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Individuals' power and their social network accuracy: A situated cognition perspective

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ABSTRACT

Individuals differ in how accurately they perceive their social environment, but research and theory provide conflicting predictions on whether powerful people are more or less accurate than others. Drawing on social network theory and the situated cognition theory of power, we examine the relationship between individuals' formal and informal power and their perceptual accuracy of social network relationships. We propose that individuals' perceptual accuracy is related to: 1) their formal and informal power in the organization; 2) the type of relationship being perceived (positive/negative valence) and its relevance to task and goal completion; and 3) the dependence relationship with the target of perception (i.e., whether the perceiver is dependent on the perceived to get their work done). Predictions were tested using cognitive social structure data collected from a technical call center. Results showed that power was generally linked to increased perceptual accuracy, particularly for the types of relationships most relevant for task and goal completion. We further demonstrated that social network accuracy was related to employees' outcomes, including subsequent transfer, promotion, and exit from the organization.

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Social network theory views organizations as a nexus of formal and informal social relationships among a set of organizational actors (Borgatti et al., 2009). These social ties are viewed as key sources of benefits for individuals, including nonredundant information, social support, and status, as well as liabilities, including negative gossip and undermining (e.g., Borgatti et al., 2009; Brass et al., 2004; Duffy et al., 2002; Ellwardt et al., 2011; Kilduff and Brass, 2010; Labianca and Brass, 2006; Mehra et al., 2001). The predominant approach to studying social networks assumes that the network exists independent of each actor, and that the network is either a set of "pipes" through which resources flow or "prisms" through which others make judgments about each actor's status (Podolny, 2001).

However, many of the mechanisms suggested to underlie the benefits or liabilities of networks presume that the other network members *perceive* these relationships accurately. A tie is most useful as a pipe when people can accurately perceive the network and its flows (e.g., a friend who might provide social support), which allows for the greatest likelihood of successfully tapping into the resource flows. As a prism, being socially tied to a prestigious actor is unlikely to convey reflected status if observers don't perceive the relationship exists. A cognitive or perceptual view of relational ties is, thus, an important addition to understanding the full complexity of social networks (Brands, 2013). This cognitive perspective assumes that each individual forms mental maps or cognitive social structures (Krackhardt, 1987) of both their own social ties and the surrounding relationships in the broader social network. Cognitive social structures are the relationships that a person perceives to exist or not exist among network members (e.g., Kilduff et al., 2008; Krackhardt and Kilduff, 1999). For example, individuals hold perceptions of who interacts with whom and who are friends in a network, and these beliefs and perceptions can be unique for each individual in the network (e.g., Freeman et al., 1987). These mental maps are integral to how individuals interpret, experience, and interact with the social environment, and possibly influence their attitudes, decisions and subsequent behaviors.

Given the enormous amount of information individuals are exposed to in their social environment, it is reasonable to believe that not all information is processed or perceived equally accurately (Fiske and Taylor, 1991; Kenny and West, 2010). Thus, individuals' perceptions of the social relationships among actors can vary greatly, with some people having more accurate tie perceptions than others. Indeed, prior research finds that individuals' cognitive maps are prone to error (e.g., Bondonio, 1998; Casciaro et al., 1999), which is not surprising when considering that even a small network of only 25 individuals has 600 (N*(N−1)) potential dyadic relationships to track cognitively.

This potential for complication and cognitive overload makes errors highly likely, and these errors can have consequences. The degree to which individuals are accurate about or aware of the relationships in the social network might be a vital resource unto itself, potentially providing the cognitively accurate individual an information advantage over others. This might be particularly important for powerful individuals in the organization who can better leverage their so-

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cial knowledge in pursuit of their personal goals. For example, individuals with informal power derived from their advantageous position in a social network can use their social knowledge to maintain or improve their influence in the organization by, for example, building supporting coalitions to further their careers (Marineau, 2016; Mintzberg, 1983; Pfeffer, 1981). Accurately perceiving social relationships can also be important for those with formal power, such as managers, who have the authority to direct others' behavior in pursuit of organizational goals (French and Raven, 1959; Keltner et al., 2001). For example, if a manager needs to assign employees to a work team, but is unaware of which employees have conflictual or negative relationships, this can likely create a less effective team than if the manager can select team members with more positive relationships or with less relationship conflict (Jehn and Mannix, 2001; Jehn et al., 2008; Shaw et al., 2011).

While accurate perceptions of relationships might be particularly important for those with power in organizations, being powerful might in itself affect one's perceptual accuracy of the organization's social structure. Indeed, power has been linked to behavioral and cognitive consequences for those who wield it (Galinsky et al., 2011). For example, in her summation of the current research on the effects of power on individuals, Guinote noted that "power has a fundamental impact on how individuals perceive the world around them and how they behave" (2010: 141). Despite the importance of understanding this relationship, the effects of power on perceptions of social networks have received insufficient research attention. The few results have been consistent, but limited in scope—power tends to be related to *decreased* accuracy in perceiving the social network (Casciaro, 1998; Simpson et al., 2011). Recent theorizing in the social psychology of power, however, suggests that the power-network accuracy relationship might not be so clearly negative.

Our main theoretical contribution is to incorporate recent theorizing about the situated cognition approach to power (Guinote, 2010) into understanding how formal power (i.e., occupying a managerial position) and informal power (i.e., personal influence in the organization) might relate to employees' accuracy in perceiving networks in the workplace. This perspective suggests that power is related to *increased* flexibility in, attention to, and cognitive processing of social information (Guinote, 2007a) such that the powerful are able to block out peripheral information that is not task- or goal-oriented, while the powerless do not possess the same level of discretion (Guinote, 2010). This body of work suggests that power would lead to *increased* accuracy of the social world in certain task- and goal-oriented contexts, as well as awakening the attention of the powerful toward the less powerful. Specifically, we argue that the powerful will be more accurate than the less-powerful in perceiving ties involving negative affect and possible relationship conflict, which tend to threaten individuals' task and goal oriented outcomes, while there won't be an accuracy difference with regard to perceiving positive affective relations, which are less directly tied to task- and goal-oriented outcomes. We will further argue that the powerful will be more accurate for their direct incoming ties compared to the less powerful. We examine individuals' power both as formal position within the organizational hierarchy (i.e., being a manager) and as informal power based on peer influence nominations, each of which has implications for network accuracy in an organizational setting. In particular, we will show that those with informal power are more accurate about relationships with direct alters than less powerful others, while those with formal power are more accurate both about ties with direct alters as well as those that are more socially distant in the network.

This study answers the call for new research linking employee outcomes and network accuracy (Brands, 2013). We build off of our previous work, which showed that high-performing individuals who were accurate about their incoming trust and distrust ties were more likely to be promoted at work (Marineau, 2017). The current study extends this work in a number of ways: 1. by investigating key organizationally-relevant antecedents to being accurate about network ties – being in positions of formal and informal power; 2. by exploring the importance of being accurate about one's own ties as compared to others' ties in the broader network; and 3. by relating accuracy toa broader set of outcomes. Specifically, we will illustrate the influence ofindividuals' formal power on whether they will remain in their currentorganizational position, transfer to another department, receive a promotion,or exit the organization entirely, through their social network accuracy oftheir dislike and friendship ties.

We begin by articulating a view of the powerful as activating different priorities in cognitionand attention in how they perceive their social environment in comparison tothe less powerful. Then we compare the powerful and less powerful individuals' accuracy for the entire constellation of network relationships within the workplace –the *whole network* – followed by acomparison for their *own incoming socialnetwork ties*.

Theory and hypotheses

A few social network studies have attempted to relate power with accuracy in perceiving the whole network of relationships in an organization. Krackhardt (1990) controlled for formal power in his field study of network accuracy, but results showed no significant relationship between being a manager and the accuracy of a person's mental map of advice and friendship networks. Casciaro (1998) argued that individuals in higher hierarchical positions would have a greater interest in and access to work-related ties, such as advice ties, than friendship ties. However, in her field study, she found that power was negatively related to both friendship and advice network accuracy. In an experimental study, Simpson et al. (2011) theorized that individuals primed to experience low power in an experimental setting would make fewer errors when learning social networks than high power individuals. High- and low-power primed subjects did not differ statistically when considering only ties that were present, but low-power subjects were more accurate about absent ties. Thus, although the evidence is somewhat mixed, these studies suggest that power has some influence on how individuals perceive social information generally, and social networks specifically. Overall, the picture painted is one of powerful individuals being less accurate about networks, perhaps because of inattentiveness or employing automatic processing to rely on cognitive maps that are not updated frequently.

However, there has been a movement in social psychology away from viewing power as leading to more automatic processing, and powerlessness as leading to more controlled processing (Galinsky et al., 2011). For example, the situated cognition perspective suggests that the powerful are more flexible and have more selective attention in where and when controlled processing of social stimuli is activated as compared to the powerless (Guinote, 2007a). While power might relate generally to cognitive processing that leads to inaccuracy, powerful individuals' cognitions will effect cognitive priorities and filter out peripheral, non-essential information, allowing them to focus more attention on task and goal-oriented information, including social information, than the powerless. This approach views cognition as situated, in that individuals' social cognitive processes are adaptive and not static or insulated from context (Smith and Semin, 2004). Cognitive processing operates selectively, as it adapts to the "primary factors" of the situation, such as environmental cues, expectancies,

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and goals (Guinote, 2010: 147–148). Indeed, recent work has shown that powerful individuals are not cognitive misers or automatons, but have flexibility and focus in where and how they prioritize their attention and cognitive energy (e.g., Overbeck and Park, 2006). This view is best articulated by the situated focus theory of power (Guinote, 2010), which accounts for how a sense of power can allow the inhibition of peripheral information and instead increase focus on information related to relevant constructs such as goals, needs, or tasks (Guinote, 2007b).

