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Effects of relative team size on teams with innovative tasks: An understaffing theory perspective

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Abstract

A large body of research accumulated on the consequences that absolute team size (i.e., team headcount) entails for the performance of teams working on innovative tasks. However, there is a dearth of research on team size in relation to a team's assignments and objectives (i.e., relative team size). How this relative team size might influence innovation teams is therefore poorly understood. To stimulate theorizing on relative team size, we derive propositions from understaffing theory on how varying levels of relative team size affect teams with innovative tasks. We provide a more fine-grained analysis by differentiating between different dimensions of these teams' performance (i.e., team creativity, output quality, and team efficiency) and develop an input-mediator-output model. Implications of our theoretical considerations and avenues for future research are discussed.

Keywords

Creativity, innovation teams, relative team size, understaffing theory

In today's business world, the lion's share of innovative work is executed by teams (Edmondson & Nembhard, 2009; Wuchty, Jones, & Uzzi, 2007). When it comes to staffing these teams, assigning an adequate number of team members surely is one of the basic tasks and a key objective of those having to recruit and set up the team (Hoegl, 2005; Staats, Milkman, & Fox, 2012). However, what actually constitutes an adequate number of members for teams with innovative tasks? On the one hand, considerable theoretical and empirical research has been conducted on the effects of absolute team size (i.e., team headcount) on

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teams with innovative tasks (for meta-analytic reviews, see Hülsheger, Anderson, & Salgado, 2009; Sivasubramaniam, Liebowitz, & Lackman, 2012), which surfaced important benefits (e.g., breadth and depths of expertise) and liabilities (e.g., coordination needs) connected with increasing absolute team sizes. On the other hand, the same absolute number of team members that is adequate for one innovation team may well be inadequate for another one (Campion, Medsker, & Higgs, 1993; Moreland, Levine, & Wingert, 1996; Vecchio & Sussmann, 1981). For example, a team working on a very broadly set up assignment surely needs more headcount than a team working on an assignment narrower in scope and size. This aspect, judging team size in relation to the team assignment and its requirements, is reflected in the construct of relative team size, independent of a team's absolute number of members (Campion et al., 1993; Ganster & Dwyer, 1995).

However, in contrast to absolute team size, research on possible effects of relative team size on the performance of teams with innovative tasks is absent, despite early empirical evidence associating relative team size with general effectiveness of work teams (e.g., Campion et al., 1993; Ganster & Dwyer, 1995). This is surprising, since prior research emphasized the importance of relative team size in the explanation of team processes and performance (e.g., Hackman, 1987; Kozlowski & Bell, 2003; Moreland et al., 1996; Steiner, 1972; Wicker, 1979b). This relevance of relative team size is also indicated by Campion et al. (1993; Campion, Papper, & Medsker, 1996), including it as one of three consistent core aspects of team composition in their highly influential framework of team effectiveness. Moreover, Hackman (1987, p. 327) essentially points to relative team size in his recommendation that the size of a well-composed team should be "just large enough to do the work." In particular, research on behavior settings in ecological psychology identified relative team size (describing this phenomenon as staffing or manning levels) to be an important structural determinant of team member behavior (Barker, 1968; Schoggen, 1989; Wicker, 1979b). Moreover, as we will further elaborate in this article, the team properties captured by relative team size and the mechanisms they trigger are different from the ones captured by absolute team size (albeit there are also overlapping ones), which is why the aspect of relative team size is expected to nicely complement the aspect of absolute team size. As Moreland et al. (1996, p. 14) suggested, "the size of a group may be less important than its staffing level," with the latter representing relative team size.

In order to stimulate theoretical and empirical research on relative team size and its consequences for teams with innovative tasks, in this article we develop an I-M-O framework of mechanisms caused by varying levels of relative team size that we propose influence team performance on innovative tasks. Throughout this paper, relative team size is specified as the number of team members in relation to the team's tasks, which essentially captures how adequate the number of a team's members is, given its task assignments (Campion et al., 1993; Ganster & Dwyer, 1995). Moreover, we define team performance as the degree to which predefined objectives are met (Gladstein, 1984; Hackman, 1987). While the basic mechanisms triggered by varying levels of relative team size are expected to be universal, we assume these mechanisms' consequences for team performance to depend upon the task type (e.g., innovative vs. routine tasks) and the specific dimension focused on, to evaluate performance (e.g., Ganster & Dwyer, 1995; Sebok, 2000). In this regard, we expect substantial differences on the performance-related consequences of relative team size for teams with innovative tasks (as compared to routine tasks) due to the peculiarity of these tasks. Specifically, compared to routine tasks, the innovative tasks teams use to work on in organizations are characterized by being loosely defined, by an enhanced level of

uncertainty and multidisciplinary interaction, and by the elevated importance of creativity (Paletz & Schunn, 2010; Reiter-Palmon & Illies, 2004; van de Ven, 1986). Moreover, a large share of empirical research on the performance consequences of relative team size was done on team tasks that, building on the typology by Steiner (1972), can be classified as unitary tasks (Perkins, 1982), while innovative tasks normally represent divisible tasks in Steiner's typology. Thus, it is currently unclear whether the performance implications of extant research on relative team size hold for the innovation context. Therefore, we build on assumptions and findings from research on behavior settings in ecological psychology, in particular understaffing theory (Barker, 1968; Heft, 2001; Schoggen, 1989; Wicker, 1979b), to develop a conceptual model to systematize expected positive and negative influences of relative team size on the performance of teams with innovative tasks.

The performance of teams with innovative tasks represents a multidimensional phenomenon (Chiesa, Frattini, Lazzarotti, & Manzini, 2009; Hoegl & Gemuenden, 2001; LePine, Piccolo, Jackson, Mathieu, & Saul, 2008). The three performance dimensions dominant in research on innovation teams are a team's creativity, output quality, and efficiency, (Chiesa et al., 2009; Hülsheger et al., 2009; Sivasubramaniam et al., 2012), which reflect three clearly distinct (albeit not completely independent) aspects of team performance. In the context of teams with innovative tasks, we define output quality as the degree to which a team meets expectations regarding predefined properties of the product, service, or process to be developed, such as functionality, robustness, or reliability (Hoegl & Gemuenden, 2001). Further, we refer to team efficiency as the ratio between intended resource input and actual resource inputs (e.g., time and cost) invested to realize a specific outcome (Beal, Cohen, Burke, & McLendon, 2003). Output quality and efficiency are core dimensions to evaluate team performance in any task domain (Cohen & Bailey, 1997; Hoegl & Gemuenden, 2001; Mathieu & Gilson, 2012). For teams working on innovative tasks, in addition, team creativity is essential in order to come up with novel processes or products (Hülsheger et al., 2009; Somech & Drach-Zahavy, 2013), with creativity being defined as the ability to come up with ideas that are novel and appropriate for the purpose at hand (Sternberg & Lubart, 1999). Therefore, differential effects of relative team size have to be considered, depending on the performance dimension focused on. In developing our conceptual model we take a more fine-grained look at the consequences expected to arise from varying levels of relative team size that takes into account the three aforementioned performance dimensions. In so doing, our article sets out to make two main contributions.

