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## RESEARCH ARTICLE

# On the origins of informal hierarchy: The interactive role of formal leadership and task complexity

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## Summary

Informal hierarchies are a common and important feature of many groups, yet we know little about the antecedent conditions that determine the strength of such hierarchies. Building on theory that has depicted hierarchy as a mechanism for reducing uncertainty and creating structure, we posit that informal hierarchies emerge most strongly in situations that are ambiguous, ill-defined, and unstructured. Three independent studies confirm this notion, demonstrating that groups develop particularly strong informal hierarchies in situations characterized by both a lack of strong formal leadership and high task complexity. These findings support the theoretical notion that formal and informal hierarchies are closely related, but only under conditions of high task complexity in which the structuring functions of hierarchies are most crucial.

## KEYWORDS

informal hierarchy, formal leadership, task complexity

## 1 | INTRODUCTION

Informal hierarchical differentiation is a pervasive feature of human groups (Leavitt, 2004; Mazur, 1985) that materializes across widely differing contexts, ranging from groups of preschool children (Strayer & Strayer, 1976) to organizational top management teams (He & Huang, 2011). Even in the absence of formal power and authority structures, informal influence differences between a group's members emerge on a regular basis (Bales, Strodbeck, Mills, & Roseborough, 1951; Heinicke & Bales, 1953), enabling more influential members to change others' behavior, direct group activities, and distinctly shape a group's functioning (Anderson & Brown, 2010; Mowday, 1978).

Despite the near ubiquity of informal group hierarchies, research has shown that the strength of informal hierarchical differentiation varies widely, with some groups exhibiting more pronounced and clear-cut influence differences between their members than others (Bunderson, Van der Vegt, Cantimur, & Rink, 2016; Schmid Mast, 2002). This raises important questions about the antecedent

conditions that may shape a group's informal hierarchy strength. Existing research has rarely considered this issue (Ravlin & Thomas, 2005). So far, individual-level studies have investigated members' informal influence or leader emergence (e.g., Anderson, John, Keltner, & Kring, 2001; Walter, Cole, Van der Vegt, Rubin, & Bommer, 2012), and group-level research has examined factors that predict a group's average degree of informal or shared leadership (e.g., Carson, Tesluk, & Marrone, 2007; D'Innocenzo, Mathieu, & Kukenberger, 2016; Pearce & Conger, 2003). Although these studies have produced important insights, they have typically focused on the extent to which leadership roles are distributed among a team's individual members (D'Innocenzo et al., 2016). As such, this research has not investigated how groups develop distinct patterns of informal hierarchical strength, denoting how a group, as a whole, is characterized by its members' *dyadic influence and deference relations* (cf. Bunderson et al., 2016; Krackhardt, 1994; Oedzes, Rink, Walter, & van der Vegt, 2018). For example, even if informal leadership roles are shared between individual members, a group may exhibit either a relatively weak (if most members' dyadic influence relations are reciprocal) or a relatively

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strong informal hierarchy (if most members' dyadic influence relations are unidirectional; Bunderson et al., 2016). In the former case, most of the team's members would mutually influence each other, such that the group exhibits little informal hierarchical differentiation. In the latter case, by contrast, the group's informal leadership pattern would exhibit a more clear-cut ordering; even though most members may take part in the leadership process, their informal influence relations follow a more hierarchical, top-down pattern.

This study draws from theory that has cast hierarchy as a functional mechanism for uncertainty reduction (Halevy, Chou, & Galinsky, 2011; Magee & Galinsky, 2008) to examine why groups may differ in the strength of their informal influence hierarchies. This theoretical perspective holds that (informal) group hierarchies typically arise because they reduce ambiguity and offer clarity regarding members' roles, positions, and responsibilities (De Kwaadsteniet & van Dijk, 2010; Friesen, Kay, Eibach, & Galinsky, 2014; Tiedens, Unzueta, & Young, 2007). Building on this conceptual backdrop, we propose that a strong informal hierarchy is particularly likely to develop if other means cannot accommodate a group's need for structure and predictability.

In organizational practice, groups' respective needs are often met by imposing a clear-cut *formal* hierarchy, such that a formal leader (e.g., a supervisor) is equipped with authority to direct group members' behavior, assign roles to individual members, and monitor their efforts and performance (Lorinkova, Pearsall, & Sims, 2013; Sagie, 1996; Somech, 2006). Interestingly, however, much of the existing research on informal hierarchies has been conducted in groups without a formal leader (e.g., Bales et al., 1951; Fiske & Ofsche, 1970). Hence, although scholars have rarely examined this notion, a group's tendency toward strong informal hierarchical differentiation may be most pronounced if the group has no formal leader.

At the same time, focusing on the mere presence or absence of a formal leader may not be sufficient to explain a group's informal hierarchy strength. It is well established in the leadership literature that formal leaders differ markedly in their behavior toward subordinates (i.e., their leadership style; Yukl, 2013). Hence, some formal leaders' behavior may more effectively create structure and clarity within the group than other leaders' behavior, and these differences appear critical for understanding formal leaders' roles for their groups' informal hierarchies. Again, drawing from functional theories of hierarchy (Friesen et al., 2014; Halevy et al., 2011), we propose that a group's need for predictability and order is more likely to be met when the formal leader provides clear-cut directions for joint task accomplishment (i.e., a highly directive leadership style; Lorinkova et al., 2013). When the formal leader grants greater autonomy and leaves more discretion for members' task accomplishment (i.e., a less directive leadership style), by contrast, group members may strive to reduce the resulting ambiguity by self-organizing their collaboration, thus establishing more pronounced informal influence differences.

Importantly, this argument rests on the assumption that a group experiences salient uncertainty and thus requires clear-cut structures and processes to accomplish its tasks. It is evident that this assumption is not equally valid for all groups but may hinge on a group's task characteristics (Lord, 1976). Under simple task conditions with unambiguous procedures and solutions, it is relatively easy for group members to know what is expected of them and of others, and members face few problems that require complex coordination (Withey, Daft,

& Cooper, 1983). With more complex tasks, however, groups require clear internal structures to deal with their work's greater ambiguity (Rousseau & Aube, 2010; Withey et al., 1983). Consequently, we cast task complexity as a critical boundary condition for the link between formal leadership and informal hierarchy strength.

In summary, the present set of studies aims to shed new light on the antecedents of groups' informal hierarchical structuring and, more specifically, to advance our theoretical understanding of the formal leadership–informal hierarchy linkage. As Diefenbach and Sillince (2011, p. 1532) argued, investigating “formal *and* informal hierarchy (and their relationships) at the same time helps us to understand hierarchy, its mechanisms and dynamics in more differentiated ways.” In this research, we propose that the absence of strong formal leadership may, somewhat ironically, trigger tendencies toward stronger informal hierarchical differentiation. Moreover, our studies highlight the important functional role of informal group hierarchies by demonstrating that such hierarchies are most pronounced in situations that require clearly structured and well-coordinated influence relationships between a group's members due to both a lack of (directive) formal leadership and high task complexity. Taken together, our findings illustrate that formal leaders' role for their groups' informal influence structure is intricate and context-dependent.