Consistent with this situated focus perspective, we argue that the situation – work-related goals and priorities activated either by the formal power inherent in managerial status or by goals and priorities activated by informal power based on peer-rated influence – will differentially affect perceptions of various types of workplace social relationships. We are interested in relationships in the organization that can facilitate or hinder workplace collaboration and effectiveness. Previous studies have consistently included positive expressive ties (friendship) to examine network accuracy, and we follow this work; however, we also include negative expressive ties (dislike) to explore the relevance of power on both positive and negative ties in organizations. Expressive ties, whether positive or negative, have been consistently related to group and individual performance (Han and Van Dongen, 2015; Marineau et al., 2016; Mehra et al., 2006). Thus, we contribute to and extend previous cognitive network research using expressive ties (cf, Casciaro, 1998; DeSoto, 1960; Kilduff and Brass, 2008; Krackhardt, 1990; Kumbasar et al., 1994).

Positive and negative affective ties and whole network accuracy

Expressive ties involve the emotional expressions of interpersonal affect between individuals and we view these affective ties as being valenced (e.g., Labianca and Brass, 2006; Labianca, 2014). Positive affective ties (e.g., friendships) in organizations are sources of social support, provide a sense of identity and personal belonging, and serve to transmit normative expectations (Coleman, 1988, 1990). These positive emotional links often form the affective basis for interpersonal trust that facilitates cooperation in organizations and which contribute to better team work and performance (e.g., Baldwin et al., 1997; Balkundi and Harrison, 2006; Fang et al., 2015; Mehra et al., 2006). Negative affective ties, in contrast, denote interpersonal dislike or relationship conflict; these ties can threaten one's security and identity, and can serve as counter-role models. They also undermine the ability to create trusting relationships and harm the ability to cooperate and achieve work goals effectively (Lau and Cobb, 2010).

Friendship ties are often the focus of social networks studies of network accuracy (e.g., Krackhardt, 1990), but our situated cognition perspective suggests that those with power would be drawn more to attending to negatively valenced affective ties. Negative affective ties denote ongoing, stable interpersonal dislike (Labianca and Brass, 2006; Labianca et al., 1998). These negative ties should garner greater cognitive attention than positive affective ties (see Labianca and Brass, 2006). One explanation for this negative asymmetry is that negative ties are more threatening because they increase the likelihood of goal frustration. Indeed, recent research in workplace networks demonstrates that negative ties lead to direct attempts to harm the other (e.g., Venkataramani and Dalal, 2007), as well as indirect undermining attempts through such mechanisms as negative gossip (e.g., Ellwardt et al., 2011; Mayes and Allen, 1977). Thus, we argue that both managers and informally powerful individuals will be strongly motivated to perceive these negative affective relationships because of their heightened potential to impede goal completion. The negative asymmetry perspective suggests that, in contrast, the positive affective ties are not subject to the same level of scrutiny and we would not expect a difference in accuracy between the powerful and less powerful. On a more mundane level, it is also likely that managers and those perceived as powerful are more likely to be called in to be mediators of interpersonal disputes in organizational settings as compared to those without power because bureaucratic structures and logics often dictate that conflicts are to be mediated or arbitrated by those with authority (Perrow, 1986). The powerful individuals' greater awareness, sensitivity to, and exposure to these negative affective relationships will relate to greater accuracy relative to low-power individuals. Our situated cognition approach suggests that it is the experience of power that increases certain types of accuracy. However, we cannot exclude the possibility that being accurate about these negative affective relationships might itself be a resource that can make an individual either more informally powerful (cf., Krackhardt, 1990) or perhaps even more valuable to the organization and ultimately promotable into a managerial position.

H1

Power will be positively related to accuracy in perceiving the negative affective (dislike) organizational network.

Accuracy regarding one's own ties

We now turn from being generally accurate about the relationships in the broader social environment to an individual's accuracy about their own personal network—that is, how accurate an individual is about the relational ties he or she receives from others. Based on the previous situated cognition theory arguments, powerful individuals should also be more accurate than the less powerful about their own incoming negative affective ties. While less prone to attending to environmental threat (Keltner et al., 2001), the powerful are characterized by attending to some aspects of the environment that are relevant to their goals. This is because the situated cognition perspective suggests that cognitions about one's own ties are driven by a similar goal-influenced attention and increased focus and flexibility toward personally relevant information. This view also suggests that the powerful have the ability to switch their focus and attention more specifically on relevant personal information, as argued above. Indeed, recent research finds that power is positively related to interpersonal sensitivity toward others (Schmid Mast et al., 2009) and high-power individuals are more capable of individuating others in relation to relevant task information (Overbeck and Park, 2001). Of course, the powerless might be motivated to engage in "other enhancement" tactics, such as flattery, in an effort to disguise negative judgments of managers or informally influential individuals (Gordon, 1996; Kilduff and Brass, 2010). But, the powerful tend to judge these kinds of actions critically, and attribute selfish motives to them (Inesi et al., 2012), making the powerful more likely to scrutinize these behaviors. In sum, we argue that greater attention to personally detrimental social ties related to goal accomplishment is likely to give the powerful better accuracy in recognizing negatively-valenced incoming ties. Of course, the same caveat applies here as in the first hypothesis—it could also be the case that those individuals who are particularly accurate about identifying their own incoming negative ties might be able to use this as a resource or a motivation to place themselves in informally powerful positions in an attempt to counter those negative ties (Smith et al., 2014) or might be able to maneuver around those negative ties to gain a promotion into a formal power position (Marineau, 2017).

H2

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Power will be positively related to accuracy in perceiving incoming negative (dislike) ties.

Situated cognition theory does not distinguish what might be expected from the real-world differences between being formally powerful in an organization (e.g., being a manager) and being informally powerful (e.g., having a large number of friends) in terms of perceptual attention and network accuracy; however, it is important to do so when extending situated cognition theory into an organizational setting. There are important role expectations for those occupying a formal power managerial position that are not as critical to those occupying informal power positions based on peer-rated influence. For example, managers have direct responsibility for formal organizational-related goals (e.g., achieving certain call times, garnering high customer satisfaction scores at both the individual and team level in this context). The role of formal authority and its concomitant responsibilities should increase managers' accuracy toward instrumentally-related network ties, such as negative ties, and should make them pay more attention to ties that are more socially distant in the whole network compared to the informally powerful. This is because these ties might impinge on instrumental goals at both the individual and team level. Individuals who are informally powerful do not have a similar set of instrumentally-related expectations and they might not have as much need to worry about the functioning of the team as whole. This is not to say informal power might not increase attention and focus on negative ties or more socially distant ties in the organization; rather, we are arguing that being formally powerful will have a stronger relationship to network accuracy than will being informally powerful due to the qualitatively different expectations related to manager positions.

Network accuracy and outcomes

Thus far, we have argued that powerful individuals will be more accurate about the social network compared to the less powerful based on a situated view of power. This theoretical view contributes directly to identifying key antecedents of network accuracy beyond previous work which has considered an array of other interpersonal traits (Casciaro, 1998; Casciaro et al., 1999; Krackhardt, 1990). While important for advancing theories of power and network cognition, considering only antecedents does not answer the call for additional research connecting network accuracy and perception to individuals' organizational outcomes (Brands, 2013). The key insight is that accurate knowledge of the network is a source of advantage, because a person who is accurate about their network is better equipped to access resources strategically, avoid social liabilities, and navigate the social world with more precision than a person who is not accurate about their ties within the organization (Brands, 2013; Marineau, 2016). Researchers have begun to address this call empirically; for example, recent work shows that players in a Dutch semiprofessional soccer club who were highly central in the friendship network and highly accurate about their incoming friendship ties had higher individual performance (Han and Van Dongen, 2015). Among employees of a technical call-center, Marineau (2016) found that accuracy about one's own position in the cognitive trust and distrust networks related to higher likelihood of being promoted in the organization. He also found that those who had relatively low supervisor-rated performance, yet were also highly accurate about their incoming distrust tie network, had a significantly *increased* chance of being promoted.

Here we extend previous work and consider the effects of friend and dislike network accuracy on key employee outcomes in an organization: whether the employee is promoted (the employee attained a higher position in the organization), transferred (moved laterally to a different position or department in the organization), exited (left the organization entirely), or remained in their position. While promotion is an important outcome that rewards employees for their effort, firms are becoming increasingly decentralized and employing flatter organizational structures with wider managerial spans of control, thus reducing promotional opportunities. Many organizations increasingly rely on transferring talented employees to other functional areas to keep them challenged and engaged when promotions are unavailable. Promotion and transfer can also help promote cross-fertilization, reinforce corporate culture, and reduce entrenched interests that lead to a "silo mentality" in the organization (Feldman, 1988; Feldman and Ng, 2007). Employee exit is also an important outcome because it is often very costly for organizations, both in terms of lost organizational knowledge and the expense of employee replacement (Abelson and Baysinger, 1984; Dess and Shaw, 2001; Guthrie, 2001; Kacmar et al., 2006; Shaw et al., 2005). Thus, understanding factors which contribute to employee movement both within and out of the organization is an important concern for retaining and managing employee talent. We test the role of dislike tie network accuracy as a mediating variable between power and whether one is promoted, transferred, exits the organization, or remains in their current position. In a set of post hoc analyses, we'll also examine whether network accuracy of friendship ties act as a mediator.

H3

Accuracy in perceiving negative affective (dislike) ties (either in the whole network or for one's incoming personal ties) will mediate the relationship between power and employee outcomes (promotion, transfer, exit, remain)

Methods

Sample and setting

We conducted this research in a Southern U.S. division of a multinational focused on design and manufacturing of advanced automatic espresso machines (Marineau, 2017). The sample came from the firm's technical call center, which serviced customers (e.g., restaurants) and service providers (e.g., on-site service technicians) with service support. The employees were expert in the sophisticated technical aspects of equipment operation and repair, and received regular training on new equipment and features. The call center employees were housed in one large open room with only partial cubicle barriers between them, making much of the social interaction in the workplace easily visible to all. They were organized into four functional groups: Groups 1 and 2 were the largest groups and were responsible for day-to-day service calls (n = 25 and 17, respectively); Group 3 was responsible for scheduling regular maintenance with new and existing customers (n = 6); and Group 4 consisted of administrative personnel (n = 4). All told, there were 52 individuals in the call center, including 12 managers. Study participation was confidential, voluntary, and involved formal, signed, informed consent, as required by our Institutional Review Board to protect our human subjects. One individual chose not to participate in our survey and 3 had incomplete data (n = 48; 92% response rate); all 12 managers participated (100% response rate). The sample was 41% female and 38% minority (non-Caucasian Hispanic or African-American; two individuals did not disclose their ethnicity); 29.2% were college graduates, and 62.5% had some college or post-high school education. Organizational

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tenure ranged from 5 to 160 months (M = 34.4, median = 18.5 months).