First, to our knowledge, there has been no systematic investigation of relative team size or related constructs in teams dealing with innovative tasks in the literature at all. Given that most innovative endeavors are carried out in teams (Edmondson & Nembhard, 2009; Wuchty et al., 2007), the question of what effects relative team size exerts on team processes and outcomes in these teams assigned with innovative tasks possesses great relevance for innovation in organizations. This is particularly the case since a small relative team size may seem desirable in times of tight budgets and increasing efforts towards research and development (R&D) efficiency (Browning & Sanders, 2012), where project team staffing is often seen as a hot spot for cost reduction (Kessler, 2000). Therefore this paper will shed first light on the relationship between relative team size and performance in teams with innovative tasks. We develop an input-mediator-output (I-M-O) model and derive testable propositions of relative team size's consequences for the core performance dimensions—team creativity, output quality, and team efficiency—and the mechanisms that transmit these effects of relative team size. This seems not only overdue

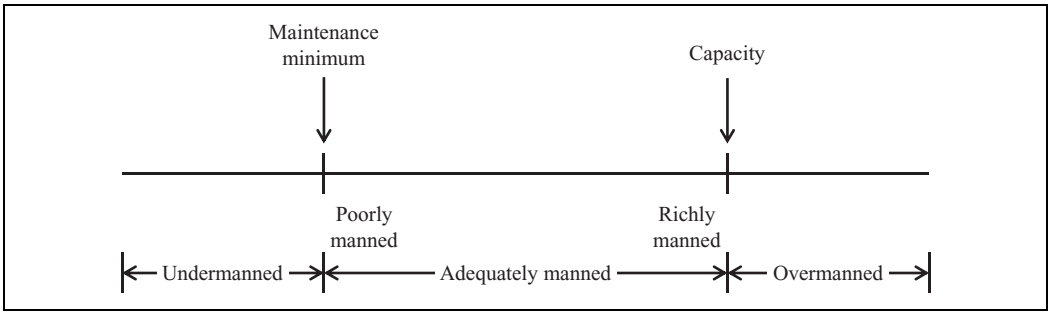

Figure 1. Continuum of manning levels by Wicker (1973, p. 191).

given the lack of attention devoted to such a basic aspect as team staffing levels and their consequences for innovation teams; it also appears theoretically valuable to focus on the innovation context for examining mechanisms proposed by understaffing theory to extend the scope of these theories, as previous research hints to task contingencies of these mechanisms' outcomes (e.g., Ganster & Dwyer, 1995; Sebok, 2000).

Second, this paper contributes by tapping the literature on behavior settings from ecological psychology (Schoggen, 1989; Scott, 2005; Wicker, 1987) for the study of team innovation. This provides a theoretical foundation for deriving new propositions on how a team's environment might influence team members' creative behavior and innovation performance. Specifically, including the aspect of relative team size in the examination of teams with innovative tasks, and thus differentiating between absolute and relative team size, allows a more fine-grained look at the mechanisms acting behind the team size effects observed in the literature (Hülsheger et al., 2009; Sivasubramaniam et al., 2012), which might be obscured when taking into account absolute team size only. As such, this article answers calls to pay more attention to the phenomenon of understaffing in organizations (Hudson & Shen, 2015). We complement the work by Hudson and Shen (2015), who provided a multidimensional conceptualization of the construct of understaffing in organizations in general (i.e., without specifying task domain or outcome dimensions), and contribute by elaborating on the role of staffing levels in the specific case of innovation teams. Thus, we go beyond the theorizing by Hudson and Shen (2015) and specify how understaffing matters to various team performance dimensions above and beyond the well-researched effects of absolute team size with a special focus on teams working on innovative tasks.

The article is organized as follows. We (a) explain the concept of relative team size and provide a summary of research incorporating this concept in the literature, (b) outline the core tenets of understaffing theory as part of the behavior setting theory framework in ecological psychology, (c) derive propositions as to how mechanisms triggered by varying levels of relative team sizes influence innovation teams' performance concerning different performance dimensions, and (d) discuss the implications of these expected relationships and set an agenda for future (empirical) research on relative team size in the innovation context.

Relative team size

In conceptualizing relative team size, we refer to Wicker (1973), who conceptualized this construct as a continuum (see Figure 1). This continuum ranges from "undermanned" (or understaffed) teams, that is, a team size below the minimum of team members needed to maintain the pursuit of the team task, to

"overmanned" (or overstaffed) teams, that is, the condition when team size exceeds the capacity maximum of a team (Wicker, 1973, p. 191). This conceptualization of manning levels is congruent with the similar concept of inhabiting levels in ecological psychology (Wicker, 1979b), which can be defined as "the number of people in a setting for each of its 'people positions'" (Scott, 2005, p. 299). In this paper, we focus on that part of the continuum that actually allows the team to carry out its tasks. Therefore, the relative team size we refer to as small, to represent the lower bound of relative team size, parallels the "poorly manned" condition in Wicker's concept (Wicker, 1973, p. 191). This corresponds to a relative team size being equal to or slightly above the maintenance minimum. Further, we will refer to Wicker's "richly manned" condition as large relative size, which is equal or slightly below the team's capacity maximum, constituting the upper bound of relative team size in our considerations.

Relative versus absolute team size

Further, as mentioned before, it is important to distinguish between the absolute number of team members and relative team size, because the latter takes into account the tasks and goals to be accomplished by a team (Hudson & Shen, 2015). Even large teams can be understaffed and thus be of small relative size, just as small teams can be overstaffed and thus be of large relative size (Moreland et al., 1996). It is important to note that absolute team headcount numbers certainly represent a meaningful explanatory variable of team processes in innovation (Hülsheger et al., 2009; Sivasubramaniam et al., 2012), for example, by impeding innovation through increasing problems in team internal communication and coordination (Hoegl, 2005; Mueller, 2012; Staats et al., 2012), or by facilitating innovation through providing a larger reservoir of knowledge with growing absolute team sizes (Guimera, Uzzi, Spiro, & Amaral, 2005; Stewart, 2006). Nonetheless, the absolute headcount of a team does, by itself, say nothing about how adequate the number of team members actually is for the number and type of tasks the team is assigned with (Steiner, 1966, 1972), which, in turn, relative team size does. We argue that precisely this aspect is related to team member behavior and performance, above and beyond any effects that absolute team size exerts.

Understaffing theory

Theoretical background

The theoretical foundation of our paper comes from ecological psychology (Barker, 1968; Schoggen, 1989; Wicker, 1979b), a field that focuses on the explanation of individuals' interactions with their sociophysical surroundings (Stokols, 1995). In this field, Barker (1960, 1968) started to focus on the behavioral consequences of specific attributes of the context in which people are acting, that is, the behavioral setting. Formally defined, behavior settings represent "systemically organized environmental units occurring at a specific time and place and consisting of both physical components and a behavioral program" (Stokols, 1995, p. 824). Such behavior settings include, but are not restricted to, teams and also include higher level entities such as organizations and communities. In behavior setting theory, Barker proposes that these behavior settings have a strong influence on human behavior, which indeed consistently materialized in following empirical studies (Scott, 2005).