## 2 | THEORY AND HYPOTHESES

### 2.1 | Informal group hierarchy

Studies on informal group hierarchy have been conducted within various research areas and literature streams (Magee & Galinsky, 2008). One common perspective within the management and organization literature is the inequality approach, which conceptualizes a group's informal hierarchy strength as the overall degree of differentiation between its members' influence levels (Bunderson et al., 2016). Studies following this perspective have drawn on individual members' overall influence in the group to operationalize this construct, capturing either the disparity of influence among a group's members (e.g., the standard deviation of individuals' influence scores; Greer & Van Kleef, 2010) or the concentration of influence within one or a few members (e.g., using the Freeman index; Bunderson, 2003). Although this approach is informative, scholars have noted that it cannot address a crucial aspect of informal hierarchical differentiation, namely, that a focal member can only have influence when there is another member who shows deference (Bunderson et al., 2016). Indeed, influence is not primarily a characteristic of an individual member, but a property of the dyadic relationship between two members (Emerson, 1962).

Based on this notion, ethologists and social network scholars have advocated an alternative, dyadic approach, conceptualizing informal hierarchy as the overall structure of the dyadic influence relations within a group (Chase, 1980; Everett & Krackhardt, 2012). A strong informal hierarchy exists, in this conceptualization, if members' dyadic influence relations are linear, such that influence exclusively flows in one direction throughout the group (i.e., if Group Member A has influence over Member B, and B has influence over C, then A also has influence over C; Chase, 1980). In weaker informal hierarchies, the

unidirectional flow of dyadic influence is disrupted (e.g., Member C could have influence over A). This presence of intransitive (i.e., cyclical) influence relations reduces clarity about who dominates the informal hierarchy, such that lower ranked members may exert influence over some otherwise higher ranked individuals (Chase, 1980; Mazur, 1985). For the present purposes, we adopt this dyadic approach because it more accurately captures the uncertainty-reducing potential of informal hierarchies in groups (Bunderson et al., 2016).

The near omnipresence of informal influence hierarchies in groups has led scholars to suggest that hierarchies fulfill pivotal functions for both individual members and the group as a whole (Anderson & Brown, 2010; Halevy et al., 2011). Specifically, this theorizing suggests that informal hierarchies serve to meet members' fundamental need for structure by reducing uncertainty regarding group members' social interactions and joint task accomplishment (De Hoogh, Greer, & Den Hartog, 2015; Gruenfeld & Tiedens, 2010; Tiedens et al., 2007). Various streams of empirical research have, accordingly, directly or indirectly illustrated this structuring function of hierarchical differentiation. At the individual level, for example, people report an increased preference for hierarchical structures when their sense of personal control is threatened (in an effort to restore perceptions of environmental structure, safety, and predictability; Friesen et al., 2014). Furthermore, at the dyadic level, group members generally accept (and even appreciate) informal hierarchical relations between peers because such relationships clarify who leads and who follows, thus facilitating smooth interactions (Dryer & Horowitz, 1997; Tiedens et al., 2007). Relatedly, on the group level, informal hierarchy is negatively related to groups' process conflict and positively related to members' coordination efforts (Bunderson et al., 2016; Klein, Ziegert, Knight, & Xiao, 2006). Together, these studies indicate that strong hierarchical structures can help individuals, dyads, and groups clarify key interaction norms and promote joint work processes (Clark, Clark, & Polborn, 2006; De Kwaadsteniet & van Dijk, 2010).<sup>1</sup> Building on this theoretical and empirical backdrop, we propose that strong informal group hierarchies are particularly likely to develop in work situations that are ill-defined, ambiguous, and do not offer alternative ways to clearly structure members' interactions and tasks. By contrast, a group's informal hierarchy strength should be less pronounced in situations that offer alternative means of guiding members' interactions and establishing certainty and clarity.

## 2.2 | Formal leadership and informal hierarchy strength

Several research streams have emphasized the relevance of formal leadership for structuring group interactions and creating a well-defined, predictable working environment. Scholars have argued, for example, that formal leaders should provide guidance, specify working procedures, and assign clear-cut responsibilities to group members (House, 1996; Katz & Kahn, 1966; McGrath, 1962; Morgeson, DeRue, & Karam,

2010). Without such formal leadership, group members may experience uncertainty about how to interact and cooperate (De Hoogh et al., 2015), promoting their feelings of role ambiguity and role conflict (Rizzo, House, & Lirtzman, 1970; Schriesheim, House, & Kerr, 1976).

Interestingly, however, functional theories of leadership (e.g., McGrath, 1962; Morgeson et al., 2010) argue that structuring activities may also be performed by individual group members who take on an informal leadership role (i.e., without having formal leadership authority; Carson et al., 2007; Morgeson et al., 2010). Classical sociological experiments by Bales and colleagues (Bales, 1950; Bales et al., 1951; Heinicke & Bales, 1953) provide evidence for this argument, illustrating that in leaderless groups, members automatically engaged in interactions that lead to the emergence of a strong informal hierarchy (also see Burke, 1974; Fisek & Ofsche, 1970). Hence, although this notion has never been explicitly examined, research on formal and informal leadership emergence suggests that informal hierarchies may develop more strongly in groups without than in groups with a formal leader. In the absence of formal leadership, group members are likely to experience ambiguity about how to resolve coordination difficulties or conflicts, because there is no formal authority to turn to for help (De Hoogh et al., 2015). Thus, we hold that groups without formal leadership will seek internal solutions to cope with such difficulties. Establishing a strong informal hierarchy may represent an important means of achieving clarity and structure in such situations (cf. Halevy et al., 2011).

In the presence of formal leadership, by contrast, group members are less likely to experience ambiguity and uncertainty because they can ask their leader for guidance in case coordination issues or conflicts arise (Fleishman et al., 1991; Zaccaro, Rittman, & Marks, 2001). Hence, in groups with a formal leader, members should experience less need to resolve internal struggles themselves by organizing pronounced patterns of influence and deference (i.e., developing a strong informal hierarchy). In other words, the straightforward organization a strong informal hierarchy provides is largely dispensable if groups can rely on their formal leader to facilitate joint task accomplishment. Accordingly, we hypothesize,

**Hypothesis 1.** *Groups without formal leadership develop stronger informal hierarchies than groups with formal leadership.*

Beyond the mere presence or absence of a formal leader, we further anticipate that a formal leader's typical pattern of behavior toward subordinates (i.e., his or her leadership style) may shape the degree of hierarchical differentiation in his or her group. One leadership style that is particularly concerned with the clear structuring of group activities is directive leadership. Specifically, directive leadership is defined as the extent to which leaders clearly specify group members' roles, provide directions for joint task accomplishment, and structure group interactions (Lorinkova et al., 2013). Hence, highly directive formal leaders fulfill important structuring functions for their groups, providing members with role-relevant directions and helping them integrate subtasks and orchestrate joint efforts (Muczyk & Reimann, 1987; Somech, 2006). Consequently, we expect that highly directive formal leaders leave little necessity for their groups to develop clear-cut hierarchical differences, such that informal hierarchies should remain rather weak.