Data

We collected data in three stages, beginning with 25 semi-structured interviews among the respondents to develop our survey. We then conducted an online survey sent to all four groups (n = 52) which included demographic and personal social network questions. Finally, we collected cognitive social structure (CSS) data from Groups 1 and 2 (n = 42) where each individual provided a complete map of their perceptions of the ties among everyone else in their respective groups using a matrix design. This resulted in 42 binary N × N matrices, in which a 1 in cell ij indicated a perceived tie from i to j, and 0 indicated the lack of a perceived tie. The analyses for H1 required CSS data, and were therefore conducted only on Groups 1 and 2, while H2's focus on incoming personal (egocentric) ties could be tested on the overall population.

Each individual's perceptions of their work group network, that is, their cognitive social structure (CSS) (Krackhardt, 1987), was collected using a matrix design (Casciaro, 1998). The survey listed the names of the individuals within the respective work groups repeated along the sides, top and bottom of a square matrix. Individuals were asked to indicate the relationship among coworkers (and themselves) in their workgroup by filling in the cell within the matrix for each row and column where they perceived a relationship. For example, if person A was believed to have a tie with person B, the respondent would indicate that relationship by marking the cell in row A, column B, and so on, for all pairs of names for which the respondent perceived a tie. For the affective friend and dislike CSS matrix, respondents wrote a "1" for friendship or a "2" for dislike (or left it blank) for each person-to-person dyad in the matrix where they perceived a friend or dislike tie (excluding the diagonal). We were careful to ask respondents to leave the answer blank if they did not know or were unsure about the relationship to minimize false positives in their answers. They were also asked to fill out their own row and column first, before moving on to the other names in the matrix (see Appendix A for an illustration of this matrix approach to collecting CSS data).

After these paper-and-pencil matrices were collected, they were recorded into a digital format in MS Excel. Multiple coders were used to ensure that the matrices were 100% accurate before they were used in analysis by rechecking the digital versions with the originals. These matrices were then imported into UCINET (Borgatti et al., 2002) and separated into two dichotomous networks (friendship and dislike) for each group for analysis.

Because the CSS matrix only captured the ties within and among Groups 1 and 2, all employees also filled out a digital survey that included questions about their network ties in the broader organization. They indicated their incoming and outgoing friend and dislike ties in response to the question: "Please select each person who you consider to be your personal friend at work, and please indicate each person who you consider to be someone you dislike at work by checking 'personal friend' or 'dislike' next to their name. If you don't know the person, please do not answer the question for that person." In addition, we asked who they believed considered them a friend or disliked them. The network answers from the digital surveys were combined with the CSS matrices in UCINET (Borgatti et al., 2002) to generate whole networks of the population where necessary.

Mediators and dependent variables

We created network perceptual accuracy measures for both levels of analysis: whole network accuracy (H1) and personal incoming tie accuracy (H2). Accuracy was defined as the agreement between a respondent's perceived network and the criterion or objective "true" network (see below for more detail). The measure of agreement used was the Jaccard index (Jaccard, 1912): Given two binary variables X and Y, the Jaccard index is computed as the number of times X and Y are both 1, divided by the number of times one or both are 1. Thus, a person's accuracy was measured in terms of positive agreement with the criterion matrix. This method resulted in individual scores of network accuracy which were used as our outcome variables of interest for Hypothesis 1 and 2. The fundamental difference between our outcome variables for our hypotheses is that H1 tested the whole-network accuracy of individuals (i.e., whether they were accurate about the constellation of network ties in the organization, including socially distant ties) and H2 tested the individuals' personal incoming tie accuracy (ie., whether they accurate about their direct ties coming from others). As a robustness check, we also conducted analyses using the Pearson correlation coefficient as the measure of agreement, and the pattern of results presented here were unchanged (results available on request). The difference between the two measures is that the Jaccard measure ignores agreement on non-ties, whereas the Pearson measure gives them equal weight. In sparse networks, which are typical with negative ties, the Pearson measure tends to inflate accuracy scores, so we chose the more conservative Jaccard index approach.

*Whole network accuracy (*H1*)*

We created dependent variables for whole network accuracy using the locally aggregated network method to determine the "true" network (LAS; Krackhardt, 1987). Each actor's direct nominations of others (as a friend or someone they disliked) in the network were aggregated together to form the objective criterion network from which network accuracy was calculated. This method of determining the criterion network has good face validity because it relies on a person's reported ties to others to construct the network that "actually" exists. Each person's reported outgoing ties (the person's own row in the matrix) from their own CSS network map were joined with all others' outgoing tie rows. This formula used the following notation: i = row, j = column, and k is the observer, and R is the NxN network. The definition of this "row dominated" LAS is as follows (Krackhardt, 1987):

$$\left(R'\right) i, j = (R)\, i, j, k$$

Thus, criterion network R' was a compilation of i to j ties for all k's, where k = i. To calculate the accuracy of each individual, the row-dominated LAS network was correlated with the Jaccard index to each individual's reported (perceived) CSS network at the matrix level, providing each individuals' accuracy score for the friendship and dislike networks. We also calculated an alternative criterion matrix using a Bayesian Network Accuracy Model (BNAM: Butts, 2003), which is a probabilistic network, loosely similar to a consensus approach. Results were consistent across both methods of calculating the criterion networks in the whole network accuracy models for H1 (see Appendix B for results from the BNAM approach).

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*Incoming tie accuracy (*H2*)*

Hypothesis 2 required an accuracy score for each individual's perception of their own incoming ties from others. This was done by correlating (using the Jaccard index) each individual's perceptions of their incoming ties with others' actual nominations of that person for each type of relation. To create the criterion matrix of individuals' actual incoming ties, a 48 × 48 matrix was created such that cell ij represented the reported relationship from i to j; for example, if person i indicated they were friends with person j, the ij cell in the matrix would receive a "1", and a "0" otherwise. To create the 48 × 48 incoming tie perception network, cell ij represented j's perceptions of i's nomination of j. For example, cell ij would receive a "1" if j believed i considered j to be a friend, and that cell would receive a "0" otherwise. To calculate accuracy for each actor, the corresponding rows in each matrix were correlated using the Jaccard coefficient. The correlations across these matrix rows were used as the accuracy measure for each individual's accuracy for their own incoming ties.

*Employee outcomes (*H3*)*

We tested the possibility that the relationships among employees' formal and informal power and their career outcomes were mediated by network accuracy. Employee outcomes were collected from the organization's HR department nine months after the network data were collected. Those individuals who moved vertically (i.e., into a higher position and rank, rather than horizontally into an equivalent position) were counted as being "promoted." "Transfer" was defined as having moved horizontally in the organization into a new position or a new department, but remaining at the same organizational rank. "Exit" was defined as having left the organization. The base-line outcome was "remained" (i.e., no change in the employee's position). In the intervening nine months between the network data collection and the organization's report of employee outcomes, 14 individuals were promoted (29%), 3 exited (6%); 8 transferred (17%); and 23 remained in their previous position (48%).

Independent variables

Formal power

While there are various sources of power in organizations, formal managerial position is related most clearly to the psychological activation of a sense of power (Tost, 2015). This is because the formal power position of being a manager—where the individual has asymmetric control over valued resources—is likely to supply critical contextual cues that produce the psychological activation of power. Formal power roles in organizations also trigger "status symbols, behavioral deference from others, and behaviors enacted in the process of fulfilling a structurally powerful role" (Tost, 2015: 38). Thus, occupying a formal power role is a primary source of activation of psychological power in organizations.

While potentially triggering status signals, we differentiate power from status, which is a related, but distinct construct (for a thorough review comparing status and power, see Magee and Galinsky, 2008). Status can be defined as respect and admiration (Fast et al., 2011), and is closely related to the notion of social hierarchy, which is the "implicit or explicit rank order of individuals or groups with respect to a valued social dimension" (Magee and Galinsky, 2008: 352). A person's formal power in this study relies on the degree to which they have asymmetric control over valued resources, or fate control over others, and is not based on how much personal status the employee has in the organization's social hierarchy.

Formal power was a dichotomous variable with "1" indicating a manager and "0" indicating an individual contributor. There were 12 managers and 40 subordinates. The managers in this setting held strong outcome control over their subordinates. Raises and bonuses were wholly based on goal achievement, which was set for both individuals and departments by the direct supervisor and department head, respectively. Managers were also key in determining which subordinates could be promoted out of the call center and into positions elsewhere in the organization (e.g., receiving a "negative write-up" by a manager made an employee ineligible for a promotion or new position for a six-month period).

Informal power

Informal power was based on peer-ratings of influence within the organization. We asked each individual in the organization to rate the level of informal power the focal person had without regard to their formal position (*peer-rated informal power*) (Brass and Burkhardt, 1992) using the following question from the digital survey: *"For each individual in your organization, including yourself, please select the answer that best describes the level of influence each person has in the everyday activities of the XX Division (from [1] not at all influential, to [5] highly influential)*. The average for each individual's incoming ratings of influence indicated their informal power (*M = 3.33, SD = .54*). One individual from the sample was missing peer-rated informal power (N = 47).

Control variables

Workflow centrality

Employees were required to work with others both within and outside their workgroup. Using a roster method, each individual was asked to select those people from whom they either received inputs or sent outputs to (Brass, 1981). The number of work ties each individual was required to hold might expose them to more or less information about the ties in the network, so we controlled for individuals' in-degree centrality in this required workflow network for both H1 and H2. To capture individuals' work ties, we asked the following question: 'Please indicate who you receive inputs from, provide outputs to, or both in order to accomplish your task(s) at work. For example, you might require the input of certain items before you can do your work. And others must receive specific items from you before they can do their work. If you don't receive inputs or provide output for the person, please don't check those boxes.'