One of the core attributes proposed by the behavior setting theory to influence people's behavior is the *staffing level* (formerly termed as *manning level*) of the behavioral setting (Wicker, 1979a), essentially describing in a more general way what we understand as relative team size when referring to teams. Recognizing the key role of this aspect led Barker to develop a theory focusing on the consequences of varying manning levels for human behavior named undermanning theory

Table 1. Behavioral and psychological consequences of understaffed settings proposed by understaffing theory.

1. Greater effort to operate and maintain the setting, in terms of "harder" work or longer hours.
2. Performance of more difficult and more important tasks.
3. Involvement in a greater diversity of tasks and roles.
4. Less sensitivity to, and evaluation of, individual differences.
5. A lower level of maximal performance.
6. Greater functional importance of individuals within the setting.
7. Greater responsibility in the sense that the setting and the satisfaction it provides depend more on each occupant.
8. Thinking of oneself and others more in terms of task-related functions and less in terms of personality characteristics.
9. Lower standards and fewer tests of admission into the setting.
10. Greater insecurity about one's own performance and about the continued maintenance of the setting.
11. Viewing oneself as more versatile/able to carry out satisfactorily a greater diversity of tasks.
12. More frequent occurrences of success and failure, depending on the outcome of the setting's functions and the individual's evaluation of the setting's importance.

Note. Adapted from Perkins (1982, pp. 618–619).

(Barker, 1960, 1968), which is now commonly referred to as understaffing theory (Ganster & Dwyer, 1995; Hudson & Shen, 2015). It is particularly this understaffing theory, which represents a subtheory embedded in the framework of behavioral setting theory, that is relevant for theorizing about consequences of varying relative team sizes (Hudson & Shen, 2015). The core tenet of understaffing theory is that staffing levels influence the behavior of people within the behavior setting in specific ways, which resulted in the proposition of basic mechanisms caused by decreasing staffing levels or understaffing (Bechtel, 1974).

First, in order to maintain the setting, fewer inhabitants of the setting must do the same work as it is usually done by a larger number of persons. Thus, an understaffed setting is expected to exert a stronger claim on the people inhabiting this setting (Barker, 1960, 1968). Second, since in each setting specific tasks are required to be carried out, the pressure to perform, the obligations, and the psychological forces tend to increase for each person in an understaffed setting (Barker, 1960, 1968). Third, because the pressure to perform is stronger and results in a wider range of tasks for each person in the setting, more importance is attributed to each individual within the setting, since his or her contribution is more relevant for maintaining the setting (Barker, 1968; Wicker, 1979a). The 12 specific consequences posited by understaffing theory to follow from these basic mechanisms are outlined in Table 1. It is important to note that understaffing theory does not specify (secondary) long-term effects that might arise from the continued occupation in an understaffed setting. As we will elaborate later in the paper, the elevated level of workload, pressure, and responsibility predicted by understaffing theory might in the long run promote stress, burnout, and health problems (Ganster & Rosen, 2013). Contrary to short-term predictions by understaffing theory, the continuous perception of elevated claim in understaffed settings might thus compromise individual motivation and performance.

The propositions by understaffing theory have been confirmed in a large number of field and experimental studies (for summaries, see e.g., Schoggen, 1989; Wicker, 1979b), pointing to the robustness of these mechanisms and providing "an impressive array of evidence that the behavior of persons in small, underpopulated settings differs from the behavior of inhabitants of adequately and overpopulated

settings in ways consistent with expectations derived from behavior setting theory" (Schoggen, 1989, p. 245). For example, consistent with the predictions of understaffing theory, members of understaffed teams tended to perceive their roles as being more important (Vecchio & Sussmann, 1981; Wicker, Kirmeyer, Hanson, & Alexander, 1976), to perform more difficult, diverse, and important tasks (Greenberg, Wang, & Dossett, 1982; Perkins, 1982), and to be less likely to reject deviates (Arnold & Greenberg, 1980).

Focusing on the specific case of teams, smaller relative team sizes (paralleling the more general concept of staffing levels) should therefore substantially influence the behavior of team members through these basic mechanisms in the same directions. For example, if a team is of small relative size, it is expected that its members will be increasingly motivated and show greater effort in performing the team task in order to accomplish team goals, despite the disadvantageous staffing conditions (Perkins, 1982; Wicker, 1973). This assumption reflects a frequently observed phenomenon in team sports that players of a short-handed team tend to increase their efforts (Mechtel, Bäker, Brändle, & Vetter, 2011). In this regard, a study on the consequences of player dismissal in professional soccer found that the individual work-rate of players in the short-handed team increased significantly after the dismissal (Carling & Bloomfield, 2010). This suggests that a smaller relative team size indeed results in an increased motivation among the remaining team members. Although this seems plausible, it is nonetheless surprising that professional soccer players on the highest national levels do not always utilize their full physical potential, thereby suggesting a parallel to teams in organizational contexts. Here, it is also likely that employees tend not to engage to the fullest extent in their work on team tasks, either deliberately or unconsciously, and that an understaffed team might trigger additional effort among team members in order to maintain the setting and to achieve the task despite the less adequate staffing level. For example, members of an innovation project team are likely to try to offset the absence of an ill team member by increased individual effort and would display a level of effort (materializing, e.g., through extra hours) that lies well above the level in a more adequately staffed setting. Regarding the reverse case of large relative team sizes, Linberg (1999) reported a case of a failed software development project where relative team size was very large and quoted a software engineer: "There were six people working on what I thought I could do. It was a mess. I left and within six months that project was also canceled. Management systematically killed the project by overstaffing!" (Linberg, 1999, p. 183). Here, apparently, motivation sharply decreased as a consequence of the large relative team size.

It is important to note that these mechanisms triggered by varying levels of relative team size are qualitatively different from those mechanisms triggered by absolute team size. To this end, we keep the sports team analogy to illustrate the distinction between effects of absolute and relative team size, and thus the incremental explanatory power the analysis of relative team size is able to provide. Specifically, we can expect a short-handed soccer team of 10 players (a soccer team usually consists of 11 players) to be increasingly motivated due to its small relative size. In contrast, a basketball team (which usually comprises five players) consisting of six players, which is of smaller absolute size than the short-handed soccer team, is expected to be decreasingly motivated, due to the elevated number of team members relative to its regular people positions in the team and thus its larger relative size. The same applies for teams working on innovative tasks, where the same absolute number of team members might represent a team of small relative size if the task is to develop a new satellite, while it might constitute a large relative size for a team working on the improvement of a simple device like a screwdriver.