<sup>1</sup>We note that although hierarchical structures may be functional in terms of structuring group processes, this does not mean that strong informal hierarchies are always beneficial for overall group performance. In fact, performance consequences of informal hierarchy strength appear contingent on a number of situational factors (e.g., group size and task complexity; Bunderson et al., 2016; He & Huang, 2011; Oedzes et al., 2018).

With less directive leaders, in contrast, group members cannot rely on these formal organizing mechanisms, and thus, they have to find alternative ways to establish predictability in their work environment (Kahai, Sosik, & Avolio, 2004; Muczyk & Reimann, 1987). Although giving freedom and autonomy to their subordinates, less directive leaders also leave considerable uncertainty on how to structure cooperation within their groups (Hmieleski & Ensley, 2007). Hence, these leaders may not sufficiently meet their groups' need for structure and certainty. Consequently, we anticipate the emergence of stronger informal group hierarchies as members strive to self-organize their collaboration.

**Hypothesis 2.** *Formal directive leadership is negatively related to informal hierarchy strength.*

### 2.3 | The moderating role of task complexity

It is important to note that these hypotheses are based on the assumption that group members need to coordinate their activities to realize important group goals. Such requirements are most likely to arise in groups that perform relatively complex tasks. By definition, such tasks are multifaceted and rather unpredictable, often comprising multiple subtasks that are interdependent and necessitate careful alignment (Campbell, 1988; Wood, 1986). Research has shown that groups facing more complex task conditions are more likely to encounter uncertainty on how to deal with their assignments and, hence, are more reliant on structuring mechanisms, as compared with groups facing simpler tasks (Espinosa, Slaughter, Kraut, & Herbsleb, 2007; Rousseau & Aube, 2010). We therefore anticipate the negative association between directive leadership and informal hierarchy strength to be more pronounced in teams with higher (rather than lower) task complexity.

As noted, a strong directive leader can offer orientation and guidance for the group (Lorinkova et al., 2013; Somech, 2006), which should be particularly important in high-complexity task settings. Strong directive formal leadership may resolve the ambiguity and uncertainty inherent in highly complex tasks, alleviating group members' need to seek for alternative, informal hierarchical coordination mechanisms despite such complexity. A less directive formal leader, in contrast, is likely to leave his or her group with considerable uncertainty in complex task settings, because he or she does not offer sufficient structure and predictability. Thus, group members may experience a salient need to self-organize their interdependent efforts. In this situation, a strong informal hierarchy is likely to develop as some members may try to take the lead, whereas others willingly yield to such influence attempts to facilitate effective task accomplishment (Tiedens et al., 2007).

For groups with less complex tasks, by contrast, joint task accomplishment is relatively simple and does not require elaborate internal structuring (Withey et al., 1983). Thus, we would expect strong directive leadership to be superfluous in these situations. Even without such leadership, group members should find it relatively easy to discern appropriate task procedures, and in fact, they should be able to draw on readily available routines and procedures to structure group processes, rather than having to develop a distinct pattern of informal

hierarchical differentiation (Withey et al., 1983). Hence, groups' informal hierarchy strength should remain limited even in the absence of directive formal leadership in groups with relatively noncomplex tasks. We therefore hypothesize,

**Hypothesis 3.** *Task complexity moderates the negative relationship between directive formal leadership and informal hierarchy strength. This relationship is more pronounced for groups performing more complex tasks than for groups performing less complex tasks.*

## 3 | STUDY OVERVIEW

This investigation employed three independent studies to test our hypotheses. The first two studies examined the role of formal leadership in relatively complex task settings (i.e., Hypotheses 1 and 2). Study 1 was a laboratory experiment to establish a causal link between the presence versus absence of formal leadership and informal hierarchy strength. Adding to this, Study 2 investigated the consequences of formal leaders' directive behavior for informal hierarchy strength in longer term groups, enabling the examination of potentially reciprocal linkages between these variables over time. Finally, Study 3 investigated the link between directive formal leadership and informal hierarchy strength in real-life work groups (i.e., Hypothesis 2) and incorporated task complexity as a critical boundary condition to examine our full moderation model (i.e., Hypothesis 3).

## 4 | STUDY 1—METHOD, RESULTS, AND DISCUSSION

### 4.1 | Design and participants

Study 1 employed an experimental design to test Hypothesis 1. We manipulated the presence versus absence of formal leadership in experimental task groups using a one-factorial between-subjects design. In the formal leadership condition, groups comprised an appointed leader and four subordinate members. In the no formal leadership condition, groups comprised four members without a formally appointed leader. Importantly, our subsequent analyses refer to the four group members without formal leadership authority across both conditions (i.e., formal leaders were excluded from the informal hierarchy analyses to avoid distortions) because our aim was to compare informal hierarchy strength in groups of formal peers.

A total of 41 groups participated in the experiment, consisting of 184 business and economics students who received either course credit or financial compensation for their participation. One group in the no formal leadership condition was omitted because members interacted for only 5 min, which was insufficient for serious task accomplishment and far below the other groups' interaction times ( $M = 10.14$  min,  $SD = 1.57$ ). Hence, the final sample consisted of 40 groups (20 per condition) comprising 180 participants. Forty-nine percent of the participants were female, their mean age was 22.38 years

( $SD = 1.93$ ), and the majority were Caucasian (83.3%, 15% Asian, and 1.7% Hispanic).

## 4.2 | Experimental task and procedure

Participants were invited to the laboratory in groups of four or five to work on NASA's "Lost on the Moon" task (Hall & Watson, 1970). In this task, participants act as a group of astronauts that has crash-landed on the moon and needs to return to the mother ship. To do so, the group has to arrive at a collective ranking of 15 items salvaged from their damaged vessel in order of their importance for survival (e.g., oxygen tanks and nylon rope).

Before working on this group task, participants were individually seated in separate cubicles to sign an informed consent form, receive task instructions, and complete a leadership questionnaire. We used participants' answers to this questionnaire as part of the formal leadership manipulation. Last, participants prepared for the group discussion by individually ranking the 15 survival items. Afterwards, group members were seated together in a collaboration room to work on the group task. Members were allowed to use their individual rank order of survival items as input during the collective discussion. After the group task, participants returned to their individual cubicles to complete a posttask questionnaire that included measures of informal hierarchy strength along with demographic variables and manipulation checks.

## 4.3 | Formal leadership manipulation

To manipulate the presence versus absence of formal leadership, we used a procedure developed by Galinsky, Gruenfeld, and Magee (2003). Across both experimental conditions, participants were informed (prior to the group task) that their role in the group was based on the outcomes of the pretask leadership questionnaire. This was important (a) to ensure acceptance of the formally assigned leader in the group and (b) to increase the realism of our study (after all, formal leaders in real-life work groups are typically endowed with legitimate authority as well; Yukl, 2013). Actually, however, the experimenter randomly assigned roles to the group members.

