchers have proposed that people differentiate among alters and decide whom to turn to based on the match between the need and the skills or resources possessed by the alter (Perry & Pescosolido, 2010; 2012; also Wellman & Wortley, 1990; Bearman & Parigi, 2004). Others have argued that people often do not deliberate on the matter, and may at times decide based mainly on opportunity or availability (Small & Sukhu, 2016; Small, 2017, 2021). Other works have shown that cognitive processes affect who people call to mind when deciding they need help, such that both how alters are stored in memory and how recall operates shape the process (Sun et al., 2021; see below). Still others have argued that, rather than examining a single decision, researchers should focus on sets of decisions, given that many conditions for which people need help are recurring or ongoing (Pescosolido, 1992).

One development from research on mobilisation has been methodological. Rather than beginning by mapping the personal network via a name generator, researchers have argued that beginning with either the need for help or with the event are essential to understand mobilisation. Pescosolido (1992) has shown that beginning not with the network but with the pattern of decisions shows that the network of support is broader than often believed and that the features of interaction are more important than typically understood. Small (2017) has shown that if, instead of eliciting the network of those they talk to, respondents are first asked to report the issues for which they have needed someone to talk to, the resulting set of alters – those they actually talked to about those issues – is more likely to include weak ties (see Small, 2021, for an extensive discussion). These works bear a similarity to earlier anthropological work by Boswell (1969), who argued that 'the crisis situation' was the key starting point to understand how social networks are mobilised by those in need.

Cognition

An area that has expanded rapidly focuses on networks, cognition and the brain (see Brashears & Money, this volume). This research is rooted in human evolutionary theories of the social brain. These suggest that humans' large brains and high intelligence evolved to remember and process increasingly complex social information required to adapt to life in larger social groups (Brashears & Brashears, 2019). While early research in this area claimed that the brain could only hold a finite number of people in memory – and, thus, in a personal network – more recent studies have consistently shown that human social networks exceed this number (Dunbar, 1992; McCarty et al., 2001; Omodei et al., 2017). Researchers have shown that the large capacity is due to

compression heuristics, or cognitive schemas that facilitate recall and information processing (Brashears, 2013). Individuals can recall their networks using partial information, rather than having to remember every tie (Omodei et al., 2017). Research has provided evidence for a number of compression heuristics. For example, experimental studies have shown that people recall social networks more accurately when networks exhibit triadic closure and affective balance (Brashears, 2013; Brashears & Brashears, 2016).

This research provides important insight into methodological limitations and potential biases in egocentric network research (Perry et al., 2018). Compression heuristics may be especially likely to bias free recall when the name generating task is vague or subject to interpretation, and therefore more cognitively taxing (Omodei et al., 2017). This process would explain why respondents omit fewer alters when the elicitation references specific functions, roles, or contexts or provides a concrete cognitive anchor (Bell et al., 2007). Similarly, it would help explain why respondents are more likely to omit weaker bridging ties (i.e., those that connect ego to a set of actors unconnected to any other alters) or incidental ties (i.e., those that are activated for support or discussion because they happen to be accessible) (Brewer & Webster, 1999; Marin, 2004), even if they perform significant functions (Small & Sukhu, 2016). Taken together, this research suggests that compression heuristics tend to produce observed ego networks that are affectively strong, kin-centred and densely connected. To study social phenomena like diffusion, weak ties, or structural holes, specialised name generators that target unembedded and irregular interaction partners may be necessary.

The last decade has also seen an increase in research combining personal network analysis with neuroscience. Some studies have shown that neural networks influence social learning and behaviour (Noonan et al., 2018; Schmälzle et al., 2017) and, conversely, that social experiences and environments shape brain structure and function (Peer et al., 2021; Sallet et al., 2011). For example, a recent study examined how large egocentric networks are represented in the brain using Facebook data and functional magnetic resonance imaging (fMRI), a technology that measures the amount and location of brain activity (Peer et al., 2021). The authors found that thinking about the structural position of alters in the ego network activated the part of the brain involved in spatial processing, indicating that social and spatial distance may be processed similarly (see also Parkinson et al., 2014). Conversely, the personality traits of alters were coded in the region responsible for social cognitive processing, suggesting that encoding and retrieving information about social networks requires complex cooperation between different parts of the brain (Weaverdyck & Parkinson, 2018). In an experimental study (Schmälzle et al., 2017), researchers examined what happens to brain connectivity when people experience social exclusion, finding increased activity in areas of the brain responsible for understanding the mental states of others. Moreover, people whose brains exhibited more functional connectivity in those regions involved in 'mentalising' had less dense friendship networks (see also Falk & Bassett, 2017; Weaverdyck & Parkinson, 2018).

Context

Although early egocentric research tended to analyse personal networks in a context-less state, people's daily lives do not unfold in a vacuum. They unfold in a range of contexts which, in turn, influence their chances at forming and maintaining different types of personal networks. As such, there is a burgeoning body of literature that addresses how multiple contexts, particularly cultural, organisational and spatial contexts, shape personal networks.

We begin with cultural context. The traditional network model in the sociology of culture posits that social networks shape culture (DiMaggio, 1987; Erickson, 1996; Mark, 1998, 2003). This claim finds support in the social contagion literature, which asserts that social behaviours – including beliefs, tastes and preferences – are learned through interactions with others (Centola, 2015; Christakis & Fowler, 2013). However, the traditional network model has been criticised for framing culture as passively transmitted from person to person. Researchers have argued that one's cultural milieu influences their involvement in social relationships (Lizardo, 2006; Vaisey & Lizardo, 2010; see Bourdieu, 1986). For example, a person with 'highbrow' interests (e.g., opera, classical music) may leverage their cultural capital to integrate themselves with an elite crowd by signalling that they belong to the proper social class (Lizardo, 2006; see also McConnell, 2017). The more reasonable view today is therefore not that networks shape culture, but rather that culture and networks shape each other (Emirbayer & Goodwin, 1994, p. 1438). Egocentric research has been crucial to understanding how.