Understaffing theory and relative team size in organizational research

As mentioned before, research on relative team size has received considerably less attention in organizational research than research on absolute team size, being completely absent in the domain of innovation. To illustrate this discrepancy, looking through the body of the empirical research on creativity and innovation at the team level, we found more than 150 studies that incorporated absolute team size (either as a focal or as a control variable), while we found none to include relative team size. This resonates with the observation by Hudson and Shen (2015) that there is only little conceptual and empirical work on this topic in organizational science. In their conceptual piece, they provided a discussion of how understaffing in organizations can be specified and differentiated from related concepts. A main reason underlying this observation may well be that relative team size is much more difficult to measure than absolute team size. In contrast, organizational research outside the domain of innovation now and then examined the influence of relative team size on team behavior and outcomes.

In this regard, Ganster and Dwyer (1995) focused on the consequences of relative team size in organizational teams to test assumptions of understaffing theory in a field setting. Their results indicated that smaller relative team sizes came along with higher levels of task perceptions (i.e., autonomy, feedback, task significance, task identity, and skill variety). These higher levels of task perceptions, in turn, had a positive relationship with skill utilization and organizational commitment for both blue-collar and white-collar workers. Regarding individual performance, however, higher levels of task perceptions were associated with higher performance only for the white-collar sample while there was no significant relationship with the blue-collar sample. In contrast, at the team level, larger relative team sizes were positively associated with performance for teams of blue-collar as well as white-collar workers. Consistent with these findings, Sebok (2000) found in an experiment with nuclear plant crews that members of crews of smaller relative size exerted more effort than members of crews with a larger relative team size and that relative team size was positively related to crew performance. Beyond that, however, Sebok (2000) also found that the effect of relative team size on performance was contingent upon the interface design the crews had to use (conventional vs. advanced), in that crews of larger relative size only performed consistently better than crews of smaller relative size in the conventional setting. In the advanced setting, crews of small and large relative size performed equally well. Finally, studying 19 key work team attributes' consequences for effectiveness, Campion et al. (1993) found in a sample of clerical work teams that relative team size was positively correlated to all applied criteria of team effectiveness. In a replication study on 17 of the 19 key work team attributes with a sample of knowledge work teams, Campion et al. (1996) found a smaller number of significant correlations between relative team size and team effectiveness (only four out of 12 examined relationships), with all except one (performance appraisals in the employee sample) being negative.

As all these studies found differential effects of relative team size depending on the task type (blue- vs. white-collar workers; conventional vs. advanced design of plant interfaces; clerical vs. knowledge work), the results point to differences in the performance consequences of relative team size, depending on the type of tasks the teams are assigned with. To put it in other words, while the basic mechanisms varying levels of relative team size entail appear to be universal, the inconsistent findings of studies conducted in real organizational settings on the relative team size–performance relationship suggest that these mechanisms' consequences for team performance might depend upon the

task type. In this regard, the peculiar attributes of innovative tasks might result in systematic differences in the consequences of varying levels of relative teams size between routine and innovative tasks. In order to specify the effects of relative team size on different variables of innovation team performance (i.e., keeping task type conceptually constant), we will provide a set of propositions derived from understaffing theory in the next section.

Relative team size and innovation team performance

As outlined before, the literature on understaffing theory proposed a number of mechanisms caused by varying relative team sizes that are likely to affect an innovation team's performance. In this sense, these mechanisms can be seen as mediators of the effects of relative team size on innovation team performance. In outlining the consequences of team size on innovation team performance, we deliberately chose to include a broad range of mechanisms triggered by varying relative team sizes, as suggested by understaffing theory, argued as mediators of the relative team size–innovation team performance relationship. We therefore include attitudinal, cognitive, and behavioral processes and emergent states in our I-M-O model (Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Marks, Mathieu, & Zaccaro, 2001) to illustrate the broad range of consequences varying relative team sizes might bear for teams working on innovative tasks and the broad potential for application of understaffing theory in research on team-level innovation.

That being said, the performance of teams with innovative tasks is not monolithic, but rather represents a multidimensional phenomenon that can be conceptualized from a wide range of perspectives (Chiesa et al., 2009; Hoegl & Gemuenden, 2001; LePine et al., 2008), consisting of dimensions that are not necessarily related to each other or that might even contradict each other (Blank & Naveh, 2014; Sethi & Sethi, 2009). Thus, to provide a more fine-grained analysis, we put the consequences of varying relative team sizes understaffing theory suggests into the context of three specific and commonly used indicators of immediate innovation team performance (e.g., Hülsheger et al., 2009; Sivasubramaniam et al., 2012): team creativity, output quality, and team efficiency. Thus, the specific performance dimension consequentially represents the main (categorical) moderator variable in our model, with the effects of relative team size on team performance being contingent upon the performance dimension in focus. A summary of the mechanisms triggered by varying levels of relative team size and their proposed effects on the three focused dimensions of innovation team performance is depicted in Figure 2. It should be noted, however, that the relationships and pathways between relative team size and innovation team performance described in the conceptual model are not (and cannot be) exhaustive and there might be further meaningful links between the variables in this model or connections to further variables not included in this model.

Motivation

Given the assumptions of understaffing theory, we can expect that the increased claim a setting of a team of small relative size is supposed to exert on team members is highly likely to increase motivation of team members and their willingness to take greater efforts to achieve the team goals despite the less than adequate staffing condition (Perkins, 1982; Wicker, 1973). Moreover, as per job characteristics theory (Greenberg et al., 1982; Hackman & Oldham, 1976), this increase of motivation in teams of small relative size should be further reinforced by the consequences such a small relative team size entails for the nature of the tasks team members have to carry out. In this regard, the study by Ganster and Dwyer (1995)

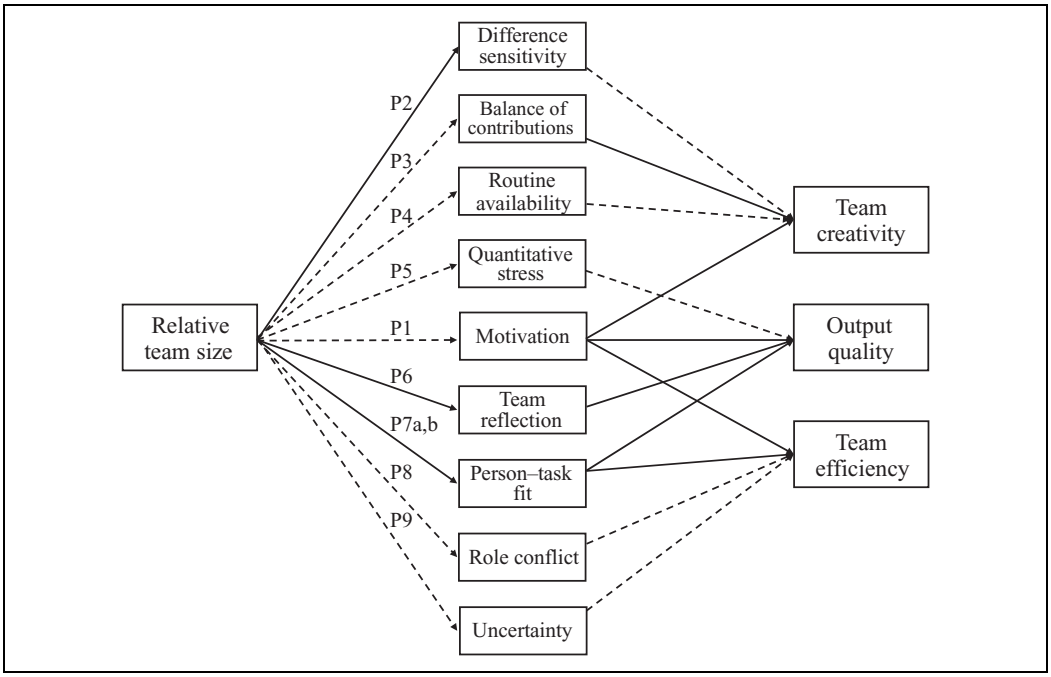

Figure 2. Summary of propositions.
Note. Continuous lines represent positive relationships; dashed lines represent negative relationships between variables.

