THE EFFECTS OF ADVICE-GIVING AND ADVICE-TAKING ON SAFETY BEHAVIOR: A SOCIAL NETWORK PERSPECTIVE

A Dissertation

by

YIMIN HE

Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Chair of Committee,	Stephanie C. Payne
Committee Members,	Mindy E. Bergman
	Winfred Arthur, Jr.
	Oi-Man Kwok
Head of Department,	Heather C. Lench

May 2020

Major Subject: Industrial/Organizational Psychology

ABSTRACT

Previous research suggests that safety behavior is an important antecedent of workplace safety that can be influenced by coworkers within the employee's network. Drawing on the social network perspective, both advice and trust network structures (centrality and density) are proposed to influence resource exchanges among employees and thus impact their safety behaviors. The objective of the current study is to examine the extent to which: 1) advice-giving (indegree centrality) and advice-taking (outdegree centrality) impact safety behavior, 2) cognitive and affective trustworthiness (indegree centrality) and trust in coworkers (outdegree centrality) are related to advice-giving and advice-taking behaviors which in turn are expected to be related to safety behavior, and 3) advice network density relates to safety behavior. Four hundred sixteen nurses in 42 workgroups and their respective supervisors from a hospital in China each completed a survey. Data were analyzed using social network analysis and hierarchical linear modeling. Advice-giving was positively associated with safety behavior and this relationship was stronger when corresponding group members reported more advice-giving and advice-taking behaviors within the group. Further, cognitive and affective trustworthiness were positively related to advice-giving and subsequent safety behavior; whereas cognitive trust in coworkers was positively related to advice-taking. Both cognitive and affective trust in coworkers were not related to safety behavior. These findings highlight the relevance of the advice social network to safety behavior revealing in part the value of measuring social network variables to understanding workplace safety.

CONTRIBUTORS AND FUNDING SOURCES

I would like to thank all of the professors who have supported me throughout the course of this project. First, thank you Dr. Stephanie C. Payne, my committee chair, for your advice, guidance, patience, and efforts. I am really grateful to have you as my advisor throughout my Ph.D. study. These experiences are invaluable for my career development. Additionally, thank you Drs. Mindy E. Bergman, Winfred Arthur, Jr., and Oi-Man Kwok for your generous support and valuable suggestions for my dissertation manuscript. I really appreciate all your help and guidance. Finally, thanks to my family for your support and unconditional love, and my friends and the department faculty and staff for all your help and encouragement.

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INTRODUCTION

Millions of nonfatal injuries and illnesses and thousands of fatalities occur because of workplace safety-critical incidents each year in the United States (Liberty Mutual Research Institute for Safety, 2016; U.S. Bureau of Labor Statistics, 2018) and in China[1] (National Bureau of Statistics of the People's Republic of China, 2019). These statistics indicate the importance of workplace safety in organizations and the devastating consequences caused by workplace safety-critical incidents, which can lead to significant employee suffering and substantial financial losses to organizations. Therefore, it is crucial for researchers to identify the determinants of safety-related incidents and injuries in order to enhance workplace health and safety.

Given that employees are embedded in an organizational network and are frequently organized into workgroups or teams (Brass, 1984; Granovetter, 1985; Podolny & Baron, 1997), they are likely to engage in social exchanges with one another. To the extent that these exchanges concern safety-related information, they may influence employees' safety behavior. Knowledge sharing and safety communication research has primarily measured individual employee's information exchange with a group of individuals (Neal et al., 2000; Zohar & Tenne-Gazit, 2008). This ignores the possibility that individuals share distinct information with each other; an individual may share different pieces of information with different members within the team. To address this shortcoming, a social network perspective is taken to assess interpersonal (i.e., advice and trust) exchanges within the network and to explore how the network structures influence safety behavior. This study also responds to calls from Zohar (2011) and Hofmann,

[1] The present study was conducted in a Chinese hospital.

Burke, and Zohar (2017) who advocated for a multilevel and systematic view of workplace safety and the need to examine the role of team and social networks on safety behavior. In particular, the effects of characteristics of the advice and trust networks on individual employee safety behavior will be explored.

According to the social network perspective, the structure of networks is likely to influence individuals' access to valued resources (e.g., Brass, 1984; Granovetter, 1985; Podolny & Baron, 1997). Within an advice network, network ties or connections between individuals act as conduits for the transmission of resources including knowledge, information, assistance, and guidance for how to conduct tasks at work. In short, an advice network is a conduit for task-related information exchanges to tackle task problems (Cross, Cross, & Parker, 2004). Recognizing that advice is not always beneficial, in this study, an important boundary condition set forth up front is that any advice provided is well-intentioned. It is important to note that often times strategies for getting the job done quickly may not be the most safe; thus, another caveat is that the advice is consistent with getting the job done safely. Both individual-level and team-level advice network structures are proposed to influence individual employee's safety behavior. In addition, because trust is a crucial precursor to advice-taking (Bonaccio & Dalal, 2006), it is proposed that individuals who are highly trusted are likely to be critical to the advice network. In other words, advice provided by individuals who are trusted by most team members is likely to be deemed most useful and therefore likely to be accepted by others.

The objective of the present study is to investigate how interpersonal advice-giving and advice-taking influences safety behavior using a social network approach. First, the current study examines the extent to which advice-giving and advice-taking have an influence on individual safety behavior. According to the social network perspective (e.g., Brass, 1984; Granovetter,

1985; Podolny & Baron, 1997), occupying a central position in an advice network permits individuals to have access to more resources, including safety-related knowledge and information. Correspondingly, advice-giving and advice-taking are expected to relate positively to safety behavior.

Second, the current study examines the extent to which network-level density (i.e., the overall number of advice-related connections within the network) is related to safety behavior and if it alters (strengthens) the advice-giving-safety behavior or advice-taking-safety behavior relationships. Based on the social network perspective, frequent exchanges are likely to facilitate employees' work performance, enhancing the effects of advice-giving and advice-taking on safety behavior.

Third, as trust is an important determinant of advice-taking (Bonaccio & Dalal, 2006), the current study examines trustworthiness of an employee (as perceived by his/her teammates) as a predictor of the extent to which that employee gives advice. The current study also examines trust in teammates as a predictor of taking advice from those same teammates. Both advice-giving and advice-taking are expected to be related to safety behavior. The findings from this study reveal the value of taking a social network approach to studying trust, advice-giving, and advice-taking on workplace safety.

The Importance of Safety Behavior to Workplace Safety

Within the Industrial/Organizational psychology safety literature, researchers have proposed various models of workplace safety and identified multiple antecedents of workplace accidents and injuries. Based on Neal and Griffin's (2004) framework of workplace safety, Christian et al. (2009) developed an integrated model of workplace safety depicting person- and situation-related predictors of workplace safety. Distal factors including situation-related (e.g.,

safety climate and leadership) and person-related factors (e.g., personality and safety attitudes) are expected to influence safety behavior through the more proximal person-related factors: safety motivation and safety knowledge. As indicated in their model, the most proximal cause of workplace incidents and injuries is safety behavior (Christian et al., 2009; Neal & Griffin, 2004).

Safety behavior refers to actions that individuals engage in to promote the health and safety of employees, customers, and the environment (Burke, Sarpy, Tesluk, & Smith-Crowe, 2002). Analogous to the distinction between task and contextual performance (Borman & Motowidlo, 1997), researchers differentiate between two types of safety behaviors (Griffin & Neal, 2000; Neal, Griffin, & Hart, 2000). *Safety compliance* refers to generally mandated safety behaviors to maintain workplace safety, which include adhering to standard safety procedures and wearing personal protective equipment (Christian et al., 2009; Neal, Griffin, & Hart, 2000). On the other hand, *safety participation* refers to the frequently voluntary safety behaviors, which describe efforts that contribute to the safety environment in the organization, not just an individual's personal safety. Some examples of participation behaviors are volunteering to serve on a safety committee and helping coworkers with safety-related challenges. The focus of this study is on safety compliance, as it is the most critical aspect of safety behavior. Based on Christian et al.'s (2009) model, safety communication, an important dimension subsumed under safety climate, is expected to contribute to safety behavior.

Safety Communication as an Antecedent of Safety Behavior

Safety researchers have demonstrated the important role of communication and knowledge sharing on the promotion of safety climate and performance (Neal et al., 2000; Zohar & Tenne-Gazit, 2008). For instance, Zohar and Tenne-Gazit (2008) found that transformational leadership could enhance safety climate strength by promoting the frequency and quality of

communication among group members. Safety climate strength, the degree to which group members agree about safety norms, priorities, and expectations (Schneider, Salvaggio, & Subirats, 2002) is positively related to safety behavior (Lee & Dalal, 2016). Cigularov, Chen, and Rosecrance (2010) explored the effect of worker safety communication on safety behavior, pain, and injury using a sample of 235 union construction workers in the Midwest and Northwest regions of the United States. They found that safety communication was positively related to safety behavior and pain but not injuries.

Kath, Magley, and Marmet (2006) examined the effects of upward safety communication on organizational trust and subsequent safety behaviors by surveying 599 employees across a New England grocery store chain. Results from hierarchical linear modeling revealed that upward safety communication was positively related to organizational trust and subsequently led to increased safety behaviors, suggesting that organizational trust is a key mediating mechanism explaining why safety communication promotes safety behavior. Huang, Sinclair, and Lee (2018) examined the distinct contribution of supervisory safety communication, consisting of subordinates' perceptions of both top-down (i.e., the extent to which job-related safety information is provided by supervisors) and bottom-up safety communication (i.e., the extent to which employees discuss safety-related issues or concerns with their supervisors) on safety-related outcomes. They collected data from 5162 truck drivers from a trucking company in the United States. They found that supervisor safety communication was positively associated with safety behavior, which in turn predicted injury rates.