Network centrality

Because central individuals might have more access to social information in the network (e.g., Bondonio, 1998; Casciaro, 1998; Casciaro et al., 1999; Krackhardt, 1990), we controlled for individuals' in-degree centrality in both of the affective network relationships we analyzed (friendship ties and dislike ties).[2]

Organizational tenure

Individuals who have been with the organization for longer periods might have an advantage in accuracy because individuals with longer tenure will be more cognizant of the interpersonal relational patterns in the organization. While tenure does not mean a person is intentionally paying more attention to the network ties of others, we

[1] For H1, centrality measures for dislike and friendship were normalized to control for the different group sizes.

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controlled for this possibility by including each individual's tenure with the organization in number of months.

CSS density/perception

The number of ties that a person perceives in their CSS can vary significantly; it is possible that those who perceived few ties could be confounded with those who perceived many ties, but were also inaccurate about many ties. Because our interest was to isolate the effects of individuals' power on network accuracy, we controlled for the tendency for individuals to perceive greater or fewer ties. Thus, we included each person's CSS *density* (the number of ties recorded over the total number of possible network ties) for each type of tie in the appropriate regression model (e.g., Casciaro et al., 1999). For H2, these perceiver differences were controlled for by including each individual's count of *perceived* incoming ties in the appropriate regression model.

Employee performance

For our mediation models, we controlled for the effect of individuals' supervisor-rated performance on career mobility, as one's work performance is likely to be related to employee outcomes (i.e., promotion, transfer, exit, or remaining). Each employee's direct supervisor was asked to rate statements about their employee's work performance on a 1–5 scale (1 = strongly disagree; 5 = strongly agree) across seven items (adapted from Tsui, 1984). The measure for performance was the average score of the rated items for each individual (Cronbach's alpha = 0.89). Example items included: "This employee is performing his/her total job the way I would like it performed"; "I am satisfied with the total contribution this employee has made to the organization"; "I enjoy working with this employee".

Analytical approach

Our dependent variables were fractional (Jaccard index) and therefore included both 0's and 1's, as well as proportions; thus, we ran our models using a Tobit model which handles limited dependent variables such as ours. To ensure our results were robust, we also used a generalized linear model from the binomial family with a logit link (McDowell and Cox, 2004; Papke and Wooldridge, 1993); our main findings were unchanged (analyses available on request). We also used robust standard errors clustered around supervisor to control for variance in individuals' network accuracy due to group level effects (such as in-group communication, cohesion, and knowledge sharing as part of the formal structure within the organization) (Williams, 2000). Models for H1 and H2 were run in STATA v14.2 (StataCorp, 2014).

For our mediation models, we used Generalized Structural Equation Models (GSEM) in Stata 14.2. This was because our employee outcome variable was multinomial (promotion, transfer, exit, and remained) and SEM cannot handle multinomial outcomes. This approach also allowed us to model the mediation elements within a single model (that is, both dislike and friend incoming ties as mediators). The GSEM approach provided the necessary coefficients to test mediation using the traditional multiple equations approach (e.g., Baron and Kenny, 1986). This approach generally requires three equations to test mediation (Zhao et al, 2010)[2] (note: M = mediator, X = IV, Y = DV): Eq. (1): effect for X to Y; Eq. (2): effect for X to M; and, Eq.(3): effect for M to Y, controlling for X (i.e., indirect effect). Mediation is established if there is a significant effect for at least Eq. (3) (Zhao et al., 2010), and for the Sobel test (Baron and Kenny, 1986; Sobel, 1982).

Results

*Whole network accuracy (*H1*)*

Table 1 shows all relevant whole network correlations and descriptive statistics. Hypothesis 1 proposed a positive relationship between power and accuracy for negative affective (dislike) ties. Results demonstrate a positive, significant coefficient for dislike network accuracy and formal power (Table 2: $b = 0.04$, $t = 2.19$, $p < .05$), suggesting that managers were generally more accurate than non-managers about dislike ties among others in the organization. However, having more informal power was not significantly related to accuracy about the dislike network. We also ran supplemental models for friendship network accuracy, although these were not formally hypothesized. As expected from our situated cognition perspective, there were no significant relationships between managerial position and friendship accuracy (Table 2: $b = 0.03$, $t = 1.37$, *ns*) or informal power and friendship accuracy (Table 2: $b = -0.02$, $t = -0.59$, *ns*).

*Incoming tie accuracy (*H2*)*

Table 3 shows all relevant correlations and descriptive statistics. Hypothesis 2 argued that power would be positively related to individuals' perceptual accuracy of their own incoming negative affective (dislike) ties. Results (see Table 4) showed that there was a significant positive relationship between formal power and incoming dislike tie accuracy ($b = 0.26$, $t = 2.22$, $p < .05$). Results also showed a significant positive relationship between one's informal power and incoming dislike tie accuracy ($b = 0.24$, $t = 3.49$, $p < .01$). Supplemental models were also run for incoming positive tie accuracy (which were not formally hypothesized). There were significant positive relationships between formal power and friendship accuracy (Table 4: $b = 0.17$, $t = 4.02$, $p < .01$), and informal power and friendship accuracy ($b = 0.23$, $t = 2.20$, $p < .05$). Thus, more powerful individuals showed greater accuracy for their own incoming dislike ties and friendship ties compared to less powerful individuals.

*Employee career outcomes (*H3*)*

We expanded on previous research by considering a mediated model using employee outcomes (promoted, transferred, exited, or remained) as the DVs, network accuracy as the mediator, and formal and informal power as the IVs (see Table 5 for relevant descriptive statistics). We tested mediation by including the simultaneous effects of the mediators (incoming dislike tie accuracy and incoming friend tie accuracy), the dependent variables (promotion, exit, and transfer) and the independent variables (formal power and informal power), along with control variables (tenure, work ties, number of dislike ties, number of friend ties, perceived ties, and performance) in Generalized Structural Equation Models (GSEM) (see Table 6 and Fig. 1). Mediation is generally considered to be partial or full depending on whether the coefficient of total effect (c) is larger or becomes non-significant compared to the direct effect (c') with the inclusion of the mediator variable (i.e., c' < c) (Baron and Kenny, 1986).

Model results indicated that incoming dislike tie accuracy was negatively related to both exit (the employee left the organization) (Table 6 Model 4: $b = -28.46$, $p < .01$) and transfer (the employee

[2] Weshould also note that contemporary mediation methods have found Eq. 1 and Eq. 2 from the Baron and Kenny method are less necessary to establish mediation.

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Table 1
Correlations and Descriptive Statistics for Whole Network Accuracy.

		M	SD	1	2	3	4	5	6	7	8	9	10
1	Dislike Accuracy	0.07	0.08										
2	Friend Accuracy	0.25	0.13	.42**									
3	Formal Power (Manager)	0.26	0.44	.22	.31								
4	Informal Power	3.27	0.54	.27	.18	.50**							
5	Org. Tenure	26.54	25.25	.34*	.18	.55**	.61**						
6	Group	0.44	0.50	.51**	.57**	.08	.29	.33*					
7	Work Ties	19.82	7.10	.11	.26	.43**	.81**	.34*	.22				
8	Dislike Ties	4.33	5.52	−.08	.15	.23	.15	.11	−.05	.23			
9	Friend Ties	39.21	16.36	.28	.28	.10	.51**	.27	.63**	.33*	−.32*		
10	Dislike Perceptions	0.03	0.04	.30	.21	−.07	.15	−.10	−.01	.20	−.12	.02	
11	Friend Perceptions	0.24	0.22	.41**	.87**	.30	.10	.22	.46**	.12	.09	.21	.19

Note: n=38; Informal Power n=38. Manager=1, non-manager=0; Group 2=1, Group 1=0.

* p<0.05.

** p<0.01, two-tailed.

Table 2
Analysis for Whole Network Dislike and Friend Tie Accuracy and Power

Variables	Whole Network Dislike Tie Accuracy				Whole Network Friend Tie Accuracy			
Group	0.08**	0.09**	0.09**	0.09**	0.07**	0.07**	0.07**	0.07**
	(3.85)	(4.21)	(3.35)	(3.66)	(3.85)	(3.53)	(3.57)	(3.35)
Org. Tenure	0.00**	0.00+	0.00	0.00	−0.00*	−0.00*	−0.00+	−0.00*
	(3.30)	(1.93)	(1.44)	(1.00)	(−2.43)	(−2.74)	(−1.70)	(−2.23)
Dislike Ties	−0.00	−0.00	−0.00	−0.00	0.00	0.00	0.00	0.00
	(-0.28)	(−0.36)	(−0.34)	(−0.42)	(0.50)	(0.45)	(0.47)	(0.42)
Friend Ties	−0.00	−0.00	−0.00	−0.00	−0.00	−0.00	−0.00	−0.00
	(-0.79)	(−0.62)	(−0.95)	(−0.76)	(−0.51)	(−0.53)	(−0.28)	(−0.28)
Work Ties	−0.00+	−0.00*	−0.00	−0.00+	0.00*	0.00*	0.00*	0.00*
	(-1.93)	(−2.22)	(−1.25)	(−1.94)	(2.16)	(2.30)	(2.45)	(2.45)
Network Perception	0.80*	0.83*	0.79*	0.85*	0.45**	0.44**	0.45**	0.43**
	(2.22)	(2.40)	(2.06)	(2.26)	(6.52)	(5.25)	(6.48)	(5.22)
Formal Power (Manager)		0.04*		0.04*		0.03		0.03
		(2.19)		(2.06)		(1.22)		(1.37)
Informal Power			0.04	0.04			−0.02	−0.02
			(0.66)	(0.77)			(−0.56)	(−0.59)
Constant	0.04	0.05	−0.03	−0.02	0.08**	0.09**	0.12+	0.13*
Sigma	0.06**	0.06**	0.06**	0.06**	0.05**	0.05**	0.05**	0.05**
Pseudo Log-Likelihood	54.65	55.57	53.16	54.25	58.79	59.34	56.92	57.52
Model F (all p<0.05)	11.12	42.27	24.39	1757.60	234.66	123.65	348.90	278.01
N	39	39	38	38	39	39	38	38

Note: Standardized beta coefficients; t-statistics in parentheses. Standard errors clustered around supervisor (n=9) are robust. Manager=1, non-manager=0; Group 2=1, Group 1=0. Two-tailed.

* p<0.05.

** p<0.01.

Table 3
Correlations and Descriptive Statistics for Incoming Tie Accuracy.