In the formal leadership condition, one of the members was appointed to the role of group leader, whereas the other four members were appointed the role of subordinate. The experimenter always chose male leaders to prevent differences in leaders' gender from biasing the results. Leaders and subordinates learned that the formal leader had control over work processes within their group as well as the authority to evaluate subordinates' performance and allocate bonus money accordingly (see Galinsky et al., 2003, p. 455). In the no formal leadership condition, all members were assigned to the neutral role of a regular group member, and they received no further role instructions.

As a manipulation check, we asked all participants to indicate which role they had been assigned to (i.e., leader, subordinate, or group member). Nine participants across nine different groups answered this question incorrectly (four regular group members and five subordinates). Analyses with and without these nine groups

yielded virtually identical results, so we decided to include all groups in the analyses.

## 4.4 | Informal hierarchy strength

Consistent with previous research (Bunderson et al., 2016), we adopted a dyadic approach to measure members' influence and compute a groups' informal hierarchy strength (Schmid Mast, 2002; Singh, Singh, Sharma, & Krishna, 2003). We presented the four subordinate members in the formal leadership condition and the four regular members in the no formal leadership condition with a list of all possible member pairings. Subsequently, we asked these participants to indicate which individual in each pair was more influential during the group task. For each pair, the answer options were: (a) Member A was more influential than Member B; (b) Member B was more influential than Member A; and (3) Members A and B were equally influential. To circumvent order effects, pairs of group members were presented following Ross's (1939) ordering method.

The dyadic influence assessments were subsequently used to compute the overall strength of a group's informal influence hierarchy (cf. Chase, 1980), using linearity as a prominent indicator of informal influence differences within groups (Schmid Mast, 2002). Linearity indicates the degree to which informal hierarchical relationships in a group are transitive (i.e., do not include cyclical influence relations; Chase, 1980). As such, linearity is maximized if one member has influence over all others in the group, the second member has influence over all members but the first, down to the last member who has influence over no one (Chase, 1980; Schmid Mast, 2002). Linearity is reduced to the extent that cycles occur within the informal hierarchical ordering, such that Member A has influence over B, Member B has influence over C, but Member C has influence over A. Notably, we excluded group leaders in the formal leadership condition from these calculations. By definition, formal leaders were more influential than the other members due to their official leadership role. Hence, their inclusion would inflate informal hierarchy strength estimates in the formal leadership condition and make comparisons between conditions meaningless.

To calculate informal influence linearity, we created two influence matrices for each group (Chase, 1980). In the first matrix, each cell captured the percentage of participants that rated a specific group member as more influential than another member. In the second matrix, each cell captured the percentage of members that rated the influence relation between two specific members as tied. Adding these two matrices (with ties weighted as 0.5) resulted in a perfectly symmetrical informal influence matrix for each group. These added matrices served as input for calculating linearity scores for each group using Singh et al.'s (2003)  $h$  index:

$$h = \frac{[12/(n^3-n)] \sum [d_a - (n-1)/2]^2}{\text{where } d_a = \sum P_a}$$

$P_a$  refers to the proportion of pairwise comparisons in which a group member is rated as more influential, and  $n$  indicates group size (number of members). Linearity scores can range from 0 (all influence relations are intransitive) to 1 (all influence relations are transitive).

The dyadic influence assessments also enabled us to calculate overall influence scores for individual participants.<sup>2</sup> As an additional manipulation check, we examined whether formal leaders in the leader-present condition had higher individual influence scores than subordinates. As expected, leaders' individual influence scores were significantly higher ( $M = 2.92$ ,  $SD = 0.92$ ), compared with subordinates ( $M = 1.77$ ,  $SD = 0.94$ ,  $F[1, 98] = 24.11$ ;  $p = 0.00$ ), supporting the effectiveness of our formal leader manipulation.

#### 4.5 | Results Study 1

We tested Hypothesis 1 using a one-way analysis of variance, with informal hierarchy strength as the dependent variable. As expected, linearity of the informal influence hierarchy was lower in groups with a formal leader ( $M = 0.46$ ,  $SD = 0.18$ ) than in groups without formal leadership ( $M = 0.59$ ;  $SD = 0.19$ ;  $F[1, 38] = 5.24$ ,  $p = 0.03$ ,  $\eta^2 = 0.12$ ). Hence, Hypothesis 1 was supported.

#### 4.6 | Discussion Study 1

In line with our first hypothesis, this experimental study demonstrated that groups developed stronger informal hierarchies when formal leadership was absent and weaker informal hierarchies when formal leadership was present. These results are consistent with previous experimental work showing that in leaderless groups, informal hierarchies emerge strongly (Bales et al., 1951; Fisek & Ofsche, 1970). Our findings add to this research by providing causal evidence for the formal leadership–informal hierarchy link, thus offering initial evidence for the proposed uncertainty-reducing function of informal hierarchies in groups.

At the same time, the experimental nature of the study may raise questions about the generalizability of its findings to more realistic settings in which groups may interact over longer time periods. Indeed, a complete absence of formal leadership (as in our no formal leadership condition) is relatively rare within most groups outside the laboratory (Devine, Clayton, Philips, Dunford, & Melner, 1999). Even self-managing or autonomous work teams typically have external leaders who act as coordinators or coaches with official authority (Carson et al., 2007; Manz & Sims, 1987). Also, consistent with previous work (e.g., Bottger & Yetton, 1988), we considered the present experimental task to be relatively complex. In real-life work groups, however, assignments may be even more complex than the task used in this experiment because these groups are often responsible for multiple different subtasks that require intricate integration over a prolonged time period.

We also note that all formal leaders in the experiment were male, and groups across the two conditions had different sizes. These design choices were deliberate to rule out leader gender effects and to create a viable basis for the comparison of informal hierarchy across conditions, but they may raise questions about the effects of leader gender and group size on informal hierarchy strength. Finally, we assigned

subordinate roles to peer members in the formal leadership condition, whereas we assigned team member roles to peer members in the no formal leadership condition. We did this to ensure that participants accepted their appointed leader as legitimate in the formal leadership condition, but this differential role assignment across conditions may also have affected our results. We conducted two additional studies to address these limitations and to test Hypotheses 2 and 3.

## 5 | STUDY 2—METHODS, RESULTS, AND DISCUSSION

### 5.1 | Study context

We conducted Study 2 in the context of a 4-week full-time management simulation that was part of the graduate management program of a large Dutch university. The simulation was developed by MCC Nederland BV and has provided the setting for previous academic research (e.g., Bunderson, Van der Vegt, & Sparrowe, 2014). During the simulation, business students assumed the role of the senior management team of a fictional medium-sized company. These teams' primary goal was to build and execute a workable strategic business plan. This required that teams made decisions about all aspects of corporate management, including production, staffing, marketing, finance, and R&D. Furthermore, the teams were responsible for managing and satisfying several important stakeholders (e.g., banks, the board of directors, and the workers' council). As such, the management simulation represented a highly complex task in which close coordination between team members was pivotal.

Once students had been assigned to a team, they selected a general manager who functioned as formal leader. This selection was generally based on who was most willing to come forth and take responsibility; if multiple individuals volunteered for the formal leader role, then selection was typically based on votes. After choosing the formal leader, team members divided the other functional roles (e.g., HR officer, finance officer, and marketing officer). Each team worked together on a daily 8- to 9-hr work schedule in a designated area within the university. The simulation comprised four rounds (one round per week), with formal performance evaluations after each round.