showed in an organizational setting that lower levels of relative team size were associated with higher levels perceived autonomy, feedback, task significance, task identity, and skill variety. This is expected to stimulate team members' intrinsic motivation, empowerment, and job satisfaction (Hackman & Oldham, 1976; Maynard, Mathieu, Gilson, O'Boyle, & Cigularov, 2013). This assumption parallels the core tenet of theory on social loafing, which makes similar predictions regarding the relationship between team size and team members' motivation (Karau & Williams, 1993), albeit not specified to either absolute or relative team size. Thus, we can expect that the smaller the relative size of a team is, the more motivated its members are. Since motivation can be seen as a universal facilitator of all three examined performance dimensions, we propose:

Proposition 1: Decreasing relative team size leads to increasing motivation in the team, which in turn leads to higher team creativity, output quality, and team efficiency.

Relative team size and team creativity

Sensitivity to differences

Understaffing theory suggests that with teams getting smaller in relative size, their team members tend to be less sensitive to individual differences and think of themselves and other team members more in terms of task-related functions and less in terms of personality characteristics (Wicker, 1973). This mechanism bears several beneficial consequences for team creativity. Differences in perspectives and

knowledge held by team members are basically predicted to stimulate team creativity by offering a larger pool of cognitive resources applicable for the work on team tasks and idea generation (Jackson, Joshi, & Erhardt, 2003; Kearney & Gebert, 2009). A major hindrance of leveraging the performance-supporting potential of these diverse perspectives and knowledge among team members, however, is supposed to be that diversity is also likely to induce internal friction and personal conflict among team members (Cronin & Weingart, 2007). That is, diversity aspects offering social categorization cues such as aspects of demographic diversity (e.g., gender, age, ethnicity) are likely to spark friction and conflict within teams (Kearney, Gebert, & Voelpel, 2009; van Knippenberg, De Dreu, & Homan, 2004). Moreover, such social categorization processes are assumed to result in reduced social contacts and social integration within teams (Blau, 1977; O'Reilly, Caldwell, & Barnett, 1989), which is also expected to hamper the integration of diverse knowledge and perspectives within teams and thus team performance. Given that with decreasing relative team size team members are assumed to become less sensitive to such interpersonal differences (Bechtel, 1974; Wicker, 1973), the described interfering effect of diversity should be reduced as well, because the reduced sensitivity is likely to reduce or even to prevent the triggering of social categorization processes. To put it in other words: assuming other things being equal, the potential downsides of team diversity should be less critical in teams of small relative size than in teams of larger relative size, while the advantages of team diversity are expected to remain constant. In sum, this results in teams of smaller relative size being better able to leverage their members' diverse potentials.

Moreover, this desensitizing mechanism induced by smaller relative team size is also likely to reduce problems associated with team faultlines, that is, "hypothetical dividing lines that may split a group into subgroups based on one or more attributes" (Lau & Murnighan, 1998, p. 328). Such team faultlines may divide teams into subgroups based on certain personal characteristics of team members such as demographic attributes (Lau & Murnighan, 1998, 2005). This is likely to impede teamwork by introducing out-group biases and intrateam conflict that causes coordination and communication dysfunctionalities (Pearsall, Ellis, & Evans, 2008), and thus the integration of team member knowledge to accomplish innovative tasks (Pearsall et al., 2008). However, for these subgroups to form and the potential negative effects to materialize, the faultlines first have to be activated. This means that the perceived individual differences in the dividing personal characteristics of team members actually have to become consequential for teamwork through triggering the aforementioned social categorization processes (Jehn & Bezrukova, 2010; Lau & Murnighan, 1998, 2005). Assuming that smaller relative team sizes are negatively related to the sensitivity to interpersonal differences, it is also expected that faultlines are less likely to be activated in teams of small relative size, thus preventing, or at least reducing, the potentially detrimental effects of activated team faultlines.

Beyond these general expectations regarding the effect of a reduced sensitivity to differences on team creativity, however, the degree and kind of diversity can be assumed to determine the extent to which relative team size affects team performance, even though the direction of the relationship is expected to remain constant. More specifically, the facilitating effect of smaller relative team sizes should be stronger the more diverse a team is. This is because when there is a broader team repertoire in terms of knowledge and perspectives, the value of leveraging this potential to a higher degree will increase as more unique contributions can be brought into team processes in order to provide incremental gains for team creativity (Hoever, van Knippenberg, van Ginkel, & Barkema, 2012; Jackson et al., 2003; Kearney & Gebert, 2009; Steiner, 1972). In contrast, although a

more homogeneous team will also benefit from better leveraging its (comparatively more limited) potential, in this case the likelihood would be higher that there are redundancies in team members' knowledge and perspectives, with less positive effects on creativity (Baer, 2010). Moreover, the higher the degree of a team's diversity, the more likely there will develop internal frictions and personal conflicts among team members (Kearney et al., 2009; van Knippenberg et al., 2004; van Knippenberg & Schippers, 2007). Thus, it becomes clear that the potential downsides of team diversity can be expected to be more consequential the higher the degree of diversity is. Accordingly, the reduced sensitivity to team members' differences bears particularly positive potential in conditions of high diversity, even though the general relationship is assumed to be positive for all team configurations and to just differ in terms of strength.

In sum, given equal levels of diversity and subgroup configurations, teams of smaller relative size are expected to be in an advantageous position to leverage the team members' (more or less diverse) knowledge resources for the generation of creative ideas, due to the lower sensitivity to differences. Therefore, we propose:

> **Proposition 2:** Decreasing relative team size leads to decreasing team members' sensitivity to differences, which in turn leads to higher team creativity.