		M	SD	1	2	3	4	5	6	7	8	9
1	Dislike Accuracy	0.04	0.17									
2	Friend Accuracy	0.24	0.16	.36*								
3	Formal Power (Manager)	0.24	0.43	.45**	.30*							
4	Informal Power	3.33	0.54	.02	.24							
5	Org. Tenure	33.73	36.01	.08	−.07	.52**	.66**					
6	Work Ties	20.21	6.63	−.14	.18	.43**	.90**	.48**				
7	Dislike Ties	1.52	1.69	−.01	.03	.17	.13	.15	.13			
8	Friend Ties	12.52	4.43	−.08	.31*	.12	.61*	.39**	.60**	−.12		
9	Dislike Perception	1.23	3.35	.02	−.20	.00	−.05	−.07	−.05	−.12	−.40**	
10	Friend Perception	10.75	9.85	.03	.62**	.06	.14	−.07	.18	−.10	.28	−.02

Note: n=48; Informal Power n=47 Manager=1, non-Manager=0.
Two-tailed.

* p<0.05.

** p<0.01.

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Table 4
Analysis for Incoming Dislike Tie Accuracy and Power (H2)

Variables	Incoming Dislike Tie Accuracy				Incoming Friend Tie Accuracy			
Org. Tenure	0.00	−0.00	−0.00	−0.00**	−0.00*	−0.00**	−0.00**	−0.00**
	(0.94)	(−1.03)	(−0.36)	(−2.72)	(−2.13)	(−2.91)	(−3.27)	(−3.01)
Dislike Ties	−0.00	−0.00	−0.00	−0.00	0.02	0.01+	0.02	0.01
	(-0.24)	(−0.11)	(−0.45)	(−0.36)	(1.49)	(1.79)	(1.24)	(1.52)
Friendship Ties	−0.00	0.01	−0.00	0.00	0.01*	0.02**	0.01	0.01**
	(-0.47)	(1.29)	(−1.32)	(0.83)	(2.03)	(3.48)	(1.63)	(3.58)
Work Ties	−0.01	−0.01*	−0.02**	−0.03**	0.00	0.00	−0.02*	−0.02**
	(-0.97)	(−2.19)	(−2.80)	(−2.95)	(−0.04)	(−1.61)	(−2.53)	(−2.85)
Network Perceptions	0.00	0.00	−0.00	0.00	0.01**	0.01**	0.01**	0.01**
	(0.12)	(0.87)	(−0.64)	(0.42)	(4.98)	(5.02)	(5.52)	(5.14)
Formal Power (Manager)		0.27*		0.26*		0.19**		0.17**
		(2.30)		(2.22)		(4.27)		(4.02)
Informal Power			0.29**	0.24**			0.26*	0.23*
			(4.19)	(3.49)			(2.60)	(2.20)
Constant	0.14	0.15	−0.39**	−0.28*	−0.01	0.02	−0.49*	−0.41+
Sigma	0.17*	0.14**	0.16*	0.13**	0.14**	0.12**	0.13**	0.11**
Pseudo Log Likelihood	15.50	24.96	18.00	27.43	14.66	20.62	17.67	23.62
Model F	0.36	5.95	8.32	10.54	11.07	8.25	34.51	14.23

Note: n=48; models including Informal Power n=47. Standardized beta coefficients; t-statistics in parentheses. Standard errors clustered around supervisor (n=11) are robust. Manager=1, non-manager=0.
Two-tailed.
* p<0.05.
** p<0.01.

Table 5
Correlations and descriptive statistics for employee outcomes models.

	Variable	M	SD	1	2	3	4	5	6	7	8	9
1	Dislike tie accuracy	0.04	0.17									
2	Friend tie accuracy	0.24	0.16	.36*								
3	Formal power	0.23	0.43	.48*	.34*							
4	Informal Power	3.33	0.54	.02	.24	.43*						
5	Promoted	0.29	0.46	−.10	.10	−.14	.10					
6	Exited	0.06	0.25	−.07	.13	.06	.08	−.17				
7	Transferred	0.17	0.38	−.12	.17	.15	.18	−.30*	−.12			
8	Remained	0.47	0.50	.22	−.28	−.02	−.28	−.61*	−.25	−.43		
9	Tenure	31.43	31.53	.12	−.01	.46*	.59	−.01	−.15	.09	.01	
10	Dislike ties	1.53	1.71	−.01	.03	.18	.16	.02	−.03	.06	−.04	.20
11	Friend ties	12.38	4.37	−.07	.35*	.07	.59	.16	−.08	.20	−.25	.34*
12	Performance	3.99	0.63	.04	.01	−.14	.28	.22	−.26	.14	−.18	.04
13	Work ties	19.98	6.51	−.13	.22	.39*	.90*	.07	.06	.31*	−.32	.43*
14	Perceived dislike	1.26	3.39	.02	−.21	.02	−.04	−.15	.01	−.09	.20	−.05
15	Perceived friend	10.92	9.89	.03	.61*	.09	.23	.24	−.07	.07	−.24	−.01
				10	11	12	13	14	15			
11	Friend ties			−.11								
12	Performance			−.21	.41*							
13	Work ties			.15	.57*	.21						
14	Perceived dislike			−.13	−.40*	.06	−.04					
15	Perceived friend			−.10	.31*	.06	.22	−.02				

Note: N=47.
Two-tailed.
* p<0.05.

moved from one position to another without being promoted) (Table 6 Model 5: $b=-57.07$, $p<.01$). Further, we found a significant Sobel test for the indirect effect of formal power on exit through incoming dislike tie accuracy (Table 7 Model 2: *Sobel* $Z=2.29$, $p<.05$). Results of the Sobel test also showed that transfer was indirectly effected by formal power through incoming dislike tie accuracy (Table 7 Model 3: *Sobel* $Z=2.30$, $p<0.05$). In this case, the total effect was negative ($c=-0.24$), while the direct effect was positive and larger ($c'=.02$) (*i.e.,* $0.02>-0.24$), indicating that the addition of the mediator *increased* the relationship between formal power and transfer. This suggests the possibility of a suppression effect or an inconsistent mediator. This occurs when the addition of the mediator increases, rather than decreases the effect of the independent variable on the outcome (MacKinnon et al., 2000). In these cases the indirect effect (ab) has a different sign than the direct effect (c') yet mediation can still occur (MacKinnon et al., 2007).

Mediation effects for informal power on exit and transfer showed a similar pattern of results as formal power. The Sobel test showed that the effect of informal power on exit was mediated by incoming dislike tie accuracy (Table 7, Model 8: *Sobel* $Z=-3.12$, $p<.01$). Likewise, results suggested mediation was evident for informal power on transfer through incoming dislike tie accuracy (Table 7, Model 9: *Sobel* $Z=3.17$, $p<.01$). The total effect of informal power on transfer was smaller ($c=-0.88$) than the direct effect ($c'=-0.19$) (*i.e.,* $-0.19<-0.88$), indicating a suppression effect consistent with the formal power results described above.

These results indicate that dislike tie accuracy was negatively related to both transfer and exit, suggesting knowing the source of

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Table 6
Multinomial logit GSEM testing indirect effect of informal and formal power on promoted, exit, and transfer through incoming dislike and friend tie accuracy.

Model	1	2	3	4	5
Variables	Incoming dislike tie accuracy	Incoming friend tie accuracy	Promoted	Exit	Transfer
Dislike tie accuracy			−8.44	−28.46**	−57.07**
			(−1.10)	(−7.78)	(−8.62)
Friend tie accuracy			7.18*	−11.35	11.79**
			(2.30)	(−1.52)	(2.93)
Informal power	0.22**	0.27**	3.26	6.87*	−3.45
	(3.41)	(3.10)	(0.93)	(2.39)	(−0.93)
Formal power	0.26*	0.15**	−0.76	6.88	0.48
	(2.39)	(3.59)	(−0.37)	(0.94)	(0.44)
Tenure	−0.00	−0.00**	−0.01	−0.76*	0.014
	(−1.43)	(−3.20)	(−0.50)	(−1.98)	(0.54)
Dislike ties	−0.00	0.01	−0.01	−1.01	0.087
	(−0.41)	(1.61)	(−0.06)	(−0.29)	(0.28)
Friend ties	0.00	0.01**	−0.04	1.54	−0.06
	(0.25)	(3.47)	(−0.23)	(1.40)	(−0.47)
Work ties[a]	−0.02**	−0.02**	−0.15		0.30
	(−3.11)	(−3.60)	(−0.68)		(1.33)
Performance	0.04	−0.03	1.30	−9.26	2.01+
	(1.12)	(−1.41)	(1.47)	(−1.28)	(1.85)
Perceived ties	−0.00	0.01**			
	(−0.19)	(5.26)			
Constant	−0.38**	−0.33*	−13.68+	6.17	−3.94
Log psuedolikelihood	37.96				
AIC	−55.92				
BIC	−37.42				

Note: N = 47.

[a] Work ties was excluded from model 4 (Exit) due to multicollinearity. Coefficients are unstandardized; standard errors are robust, clustered on supervisor (n = 10). Typical goodness of fit tests available for SEM are not available for GSEM in Stata v14.2 (such as Chi2 test, or indexes such as RMSEA, or CFI), so they are not presented here.

one's incoming dislike ties reduced the likelihood of leaving the organization or transferring to a new position in the organization. While the inclusion of incoming dislike tie accuracy decreased the effect of formal and informal power on exit, there was a consistent finding that incoming dislike tie accuracy increased the effect of formal and informal power on transfer. There were no significant mediation effects for whole network dislike tie accuracy.

Although not hypothesized, we conducted a post hoc mediation test for friendship tie accuracy as well. There were positive, significant paths between formal power and informal power and incoming friend tie accuracy (Table 6 Model 2: $b = 0.147$, $p < .01$; $b = 0.27$, $p < .01$, *respectively)*, as well as significant paths between incoming friend tie accuracy and promotion (Table 6 Model 3: $b = 7.18$, $p = .05$), and transfer (Table 6 Model 3: $b = 11.79$, $p = .01$). Incoming friend tie accuracy was not significantly related to exit. To test the indirect effect between formal power and informal power and promotion and transfer through incoming friend tie accuracy, we used the same approach as for the incoming dislike tie accuracy models above. Sobel test results showed a significant indirect effect for formal power on transfer through incoming friendship tie accuracy (*Sobel* $Z = 2.27$, $p < .05$). We found a similar pattern of results for indirect effects of informal power on being transferred (*Sobel* $Z = 2.13$, $p < .05$). These results indicate that incoming friendship tie accuracy mediates the relationship between formal and informal power and transfer in the organization. Thus, increasing power has a positive effect on transfer through friend tie accuracy. Again, there were no significant mediation effects for whole network accuracy.