### 5.2 | Sample and procedures

The sample comprised 160 students who were randomly assigned to 20 eight-person teams. Of the formal leaders, 60% were female, and their average age was 21.35 years ( $SD = 0.88$ ). Of the other participants (i.e., subordinates), 52.5% were male, and their average age was 21.76 years ( $SD = 1.63$ ). We presented our data collection as a study into leadership and team dynamics, and participation was voluntary. Also, we informed the students that they would be allocated a unique code for matching their data over different time points and that after data collection, their responses would be anonymized. We distributed a presimulation questionnaire to collect information on demographics. Subsequently, we distributed four questionnaires at the end of every week, which contained our measures of formal leadership style and informal hierarchy strength.

<sup>2</sup>A minimal individual influence score of 0 means that none of the group members rated the formal leader as most influential in any of the dyadic influence comparisons. A maximum score of 4, by contrast, means that all group members scored the formal leader as most influential in all of the dyads.

### 5.3 | Measures

#### 5.3.1 | Directive formal leadership

Group members rated their formal leader's directive leadership style using seven items from Lorinkova et al. (2013). Example items are, "The group leader takes charge of our group" and "The group leader defines tasks and responsibilities of group members." Cronbach's alpha was 0.92 in Week 1; 0.90 in Week 2; 0.92 in Week 3; and 0.94 in Week 4. Aggregation statistics supported averaging individual members' responses to the group level (on average over the four time points, ICC1 = 0.19, all *ps* < 0.01; ICC2 = 0.61; mean  $r_{wg(j)}$  = 0.90; Bliese, 2000; James, Demaree, & Wolf, 1984).

#### 5.3.2 | Informal hierarchy strength

As in Study 1, we captured informal hierarchy strength using a dyadic measurement approach in which each group member assessed all members' relative influence within each possible dyad in the group (excluding formal leaders). We subsequently used these ratings to calculate linearity scores (Singh et al., 2003), using the same formula as in Study 1.

#### 5.3.3 | Control variables

We considered a number of control variables. First, although we had no a priori hypotheses about the effects of other formal leadership styles, we also measured empowering leadership (i.e., leadership focused on promoting participation in decision making, information sharing, and teamwork) because prior research has often examined directive and empowering leadership in conjunction (e.g., Hmieleski & Ensley, 2007; Lorinkova et al., 2013). All group members rated their formal leaders' respective behavior, using seven items from Lorinkova et al. (2013). Cronbach's alpha was 0.85 in Week 1; 0.89 in Week 2; 0.93 in Week 3; and 0.94 in Week 4. Aggregation statistics supported aggregating individual members' responses to the group level (on average, over the four time points, ICC1 = 0.11, all *ps* < 0.01; ICC2 = 0.47; mean  $r_{wg(j)}$  = 0.92).

Second, we considered both leaders' gender and within-group gender diversity because these variables are potentially related to the development of informal influence relations within groups (Schmid Mast, 2002). Gender diversity was captured using Blau's diversity index (1977), which was calculated as  $1 - \sum P_i^2$ , where *P* is the proportion of individuals in a category (male/female) and *i* is the number of categories.

### 5.4 | Results Study 2

Table 1 presents means, standard deviations, and intercorrelations for the variables across the different time points. The measures of formal directive leadership and informal hierarchy were moderately to highly stable over time (directive leadership, T1–T2: *r* = 0.69; T2–T3: *r* = 0.93; T3–T4: *r* = 0.89; all *ps* < 0.05; informal hierarchy strength, T1–T2: *r* = 0.60; T2–T3: *r* = 0.54; T3–T4: *r* = 0.83; all *ps* < 0.05). Of the control variables, empowering leadership at T1, T2 and T3 correlated significantly with informal hierarchy strength at T2. We therefore also ran our models including the control variables (Becker, 2005).

**TABLE 1** Means, standard deviations, and bivariate correlations (Study 2)

	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Empowering leadership T1	4.99	0.46													
2. Empowering leadership T2	5.14	0.38	0.67*												
3. Empowering leadership T3	5.03	0.56	0.44*	0.86*											
4. Empowering leadership T4	5.00	0.52	0.54*	0.71*	0.71*										
5. Leader gender	0.60	0.50	-0.18	-0.24	-0.24	-0.23									
6. Gender diversity	0.43	0.09	0.01	-0.09	-0.06	-0.14	-0.15								
7. Directive leadership T1	4.66	0.70	0.74*	0.52*	0.32	0.41	0.11	-0.10							
8. Directive leadership T2	4.87	0.52	0.62*	0.81*	0.76*	0.53*	-0.21	-0.06	0.69*						
9. Directive leadership T3	4.91	0.60	0.52*	0.86*	0.89*	0.62*	-0.24	-0.21	0.56*	0.93*					
10. Directive leadership T4	4.92	0.60	0.52*	0.76*	0.80*	0.80*	-0.32	-0.20	0.52*	0.82*	0.89*				
11. Informal hierarchy strength T1	0.38	0.16	0.04	0.17	0.04	0.26	0.00	0.35	-0.09	-0.03	-0.05	0.14*			
12. Informal hierarchy strength T2	0.30	0.18	0.26	0.57*	0.49*	0.54*	-0.20	-0.16	-0.02	0.25	0.41	0.53*	0.60*		
13. Informal hierarchy strength T3	0.30	0.16	-0.11	0.10	0.07	0.20	0.17	0.16	-0.03	-0.09	-0.03	0.13	0.74*	0.54*	
14. Informal hierarchy strength T4	0.22	0.18	-0.07	-0.06	-0.07	0.12	0.11	0.18	0.03	-0.14	-0.15	0.02	0.61*	0.21	0.83*

Note. *n* = 20. Leader gender is coded 0 = male, 1 = female.

\**p* < 0.05.

Hypothesis 2 predicted that directive formal leadership is negatively related with informal hierarchy strength. We used multilevel regression analysis with time as nesting variable to examine this notion, using grand-mean-centered predictors (Hox, 2010). To examine the relationship between formal directive leadership and informal hierarchy strength over time, we regressed informal hierarchy strength at time points 2, 3, and 4 on directive leadership at time points 1, 2, and 3, respectively (i.e., a lagged design).

In the first step of the analyses, we estimated a null model with only an intercept term and variance across time points and across groups. Model 2 added directive leadership as a fixed, time-varying predictor of informal hierarchy strength (see Table 2). In support of Hypothesis 2, results demonstrated a significant negative relationship between directive leadership and informal hierarchy strength at the next time point ( $B = -0.09$ ;  $SE = 0.04$ ;  $p = 0.02$ ). We note that this relationship was still significant when (a) allowing the slope of directive leadership to vary and (b) including the control variables time, leader gender, group gender diversity, and empowering leadership. Furthermore, comparing the  $-2\log$  likelihood values of the models, we conclude that Model 2 (including the predictor variable) is a significant improvement over Model 1 (the null model;  $\chi^2(1) = 4.456$ ,  $p = 0.00$ ).