Hofmann and Morgeson (1999) explored how leader-member exchange and perceived organizational support influence safety communication, safety commitment, and accidents with data collected from 49 leader-member dyads in a manufacturing facility. They found both leader-

member exchange and perceived organizational support were positively related to safety communication, which was positively associated with safety commitment. Increased safety commitment led to decreased accidents. Neal et al. (2000) found that open communication is an important dimension of organizational climate that was positively associated with safety behavior as it enhances safety climate, knowledge, and motivation. Moreover, safety communication is considered an important dimension of safety climate and should be fostered by supervisors and top management in order to achieve a favorable safety climate (Beus, Payne, Bergman, & Arthur, 2010; Zohar, 2003, 2014).

Advice-giving and Advice-taking Influences on Safety Behavior

Whereas previous research has demonstrated the impact of safety communication on safety behavior, this research did not examine whether this effect is influenced by the direction of safety communication. This study will take the direction of communication into consideration by examining the effects of both advice-giving and advice-taking on safety behavior using a social network approach. In this study, *advice-giving* is the extent to which teammates report taking advice from a focal individual.[2] In contrast, *advice-taking* is the extent to which a focal individual incorporates others' suggestions or opinions into his or her own decision making and actions (Bonaccio & Dalal, 2006). Safety communication is somewhat similar to advice-giving and advice-taking as all three constructs concern knowledge and information sharing. However, they are not exactly the same, as the latter constructs capture the direction in which the

[2] In the current study, advice-giving is measured by tallying ratings of the extent to which all the other team members report taking advice from the focal person. For the sake of simplicity, such advice acceptance was labeled as advice-giving.

information is flowing and advice-taking captures the implementation of advice into future actions.

There is a scarcity of research linking advice exchange with safety behavior in organizations. Only one study could be located investigating advice networks among 109 doctors, nurses, allied health professionals, and administrative staff in emergency departments (Creswick, Westbrook, & Braithwaite, 2009). The researchers found that senior doctors and nurses were more central in the advice network and thus were important sources of medication advice to their colleagues. Taken together, the findings from this study and safety communication studies cited in the previous section demonstrate that safety communication is an important contributor to workplace safety.

Social Network Perspective

Traditionally, workplace safety researchers examine various constructs depicting interpersonal relationships (e.g., social relationships, safety communication) that could influence safety-related outcomes (e.g., safety behavior, knowledge, and motivation) at both the individual and unit levels of analysis by collecting data without modeling the interdependencies among employees within their various social networks (e.g., friendship network, trust network). For example, Yagil and Luria (2010) examined whether high quality social relationships could strengthen the relationship between safety climate and safety behavior using a large sample of employees and managers from 11 manufacturing companies in Israel. Their results indicated that safety climate was more strongly related to safety behavior when there were high-quality relationships with coworkers, suggesting that high-quality social relationships with coworkers enhance the effects of safety climate on safety behavior.

Whereas these types of studies are informative as they reveal some information about interpersonal variables that correlate with one another and contribute to prediction models of workplace safety; these approaches do not consider the influence of employees' social networks. This is problematic conceptually because it ignores the fact that employees do not work in isolation and employees establish different relationships or share different resources with different coworkers. Instead, they are embedded or nested within work teams or physically clustered by organizational department or temporally clustered by shift within a broader organization. Theoretically, their safety behaviors are likely to be influenced by other members either directly or indirectly and to different extents within those team or organization-level networks. Thus, efforts to model and understand their behavior need to take this interdependence into account.

Another reason why the traditional analytical approach is problematic for understanding the influence of social networks concerns a violation of a statistical assumption. Granovetter (1985) pointed out that data from nested sources violate the assumption of independent observations and proposed that it is important to model the interdependence within the data. Failure to model this interdependence can result in biased findings. One way to model this interdependence is to take a social network approach when gathering the data. This way characteristics of the interpersonal relationships within the network and network-level entities (e.g., network density) are captured and accounted for in the analyses. The current study adopts the social network approach to model the interdependence between team members and a multilevel approach to simultaneously examine the influences of individual- and network-level characteristics on safety behavior.

A network is defined as a group of interconnected individuals. Within an organization, there are many formally defined groups including departments, workgroups, and business units. Correspondingly, any of these groups could be examined as a network. In this study, a network is defined as a workgroup or all of the employees who report to the same supervisor. A social network reflects interpersonal relationships or interactions among members embedded in a network. Thus, social networks are usually operationalized and modeled within organizationally-defined networks. There are various types of social networks depicting different kinds of interpersonal interactions. For instance, an *advice network* in the current study delineates who takes advice such as task-related information and knowledge from whom within the network and the direction of this exchange. A trust network reflects the extent to which each network member trusts every other network member (i.e., interpersonal trust).

Contrary to the alternative of asking about advice-taking from all the members within the network as one combined unit (e.g., Colquitt et al., 2007), a social network approach involves gathering ratings about network member interactions for pairs of members within the network. This provides a much more refined and nuanced assessment of advice-taking. Specifically, two types of methods (i.e., closed-ended versus open-ended rosters) can be used to collect primary network data (Wasserman & Faust, 1994). With a closed-ended roster method, respondents are presented with a roster of all network members comprising the full network to answer the required network questions. With an open-ended roster method, respondents are asked to write down the names or initials of members within the network and then answer the network questions about each person they listed. In the current study, a closed-ended roster method is adopted as this reduces respondents' recall error. Ratings can be made on a dichotomous scale indicating some versus no interaction or they can be made on a continuous scale to represent the

frequency or quality of interactions among the various members. Also, social networks can be differentiated on the direction in which information is flowing which is called a directed network or without capturing this information which is called an undirected social network (Wasserman & Faust, 1994). The focal advice network in the current study is a directed social network rated on a continuous scale.

According to the social network perspective, the structure of the network is likely to influence individuals' access to valued resources (e.g., Brass, 1984; Granovetter, 1985; Podolny & Baron, 1997). There are multiple structural characteristics of networks at both the individual and the network levels of analysis. In this study, the current study examines three of the most frequently assessed network variables: indegree centrality, outdegree centrality, and density. Next, each structural variable within the advice network is described.

Network Centrality and Density

An advice network captures advice-giving and advice-taking that are indexed by indegree and outdegree centrality, respectively. These are two common indices in social network analysis and they vary in whose perspective they are providing. Indegree centrality provides multiple team members' perspectives and outdegree centrality provides an individual team member's perspective. In an advice network, indegree centrality captures the extent to which team members take advice from the focal person, whereas outdegree centrality captures the extent to which a focal individual takes advice from all the other team members within the social network. Conceptually, indegree centrality and outdegree centrality represent a focal person's advice-giving and advice-taking, respectively. Both behaviors represent the exchange of resources such as task-specific safety knowledge and work-related information. Operationally, indegree centrality is simply the sum of the number of network members who reported taking advice from

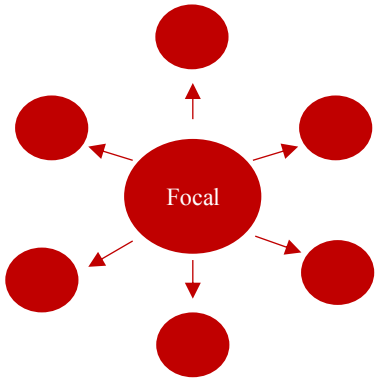
him/her, whereas outdegree centrality is the sum of the number of network members from whom he/she taken advice (see Figure 1). Thus, each network member has unique indegree and outdegree centrality scores and higher scores indicate a higher level of connectedness with other network members.

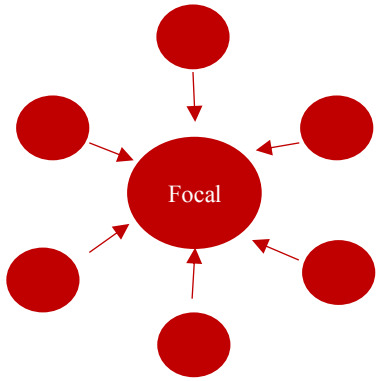
At the network level of analysis, the overall number of interactions relative to the number of possible interactions among the network members represents the density of the network. In an advice network, network density reflects the overall number of exchanges of advice among network members. Advice network density is analogous to the mean level of advice relations per network member. The more advice exchanges each group member engages in with other network members, the greater the density of the network.

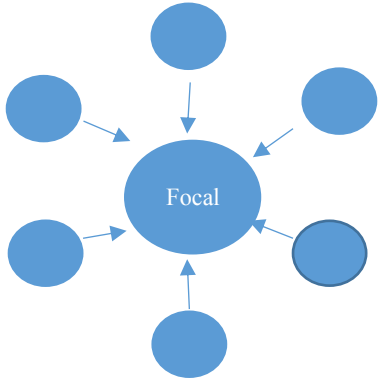
Figure 1 Illustrations of advice-giving and advice-taking

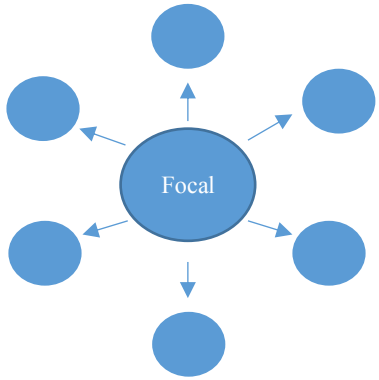
Traditional social network diagram: Arrow points to the advisor from whom the advisee takes advice

Alternative diagram: Arrow depicts the direction in which the advice is flowing









Advice-taking (i.e., outdegree centrality)

Advice-giving (i.e., indegree centrality)

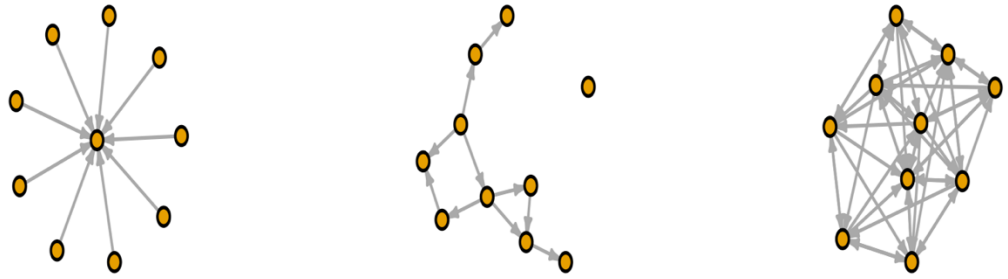
Density is operationalized as the sum of the number of connections reported by the individual network members divided by the total possible number of connections (i.e., when everyone is connected to each other; Wasserman & Faust, 1994; see Figure 2). When all employees interact with all the other employees within the network, the network is described as having the highest possible density level. When none of the employees interact with one another, the network is described as having the lowest possible density level.