Discussion

This study set out to test whether and how individuals' power related to their accuracy in perceiving social networks. We adapted and extended the situated cognition theory of power from social psychology (Guinote, 2010) to motivate our comparison of social network perceptual accuracy between powerful individuals and those who were less powerful. Because our study was within an organizational context, we theorized and tested both formal power's (holding a formal managerial position in the organization) and informal power's (peer-rated influence in the organization) relationship with accuracy. We argued that powerful individuals would be more motivated to attend to and accurately perceive negative affective ties than would less powerful individuals because these negative ties more were organizationally- and task-relevant than the positive affective ties that had been studied previously in this literature. We also showed that there were some differences between formal and informal power; while both types of power were related to perceptual accuracy at the nodal, incoming tie level, it was only formal power that related to accuracy at the whole network level. Finally, we demonstrated that network perceptual accuracy was an important phenomenon because it was related to employees' outcomes, including subsequent transfer, promotion, and exit from the organization.

The main findings suggest that, contrary to prior network perceptual accuracy research, powerful individuals can be *more* accurate about the whole social network than less powerful individuals. That accuracy, however, is limited to specific types of power and specific tie content in an organizational context. When perceiving the network as a whole, occupying a formal power position is related to better accuracy of negative affective dislike ties. However, the powerful seem to be more accurate about their own incoming ties than the less powerful, regardless of tie type and specific type of power. Occupying a formal power position or being informally powerful are both related to better accuracy of one's incoming negative and positive affective ties. These results challenged previous conclusions about the role of power in individuals' perceptions of the network, which argued that greater power should be associated with lower accuracy.

It is clear that the powerful are not simply lazy observers of the social world, but are active, accurate perceivers of network relationships within organizations − as long as they have a reason motivated by their situation to direct their attention toward those relationships. While previous network accuracy studies (Casciaro, 1998; Simpson and Borch, 2005; Simpson et al., 2011) did not include negative ties, our results showed that having greater power related consistently with better accuracy in perceiving the negative affective tie network. This is consistent with our situated cognition perspective, which argues that powerful individuals are more likely to perceive accurately those ties with the highest likelihood of disrupting their outcomes. Previous research from a social ledger theory perspective shows that negative affective ties have greater power than positive ties to affect in-role performance and organizational attachment (Labianca and Brass, 2006; Marineau et al., 2016; Venkataramani et al., 2013); our work suggests that, on the whole, the stakes around negative ties are likely greater for powerful individuals and thus more likely to draw their attention than will positive ties.

We also tested whether formal or informal power might relate to differential accuracy in perceiving the whole network as compared to perceiving one's own incoming ties. Our results suggest that while formal power has a relationship to whole network accuracy, informal power does not. However, informal power appears to be related to personal incoming ties in much the same manner as does formal

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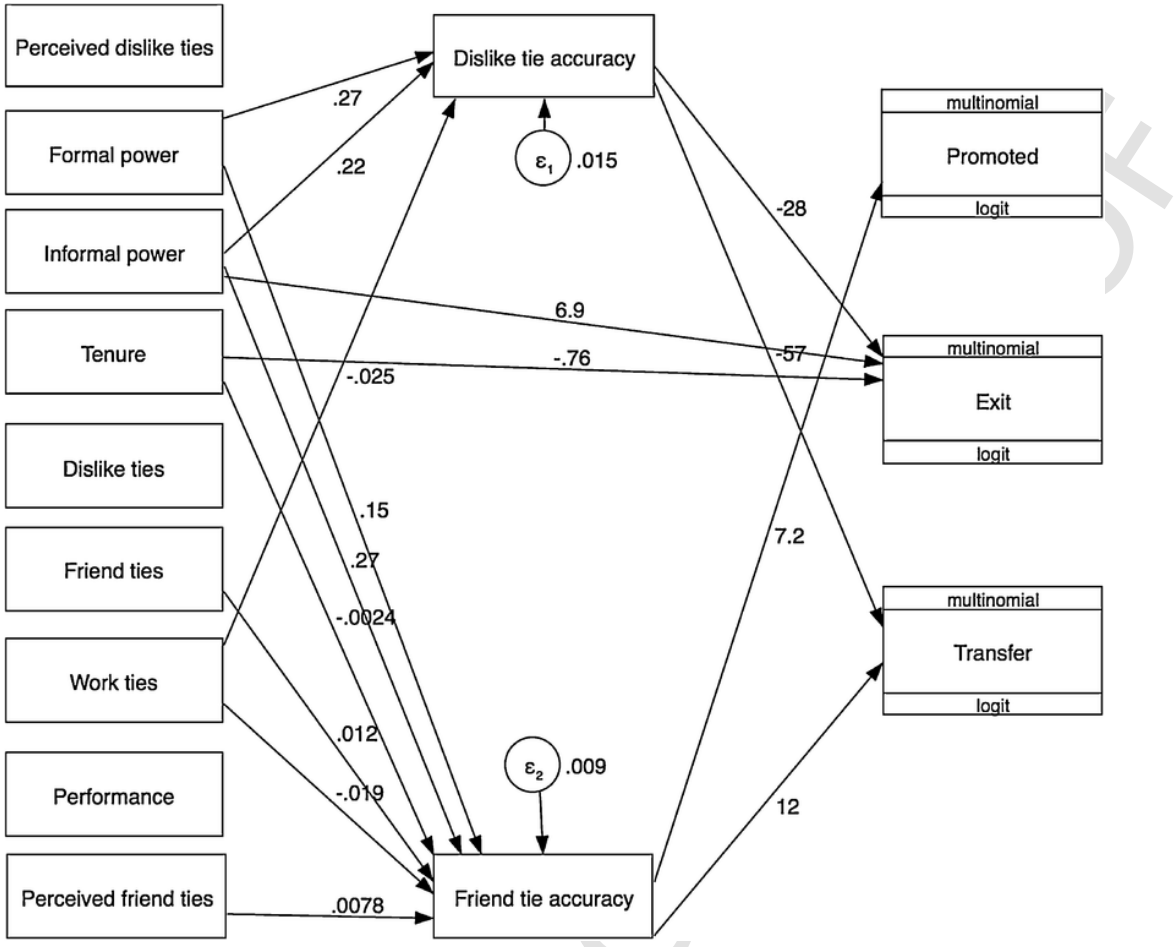

Fig. 1. Generalized Structural Equation Model for incoming dislike tie accuracy and incoming friend tie mediating formal power and employee outcomes. Coefficients are unstandardized and only significant paths are shown ($p<0.05$). All controls were modeled for all outcomes with the category "remain" as the baseline outcome. Perceived dislike (friend) ties was only modelled on dislike (friend) tie accuracy, Work ties was not modeled on Exit due to multicollinearity. AIC = −55.92, BIC = −37.42; Log psuedolikelihood = 37.96. Typical goodness of fit tests available for SEM are not available for GSEM in Stata v14.2 (such as Chi2 test, or indexes such as RMSEA, or CFI), thus they are not presented here.

Table 7
Mediation analysis results of Dislike and Friend Accuracy (M) on the relationship between Formal and Informal Power (X) and Outcomes (Y) (Promotion, Exit, Transfer).

X	M	Y	Model	a (X→M)	b (M→Y)	c' (X→M→Y)	c (X→Y)	Sobel Z	Mediation
Formal Power	Dislike Ties	Promoted	1	0.06*	−0.59	−0.14	−0.43	1.00	No
		Exit	2	0.06*	−1.01**	0.64	0.92	2.29*	Partial
		Transfer	3	0.06*	−0.99**	0.02	−0.24	2.30*	Partial
	Friend Ties	Promoted	4	0.04*	0.54*	−0.16	0.01	1.94	No
		Exit	5	0.04*	−0.54	0.84	0.65*	1.40	No
		Transfer	6	0.04*	0.72*	0.08	0.29	2.27	Partial
Informal Power	Dislike Ties	Promoted	7	0.07*	−0.49	0.61	0.23	1.04	No
		Exit	8	0.07*	−0.76*	0.60*	0.77+	3.12**	Partial
		Transfer	9	0.07*	−0.96*	−0.19	−0.88	3.17**	Partial
	Friend Ties	Promoted	10	0.08*	0.42*	0.38	0.44	1.85	No
		Exit	11	0.08*	−0.46	0.89*	0.75	1.37	No
		Transfer	12	0.08*	0.61*	−0.72	−0.71	2.13*	Partial

Note: X = Independent variable; M = Mediator; Y = Outcome. For Sobel Z test, scores 1.96 or higher indicate significance at $p<0.05$ level. All coefficients are scaled for dichotomous outcome variables (for details, see http://www.nrhpsych.com/mediation/logmed.html).

power. This suggests that occupying a formal power position creates new pressures that shifts attention to who dislikes whom in the organization beyond one's immediate network neighborhood. We speculate that managers need to focus not only on their own outcomes but also on their team's outcomes and that this might broaden their attentional gaze on the network; future research would be welcome to examine this.

Clearly, formal and informal power are not mutually exclusive in an organizational setting; thus, we tested whether informal power moderates the relationship between formal power and network accuracy in a post hoc analysis (see Table C1 in Appendix C). Results show that non-managers (i.e., those lacking formal power) can compensate for lower accuracy of their own incoming ties when they have high informal power. This result compares well with previous

work, where informal status is related directly to network accuracy (Krackhardt, 1990). Having both formal and informal power simultaneously does not, however, lead to the highest level of perceptual accuracy, suggesting that the effects are not additive. These results broaden our understanding of how different types of power are related to network perceptual accuracy.