We also tested whether the direction of the directive leadership–informal hierarchy relationship could be reversed. To do so, we regressed directive leadership at time points 2, 3, and 4 on informal hierarchy strength at time points 1, 2, and 3, respectively. First, we again estimated a null model. Then Model 2 added informal hierarchy strength as a fixed, time-varying predictor of formal directive leadership. Results demonstrated that informal hierarchy strength did not significantly predict directive leadership at the next time point ( $B = 0.31$ ,  $SE = 0.27$ ,  $p = 0.27$ ). Overall, this pattern of findings suggests

that the relationship between directive leadership and informal hierarchy strength is nonreciprocal.

## 5.5 | Discussion Study 2

Study 2's results supported Hypothesis 2, indicating that formal directive leadership at one time point negatively related with informal hierarchy strength at a later time point (i.e., 1 week later), but not the other way around. Adding to the findings from Study 1, these results indicate that beyond the mere presence of a formal leader, the formal leader's directive behavior significantly shapes the strength of the informal influence hierarchy within the group. Consistent with the proposed uncertainty-reducing function of informal hierarchies, a group's informal hierarchy was less pronounced in groups in which the formal leader provided clear structure and direction to the groups' members.

A notable strength of Study 2 is that it examined the relationship between formal directive leadership and informal hierarchy strength in a relatively controlled setting in which participants worked together on a complex task for a longer time period. Moreover, the results showed that neither leaders' gender nor groups' gender diversity significantly related with informal hierarchy strength, and controlling for these aspects did not meaningfully alter our findings and conclusions. We note, however, that group size was fixed in Study 2, and we employed student participants to test our hypothesis. Moreover, because task complexity did not vary, we were unable to test Hypothesis 3. Study 3 was designed to address these issues and to examine the generalizability of our findings to real-life work settings.

## 6 | STUDY 3—METHOD, RESULTS, AND DISCUSSION

### 6.1 | Sample and procedures

We drew on a heterogeneous sample of organizational work groups to test our full moderation model (i.e., Hypothesis 3). Specifically, our data collection focused on intact work groups that (a) consisted of at least four members, (b) worked toward common goals, and (c) had frequent face-to-face interaction (Kozlowski & Bell, 2003). We first contacted groups' formal leaders who, after agreeing to participate, provided additional information about group tasks, group size, and members' names. We then administered a survey in which all group members rated their formal leaders' directive behavior, group task complexity, and each other's informal influence. Participation was voluntary, and we assured all participants of the confidentiality of their responses.

Fifty-five groups whose leaders agreed to participate in the study matched the selection criteria. After receiving the questionnaires, however, members from three groups indicated that the survey was not applicable to their working situation, and two groups' response rates were insufficient to calculate informal hierarchy scores (i.e., below 50%; Bunderson, 2003). The final sample therefore consisted of 50 work groups comprising 230 members, distributed across 42 organizations from a variety of industries (e.g., services—28%; manufacturing—20%; logistics and trade—20%; finance and insurance—14%; education—10%; and health care—8%). The individual response rate among the participating work groups was 93%. Of the participants,

**TABLE 2** Multilevel regression results (Study 2)

	DV: Informal hierarchy strength	
	Model 1	Model 2
	B (SE)	B (SE)
Intercept	0.27 (0.03)	0.27 (0.03)
Directive leadership		-0.09 (0.04)*
Variance		
Time points	0.014 (0.006)	0.013 (0.003)
Groups	0.016 (0.004)	0.017 (0.007)
-2Log likelihood	-53.160	-57.616
	DV: Directive leadership	
	Model 1	Model 2
	B (SE)	B (SE)
Intercept	4.90 (0.12)	4.80 (0.15)
Informal hierarchy strength		0.31 (0.27)
Variance		
Time points	0.040 (0.009)	0.040 (0.009)
Groups	0.273 (0.091)	0.267 (0.089)
-2Log likelihood	38.978	37.706

Note.  $n = 60$ . Values are unstandardized regression coefficients. Standard errors are in parentheses.

\* $p < 0.05$ .

58% were male, their average age was 39.82 years ( $SD = 12.53$ ), and average organizational tenure was 4.60 years ( $SD = 5.20$ ).

## 6.2 | Measures

Unless otherwise indicated, the items were rated on a 7-point scale (1 = *strongly disagree*, 7 = *strongly agree*).

### 6.2.1 | Directive formal leadership

Group members rated their formal leader's directive leadership style using seven items from Lorinkova et al. (2013). Example items are, "The group leader takes charge of our group" and "The group leader defines tasks and responsibilities of group members." Cronbach's alpha was 0.88, and aggregation statistics supported aggregating individual members' responses to the group level ( $ICC1 = 0.38$ ,  $p < 0.01$ ;  $ICC2 = 0.73$ ; mean  $r_{wg(j)} = 0.86$ ; Bliese, 2000; James et al., 1984).

### 6.2.2 | Task complexity

We measured task complexity with eight items adapted from Withey et al. (1983). Example items include, "We follow an understandable sequence of steps in performing our group tasks" and "Group members do about the same job in the same way most of the time" (both items reverse-scored). Cronbach's alpha was 0.77, and aggregation statistics supported aggregating individual responses to the group level ( $ICC1 = 0.39$ ,  $p < 0.01$ ;  $ICC2 = 0.75$ ; mean  $r_{wg(j)} = 0.92$ ).

### 6.2.3 | Informal hierarchy strength

As in the previous studies, we captured informal hierarchy strength using a dyadic measurement approach in which each group member assessed all members' relative influence within each possible dyad in the group (excluding formal leaders). We subsequently used these ratings to calculate informal hierarchy linearity scores (Singh et al., 2003), using the same formula as in Studies 1 and 2.

### 6.2.4 | Control variables

Given that we gathered data from a diverse sample of teams, we checked whether teams from different industries and from differently sized organizations varied in informal hierarchy strength. One-way analyses of variance did not yield significant effects of either industry type ( $F[5, 44] = 1.40$ ,  $p = 0.24$ ) or organization size ( $F[3, 46] = 0.29$ ,  $p = 0.83$ ) on informal hierarchy strength. Also, incorporating these

variables as categorical controls in our analyses did not change the results and conclusions. Furthermore, because groups varied considerably in size and average member tenure (in years), and because past research has demonstrated that these variables relate to group processes and communication (Ancona & Caldwell, 1992; Stewart & Barrick, 2000), we considered these variables as covariates. As in the previous study, we also incorporated leader gender and group gender diversity as potential controls.

## 6.3 | Results of Study 3

Table 3 presents means, standard deviations, and intercorrelations for all Study 3 variables. We note that none of the control variables (group size, average team tenure, leader gender, and group gender diversity) significantly related to informal hierarchy strength. We therefore report the results of the analyses without these controls to avoid power problems and biased parameter estimates (Becker, 2005). We note that the pattern of results and conclusions remained highly similar when incorporating the control variables.

Table 4 summarizes the results of a moderated hierarchical regression analysis with standardized predictors. As shown, these findings do not support Hypothesis 2, because formal directive leadership and informal hierarchy strength were not significantly related. Importantly, however, we note that this does not contradict our earlier results because we expected the relationship between formal leadership and informal hierarchy strength to be especially strong under conditions of relatively high task complexity (as in Studies 1 and 2) and to be reduced under conditions of lower task complexity.