In summary, taking a social network perspective to the study of advice-giving and advice-taking on workplace safety behavior involves gathering more nuanced data that result in potentially meaningful network variables at the individual and network levels of analysis. Advice-giving and taking and advice network density are proposed to be important predictors of workplace safety behavior.

Advice-giving and Advice-taking as Antecedents of Job Performance

Although relatively few research studies have examined the influence of advice-giving on safety behavior, several studies have empirically demonstrated the effects of advice-giving on general job performance, using the social network data collection approach. Sparrowe et al. (2001) conducted a field study examining the influence of advice networks and hindrance networks (referring to relationships with team members who thwart task behaviors) on both individual and team performance.

Figure 2 Illustrations of network centrality and density



Note. In the first diagram, the central node has the highest centrality and the peripheral nodes have much lower centrality. The second diagram depicts a network with a low level of network density compared to the network in the third diagram, which has a very high level of network density.

The results evidenced that advice-giving (i.e., advice indegree centrality) was positively related to individual job performance, whereas hindrance behaviors (i.e., indegree hindrance centrality) were negatively related to individual job performance. They also found that hindrance network density had a significant, negative relationship with group performance.

Rhee and Ji (2011) conducted an empirical study investigating the contribution of advice-giving on two types of performance (individual innovation and managerial performance) using social network data collected from the strategic product development departments of six large manufacturing firms in Korea. The results indicated that advice-giving (i.e., indegree advice centrality) was positively associated with individual innovativeness and managerial performance. Wong and Boh (2014) investigated whether advice-giving could elevate managerial innovativeness through access to information. Their findings indicated that advice-giving was positively related to innovativeness, especially when managers engaged in more ambassador activities such as applying for external support and seeking resources for new initiatives.

Moreover, Regts and Molleman (2016) examined the relationship between advice-giving and job performance outcomes and its boundary conditions. They found a significant, positive relationship between advice-giving as measured by indegree advice centrality and supervisor ratings of job performance, but only for introverts high in neuroticism and extraverts low in neuroticism. Their findings indicated that a combination of personality traits appear to alter the effect of advice-giving on individual job performance.

Teigland and Wasko (2009) adopted a social network approach to investigate how individual intrinsic motivation, knowledge sourcing activities, and advice-giving influence individual performance. As expected, the findings suggested that advice-giving was positively related to individual job and creative performance. Moreover, they found that individuals who

are more intrinsically motivated were more central in the advice network and report higher levels of job and creative performance. In terms of knowledge-sourcing activities, individuals who access task-related knowledge more often through explicit knowledge transfer (e.g., intranet, documents, electronic message boards) were less likely to be central in the advice network and reported lower levels of job performance but higher levels of creative performance. These findings suggest intrinsic motivation and the use of different knowledge-sourcing activities influence the individual's advice network centrality and subsequent job and creative performance. Taken together, these findings demonstrate that advice centrality is positively associated with job performance.

Advice-giving and Advice-taking as Antecedents of Safety Behavior

In organizational settings, employees are embedded within interdependent teams. They are likely to share advice with each other and rely on each other as safety-related resources. For example, employees may seek advice from others in the network when they are unfamiliar with the use of a specific piece of personal protective equipment or how to safely complete a specific task that they have not completed before. Within advice networks, members are likely to share knowledge acquired and lessons learned with each other that is helpful for performing tasks in a safe manner and solving safety-related challenges. That is, advice networks are a means for obtaining safety-related information that is beneficial to an employee’s safety behavior.

In a hospital setting which is the context of this study, nurses are likely to give each other advice on a wide range of topics. They may share advice on how to interact with specific coworkers or supervisors. They may mentor each other on how to perform specific technical tasks. For example, one nurse might advise another on how to start an intravenous therapy in a

combative patient or what to do when a patient refuses to follow instructions. Nurses may also give each other advice on how to manage daily stress and to recover from long shifts.

The current study explores the effects of advice-giving and advice-taking on safety behavior. To the best of my knowledge, only one study has previously investigated the relationship between advice centrality and safety behavior. Arizon-Peretz and Luria (2017) examined the relationship between advice-giving centrality and unsafe road behaviors with a sample of 83 professional drivers embedded in eight teams from four different organizations. However, contrary to their expectation, the findings showed that advice-giving was not related to unsafe driving. This null finding may be due to a lack of statistical power given their small sample size.

Advice-giving is proposed to be positively related to one's own safety behavior as giving more advice to others is likely indicative of having more valued resources that are sought out by others. A core tenet of social network theory is that individuals who give more advice to other team members in the advice network benefit from both information and influence advantages (Brass, 1984; Ibarra, 1993; Wong & Boh, 2014). As such, as other members within the network are prone to take advice from a central individual, s/he establishes positive relationships with others, has access to resources available from others, and is likely to accumulate resources that can be used in future exchanges (Cook & Emerson 1978). In contrast, individuals who give less advice to others are likely to receive less advice, which may result in underdeveloped safety-related competencies, potentially resulting in less safe behavior.

Moreover, advice-taking is expected to positively influence one's own safety behavior, as individuals who are willing to take others' advice are more likely to accumulate knowledge which should result in a deeper understanding of safety in the workplace and in turn, safer

behavior. In other words, capitalizing on teammates' knowledge can be leveraged to improve safety behavior. The effect of advice-taking is expected to be weaker than the effect of advice-giving on safety behavior, as an individual who gives advice has both resources and influence advantages. That is, an individual who is a major source of advice not only has access to more resources but is also considered to be an influential figure with a rich reservoir of expertise. This expertise could serve as a valued resource for future exchanges with network members.

Previous research suggests that older and more experienced male employees are likely to be perceived as having access to more resources and information that they can share with their coworkers (e.g., Creswick et al., 2009), which in turn could benefit their safety behavior. Also, employees in larger teams may experience an advantage due to having access to more resources. Therefore, sex, age, tenure, and team size will be controlled in the current study to examine the effects of advice-giving and advice-taking on safety behavior above and beyond those factors.

Hypothesis 1: Advice-giving is positively related to safety behavior.

Hypothesis 2: Advice-taking is positively related to safety behavior.

Hypothesis 3: Advice-giving is more strongly related to safety behavior than advice-taking.

Trust as a Foundation for Advice-giving and Advice-taking

Previous research has revealed that individuals are not likely to alter their behaviors much in the face of new information or advice (Harvey & Fischer, 1997; Yaniv, 2004). Sometimes individuals persevere in their beliefs when confronted with new information or advice (Cherniak, Nisbett, & Ross, 1983). Reluctance to take advice may have a harmful impact on judgmental accuracy, risk perceptions, knowledge acquisition, and behavioral improvement (Gino & Schweitzer, 2008; Yaniv, 2004). Therefore, it is important to identify factors that could

facilitate advice-giving and advice-taking. Researchers have suggested that interpersonal trust plays a crucial facilitating role in the advice exchange process (Bonaccio & Dalal, 2006; Gino & Schweitzer, 2008).

McAllister (1995) distinguished between two types of trust: cognitive and affective trust. Cognitive trust is based on performance-relevant attributes of others such as competence, reliability, dependability, and responsibility. It captures the "can-do" component of trust by describing whether the trustee has the skills and abilities needed to act in an appropriate fashion. Affective trust is based on the emotional bonds or ties between individuals that are structured around elements such as genuine care and concern for the welfare of others and emotional attachments and rapport on the basis of shared caring for others. It captures the "will-do" component of trust by describing whether the trustee will choose to use those skills and abilities to act in the best interest of the trustor (Colquitt, Scott, & LePine, 2007). These two types of trust align with the broader fundamental social dimensions of competence and warmth (Fiske, Cuddy, & Glick, 2007).

A considerable amount of empirical research has supported the distinction between cognitive and affective trust (e.g., Holste & Fields, 2005; McAllister, 1995; Webber & Klimoski, 2004). First, confirmatory factor analyses indicate that a two-factor model (i.e., cognitive and affective trust) tends to fit the data better than the one-factor model (e.g., McAllister, 1995). Second, the two types of trust are differentially associated with consequences, such as types of organizational citizenship behaviors (Ng & Chua, 2006) and flows of tacit knowledge (Levin & Cross, 2004). Cognitive trust is expected to be more important to advice-taking than affective trust. Therefore, it is imperative to distinguish between these two types of trust.

Similar to the advice network, there is a trust network capturing *trustworthiness* or how much trust one deserves from their teammates, as well as *trust in coworkers*, how much trust one has in each teammate. Each direction of trust can be differentiated as affective or cognitive and for each of those there are indegree and outdegree centrality. Conceptually, *cognitive trustworthiness* reflects the level of the focal person's competence, dependability, and reliability according to his/her team members. Operationally, cognitive trust indegree centrality is the sum of the number of members who reported having cognitive trust in the focal member. A high level of cognitive trust indegree centrality indicates that an individual is considered competent, reliable, and dependable by most members. Conceptually, *cognitive trust in coworkers* indicates the extent to which an individual considers his/her team members to be competent, reliable, and dependable. Operationally, cognitive trust outdegree centrality is the weighted sum of the number of members with whom the focal person reports having cognitive trust.