Balance of team member contributions

Understaffing theory predicts teams of smaller relative size to put more pressure on each team member to participate in team activities (Barker, 1968; Wicker, 1973). In particular, teams of small relative size are predicted to be more likely than teams of large relative size to actively integrate deviates in team tasks and activities (Arnold & Greenberg, 1980; Cini, Moreland, & Levine, 1993). For teams working on innovative tasks, this means more balanced contributions of all team members to the team assignment. Representing one of the six facets of teamwork quality as specified by Hoegl and Gemuenden (2001), a better balance of member contributions is expected to facilitate team creativity. With more balanced contributions of team members in teamwork on innovative tasks, all team members are able to bring in their knowledge and perspectives (Hoegl & Gemuenden, 2001). Thus, discussions and decision-making processes are not dominated by a small fraction of team members, which would prevent leveraging the team's full potential for idea generation (Nijstad & Stroebe, 2006; Paulus, 2000). Moreover, this better integration of deviates is particularly important for team creativity, since the articulation of minority positions is suggested to stimulate information search, divergent thinking, and creativity in teams (De Dreu & West, 2001; Jetten & Hornsey, 2014; Nemeth & Rogers, 1996). In this regard, De Dreu and West (2001) found that such minority dissent induced by team members holding deviant opinions and perspectives is particularly valuable when these team members are actively involved in team decision-making processes. Considering assumptions and findings from understaffing theory, the context of teams of small relative size appears to achieve exactly this, namely, increasing a team's propensity to assign the deviate an active role and increasing the propensity of deviates to actually take on this role (Arnold & Greenberg, 1980). Thus, assuming other things being equal (such as, e.g., minority constellations), we expect team creativity to benefit from more balanced member contributions and therefore propose:

> **Proposition 3:** Decreasing relative team size leads to increasing balance of team member contributions, which in turn leads to higher team creativity.

Routine availability

A small relative team size is likely to prohibit the team's application of established working

procedures and routines in working on the assigned tasks that normally are designed to match adequate team sizes. This makes it necessary to apply alternative procedures or to modify features of the product to be developed and thus use creative thinking (Rousseau & Aube, 2010; Unsworth, Wall, & Carter, 2005). This is in accordance with a robust finding in cognitive psychology that, when generating ideas, people try to reduce cognitive effort and uncertainty in the outcome and tend to follow a path of least resistance, that is, applying the first solution that comes to mind (Ward, 1994). This first idea, in turn, is usually based on prior (successful) experience or a category exemplar (Ward, 1994). Not being able to follow established procedures and routines (i.e., a path of least resistance) due to a small relative team size is assumed to force team members to search for alternative ways to accomplish the tasks at hand, thus fostering team creativity. Empirical support for these assumptions comes from literature on the effects of resource constraints on creativity and innovation, where teams and individuals were not able to follow established approaches. In line with theory, having at hand material resources that are less adequate for a team's task, innovation project teams have been shown to develop products of a higher degree of novelty (Weiss, Hoegl, & Gibbert, 2014), and financial constraints have been found to lead to the ideation of more creative products (Scopelliti, Cillo, Busacca, & Mazursky, 2014). As smaller relative team sizes should similarly result in pushing team members off a path of least resistance in idea generation, we posit:

> **Proposition 4:** Decreasing relative team size leads to decreasing routine availability in the team, which in turn leads to higher team creativity.

Relative team size and output quality

Quantitative stress. One mechanism induced by a small relative team size that is expected to influence output quality of teams with innovative tasks is the increased task and work load in teams of small relative size, which is likely to exceed a team's workload capacity (Bedwell, Salas, Funke, & Knott, 2014). While the enhanced claim induced by such increased task load is expected to result in increased motivation (Ganster & Dwyer, 1995), it is also likely to result in higher effort to be taken by team members (Ganster & Dwyer, 1995; Sebok, 2000). This effort, in turn, is likely to induce elevated quantitative stress among team members (van den Beukel & Molleman, 2002; Wicker et al., 1976), which is defined as "conditions that consist of accumulating demands, time pressures, and overload such as when employees are given too many tasks to complete in a given period of time" (Drach-Zahavy & Freund, 2007, p. 424). Such quantitative stress has been found to be related in a direct way with reduced team performance (Drach-Zahavy & Freund, 2007), as well as with higher rates of fatigue and burnout among team members (Cini et al., 1993), which makes team members more prone to commit latent errors that have an adverse impact on output quality (Ramanujam & Goodman, 2003). The latter point seems to be of particular importance in settings of small relative team sizes when, commonly, also less time than usual is available for mutual help and monitoring behaviors (Ng & van Dyne, 2005), and where a tendency for shortcutting and omitting quality controls is at least subliminally present. Hence, the increased workload and time pressure is expected to impair the quality of work output since there is simply less time to take care for people in an understaffed setting (Bechtel, 1974).

> **Proposition 5:** Decreasing relative team size leads to increasing quantitative stress in the team, which in turn leads to lower output quality.

Team reflection. A high task load induced by a small relative team size is very likely to leave

little opportunity for team reflective behaviors (West, 1996), that is, "the extent to which group members overtly reflect upon the group's objectives, strategies and processes, and adapt them to current or anticipated endogenous or environmental circumstances" (West, 1996, p. 559). Thus, team reflection is likely to suffer from elevated levels of individual workload that result from a smaller relative team size. This is problematic, since in extant literature such reflective behaviors are positively associated with team performance in general (Schippers, Homan, & Knippenberg, 2013), and, more specifically, with output quality (e.g., De Jong & Elfring, 2010). The mechanism assumed behind these findings concerning output quality is that team reflective behaviors stimulate team members to openly discuss anticipated or actual task issues within the team and to focus on proactively improving performance (De Jong & Elfring, 2010). Moreover team reflective behaviors are supposed to help circumventing problems in teamwork connected to the search for and sharing of information (Schippers, Edmondson, & West, 2014), facilitating team information processing and thus the integration of useful and correct information in team decision processes (Schippers et al., 2014). All these aspects associated with team reflection are likely to facilitate higher quality output of team tasks (De Jong & Elfring, 2010; Schippers et al., 2014). We subscribe to this theoretical assumption and posit:

Proposition 6: Decreasing relative team size leads to decreasing team reflexivity, which in turn leads to lower output quality.

Person–task fit. In understaffed teams, team members tend to carry out more diverse tasks in order to accomplish set goals when the team is of small relative size (van den Beukel & Molleman, 2002). While, as mentioned before, exerting a positive influence on perceptions of job enrichment, these tasks, however, are also likely to include those in which team members are not proficient. Then, team members simply lack the expertise, skills, and practice that are usually required to produce high-quality outputs (Bruns, 2013; Gebert, Boerner, & Kearney, 2006). These aspects are particularly relevant for teams working on innovative tasks, as here the default work mode is in cross-functional teams (Gemser & Leenders, 2011; Keller, 2006). Therefore, usually a high level of specialization is present in these teams (Bruns, 2013; Gebert et al., 2006), which makes substitution by other team members more difficult than in teams working on routine tasks, and person–task fit particularly important. We propose accordingly:

Proposition 7a: Decreasing relative team size leads to decreasing person–task fit in the team, which in turn leads to lower output quality.