Consistent with this expectation, we found a significant interaction of directive formal leadership and task complexity with informal hierarchy strength ( $B = -0.08$ ,  $SE = 0.04$ ;  $p = 0.04$ , see Table 4). Figure 1 depicts this moderation. Simple slopes analyses revealed that the relationship between directive formal leadership and informal hierarchy strength was nonsignificant when task complexity was relatively low ( $-1 SD$ ;  $B = 0.05$ ,  $SE = 0.04$ ,  $p = 0.24$ ). The relationship was negative, by contrast, under conditions of higher task complexity, although it only reached marginal significance at  $+1 SD$  of task complexity ( $B = -0.11$ ,  $SE = 0.06$ ,  $p = 0.06$ ). Further examination of the moderation effect using a regions-of-significance approach (i.e., the Johnson–Neyman technique; Preacher, Curran, & Bauer, 2006) revealed that the negative link between directive leadership and

**TABLE 3** Means, standard deviations, and bivariate correlations (Study 3)

	M	SD	Correlations							
			1	2	3	4	5	6	7	
1. Leader gender	0.26	0.44	–							
2. Gender diversity	0.25	0.21	0.09	–						
3. Group size	4.92	2.19	0.38*	0.25	–					
4. Group average tenure	4.58	3.78	0.06	–0.27	–0.04	–				
5. Directive leadership	4.82	0.84	0.05	0.06	–0.14	0.26	–			
6. Task complexity	4.16	0.68	0.04	0.13	0.12	–0.34*	0.27	–		
7. Informal hierarchy strength	0.51	0.23	0.13	0.05	0.08	–0.12	–0.07	0.25	–	

Note.  $n = 50$ . Leader gender is coded 0 = male, 1 = female.

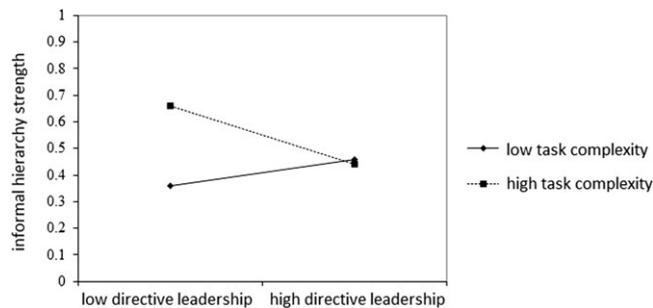
\* $p < 0.05$ .

**TABLE 4** Hierarchical moderated regression results (Study 3)

	Informal hierarchy strength
Main Effects	
Directive leadership	-0.03 (0.03)
Task complexity	0.07 (0.03)*
Interactions	
Directive leadership × task complexity	-0.08 (0.04)*
$\Delta R^2$ (from adding the interaction coefficient)	0.09
$R^2$	0.15

Note.  $n = 50$ . Values are unstandardized regression coefficients. Standard errors are in parentheses.

\* $p < 0.05$ .

**FIGURE 1** The interactive role of directive leadership and task complexity for informal hierarchy strength (Study 3)

informal hierarchy strength was significant at any value of task complexity greater than 1.41 *SD* above the mean. Collectively, these results support Hypothesis 3.<sup>3</sup>

## 6.4 | Discussion of Study 3

In support of Hypothesis 3, this study demonstrated a negative relationship between directive formal leadership and informal hierarchy strength in teams performing relatively complex tasks, but not in teams performing less complex tasks. As predicted, task complexity appears to be a critical boundary condition for the formal leadership–informal hierarchy linkage, such that groups primarily develop strong informal hierarchies in complex task contexts that require clear-cut intricate coordination and when their formal leader's nondirective behavior fails to provide structure and guidelines.

These results were obtained from real-life work groups across various organizations and industries, increasing the generalizability of our findings. We note, however, that the negative relationship between formal leadership and informal hierarchy strength reached

<sup>3</sup>Similar to Study 2, we also measured formal empowering leadership (using a seven-item scale by Lorinkova et al., 2013). Results revealed no significant main effect of empowering leadership, and inclusion of empowering leadership as a control variable in our test of Hypothesis 2 yielded a largely equivalent pattern of results. Additionally, we explored the possible moderating roles of empowering leadership as well as leader gender, group gender diversity, and team size. These additional analyses demonstrated that none of these variables interacted significantly with directive leadership to predict informal hierarchy strength.

conventional levels of statistical significance at 1.41 *SD* above the mean value of the moderator. One possible explanation is that the variance in our measures of task complexity was somewhat limited. However, we consider this not to be very likely because the standard deviation for our task complexity measure was similar to earlier research (e.g., Bunderson et al., 2016). A second, and more likely, explanation for this finding is that the diversity of organizations in our sample was relatively high. This may have resulted in some noise in the data, making it more difficult to detect significant main and interaction effects. Additional research examining the interactive relationship of directive leadership and task complexity with informal hierarchy strength in a more homogenous sample of real-life work groups would be useful to address this issue.

One notable limitation of Study 3 is that it employed a cross-sectional and correlational design, such that it is impossible to draw causal conclusions. At the same time, the proposed relationships are based on strong theory, and the results of Studies 1 and 2 suggest that, at least in more complex task environments, the direction of causality is from formal leadership to informal hierarchy strength, rather than vice versa. Nevertheless, future research using longitudinal designs might be fruitful to further examine possible reciprocal effects and provide further causality evidence. Moreover, it should be noted that we used a self-report measure of group task complexity in Study 3. This is consistent with our reasoning that group members will look for structure when they experience uncertainty, and the relatively high ICC and  $r_{wg}$  values indicate that individuals' task complexity perceptions were shared within groups to a large extent. Nevertheless, future research might examine the relationships between directive leadership behavior and informal hierarchy strength in groups that can be objectively categorized as performing more or less complex work.

## 7 | GENERAL DISCUSSION

The aim of this study was to identify critical antecedents of groups' informal hierarchy strength. Findings from three independent studies provided support for our general proposition that groups may develop stronger informal hierarchies in situations that are relatively ill-defined, unpredictable, and unstructured. More specifically, our studies showed that formal leadership was causally and nonreciprocally related with informal hierarchy strength under conditions of moderate (Study 1) and high task complexity (Study 2) and illustrated group task complexity as a key moderating factor in the formal leadership–informal hierarchy linkage (Study 3).

### 7.1 | Theoretical implications

These findings make several important contributions to the hierarchy literature. First, the present studies advance new knowledge on the origins of informal hierarchies within groups. Whereas existing research has generally focused on the consequences of informal hierarchical differentiation (e.g., He & Huang, 2011; Ronay, Greenaway, Anicich, & Galinsky, 2012), our studies uncovered the presence versus absence of formal leadership and the formal leader's directive style as critical antecedent variables and demonstrated the moderating role of

task complexity, thus expanding the nomological network around informal hierarchy. As such, this investigation is among the first to unveil key group-level predictors that may explicate important differences in distinct groups' informal hierarchy patterns. Specifically, our findings suggest that strong informal hierarchies are most likely to surface in response to ambiguous, ill-defined contexts that originate from complex group tasks and a lack of formal directive leadership.