Likewise, *affective trustworthiness* reflects the level of the focal person's geniality and caring for others. It is operationalized by affective trust indegree centrality which is computed as the sum of the number of members who reported having affective trust with that member. A high level of affective trust indegree centrality indicates that an individual is considered to be genuine and caring about the welfare of others by most other members. *Affective trust in coworkers* indicates the tendency of an individual to consider his/her coworkers as genuine and caring. It is operationalized by affective trust outdegree centrality which is the weighted sum of the number of members with whom the focal person reports having affective trust. Both cognitive and affective trustworthiness (i.e., cognitive and affective trust indegree centrality) are expected to promote advice-giving (i.e., advice indegree centrality) and subsequently improve safety behavior, whereas cognitive and affective trust in coworkers (i.e., cognitive and affective trust

outdegree centrality) are expected to promote advice-taking (i.e., advice outdegree centrality) and thereby also enhance safety behavior.

Cognitive and affective trustworthiness are proposed to positively relate to advice-giving, which in turn, is expected to positively relate to safety behavior. Specifically, if an individual is perceived by most people as competent and reliable rather than incompetent and unreliable, his/her advice is likely to be valued and believed to be useful and effective, and thus is more likely to be taken. Moreover, if an individual occupies a central position in an affective trust network and is emotionally attached or affiliated to other group members, others are prone to take his/her advice because they believe s/he is concerned about them. However, the usefulness and effectiveness of the advice is questionable if the focal individual is perceived to be less competent. Therefore, affective trustworthiness is expected to be positively related to advice-giving, but to a lesser extent compared to cognitive trustworthiness.

Hypothesis 4: (a) Cognitive trustworthiness and (b) affective trustworthiness are positively related to advice-giving.

Hypothesis 5: (a) Cognitive trustworthiness and (b) affective trustworthiness are positively related to safety behavior.

Hypothesis 6: Cognitive trustworthiness is more strongly related to advice-giving than affective trustworthiness.

Hypothesis 7: Advice-giving mediates the relationship between (a) cognitive trustworthiness and safety behavior, and (b) affective trustworthiness and safety behavior.

Cognitive and affective trust in coworkers are expected to positively relate to advice-taking which in turn relate to safety behavior. Specifically, if an individual considers others as competent and dependable, he/she is more inclined to value his/her coworkers' advice and

thereby take their advice. Additionally, if an individual is likely to consider others as genuine and concerned about him/her, he/she is prone to take his/her coworkers' advice as he/she believes they caring for him/her. Likewise, the competency of their coworkers plays a more important role in determining the extent of advice-taking than their geniality and kindness. Therefore, cognitive trust in coworkers is expected to be more strongly related to advice-taking than affective trust in coworkers.

Hypothesis 8: (a) Cognitive trust in coworkers and (b) affective trust in coworkers are positively related to advice-taking.

Hypothesis 9: (a) Cognitive trust in coworkers and (b) affective trust in coworkers are positively related to safety behavior.

Hypothesis 10: Cognitive trust in coworkers is more strongly related to advice-taking than affective trust in coworkers.

Hypothesis 11: Advice-taking mediates the relationship between (a) cognitive trust in coworkers and safety behavior, and (b) affective trust in coworkers and safety behavior.

Advice Network Density as a Predictor and Moderator of Safety Behavior

According to the social network perspective (Brass, 1984; Granovetter, 1985; Podolny & Baron, 1997), the density of a network could also influence an individual's performance. Derived from the definition of network density discussed above, a dense advice network indicates that individuals within the network frequently share and take advice from each other. Operationally, advice network density is computed as the sum of the number of advice-taking links divided by the total possible number of links (i.e., when everyone takes advice from everyone else; Wasserman & Faust, 1994).

It is proposed that advice network density is positively related to safety behavior for several reasons. First, a dense advice network reflects that individuals engage in frequent advice-giving and advice-taking behaviors with other members, which may lead to mutual interdependence between group members as they become reliant to some degree on each other for advice. Researchers suggest that mutual interdependence cultivates cooperation and collaboration and thus promotes safety behavior (Molm, 1994). Second, frequent exchange of useful information is likely to elevate the quality of group decision-making and thus enhance safety behavior (Larson, Christensen, Franz, & Abbott, 1998). Third, the exchange of advice among a large proportion of a group's members is likely to enhance the awareness of their work roles' within the team. Through advice-taking, team members learn about the responsibilities and work roles of all other members on safety tasks and come to a shared understanding of safety expectations (Smith-Jentsch, Mathieu, & Kraiger, 2005). Fourth, the exchange of advice could create stronger connections among group members and thus increase individuals' feelings of identification or affiliation with the network, which in turn promotes safety behavior. Taken together, when group members engage in intensive advice-taking activities, the group should benefit in terms of greater collaboration, more safety-related information exchanges, a stronger sense of responsibility, greater consensus on safety expectations, and stronger feelings of identification, which in turn enhances safety behavior.

Moreover, the density of an advice network is also proposed to moderate the effect of advice-giving and advice-taking on safety behavior. As discussed above, a dense network, which consists of pervasive exchanges, could facilitate team members' cooperation, enhance their accountability and identification, and facilitate reaching an agreement on expectations. Likewise, these positive consequences ensuing from the dense advice network could benefit a central

member's safety behavior. Moreover, an individual with a high degree of advice centrality in a dense advice network could benefit from the vast amount of resources available from other members directly connected to him or her. Those resources can be leveraged for safety behavior.

Hypothesis 12: Advice network density is positively related to safety behavior.

Hypothesis 13: Advice network density moderates the relationships between a) advice-giving and b) advice-taking and safety behavior, such that the relationships between a) advice-giving and b) advice-taking and safety behavior are stronger in the groups with a more dense advice network.

METHOD

Participants and Procedures

Nearly 500 nurses in 42 teams and their supervisors were recruited via email from a hospital in China to participate in the study about social networks and safety behavior. Teams ranged in size from 6 to 17 members, with an average of 12. Employees were asked to complete one online survey. A total of 453 employees provided usable responses, resulting in 92% response rate. Supervisors provided ratings of safety behavior for 444 employees, resulting in 89% response rate. The final sample consisted of 416 participants who responded to the survey with matched supervisor ratings, resulting in an 83.2% response rate. The respondents were mostly (88%) female, ranging from 20 to 50 years old (M = 27.77, SD = 4.87). On average, participants worked in the focal hospital for 5.96 years (SD = 5.04). A total of 42 supervisors rated employees on their job performance and each supervisor rated on average 10 employees (SD = 2.46). To minimize the burden imposed on supervisors, demographic survey items for supervisors were not administered.

Employees responded to demographic questions (e.g., age, sex), background information (e.g., tenure), and network questions (i.e., trust, advice-taking). After employees completed the survey, they were instructed to forward an online survey link to their supervisors to complete a brief assessment about their safety behavior. The surveys were originally written in English and then translated into Chinese using the back-translation procedure recommended by Brislin (1970), which ensures that translated versions preserve their original meaning. All surveys were linked over time and with supervisor ratings using employee identification numbers.

Measures

Social network data were gathered using the closed-ended roster method (Marsden, 1990;

see an example in Appendix A). Specifically, for each question, participants were given a list of all employees within their workgroup (generated from organizational records) and were asked to provide a response for each employee. The survey was customized for each workgroup to include all employees' names within each workgroup; each workgroup received a customized survey link. Employees were asked to rate all the members of their group and skip rating themselves. Following the norm in other social network studies (e.g., Bowler & Brass, 2006), a single-item question was used to measure the advice network in this study, which means an internal consistency measure of reliability cannot be computed for this construct. As each respondent was asked multiple questions for each teammate, it was necessary to limit the number of survey items to minimize respondent fatigue and negative reactions. Further, excessive survey items can lead to lower responses rates, which jeopardizes the ability to obtain an accurate depiction of the entire advice network within the team. Thus, a single-item measure is considered acceptable in social network studies. As noted earlier, the roster method was used as this method facilitates individuals' recall and reduces missing data (Marsden, 1990).

Advice-taking and advice-giving. Participants were asked to indicate how often they have seriously considered and taken advice from each person in their network for their work-related decision-making processes. They responded on a 5-point scale (1 = never, 2 = less than once a month, 3 = 1-3 times a month, 4 = 1-3 times a week, 5 = daily, 6 = I don't know). Before calculating advice-taking and advice-giving scores, the responses were organized into a matrix for each team in which the value of cell X_{ij} represents how often i takes advice from j. The advice network in each team was generated by forming all responses within that team into an n ×

n adjacency matrix, where n represents the team size and the value of cell X_{ij} represents how often i takes advice from j.

Advice-taking was computed for each team member by summing the number of team members (e.g., Nurses B, C, and D) who provided ratings for each employee (e.g., Nurse A) and then dividing by team size to allow for comparisons across teams with different sizes (Borgatti, Everett, & Freeman, 1992). In the social network literature, this calculation is called outdegree centrality.

Advice-giving was computed for each employee by summing the number of team members (e.g., Nurses B, C, and D) for whom s/he (e.g., Nurse A) provided ratings and then divided by team size to allow for comparisons across teams with different sizes (Borgatti et al., 1992). In the social network literature, this calculation is called indegree centrality. Advice network density was computed as the sum of the actual responses to the same question within the network divided by the total possible sum of responses within that team.

Cognitive and affective trustworthiness and trust in coworkers. Cognitive and affective trust were measured using scales adapted from McAllister's (1995) study. Cognitive and affective trust scales were modified from McAllister's (1995) study by combining several items in the original scales into one-item network measures. For cognitive trust, participants answered the extent to which they trust each network member on the roster to complete a task that he or she had agreed to do for the participant and have knowledge and competence needed to get tasks done. For affective trust, participants answered the extent to which they feel each person in the list is genuinely concerned about their personal problems and difficulties and cares about their hopes and dreams. Participants responded to both items on a 5-point Likert scale (1 = not at all, 5 = to a great extent, 6 = I don't know). The exact items appear in Appendix A.