Relative team size and team efficiency

Person–task fit. Not only output quality is expected to be affected by a low person–task fit. Efficiency is also likely to go down when team members have to carry out tasks they are less proficient in. First, this is because considerable effort is necessary to become familiar with the additional tasks team members face in teams of small relative size. Efficiency is then expected to suffer from this time and effort that is not disposable for the actual team tasks (van den Beukel & Molleman, 2002). Second, as with output quality, a team member who is lacking the expertise, skills, and practice of a specific task, will also need more time to complete this task, compared to a team member that shows a better person–task fit. As mentioned in the previous lines with regard to output quality, also the negative consequences a lack of person–task fit is likely to entail for team efficiency should be particularly relevant in teams with innovative tasks, given the cross-functionality and the high specialization levels that are prevalent in the innovation context

(Bruns, 2013; Gebert et al., 2006; Gemser & Leenders, 2011). Therefore, we propose:

> **Proposition 7b:** Decreasing relative team size leads to decreasing person–task fit in the team, which in turn leads to lower team efficiency.

Role conflict. Being responsible for a broader range of tasks, as tends to happen in teams of small relative size, is likely to induce role conflict among team members (Griffin, Neal, & Parker, 2007), that is, "when two or more sets of role pressures exist in an individual's workspace, and the compliance with any one of these pressures impedes the accomplishment of another" (Perrewé et al., 2004, p. 142). In this regard, role conflict has been shown to directly hamper innovation team efficiency (Rodríguez-Escudero, Carbonell, & Munuera-Aleman, 2010), as well as negatively affecting team communication (Li, Xin, & Pillutla, 2002). The latter, in turn, was frequently reported to be positively associated with the efficiency of team processes (e.g., Hoegl & Gemuenden, 2001), thus suggesting a direct as well as an indirect negative effect of role conflict on team efficiency. Beyond that, balancing conflicting roles is likely to demand individual resources of team members, which are again unavailable for working on the team tasks (Ralston et al., 2010), thereby further hampering efficiency. As a consequence, we propose:

> **Proposition 8:** Decreasing relative team size leads to increasing role conflict in the team, which in turn leads to lower team efficiency.

Uncertainty. An important consequence of small relative team sizes in teams working on innovative tasks is the increased insecurity and uncertainty induced by smaller relative team sizes (Barker, 1968; Wicker, 1973), beyond the already high degree of uncertainty inhering innovative tasks. Such increased uncertainty, that is, the unpredictability of team processes, inputs, and outcomes (Griffin et al., 2007), in teams of small relative size roots in the greater insecurity about the attainability of the set goals and about the continued maintenance of the setting (Perkins, 1982). Moreover, having to work on more unfamiliar tasks induces an enhanced uncertainty about one's own performance (Bechtel, 1974; Schoggen, 1989). Uncertainty is particularly likely to impair efficiency, mainly in two ways. First, elevated levels of uncertainty compromise planning processes in teams (Bstieler, 2005). Proper planning of team activities, however, is vital for innovation team efficiency (Stockstrom & Herstatt, 2008). Second, because task uncertainty reflects "the fact that it is difficult to predict whether and when a complex or simple task response will be required for a team" (Cordery, Morrison, Wright, & Wall, 2010, p. 242), increased uncertainty is likely to afford more frequent nonroutine decision-making in teams (Pearce & Ravlin, 1987). Additional instances of decision-making not only afford additional time and effort and thus hamper efficiency. Nonroutine decisions are also likely to result in less than optimal outcomes that need rework. This is especially the case in teams of small relative size, given that under these circumstances less time is available for the needed information gathering, processing, and reflection of such decisions, with negative consequences for efficiency. Moreover, these assumptions on the negative effect of uncertainty on efficiency are in line with empirical findings by Sicotte and Bourgault (2008) who found different aspects of uncertainty to be negatively related with efficiency in new product development teams. Therefore, we propose:

> **Proposition 9:** Decreasing relative team size leads to increasing uncertainty in the team, which in turn leads to lower team efficiency.

Implications for theory and practice

By shedding conceptual light on a broad range of mechanisms triggered by varying degrees of

relative team size and their consequences for teams with innovative tasks, our I-M-O model points to an influential aspect of team staffing that has gone largely unnoticed in research on team innovation so far. In this regard, it is surprising that only little research on innovation actually draws on theories and findings from ecological psychology (Barker, 1968; Scott, 2005; Wicker, 1979b) in general, and on understaffing theory (Hudson & Shen, 2015; Schoggen, 1989) in particular, as these theories focus on how the (work) environment influences human behavior and performance (Heft, 2001). By showing the explanatory potential of these theories by the example of the relationship between relative team size and team innovation, we hope to stimulate research on creativity and innovation, as well as on organizational behavior more generally, to better leverage the rich knowledge from ecological psychology. Thus, the theoretical considerations in this paper add a new perspective to the literature on innovation team staffing.

Relative and absolute team size

Drawing on the theorizing in this paper, it indeed appears worthwhile to include measures of relative team size in studies dealing with the topic of teamwork in innovation for determining the entirety of team size-related effects. This new perspective appears also instrumental for reconciling contradicting views on the relationship between team size and the performance of teams with innovative tasks. On this topic, positive and negative, as well as curvilinear relationships are proposed by scholars (Peltokorpi & Hasu, 2014). For example, positive effects of team size on team innovation are argued to result from the greater set of knowledge and perspectives potentially available in larger teams (Hülsheger et al., 2009; Stewart, 2006). Furthermore, larger teams allow for a more effective specialization and division of labor within teams that enables a better match between team members' interests, expertise, and skills and the tasks they have to carry out (Staats et al., 2012). In contrast, proponents of a negative relationship between team size and team innovation argue that team members in larger teams "expend less effort (Latane, Williams, & Harkins, 1979), engage in fewer differentiated tasks, assume less responsibility for the tasks (Wicker & Mehler, 1971)" (Mueller, 2012, p. 111), and that with larger team sizes coordination losses in teamwork tend to increasingly impair performance (Hoegl, 2005; Staats et al., 2012; Steiner, 1972). A combination of these two views is expressed in the notion of a curvilinear relationship between team size and team innovation (Curral, Forrester, Dawson, & West, 2001). It is little surprising that empirical results on this topic so far did not live up to expectations of the strong theoretical propositions of neither view. For example, in their meta-analysis, Hülsheger et al. (2009) found only small and variable relationships between team size and team innovation. Nonetheless, this discussion focused almost exclusively on absolute team size, as did the measurement in empirical studies. Thus, one way to advance the discussion on the consequences of team size on teams with innovative tasks is to disentangle the proposed mechanisms underlying this relationship by differentiating between absolute and relative team size and the corresponding mechanisms. For example, the argument that the potential for coordination losses increases in larger teams clearly relates to absolute team size (Hoegl, 2005; Steiner, 1972). However, other arguments in this discussion, such as the effort and responsibility arguments or the assumption that the possible degree and effectiveness of specialization depends on team size (Curral et al., 2001), also clearly relate to the relative size of a team. Still, all these assumed mechanisms are usually attributed (and empirically assessed) in terms of absolute team size only. Hence, refining theoretical arguments as well as empirical measurement to the specific aspect of team size targeted might mark an important step forward for advancing theory on

the effects of team size on team innovation. In particular, it appears worthwhile to theoretically and empirically cover both aspects of team size. Then, purified effects of these aspects can be obtained, controlling for the respective other aspect.