Unlike culture, organisations provide a tangible context in which individuals can form social relationships. Organisational contexts such as workplaces (Doreian & Conti, 2012; Sailer &

McCulloh, 2012), schools (McFarland et al., 2014; Small, 2017), voluntary groups (McPherson & Smith-Lovin, 1987) and childcare centres (Small, 2009) have been shown to be particularly important to personal networks, because they bring people into repeated contact with one another (Feld, 1981; Small, 2021). In this sense, organisations contribute to the selection pool of potential alters from whom an individual may eventually draw for his or her personal network (Mollenhorst et al., 2008).

Research on organisational context has paid special attention to how organisational characteristics shape patterns of network formation. For instance, Doreian and Conti (2012) analysed network data from a police academy and found that recruits tended to form friendship ties based on their academy's squad assignment and seating arrangement during formal lectures. Small (2009) studied mothers' involvement at childcare centres, and found that mothers whose children attended centres with more structured opportunities for social interactions (e.g., parent–teacher meetings, field trips) were more likely to develop friendships than mothers in centres with few such opportunities. Small and Gose (2020, p. 89) examined a wide array of studies of organisations involved in low-income populations and found that whether organisations contributed to tie formation depended 'on the degree to which an organization's institutional norms render interaction among participants frequent, long-lasting, focused on others, and centered on joint tasks'. Studies of this kind suggest that personal networks are formed not only in organisations but also by them (Small, 2021).

Research on the role of spatial context in personal networks is longstanding, with an especially large body of work studying how space affects the formation of social ties (see Small & Adler, 2019, for a review). Numerous early network studies noted that people are more likely to form ties when situated in spatially proximate locations (Bossard, 1932; Caplow & Forman, 1950; Festinger et al., 1950; Lawton & Nahemow, 1973). For example, people are more likely to know their nextdoor neighbour than they are to know their neighbour two doors down, three doors down and so on (Sudman, 1988). Others have found that, even with recent advances in communication technology, geographic distance separating individuals across towns, states and even nations dramatically influences the probability of tie formation (Laniado et al., 2018; Spiro et al., 2016).

Although proximity matters, the composition and configuration of space matter as well. Spatial composition refers to the presence of gathering places conducive to social interaction, such as parks, bars, restaurants, libraries and religious centres (Small & Adler, 2019). Such places can not only enable social interaction, but also actively encourage it (Feld, 1981; Klinenberg, 2018; Oldenburg, 1999). Spaces devoid of such places can contribute to social isolation (Klinenberg, 2002; Wilson, 1987). The configuration of space refers to 'the arrangement of physical barriers and pathways that result in the segmentation of a space' (Small & Adler, 2019, p. 120). Researchers in recent years have shown that features of spaces such as the arrangement of offices in a hallway and the position of elevators in a building shape the formation of social relations (e.g., Sailer & McCulloh, 2012).

Research on cultural, organisational, or spatial context has provided a great deal of insight into how the personal network is formed. In doing so, it has relied on many kinds of data, not all of them egocentric in nature. Studies have relied on organisational, not just individual-level data; they have been based on ethnographic observation, not just network elicitation. Today's research on personal networks has often expanded well beyond the confines of egocentric data.

Dynamics

Traditional egocentric studies almost exclusively focused on cross-sectional accounts of personal networks. An increasing number of studies are directing attention to the dynamic and evolutionary nature of personal networks. Researchers have studied several processes contributing to dynamic changes in the personal network. One is social context. Transitions into and out of different social contexts – such as school, workplace and neighbourhood – are likely to cause individuals to form new ties and dissolve old ones (Bidart & Lavenu, 2005; Small et al., 2015; Badawy et al., 2018; Comi et al., 2022). In addition, the adoption of new social roles – such as parent, patient, caregiver – has been shown to induce network changes, as needs and interests shift in response to new responsibilities or expectations (Kalmijn, 2012; Perry & Pescosolido, 2012; Roth, 2020; see also Charles & Carstensen, 2010).

A different body of work has examined turnover in the personal network. While many have documented that individuals add and subtract members from their personal networks through a variety of mechanisms, an interesting finding has shown that the size, structure and composition of personal networks tends to remain relatively stable even as network members turn over (Wellman et al., 1997; Small et al., 2015; Cornwell et al., 2021). For example, Small et al. (2015) tracked the personal networks of incoming graduate students

and found that most tended to substitute old alters with new ones, rather than expanding or shrinking the overall size of their networks. One explanation suggests that every individual has a distinctive 'social signature' that is highlighted by a habitual pattern of social interaction (Saramäki et al., 2014). Individuals may tend to develop archetypal relationships that are unique to their personal history, regardless of who alters are as individuals.

CONCLUSION

The accelerated growth of egocentric network analysis over the past decade foretells a promising future. Traditional methods and questions have given way to new approaches by researchers comfortable with understanding personal networks from methodological perspectives not common to structural analysis; with incorporating ideas from fields such as neuroscience and anthropology; and with asking questions about decision, context, or culture, or space that either had not been asked or had lain dormant for several decades. We believe this work will contribute strongly to the expansion of network analysis well beyond the traditional confines of the field.

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