Similar to advice-taking and advice-giving, before calculating cognitive or affective trust trustworthiness, the responses within the team of cognitive or affective trust network were organized into a matrix for each team in which the value of cell X_{ij} represents the extent to which i has cognitive or affective trust to j. The cognitive or affective trust network in each team was generated by forming all responses within that team into an n × n adjacency matrix, where n represents the team size and the value of cell X_{ij} represents the extent to which i has cognitive or affective trust to j. Cognitive and affective trustworthiness (i.e., indegree centrality) were computed by summing the number of cognitive and affective trust relations with a focal employee reported by other team members. Cognitive and affective trust in coworkers (i.e., outdegree centrality) were computed by summing the number of the employee's cognitive and affective trust relations with others reported by the focal person.

Safety behavior. Safety behavior was measured using scales adapted from Griffin and Neal's (2000) safety behavior measures. Two out of their four items assessed safety compliance (i.e., "This employee carries out work in a safe manner," "This employee uses all the necessary safety equipment to do the job") were utilized. These two items had the highest factor loadings on the latent construct in the original study (Griffin & Neal, 2000). A short version of safety behavior was used measure to reduce the number of items each supervisor had to rate for each employee in the network. Supervisors responded on a 5-point agreement scale (1 = strongly disagree, 5 = strongly agree). Internal consistency reliability for this scale (i.e., Cronbach's alpha) was .85.

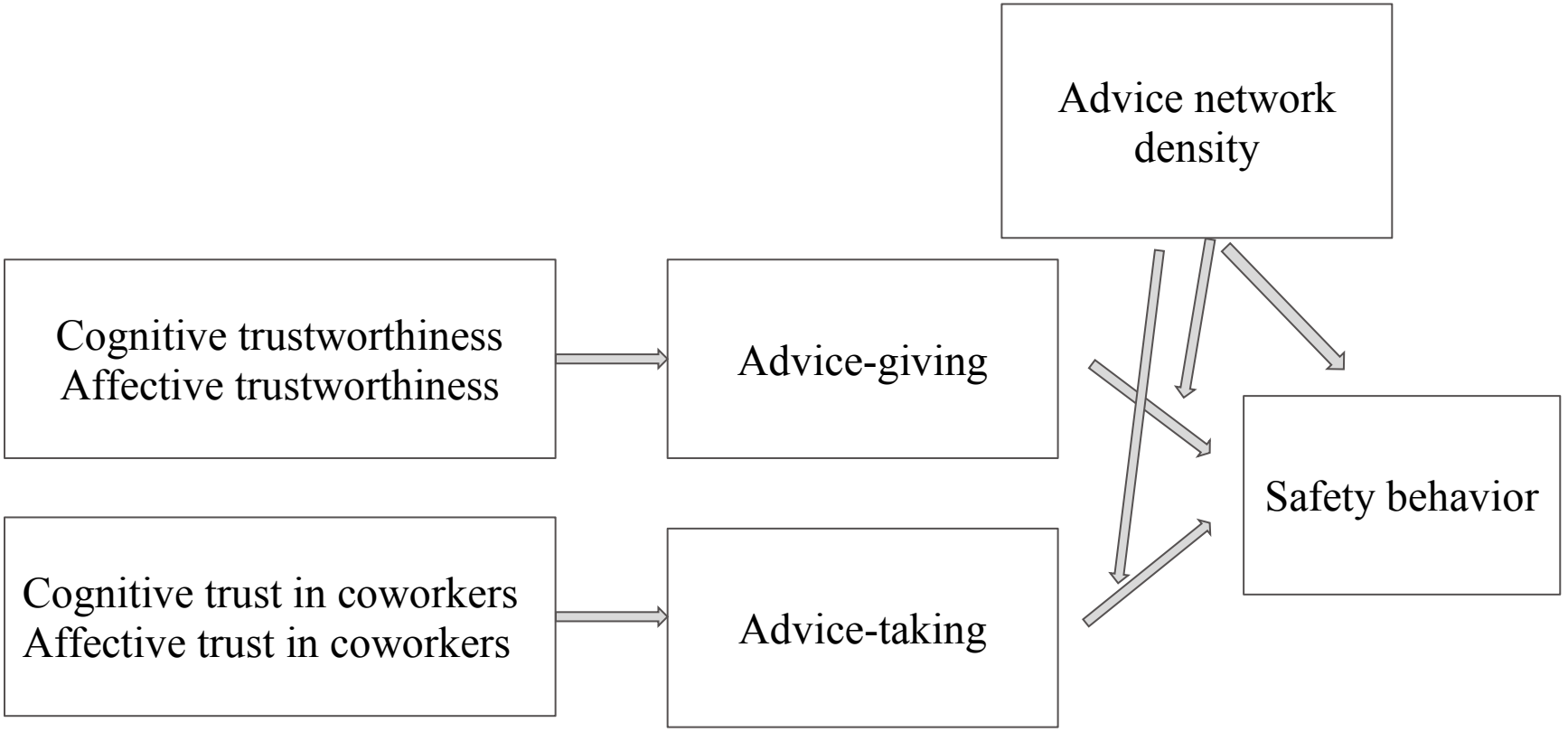
Control Variables. For the multilevel analyses, sex, age, and tenure were controlled as older and more experienced male employees are likely to have access to more resources and information that they can share with their coworkers. Team size was also included as a control

variable in the multilevel regression equations as employees in larger teams may experience an advantage due to having access to more resources.

Data Analysis

Given that the model tested had two levels of analysis with the dependent variable (safety behavior) at the individual level and the predictors and moderators spanning the individual level (i.e., advice-giving, advice-taking, cognitive and affective trustworthiness, cognitive and affective trust in coworkers, safety behavior) and team levels (i.e., advice network density), hierarchical linear modeling was used to analyze the data (Aiman-Smith, Scullen, & Barr, 2002; Kozlowski & Klein, 2000; Raudenbush & Bryk, 2002). Teams with more than 20% missing data were excluded from analysis (one was excluded based on this criterion). The sna package in R software to calculate network indegree and outdegree centrality and density (Butts, 2016; R Core Team, 2017) and used the multilevel package in R software (Bliese, 2016; R Core Team, 2017) to conduct multilevel analyses to test my multilevel model specified in Figure 3. First, the individual-level predictors of advice-giving and advice-taking were regressed on safety behavior to test the main effects.

Figure 3 The hypothesized model



Then, the group-level predictor of advice network density was regressed on the intercept estimates and the slope estimates obtained from the individual level to detect the main effect of advice network density and cross-level interaction effects. Finally, cognitive and affective trustworthiness were regressed on advice-giving and safety behavior, and cognitive and affective trust in coworkers on advice-taking and safety behavior.

Steiger's z-test was utilized to examine the differences in magnitude between the effects of advice-giving and advice-taking on safety behavior, cognitive and affective trustworthiness on advice-giving, and cognitive and affective trust in coworkers on advice-taking (Steiger, 1980). Sobel test (1982) was used to detect the mediation effect of advice-giving on the relationships between cognitive and affective trustworthiness and safety behavior, and the mediation effect of advice-taking on the relationships between cognitive and affective trust in coworkers on safety behavior.

RESULTS

Descriptive statistics and correlations among the variables are presented in Table 1. The correlations indicated that cognitive and affective trustworthiness and advice-giving were positively related to safety behavior ($r = .34$, $p < .01$; $r = .31$, $p < .01$; $r = .22$, $p < .01$). Cognitive and affective trustworthiness were positively related to advice-giving ($r = .70$, $p < .01$; $r = .71$, $p < .01$). Cognitive and affective trust in coworkers were positively related to advice-taking ($r = .81$, $p < .01$; $r = .81$, $p < .01$). Because of the nested nature of the data with employees embedded in different groups, employee's advice-giving, advice-taking, and safety behavior were not independent.

Table 1 Means, Standard Deviations, and Correlations

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1. Sex	0.06	0.23												
2. Age	27.77	4.87	-.15*											
3. Tenure	5.96	5.04	-.14*	.89*										
4. Size	12.08	2.48	.09	.00	-.00									
5. Cognitive trustworthiness	3.64	0.51	-.09*	.29*	.30*	.06								
6. Affective trustworthiness	3.63	0.50	-.08	.27*	.29*	.06	.97*							
7. Cognitive trust in coworkers	3.64	1.64	.03	-.45*	-.47*	.02	-.30*	-.30*						
8. Affective trust in coworkers	3.63	1.65	.04	-.45*	-.47*	.02	-.30*	-.30*	.99*					
9. Advice-giving	2.53	0.55	-.06	.28*	.27*	.12*	.70*	.71*	-.27*	-.26*				
10. Advice-taking	2.53	1.41	.09	-.43*	-.46*	.05	-.29*	-.28*	.81*	.81*	-.19*			
11. Advice network density	2.95	0.38	.01	-.06	-.06	.11*	.18*	.20*	.06	.06	.59*	.23*		
12. Safety behavior	4.47	0.61	-.04	.21*	.22*	.02	.34*	.31*	.06	.06	.22*	-.02	-.00	.85

Note. * $p < .05$ for two-tailed tests. Internal consistency reliability (coefficient alpha) for safety behavior is presented on the diagonal.

Accordingly, the extent of the dependence was assessed using the intraclass correlation coefficient (ICC). ICC represents the percentage of variance accounted for by group differences (Hox, 2002). The ICC values for advice-giving, advice-taking, and safety behavior were .49, .01, and .42, respectively.

Hierarchical Linear Modeling Predicting Advice-Giving and Safety Behavior

Table 2 presents the hierarchical linear modeling results predicting advice-giving and safety behavior. In support of Hypotheses 4 and 5a, cognitive trustworthiness was positively related to advice-giving and safety behavior ($\gamma = .52$, $p < .05$; $\gamma = .54$, $p < .05$), whereas affective trustworthiness was only positively related to advice-giving but not safety behavior ($\gamma = .34$, $p < .05$; $\gamma = -.06$, $p > .05$). In support of Hypothesis 1, advice-giving was positively related to safety behavior ($\gamma = .20$, $p < .05$). Consistent with Hypothesis 7, the Sobel test indicated advice-giving mediated the relationship between cognitive and affective trustworthiness and safety behavior ($z = 2.21$, $p < .05$; $z = 1.97$, $p < .05$). However, advice network density was not significantly related to safety behavior ($\gamma = .04$, $p > .05$). Thus, Hypothesis 12 was not supported.