In unhypothesized results, we also found that both formal and informal power were positively related to accuracy of one's direct incoming friendship ties. One possible explanation for this is that powerful individuals possess greater ability to investigate affective ties than the non-powerful because of their greater access to resources and greater autonomy to allocate their time and attention as they see fit. Perhaps the importance of knowing one's political position in the organization to maintain power and influence motivates increased attention and focus on the social environment. This leads directly into questions of how individuals achieve positions of formal and informal power, as having an accurate read on who are one's enemies and friends might be a critical component of achieving more powerful positions. This is a very promising line of research, and should be investigated to test the potential differences in how power is related to processing of different kinds of information, and how that might play into securing power positions.

We further tested the possibility of a relationship between network perceptual accuracy and employee outcomes: promotion (the employee was promoted to a higher position in the organization); transfer (the employee was transferred to a new position, but not promoted) and exit (the employee permanently left the organization). We argued that network accuracy, particularly of one's own incoming dislike network ties, provides an information advantage that might improve employee outcomes (Brands, 2013). However, our results imply that a more nuanced perspective needs to be taken because accuracy of different network relations were differentially related to various employee outcomes. For example, we found that accuracy of one's own incoming dislike ties was related negatively to the "stay or leave" outcomes—transfer and exit. Perhaps individuals' accurate knowledge of the dislike network provides critical insights about their own social and political liabilities, and this knowledge enables particularly powerful individuals to mitigate any pressures that might otherwise motivate them to exit the organization. Similarly, we found that both formal and informal power reduced the likelihood of transfer indirectly through increased accuracy of the incoming dislike tie network. Thus, powerful individuals were significantly less likely to be transferred and more likely to retain their position in the organization. While transfer can generally be interpreted as a positive outcome by individuals, it could be that individuals with formal or informal power, having already achieved a position of formal authority or informal influence, might resist lateral transfers and be motivated to remain in and maintain their powerful current position. Importantly, we did not find that accuracy with respect to negative ties was related to promotions, suggesting important boundary conditions to the beneficial effects of some kinds of network tie accuracy (cf, Marineau, 2017).

In unhypothesized results, we also tested the possibility that incoming friend tie accuracy relates to promotion, transfer, and exit. Our results suggested that having greater accuracy of one's position in the friend network can improve chances of promotion and transfer, but not exit. Thus, unlike negative tie accuracy, positive tie accuracy is related to "moving up", but not "moving out" of the organization. This might be because individuals who have accurate knowledge of their positive tie position within the organization can access their social capital more efficiently and confidently, and this knowledge benefits those who are looking to improve their position or find a better fit in the organization. This is a very practical view of network accuracy as social capital, with those in powerful positions able to take advantage of such knowledge due to a greater latitude to leverage such knowledge to their own ends, at least with respect to promotions, in ways that the less powerful likely cannot. Combined with the negative tie results above, these findings suggest that individuals more attuned to dislike ties were less likely to exit; while those individuals who attend more to positive ties were more likely to be promoted.

Limitations and future research

Our fundamental argument is that power creates motivation to attend to and accurately perceive the social network. However, we did not test directly for individuals' motivational attention to social relationships in their environment. Instead, we focused entirely on measuring the expected outcomes of that greater motivation and attention – accuracy of network perceptions. Future research should attempt to measure this underlying attentional mediating mechanism to strengthen our claims about situated cognition driving network accuracy.

Like all field studies of cognitive networks, this study is limited to a small sample. It is difficult to generalize to other contexts based on a small sample culled from one organization. Cognitive social structure data is very time-intensive to collect for respondents because each respondent answers full network questions not only for themselves, but for every other member of the network. Thus, increasing the size of the sample is problematic and sample sizes are intentionally kept small for these types of studies (e.g., Casciaro, 1998; Casciaro et al., 1999). Small sample sizes also limit the statistical options in analyzing some data, in terms of specifying the model and avoiding Type II error. This limited statistical power required a judicious use of control variables. Future research might also focus on issues such as whether homophilous ties on an individual attribute, such as gender or personality, are more likely to be accurately perceived than heterophilous ties.

This study suggests a number of other potentially fruitful avenues of future research. One is to continue to investigate the role of network accuracy for other important employee and organizational outcomes, such as performance. A person's ability to accurately assess the network might provide an information advantage resulting in performance above those who lack accuracy. This line of inquiry has garnered little attention, but a few studies have begun to investigate the importance of accuracy on outcomes. Understanding how network accuracy can affect individuals' ability to navigate the social world, whether by avoiding or exploiting knowledge of negative ties or instances of disconnections among individuals (e.g., "structural holes", Burt, 1992), would be very valuable. Thus, it might not be just "who you know," but whether you accurately perceive "who those you know, know."

Despite the growing interest in cognitive social structure research, we do not yet have a systematic understanding of how it is that people actually recall or experience "networks." Do individuals see maps, or do they experience more general associations or affiliations among groups (Freeman, 1992)? Do individuals recall networks as dyadic links or whole networks of actors (cf, Brashears and Quintane, 2015)? This also pertains to how network perceptions are measured by researchers. Understanding how individuals store and recall relational information as knowledge structures or schemas is a fundamentally important area of research, which could potentially impact current and future theories of network perceptions and networks in general.

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We found evidence that individuals with power can indeed be more accurate about social network ties; however, we also found that when the person with power is directly involved, accuracy increases. This was contrary to arguments often made in self-regulatory approaches to power that explore the role of approach and inhibition (Keltner et al., 2001). This provides a potential area to develop a more nuanced study to understand the relationship between accuracy generally (the whole network) and accuracy locally (one's own ties)—that is, how power operates differently at different social distances, and how power might itself be more directly related to personal, local knowledge. For example, general accuracy might be driven by situated cognition, while more local tie accuracy is driven by self-preservation for those in a power position. The motivations at different levels of analysis can be assessed more directly by considering the interplay between motivation for attention to social ties and tie social distance and tie content.

Finally, our findings indicate that network accuracy for one's incoming negative or positive ties relate differently to various employee outcomes. For example, accuracy of incoming dislike ties decreased chances for transfer, while accuracy of incoming positive ties increased chances for promotion. What we could not directly disentangle were individuals' goals or intentions with respect to these outcomes which might help explain these results. We encourage scholars to broaden the scope of network consequences to include individuals' motivations, such as career aspirations, as likely explanations for the divergent findings on negative and positive tie accuracy.

Conclusion

This study demonstrated that power is associated with *increased* accuracy about the social network, not decreased accuracy as we've seen in prior studies. Our results also suggest that this extends to individuals even when they are not in formal power positions; individuals' experience of informal power is related to a higher level of accuracy in their personal network relationships. Our results should encourage additional work in understanding how power affects the way in which individuals perceive the social environment, and begin to shift our views from the powerful as "cognitive misers" seeking to minimize their cognitive effort to the powerful as motivated and accurate perceivers of their workplace social environment whose network accuracy can lead to important outcomes.

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Appendix A.

This is an example of the matrix used to collect cognitive social structure data for this study. Each individual was asked to write a "1" for friendship or a "2" for dislike for each of the cells beginning with their own row and column where they believed to be either friendship or dislike between two individuals.

PERSONAL FRIEND (1) DISLIKE (2)		name	name	name	name	name	name	name	name	name	name	name	name	name
		A	B	C	D	E	F	G	H	I	J	K	L	M
Write a 1 in the box for personal friend or a 2 for dislike, or leave box empty for neither for each name in the ROWS (1-25).	name 1													
	name 2													
	name 3													
	name 4													
	name 5													
	name 6													
	name 7													
	name 8													
	name 9													
	name 10													
	name 11													
	name 12													
	name 13													
		name	name	name	name	name	name	name	name	name	name	name	name	name
	name 14													
	name 15													
	name 16													
	name 17													
	name 18													
	name 19													
	name 20													
If you are unsure about an answer, please leave it blank. For your name, please only mark those for whom you actually are personal friends or dislike.	name 21													
	name 22													
	name 23													
	name 24													
	name 25													
	name	A	B	C	D	E	F	G	H	I	J	K	L	M

Appendix B.

Bayesian Network Accuracy Model

We also calculated a "true" criterion network using a Bayesian Network Accuracy Model (BNAM) (Butts, 2003). This model essentially provides a mathematically derived *consensus* of the network based on each person's complete individual cognitive social structure map. The key advantage of this model over traditional consensus models, such as the row-dominated LAS approach we used in the main body of the text, is that it incorporates error terms into the calculation of the network. Unlike nearly all other measurements in social science, social network measurements are generally devoid of error calculations, i.e., the probability of false positives and false negatives in individuals' perceptions of the network ties (Butts, 2003). Individuals can inaccurately perceive ties that do not exist and can also fail to perceive ties that do exist. The Bayesian approach described here allows for the incorporation of these error terms in the network model. This method also produces a probabilistic output of the network, where the "ties" are valued probabilities of that tie's existence. In the end, the BNAM approach produced very similar results as the row-dominate LAS model, as both showed a positive association with dislike tie accuracy and formal managerial position(see Table B1 below: $b = .025$, $p < .05$, $F = 12.46$, $p < .001$).

Appendix C. Post hoc analysis

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Table B1
Analysis for Whole Network Dislike Tie Accuracy and Power Bayesian Approach.