Second, our studies address calls for a more comprehensive perspective on hierarchical differentiation in groups (Diefenbach & Sillince, 2011; McEvily, Soda, & Tortoriello, 2014). Scholars have argued, in particular, that both formal and informal hierarchies can critically shape members' coordination, cooperation, and task accomplishment. As such, studies focusing on only one of these hierarchy aspects may create an inherently incomplete account of how groups organize themselves. By examining the role of formal leadership—a key element of a group's formal hierarchy (De Hoogh et al., 2015)—for informal hierarchy strength, this investigation takes steps to integrate the heretofore disparate literatures on formal and informal hierarchies. We demonstrate that formal and informal aspects of hierarchy are closely connected, with informal hierarchical differences primarily emerging in response to a lack of clear-cut, formal hierarchical differentiation.

Finally, by illustrating that a lack of formal leadership only promotes informal hierarchy strength in complex task settings, our results show that the link between formal and informal hierarchies may be more intricate and context-specific than previously believed (cf. Diefenbach & Sillince, 2011). Our findings provide nuance, in particular, to the notion that some form of hierarchy—be it formal or informal—is inevitable within most (if not all) groups (Leavitt, 2004; Magee & Galinsky, 2008), demonstrating that group members may perceive formal and informal hierarchies as means toward the same end, namely, the reduction of uncertainty in complex situations. Without such complexity, either form of hierarchy may be dispensable.

## 7.2 | Practical implications

Work design in many organizations has changed dramatically over the past decades (Diefenbach & Sillince, 2011). A key development, in this regard, is the increasing use of self-managing teams or (semi-)autonomous work groups (Lawler, Mohrman, & Benson, 2001). Such groups are typically responsible for relatively complex tasks, and formal leaders often remain at a distance, acting only as remote coaches or facilitators without directly intervening in a group's daily task accomplishment (Carson et al., 2007; Manz & Sims, 1987). Also, this type of group is usually installed with the explicit or implicit goal of fostering equality among members (Cohen & Ledford, 1994). Paradoxically, however, our findings suggest that by reducing the strength of the formal hierarchy in groups that work on complex tasks, organizations may unintentionally replace one type of hierarchical differentiation (i.e., formal) with another type (i.e., informal). In doing so, they may retain important constraints on individual group members' participation—this time, originating not from the formal leader, but from other group members informally in charge (Barker, 1993; Langfred, 2007). Consequently, organizations motivated to increase egalitarianism and participation among peers within complex task groups may need to maintain adequate forms of formal leadership, possibly combining sufficiently

directive formal leadership behavior with initiatives that encourage individual members to voice their ideas, views, and opinions (Srivastava, Bartol, & Locke, 2006).

## 7.3 | Limitations and directions for future research

By combining three independent studies, this investigation was able to test its hypotheses across three markedly different research designs and samples, increasing confidence in our findings' internal and external validity. At the same time, a number of limitations should be considered when interpreting these results.

First, we acknowledge that our studies did not directly measure the proposed uncertainty-reducing mechanisms that may explain the relationship between formal leadership and informal hierarchical differentiation. Importantly, however, research has emphasized that people are often not consciously aware of their preference for structure, certainty, and predictability (Neuberg & Newsom, 1993). Tiedens and colleagues have shown, accordingly, that hierarchical differentiation often reflects an unconscious mechanism that individuals use to structure their situation and smoothen interactions (Tiedens & Fragale, 2003; Tiedens et al., 2007). In the present research, the moderating role of task complexity demonstrates that groups are most likely to create strong informal hierarchies in situations characterized by a severe lack of structure and predictability (i.e., resulting from a combination of weak formal leadership and complex group tasks). As such, the overall design of our studies represents a moderation-of-process approach that can underscore the plausibility of unmeasured mediating mechanisms (Spencer, Zanna, & Fong, 2005), thus indirectly supporting our theoretical rationale.

Nevertheless, future research might further increase confidence in our conceptual considerations by examining the role of other uncertainty-related variables. One possible candidate is group members' individual need for structure and certainty (Thompson, Naccarato, Parker, & Moskowitz, 2001). Individuals characterized by this trait are more readily threatened by ambiguous and unclear situations (e.g., the absence of strong formal leadership) compared with individuals low in need for structure (Thompson et al., 2001). To further bolster our conceptual reasoning, future work might therefore investigate whether the negative link between formal and informal hierarchies holds more strongly for groups composed of individuals higher (rather than lower) in need for structure and related characteristics.

Second, our operationalization of formal leadership differed across the studies. Whereas Study 1 manipulated the presence versus absence of a formal leader, Studies 2 and 3 employed a survey measure of directive leadership behavior. As a result, one may wonder to what extent the formally appointed leaders in Study 1 exhibited directive leadership styles. Although our personal observations during the experiment confirmed that the individuals assigned to a formal leadership role did act in a directive way, future experimental research might explicitly measure (or manipulate) participants' directive leadership behavior.

Third, we note that all of our studies manipulated or measured legitimate formal leadership. In Study 1, we legitimized formal leadership with a leadership questionnaire; in Study 2, group members chose their own formal leader; and in Study 3, formal leaders were endowed with official organizational authority. It would thus be an interesting

future research direction to examine formal leaders' legitimacy as a possible boundary condition, because directive formal leaders may only (or primarily) reduce informal hierarchy strength when subordinates accept their authority (Yukl, 2013). The legitimacy of formal leaders may be low, for example, when they are seen as incompetent, reducing their ability to exert authority over group members (Magee & Galinsky, 2008). Informal hierarchy may therefore emerge more strongly in groups with leaders who are seen as illegitimate, even when these leaders adopt a directive style.

Finally, future research might examine to what extent our findings can be extrapolated to the individual level. Previous research has investigated the personality correlates of individuals' informal leader emergence (Judge, Bono, Ilies, & Gerhardt, 2002), demonstrating, for example, that highly dominant individuals are more likely to take on leadership positions compared with less dominant individuals. One explanation for this finding is that dominant individuals are generally perceived as highly competent and are therefore granted influence by other group members (Anderson & Kilduff, 2009). Yet based on our findings, an interesting alternative explanation is that dominant individuals are granted influence because they are the ones most likely to fulfill group members' need for structure and certainty. Such effects are especially likely to occur in ill-defined, ambiguous, and uncertain task situations characterized by a lack of strong formal leadership and high task complexity. Future research might investigate these dynamics of influence attainment at the individual level, while incorporating group-level contextual factors that determine the structure and predictability of the group situation.

## 8 | CONCLUSION

Taken together, the findings from our studies broaden our understanding of the link between formal leadership and informal hierarchy, illustrating that informal hierarchical differences are most pronounced within groups when formal leadership is absent or nondirective and when, at the same time, groups face highly complex tasks. These findings demonstrate that formal and informal hierarchies are closely linked, but only in situations of high task complexity that require the structuring function of one or the other.

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