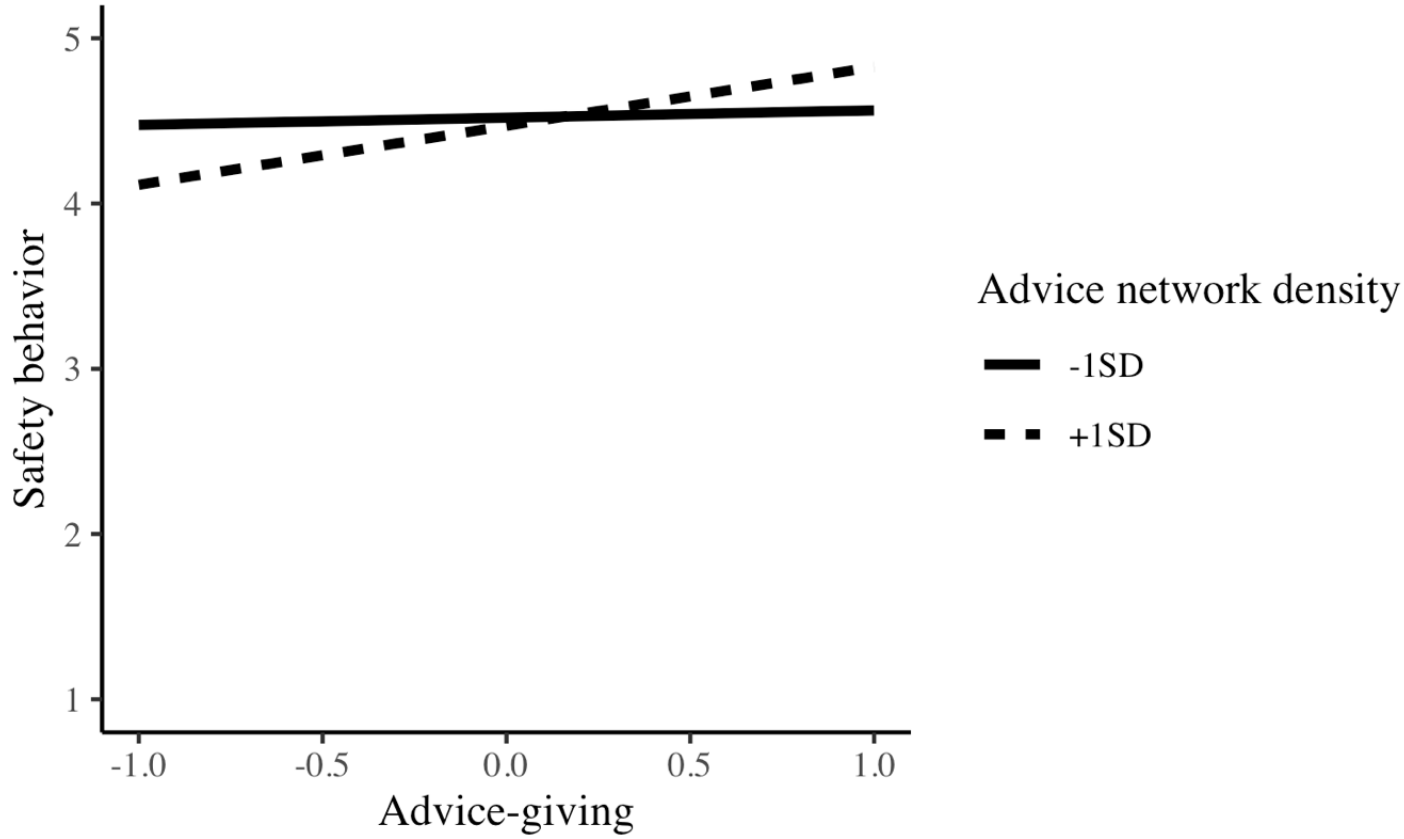
In support of Hypothesis 13a, the moderation analyses showed that advice network density moderated the relationship between advice-giving and safety behavior ($\gamma = .41$, $p < .05$). Specifically, simple slope analyses revealed that the relationship between advice-giving and safety behavior was stronger when advice network density was high (1 *SD* above the mean; $\gamma = .36$, $p < .05$) than when advice network density was low (1 *SD* below the mean; $\gamma = .05$, $p < .05$). Figure 4 displays the simple slopes for the interaction.

Table 2 Hierarchical Linear Modeling Results Predicting Advice-giving and Safety Behavior

	Advice-giving	Safety behavior		
	Model 1	Model 2	Model 3	Model 4
Constant	-0.24	4.38*	4.47*	4.50*
	(0.13)	(0.39)	(0.39)	(0.40)
Sex	-0.01	0.01	0.01	0.002
	(0.05)	(0.08)	(0.08)	(0.08)
Age	0.01*	0.01	0.01	0.005
	(0.005)	(0.01)	(0.01)	(0.01)
Tenure	-0.002	0.01	0.01	0.01
	(0.005)	(0.01)	(0.01)	(0.01)
Size	-0.001	-0.01	-0.01	-0.01
	(0.004)	(0.03)	(0.03)	(0.03)
Cognitive trustworthiness	0.52*	0.54*	0.44*	0.44*
	(0.11)	(0.20)	(0.20)	(0.20)
Affective trustworthiness	0.34*	-0.06	-0.10	-0.11
	(0.12)	(0.21)	(0.21)	(0.21)
Advice-giving			0.20*	0.20*
			(0.08)	(0.08)
Advice network density				0.04
				(0.17)
Advice-giving * Advice network density				0.41*
				(0.19)
Model deviance	0.18	258.31	257.10	256.47

Note. $N = 416$ at the individual level; $N = 42$ at the group level; $^{*}p < .05$; Standard errors are in parentheses; Model deviance is a measure of model fit. An additional model in which safety behavior was regressed on advice-giving and control variables revealed a positive effect of advice-giving on safety behavior ($\gamma = .35$, $p < .05$).

Figure 4 Interaction effect of advice-giving and advice network density on safety behavior



Hierarchical Linear Modeling Predicting Advice-Taking and Safety Behavior

Table 3 presents the hierarchical linear modeling results predicting advice-taking and safety behavior. Regarding Hypotheses 8-9, results showed that cognitive trust in coworkers was positively related to advice-taking, but not safety behavior ($\gamma = .58$, $p < .05$; $\gamma = .07$, $p > .05$), whereas affective trustworthiness was not significantly related to advice-taking and safety behavior ($\gamma = .07$, $p > .05$; $\gamma = .02$, $p > .05$). Thus, only Hypothesis 8a (not Hypothesis H8b) was supported. Also, results showed that advice-taking was not significantly related to safety behavior ($\gamma = -.02$, $p > .05$) after controlling for cognitive and affective trust in coworkers. Thus, Hypothesis 2 was not supported. The Sobel test indicated that advice-taking did not mediate the relationship between cognitive and affective trust in coworkers and safety behavior ($z = -.95$, $p > .05$; $z = -.35$, $p > .05$). Thus, Hypothesis 11 was also not supported. Advice network density did not moderate the relationship between advice-taking and safety behavior ($\gamma = -.10$, $p > .05$). Thus, Hypothesis 13b was not supported.

Comparative Analyses

The results from Steiger's z test (Steiger, 1980) indicated that advice-giving was more strongly related to safety behavior than advice-taking ($z = 2.69$, $p < .05$). Thus, Hypothesis 3 was supported. Contrary to expectation, cognitive and affective trustworthiness have similar relationships with advice-giving ($z = -1.18$, $p > .05$) and cognitive and affective trust in coworkers have similar relationships with advice-taking ($z = 0$, $p > .05$). Thus, both Hypotheses 6 and 10 were not supported. A summary of statistical support for all the hypotheses is presented in Table 4.

Table 3 Hierarchical Linear Modeling Results Predicting Advice-taking and Safety Behavior

	Advice-taking	Safety behavior		
	Model 1	Model 2	Model 3	Model 4
Constant	0.17	4.17*	4.18*	4.22*
	(0.42)	(0.39)	(0.39)	(0.40)
Sex	0.21	-0.02	-0.01	-0.01
	(0.16)	(0.09)	(0.09)	(0.09)
Age	-0.0002	0.01	0.01	0.01
	(0.02)	(0.01)	(0.01)	(0.01)
Tenure	-0.03	0.02	0.02	0.02
	(0.02)	(0.01)	(0.01)	(0.01)
Size	0.001	-0.01	-0.01	-0.01
	(0.01)	(0.03)	(0.03)	(0.03)
Cognitive trust in coworkers	0.58*	-0.06	-0.05	-0.05
	(0.19)	(0.10)	(0.10)	(0.10)
Affective trust in coworkers	0.07	0.02	0.02	0.02
	(0.19)	(0.10)	(0.10)	(0.10)
Advice-taking			-0.02	-0.02
			(0.02)	(0.02)
Advice network density				0.06
				(0.17)
Advice-taking * Advice network density				-0.10
				(0.06)
Model deviance	540.92	274.34	276.62	277.98

Note. $N = 416$ at the individual level; $N = 42$ at the group level; Standard errors are in parentheses; Model deviance is a measure of model fit; $^{*}p < .05$**.** An additional model in which safety behavior was regressed on advice-taking and control variables revealed a null effect ($\gamma = -.03$, $p > .05$).