Variables	Dislike ties				Friend ties			
Group	0.01	0.14+	0.02	0.14+	−0.01	0.02	−0.01	0.02
	(0.16)	(1.96)	(0.17)	(1.70)	(−0.63)	(0.95)	(−0.61)	(1.01)
Org. Tenure	0.00**	0.00	0.00+	−0.00	0.00	−0.00	0.00	−0.00
	(3.73)	(0.67)	(2.04)	(−0.15)	(1.38)	(−0.10)	(1.16)	(−0.07)
Dislike Ties	0.00	0.00	0.00	−0.00	0.00	0.00	0.00	0.00
	(0.35)	(0.01)	(0.31)	(−0.07)	(0.24)	(0.14)	(0.23)	(0.12)
Friend Ties	0.00	0.00	0.00	0.00	0.00+	0.00+	0.00	0.00
	−0.66	−0.39	−0.49	−0.19	(1.72)	(1.86)	(1.45)	(1.49)
Work Ties	−0.00	−0.01**	−0.01	−0.01*	0.00	0.00	0.00	0.00
	(-0.73)	(−3.17)	(−0.89)	(−2.45)	(0.96)	(0.28)	(0.99)	(0.13)
Network Perception	2.17*	2.31**	2.03*	2.25*	−0.05	−0.07	−0.05	−0.08
	(2.23)	(2.84)	(2.05)	(2.63)	(−1.02)	(−1.18)	(−0.89)	(−1.10)
Formal Power (Manager)		0.25*		0.25*		0.05		0.06
		(2.24)		(2.23)		(1.39)		(1.45)
Informal Power			0.11	0.13			−0.01	−0.00
			(0.80)	(1.18)			(−0.12)	(−0.10)
Constant	−0.14	−0.03	−0.35	−0.29	0.14**	0.16**	0.15+	0.18+
Sigma	0.17**	0.16**	0.17**	0.15**	0.07**	0.06**	0.07**	0.06**
Pseudo Log-Likelihood	−2.56	0.95	−1.77	1.72	51.22	52.23	49.42	50.50
Model F (all p < 0.05)	6.44	12.46	5.01	3481.47	3.58	4.20	3.40	209.62
N	39	39	38	38	39	39	38	38

Note: Standardized beta coefficients; t-statistics in parentheses. Standard errors clustered around supervisor (n = 9) are robust. Manager = 1, non-manager = 0; Group 2 = 1, Group 1 = 0. Two-tailed.
*p < 0.05.
**p < 0.01.

Table C1
Post-hoc analysis results for summary models including informal power and positive tie centrality interactions with formal power.

Whole Network Accuracy (n = 39)							
		Dislike			Friend		
		b	*t*	*p*	*b*	*t*	*p*
Main Effects							
	Formal Power (FP)	**0.09**	−2.36	<0.05	0.05	−1.61	ns
	Informal Power (IP)	0.10	−1.62	ns	−0.01	−0.28	ns
	Friend Tie Centrality (FTC)	0.00	−1.10	ns	0.00	−0.56	ns
Interactions							
	FP*IP	−0.03	−0.47	ns	**−0.09**	−2.50	<0.05
	FP*FTC	0.00	−0.64	ns	0.00	−1.02	ns
Incoming Tie Accuracy (n = 48)							
		Dislike			Friend		
		b	*t*	*p*	*b*	*t*	*p*
Main Effects							
	Formal Power (FP)	**0.33**	4.66	<0.01	**0.22**	6.99	<0.01
	Informal Power (IP)	**0.28**	3.12	<0.01	**0.27**	2.82	<0.01
	Friend Tie Centrality (FTC)	0.00	0.55	ns	**0.01**	2.45	<0.05
Interactions							
	FP*IP	**−0.29**	−8.53	<0.01	**−0.19**	−2.50	<0.05
	FP*FTC	0.01	0.40	ns	**0.01**	2.33	<0.05

Note: Standardized beta coefficients are shown and *t*-tests are based on robust standard errors clustered around supervisor for all models. Bold coefficients are significant at the p < .05 level. All models above included main effects and interaction terms (mean-centered), as well as controls for Tenure, Negative Tie Centrality, Positive Tie Centrality, Work Tie Centrality, and Perceived Network Density (Whole network models) or Perceived Incoming Ties (Incoming Tie Models). Whole network models also included a control for group. Tests are two-tailed. Complete models are available as an online supplement.

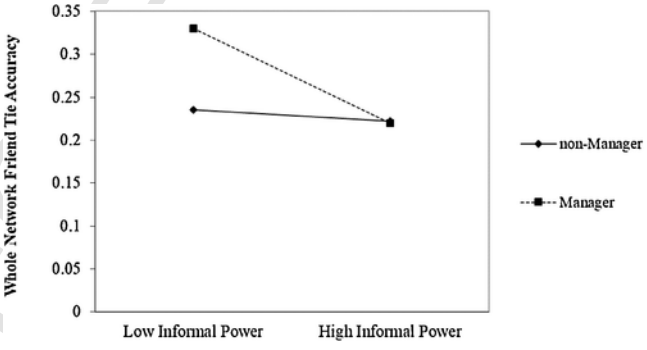

Fig. D1. Interaction effect of formal power (manager) and informal power on whole network friend accuracy.

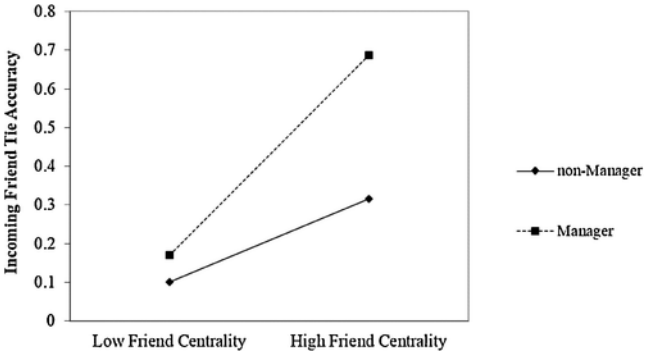

Fig. D2. Interaction effect of formal power (manager) and informal power on incoming friend accuracy tie accruacy.

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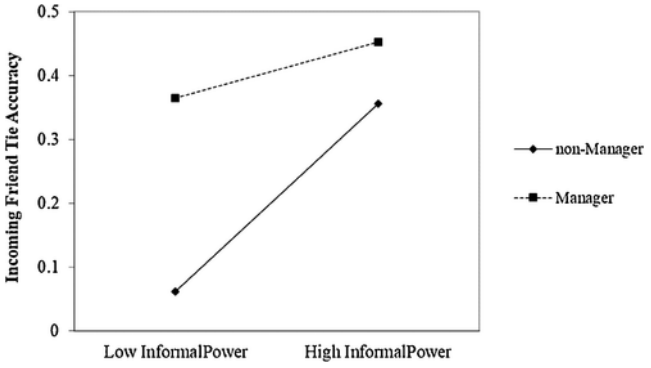

Fig. D3. Interaction effect of formal power (manager) and informal power on incoming dislike accuracy tie accruacy.

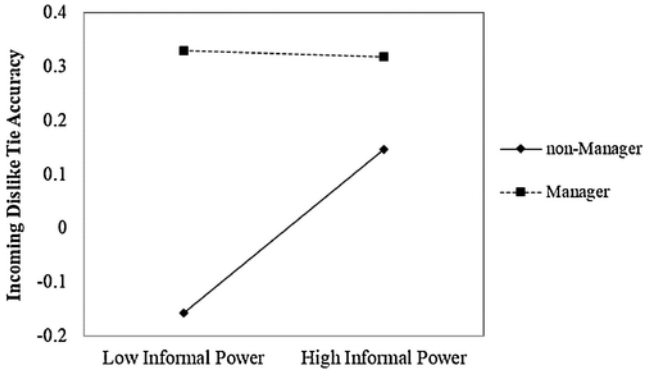

Fig. D4. Interaction effect of formal power (manager) and informal power on incoming friend accuracy tie accruacy.

Appendix D. Post hoc analysis

Below are the interaction effect plots for post-hoc models indicating a significant interaction effect of formal and two forms of informal power: peer-rated informal power and sociometric status (indegree centrality in the friendship network). Each plot shows how those with formal power (managers: solid line) compare to those without formal power (non-managers: dotted line) relative to network accuracy across different levels of either informal power or sociometric status. Fig. D1 shows these effects for formal power and informal power on whole network friend tie accuracy. Fig. D2 shows the effects of formal power and sociometric status for incoming friend tie accuracy (ego's accuracy of her own incoming ties), and Fig. D3 shows the effects of formal power on informal power for incoming friend tie accuracy. Fig. D4 shows the effects of formal power on informal power for incoming dislike tie accuracy. The y-axis measures range +/−1 SD from the mean value. For example, in Fig. D1, informal (peer-rated) power is mean centered and ranged from −0.54 to +0.54 (SD = 0.54 for both samples). The x-axis is the predicted probability of network accuracy. Following the interaction plot figures we have also included the complete result table for all models including whole network and incoming tie networks for formal power and informal power and sociometric status (see Table D1). The analysis for these models is identical to that provided in the main analysis, with the addition of the interaction variables and main effect of sociometric status where necessary (indegree friendship centrality was already included in the dislike and friend accuracy models).

Table D1
Post-Hoc Analysis of Whole Network and Incoming Tie Accuracy and Formal and Informal Power.

Variables	Whole Network		Incoming Ties	
	Dislike	Friend	Dislike	Friend
Group	0.12+	0.05**	–	–
	(2.03)	(2.89)		
Tenure	0.00	0.00	0.00	−0.00**
	(0.09)	(0.52)	(0.91)	(3.99)
Dislike Ties	0.00	0.00	0.00	0.01
	(0.87)	(0.11)	(0.80)	(1.51)
Friend Ties	0.00	0.00	0.00	0.01*
	(1.10)	(0.54)	(0.55)	(2.45)
Work Ties	−0.01	0.01*	−0.02**	−0.02**
	(1.43)	(2.09)	(3.34)	(3.30)
Perceived Tie Density	1.40*	0.43**	0.00	0.01**
	(2.59)	(6.95)	(0.46)	(6.06)
Formal Power	0.09*	0.05	0.33**	0.22**
	(2.36)	(1.61)	(4.66)	(6.99)
Informal Power	0.10	−0.01	0.28**	0.27**
	1.62	(0.28)	(3.12)	(2.82)
Formal * Informal Power	−0.03	−0.09*	0.01	0.01*
	(0.47)	(2.50)	(0.40)	(2.33)
Formal Power * Friend Tie centrality	0.00	0.00	−0.29**	−0.19*
	(0.64)	(1.02)	(8.53)	(2.50)
Constant	−0.20	0.09	−0.44*	−0.52*
Sigma	0.08**	0.05**	0.12**	0.11**
N	38	38	48	48
Log likelihood	16.35	58.92	31.8	25.33
F-statistic	10.47	25.62	528.37	192.22

Note: Standardized beta coefficients are shown and *t*-tests are based on robust standard errors clustered around supervisor for all models. All models above included main effects and interaction terms (mean-centered), as well as controls for Tenure, Negative Tie Centrality, Positive Tie Centrality, Work Tie Centrality, and Perceived Network Density (Whole network models) or Perceived Incoming Ties (Incoming Tie Models). Whole network models also included a control for group. Tests are two-tailed.

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