Table 4 Summary of Statistical Support for Hypotheses

Hypotheses	**Statistical Support**
Hypothesis 1: Advice-giving is positively related to safety behavior.	H1: Supported
Hypothesis 2: Advice-taking is positively related to safety behavior.	H2: Not Supported
Hypothesis 3: Advice-giving is more strongly related to safety behavior than advice-taking.	H3: Supported
Hypothesis 4: (a) Cognitive trustworthiness and (b) affective trustworthiness are positively related to advice-giving.	H4: Supported
Hypothesis 5: (a) Cognitive trustworthiness and (b) affective trustworthiness are positively related to safety behavior.	H5: Supported
Hypothesis 6: Cognitive trustworthiness is more strongly related to advice-giving than affective trustworthiness.	H6: Not Supported
Hypothesis 7: Advice-giving mediates the relationship between (a) cognitive trustworthiness and (b) affective trustworthiness and safety behavior.	H7: Supported
Hypothesis 8: (a) Cognitive trust in coworkers and (b) affective trust in coworkers are positively related to advice-taking.	H8a: Supported H8b: Not Supported
Hypothesis 9: (a) Cognitive trust in coworkers and (b) affective trust in coworkers are positively related to safety behavior.	H9: Not Supported
Hypothesis 10: Cognitive trust in coworkers is more strongly related to advice-taking than affective trust in coworkers.	H10: Not Supported
Hypothesis 11: Advice-taking mediates the relationship between (a) cognitive trust in coworkers and (b) affective trust in coworkers and safety behavior.	H11: Not Supported
Hypothesis 12: Advice network density is positively related to safety behavior.	H12: Not Supported
Hypothesis 13: Advice network density moderates the relationships between a) advice-giving and b) advice-taking and safety behavior, such that the relationships between a) advice-giving and b) advice-taking and safety behavior is stronger in the groups with a more dense advice network.	H13a: Supported H13b: Not Supported

DISCUSSION

In response to calls to use a social network perspective to study workplace safety (Hofmann et al., 2017; Zohar, 2011), the current study had three primary objectives. The first objective was to examine the extent to which advice-giving and advice-taking are related to safety behavior. The second objective was to explore cognitive and affective trustworthiness and trust in coworkers as antecedents of advice-giving and advice-taking behaviors which in turn were expected to relate to safety behavior. The third objective was to test how much advice network density relates to safety behavior. Supervisor ratings of 416 nurses' safety behaviors were predicted from their respective 42 advice and trust networks. Hypotheses were tested by subjecting these nested data to hierarchical linear modeling analyses.

Consistent with social network theory and expectations, advice-giving was positively related to safety behavior. Previous research has consistently demonstrated positive relationships between advice-giving and general job performance (Sparrowe et al., 2001), as well as creativity and innovative performance (Rhee & Ji, 2011; Wong & Boh, 2014). Only one study had previously examined advice-giving and safe driving behavior, however, it yielded null findings, which may be due to a lack of statistical power given that they only had 83 participants (Arizon-Peretz & Luria, 2017). Previous research also demonstrated that interpersonal interactions were positively related to safety climate (He, Wang, & Payne, 2019), which had positive influences on safety behavior (Christian et al., 2009). Comparatively, the power for the current study was sufficient (power = .85). Consistently, our findings revealed that advice-giving, which is one type of interpersonal interactions, could positively predict safety behavior.

Contrary to expectation, advice-taking was not positively related to safety behavior. It is possible that some pieces of advice taken from group members might conflict with each other

and thus not be acted upon. Therefore, enhancing advice-takers' ability to reconcile and integrate advice from multiple sources may be beneficial for safety behavior. Compared to advice-giving, researchers have been paid less attention to advice-taking. Therefore, additional research is needed to confirm this finding.

Thus, advice-giving and advice-taking appear to have differential effects on safety behavior, with advice-giving having much stronger effects. This is the first study to examine advice-taking on safety behavior and to examine both advice-giving and advice-taking in the same study.

Second, the findings indicated that both cognitive and affective trustworthiness were positively related to advice-giving which in turn was positively related to safety behavior, suggesting that advice-giving operated as an explanatory mechanism for the relationship between trustworthiness and safety behavior. Consistent with previous findings, trustworthiness serves as an essential foundation for work-related advice-giving (Bonaccio & Dalal, 2006; Gino & Schweitzer, 2008). However, this is the first time that cognitive and affective trustworthiness have been related to safety-related advice-giving. The magnitude of the relationship between cognitive trustworthiness and safety behavior was similar to the magnitude of the relationship between affective trustworthiness and safety behavior. Thus, coworkers who appear to be trustworthy based on liking are just as likely as coworkers who appear to be trustworthy based on reliability to give safety-related advice.

Results were quite different for cognitive and affective trust in coworkers and advice-taking. Contrary to expectation, only cognitive trust in coworkers was positively related to advice-taking, but not affective trust in coworkers, and advice-taking did not mediate the relationship between cognitive and affective trust in coworkers and safety behavior. Previous

research has shown that other characteristics of coworkers (e.g., conscientiousness) are related to an individuals' willingness to take advice (Bonaccio & Dalal, 2006). Thus, trust may only relate to advice-taking in the presence of these other factors. Future research measuring all of these variables will reveal the combinations of characteristics needed to foster acceptance of advice.

Third, advice network density moderated the relationship between advice-giving and safety behavior. Specifically, advice network density amplified the effects of advice-giving on safety behavior. These findings were consistent with the proposition that frequent advice exchanges within the network could increase valued resources shared by members, promote collaboration and cooperation (Molm, 1994), enhance members' responsibility and identification with the team, lead to greater consensus on safety tasks and expectations (Larson et al., 1998), which in turn enhances safety behavior, especially a central member's safety behavior.

In contrast, advice network density did not moderate the relationship between advice-taking and safety behavior. Even though previous literature suggests that more frequent advice exchanges within the network could facilitate sharing valued resources and promote collaboration and identification (Larson et al., 1998; Molm, 1994), this also increases the amount of advice for advice-takers to process which may divert their cognitive resources away from safety behavior improvement.

Theoretical Implications

The current study brings several new insights to the safety literature. According to the social network perspective (Brass, 1984; Granovetter, 1985; Podolny & Baron, 1997), advice-givers are likely to be considered influential figures with rich expertise, to be well-received by other network members, and have more resources to be leveraged than advice-takers. Moreover, advice-givers are likely to engage in more mental rehearsal and information elaboration while

mentoring other team members, which could lead to a deeper understanding of safety practices, tasks, and expectations and thereby ultimately contribute to safety behavior (Day et al., 2005). Correspondingly, advice-giving should be more beneficial to safety behavior than advice-taking. Consistent with this, advice-giving was significantly related to safety behavior; whereas advice-taking was not.

The relationship between advice-giving and safety behavior is further illuminated by measuring and examining the overall level of advice exchanges within the network. Specifically, this relationship is stronger when the workgroup engages in a high level of advice-giving with one another. This is also consistent with the social network perspective (Brass, 1984; Granovetter, 1985; Podolny & Baron, 1997), which proposes that the overall network features could affect an individual's access to valued resources (e.g., information, task knowledge) and thus influence the magnitude of advice-giving on safety behavior. Consistently, multilevel findings highlight that while individual-level advice centrality is valuable, the larger network-level social context is also important to facilitating individual safety behavior and determining the amount of benefits ensuing from advice-giving. Therefore, this multi-level investigation not only highlights the important role of individual network centrality in improving safety behavior, but it also underscores the value of global network characteristics in elevating or impeding the function of individual-level network features by simultaneously considering the effects of individual- and network-level social network features (Kilduff & Brass, 2010).

Third, the present study examined whether cognitive and affective trust play an important role in influencing advice-taking and subsequent safety behavior using the social network approach (e.g., Brass, 1984; Granovetter, 1985; Podolny & Baron, 1997). Such explorations unveil different social mechanisms by which trust functions to influence safety behavior.

Specifically, cognitive and affective trustworthiness were found to equally influence safety behavior through advice-giving. Similar relationships were not found for cognitive and affective trustworthiness with advice-giving and for cognitive and affective trust in coworkers with advice-taking. Also, contrary to expectation, Table 1 reveals that cognitive and affective trustworthiness and cognitive and affective trust in coworkers were highly correlated with one another. Taken together, these findings did not support the distinctiveness between cognitive and affective trust revealed by previous research (e.g., Holste & Fields, 2005; McAllister, 1995; Webber & Klimoski, 2004). Given that employees might rate coworkers' cognitive trustworthiness based on their previous work performance, future research could examine whether cognitive trustworthiness is more predictive of work performance than affective trustworthiness to differentiate those two constructs.

Supplemental analyses for overall trustworthiness (combining affective and cognitive trustworthiness) and overall trust (combining affective and cognitive trust) are presented in Appendices B-C. The findings were similar to the previous analyses in which cognitive and affective trustworthiness and trust were separated. Overall trustworthiness was positively related to advice-giving which was positively related to safety behavior. Overall trust in coworkers did not have an impact on advice-taking and advice-taking did not mediate the relationship between overall trust in coworkers and safety behavior. Our research did not support the distinctive effects of cognitive and affective trust on safety behavior, future research could examine other criteria to differentiate cognitive and affective trust.

Fourth, the current study provides empirical evidence of the value of using the social network perspective to study advice as an instrumental resource to workplace safety. As such, a multilevel, integrated framework of advice-giving and -taking was used by incorporating two

types of analytical techniques (i.e., hierarchical linear modeling and social network analysis), which extends our understanding of multilevel effects of advice networks on safety behavior. Via the multilevel social network approach, our findings suggest that individual advice-giving plays an important role in enhancing safety behavior and its effects could be strengthened by the global network density (Kilduff & Brass, 2010).

Practical Implications

The practical implications of the current study are threefold. First, given that the current study is conducted in a high reliability organization, an advice network represents an important precursor of collective learning and safety behavior. The findings regarding the advice network suggest that individuals who are more central in the network are likely to have a higher level of safety behavior. Therefore, organizations could encourage advice sharing among employees by rewarding employees who are more central in the advice network and helping employees who are less central in the advice network to engage in more advice exchanges.

Second, findings suggest that the benefits of advice-giving on safety behavior can be maximized under the conditions where there are more frequent advice exchanges within the network. The findings reveal the importance of advice networks to safety behavior. In order to facilitate the exchange of advice, organizations should create a learning climate to encourage employees to consider and selectively take others' advice to improve their safety behavior. To enhance advice-taking, managers can cultivate advice-taking behaviors by implementing interventions that reward interpersonal interactions and encourage advice-giving and advice-taking among team members. In order to ensure good advice is taken, organizations can encourage vetting of the advice given by multiple members within the group.

Third, the findings highlight the importance of cognitive and affective trust in facilitating advice-taking and then safety behavior. Accordingly, managers should promote a trusting environment by encouraging communication among employees to facilitate the formation of advice-taking relations and subsequent safety behavior. They can also serve as role models and engage in these behaviors themselves. Further, they can reward these behaviors and call positive attention to them when they witness them, especially in front of others.

Limitations

The current study has several limitations. First, the present study adopted a single-item question to measure the trust and advice network, which raises concerns about the reliability of the measures. However, the decision to use a single item over a multi-item measure to minimize respondent fatigue was made a priori recognizing the trade-offs. Additionally, researchers have proposed that it is appropriate to use single-item measures when the construct being measured is sufficiently narrow or unambiguous (Sackett & Larson, 1990). Thereby, single-item measures are acceptable and more prevalent in the social network studies. Additionally, the roster method was used collect the social network data, which likely facilitated individuals' recall and thus increased the reliability of single-item measures (Marsden, 1990). Also, advice-giving and taking was limited to team members. It is likely that employees receive advice from members outside of the team. Future research could also examine how advice networks beyond one's immediate work team, within and outside the organization, influence employees' safety behavior.

Second, to mitigate the cognitive load imposed on supervisors, safety behavior items with the highest loadings on the latent construct in the original study validating these items (Griffin & Neal, 2000) were selected to assess the safety behavior construct. These items emphasize safety compliance, not safety participation, which provides a deficient assessment of safety

performance. However, safety compliance is more important than safety participation making it a defendable construct to test first.

Third, an important boundary condition was set up front in this study that any advice provided is assumed to be well-intentioned; however, it is likely that well-intentioned advice is not always beneficial to safety behavior. To mitigate the cognitive load for participants, the current study did not ask participants to evaluate every piece of advice they received from their coworkers. Future research could evaluate the usefulness of advice within the advice network and explore how advice quality impacts the relationships between advice-giving, advice-taking, and safety behavior.

Future Research Directions

Future research could examine other moderators and mediators to facilitate an understanding of how and why advice-giving and advice-taking influence safety behavior. For instance, network centralization, how central the most central member is in the network, may amplify the effects of advice-giving on safety behavior. It is likely that advice-givers enjoy more influence advantages within a more central network as other members rely on taking advice from the central person. Moreover, safety climate may serve a moderating role in the relationship between advice-giving and advice-taking and safety behavior. Employees are more likely to share knowledge and information with others when they perceive more favorable, supportive safety climate, and leverage these pieces of advice for further safety behavior improvement. Also, job satisfaction may mediate the relationship between advice-giving and safety behavior (Tziner, Ben-David, Oren, & Sharoni, 2014). Employees giving more advice to others may feel that they are needed by team members and can make contributions to the team projects with their

expertise and thus feel more satisfied with their job. Individuals with a higher level of job satisfaction are more likely to follow safety rules and perform jobs safely.

Personality traits may also serve as important boundary conditions for the effect of advice-giving and safety behavior. Past research on the relationship between advice-giving and job performance found that advice-giving had a positive influence on job performance only for introverts low in emotional stability and extraverts high in emotional stability (Regts & Molleman, 2016). It is likely that different personality profiles (e.g., high extraversion and openness but low in neuroticism, low extraversion and openness but high in neuroticism) may impact the effect of advice-giving on safety behavior.

Future research could also explore other types of social networks (e.g., communication network, friendship network) and examine how network features of these social networks could impact safety behavior. For instance, the network structures of friendship network may influence the transition of both formal and informal information and thus could influence individuals' safety behavior. Individuals who are more central in the friendship network are more likely to obtain both task-related and non-task-related resources, which could benefit their safety behavior. Moreover, a denser friendship network could facilitate their collaborations and cooperation, which could enhance their team safety behavior.

Future research could explore various personal factors that could influence advice-taking behaviors. For instance, advice-takers' ability to discern good advice from bad advice might be important to safety behavior improvement. Previous research found several factors influencing the ability to discern advice. For instance, research found that anxious individuals were less discerning and more receptive to bad advice, as anxiety lowers self-confidence and impairs information processing and subsequently increases reliance upon taking others' advice (Gino,

Brooks, & Schweitzer, 2012). Future research could explore whether cognitive ability and personality traits (e.g., conscientiousness) affect advice-takers' ability and likelihood to discern advice, which may maximize their gains from others' advice.

CONCLUSION

This study took the social network approach to examine the influence of advice and trust network on safety behavior in the workplace. Specifically, advice-giving was positively associated with safety behavior and such relationship was stronger when the group members engaged in more frequent advice exchanges within the group. Further, cognitive and affective trustworthiness were found to exert positive influences on advice-giving and subsequent safety behavior; whereas only cognitive trust in coworkers was found to exert a positive influence on advice-taking. Both cognitive and affective trust in coworkers were not positively related to safety behavior. These findings highlight the important role of advice and trust networks in influencing safety behavior and underscore the value of utilizing an integrative, multilevel social network approach to examine the effects of social networks and advance our understanding of how social networks facilitate safety behavior.

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APPENDIX A

SURVEY ITEMS

Time 1 Employee survey

Cognitive trust (McAllister, 1995)

To what extent do you trust this person because you perceive him or her to be reliable and competent? For example, do you trust this person to complete a task that he or she has agreed to do for you, and have knowledge and competence needed to get tasks done? Use the following scale to indicate the extent to which you trust this person: 1 = Not at all, 5 = to a greater extent. (Ferrin et al., 2006)

Affective trust (McAllister, 1995)

To what extent do you trust this person because you are emotionally bonded with him/her? For instance, do you feel this person is genuinely concerned about your personal problems and difficulties, and cares about your hopes and dreams? Use the following scale to indicate the extent to which you trust this person: (1 = Not at all, 5 = to a greater extent)

Advice-taking

In the past 2 months, please indicate how often you have seriously considered and taken advice from this person for your work-related decision making processes? (1 = never, 2 = less than once a month, 3= 1–3 times a month, 4 = 1–3 times a week, 5 = daily)

Time 2 Supervisor survey

Employee Safety Behavior (adapted from Griffin & Neal, 2000)

1. This employee carries out work in a safe manner.
2. This employee uses all the necessary safety equipment to do the job.

An example for advice network questionnaire

In the past 2 months, please indicate how often you have seriously considered and taken advice from this person for your work-related decision making processes?

	Never	Less than once a month	1–3 times a month	1–3 times a week	Daily
Name 1	1	2	3	4	5
Name 2	1	2	3	4	5
Name 3	1	2	3	4	5
Name 4	1	2	3	4	5
Name 5	1	2	3	4	5

APPENDIX B

HIERARCHICAL LINEAR MODELING FOR OVERALL TRUSTWORTHINESS PREDICTING ADVICE-GIVING AND SAFETY BEHAVIOR

	Advice-giving	Safety behavior		
	Model 1	Model 2	Model 3	Model 4
Constant	-0.25*	4.37*	4.46*	4.49*
	(0.13)	(0.39)	(0.39)	(0.40)
Sex	-0.02	0.01	0.01	-0.002
	(0.05)	(0.09)	(0.08)	(0.08)
Age	0.01	0.01	0.01	0.01
	(0.005)	(0.01)	(0.01)	(0.01)
Tenure	-0.002	0.01	0.01	0.01
	(0.005)	(0.01)	(0.01)	(0.01)
Size	-0.001	-0.01	-0.01	-0.01
	(0.004)	(0.03)	(0.03)	(0.03)
Trustworthiness	0.44*	0.25	0.18	0.17*
	(0.02)	(0.05)	(0.05)	(0.05)
Advice-giving			0.21*	0.21*
			(0.08)	(0.08)
Advice network density				0.04
				(0.17)
Advice-giving * Advice network density				0.40*
				(0.19)
Model deviance	47.93	567.05	570.25	580.99

Note. $N = 416$ at the individual level; $N = 42$ at the group level; $^{*}p < .05$; Standard errors are in parentheses; Model deviance is a measure of model fit.

APPENDIX C

HIERARCHICAL LINEAR MODELING FOR OVERALL TRUST PREDICTING ADVICE-TAKING AND SAFETY BEHAVIOR

	Advice-taking	Safety behavior		
	Model 1	Model 2	Model 3	Model 4
Constant	0.16*	4.18*	4.18*	4.22*
	(0.42)	(0.39)	(0.39)	(0.40)
Sex	0.20	-0.02	-0.01	-0.005
	(0.16)	(0.09)	(0.09)	(0.09)
Age	0.0003	0.01	0.01	0.01
	(0.02)	(0.01)	(0.01)	(0.01)
Tenure	-0.03	0.02	0.02	0.02*
	(0.02)	(0.01)	(0.01)	(0.01)
Size	0.001	-0.01	-0.01	-0.01
	(0.01)	(0.03)	(0.03)	(0.03)
Trust in coworkers	0.32*	-0.02	-0.01	-0.02
	(0.02)	(0.01)	(0.02)	(0.02)
Advice-taking			-0.03	-0.02
			(0.02)	(0.02)
Advice network density				0.06
				(0.17)
Advice-taking * Advice network density				-0.10
				(0.06)
Model deviance	1,132.35	595.52	606.03	620.69

Note. $N = 416$ at the individual level; $N = 42$ at the group level; $^{*}p < .05$; Standard errors are in parentheses; Model deviance is a measure of model fit.