Moreover, our considerations point to a further option to reconcile the conflicting assumptions and findings on the team size–team innovation relationship. Beyond differentiating between absolute and relative team size, taking a more fine-grained view on the specific dimensions of performance of teams with innovative tasks appears to represent a promising avenue for advancing theory on this topic. Given the expected differences in the consequences of relative team size for teams with innovative tasks depending on the performance dimension focused on, it appears that measuring the performance of teams with innovative tasks by general or compound measures (i.e., measures consisting of the average of several subdimensions) of performance is likely to obscure the specific relationships, as counteracting effects on different subdimensions might cancel each other out. In this regard, the results of Hülsheger et al.'s (2009) meta-analysis suggest the existence of undetected moderators responsible for the elevated variability in the results. The specific performance dimension focused on by the individual studies included in this meta-analysis might represent just such a moderation effect and we expect the application of a more fine-grained measurement of innovation team performance to bear considerable potential for theory building on the consequences of varying (relative and absolute) team sizes. Thus, future studies might empirically test the proposition made in this paper that specific performance dimensions such as output quality, team efficiency, and team creativity are differentially affected by varying levels of relative team size. If this effect actually materializes, it would imply important practical implications for staffing innovation teams, depending on what the teams' main goals are. For example, teams assigned with tasks aiming at radical innovation tend to focus on the performance dimension of creativity, while teams assigned to tasks connected with incremental innovation are more likely to focus on the dimensions output quality and efficiency. Beyond this expected moderation effect of the specific outcome dimensions on the relationship between relative team size and innovation team performance, a valuable path for future theoretical and empirical works to take appears the identification of further moderator variables that determine the strength (or even direction) of the basic relationships outlined in this paper.

Although not the focus of our paper, we have to assume that there are overlaps between effects of absolute and relative team size (in that they trigger similar behavioral consequences), and that there exist interrelations between relative team size and absolute team size, both directly and indirectly. For example, larger absolute team sizes tend to come along with a higher potential in terms of more diverse repertoire of knowledge and perspectives in teams (Steiner, 1966, 1972), even though this not necessarily needs to be the case (consider, e.g., a highly homogeneous team with a large headcount compared to a highly diverse team with a lower headcount). Thus, if teams get smaller in absolute size, this tends also to reduce the range of knowledge and perspectives that could be contributed, thus reducing the positive potential of diversity, no matter how large the relative size of the team is. Similarly, the mechanisms triggered by varying levels of relative team size might depend in their strength on the absolute size of the team. For example, the claim exerted by understaffed conditions in teams might weaken with increasing absolute team sizes with negative consequences for team members' motivation, since such larger teams provide opportunities for hiding and free riding despite the small relative size (Staats et al., 2012; Steiner, 1972), thereby hinting at potential interaction effects.

Extant theory and empirical studies did not explicitly focus on this question of interdependencies between absolute and relative team size. Therefore, exploring the interrelations between relative and absolute team size appears to constitute a highly worthwhile avenue to take in future research on the behavioral and performance consequences of team size in general, and in order to better take into account the influence of absolute team size when examining effects of relative team size in particular.

Intertemporal effects

The proposed effects of relative team size on different dimensions of innovation team performance may also be seen in context of the different stages of the innovation process (Cooper & Kleinschmidt, 1986), suggesting that a small relative team size may be beneficial in generating more creative concepts during the initial stages of the innovation process. In contrast, during later stages of the innovation process, output quality and team efficiency may be enhanced by larger relative team sizes. Hence, one could speculate that the desired degree of relative team size depends on the specific stage in the innovation process (Goh, Goodman, & Weingart, 2013; Weiss et al., 2014), which bears particular practical relevance. At early stages of innovation projects, small relative team sizes appear likely to enable team members to develop creative ideas, but the final development of these ideas and the efficient process of turning them into a high-quality output probably require larger relative team sizes. Evidence for this assumption could be gained by future empirical research using longitudinal designs to investigate the role of relative research throughout the innovation process. Such an approach might also capture the intertemporal interdependencies between the processes and outcomes triggered by varying levels of relative team size and feedback loops between the performance dimensions. In this respect, it appears quite likely that there are linkages among the three performance dimensions over time. For example, in teams of small relative size the effects of relative team size on output quality (positive) and team creativity (negative) might amplify each other, as a higher level of creativity is likely to result in a higher degree of novelty in the outcome, which, in turn, usually is accompanied by a reduced level of quality, as the degree of novelty and quality tend to run counter each other (Blank & Naveh, 2014; Sethi & Sethi, 2009). Thus, output quality is further compromised, beyond being already negatively affected by a small relative team size. Alternatively, when teams continuously experience low levels of output quality (due to small relative team sizes), the positive effects on creativity that relatively small teams might experience are likely to be diminished over time. Longitudinal designs could help to disentangle the potential interdependencies of the mechanisms triggered by varying levels of relative team size and the performance dimensions.

In line with these intertemporal considerations, the question naturally arises whether conditions of understaffing in teams are actually sustainable. While some mechanisms triggered by small relative team sizes might appear beneficial, such as an increased balance of team member contributions, or an elevated level of motivation within the team, understaffed conditions come also with an important cost in the long run, that is, the elevated stress levels likely to be induced in teams of small relative size (Hudson & Shen, 2015). While such stress might have direct negative consequences for team performance, it also bears a negative potential going beyond such direct performance-related effects that appears even more problematic. In this respect, research has consistently argued and shown that elevated levels of stress can have severe detrimental effects on individuals' health and well-being if sustained over a longer period of time (Ganster & Rosen, 2013). Specific adverse consequences of such constellations that are frequently mentioned in the literature are

burnout, depression, and cardiovascular diseases (Ganster & Rosen, 2013). Taking these temporal aspects of stress into consideration may likely be important: while some of the directly performance-related drawbacks of small relative team size might be (over)compensated by the benefits gained from them, in the long run, these beneficial effects are unlikely to compensate for the negative consequences of sustained elevated levels of perceived stress. One practical conclusion we draw from these considerations is that when setting up teams for innovative tasks, understaffing should not be seen as a desirable work configuration in teams that might serve as default work mode. Rather, teams of small relative size might be desirable when used selectively and temporarily for specific stages in the innovation process or for certain clearly confined subtasks likely to benefit from the resulting mechanisms.

However, besides the general appeal that such time-based staffing strategies might have for reaping benefits of small relative team sizes while avoiding most of their cost, they entail some practical issues. These practical issues primarily circle around the consequences of membership changes within teams (Mathieu, Tannenbaum, Donsbach, & Alliger, 2014). Specifically, when reducing team size, at least one team member has to leave the team, which also means that this member's task and teamwork-related expertise (e.g., coordination functions) is lost, as well as this member's network position remains vacant. Hence, even though the approach of time-based team staffing might mitigate many consequences of small relative team sizes, it tends to introduce other hindrances of teamwork, such as impairing transactional memory systems or team coordination (Lewis, Belliveau, Herndon, & Keller, 2007; Summers, Humphrey, & Ferris, 2012). Generally setting up teams with a more flexible membership structure might be one remedy to these problems (Ancona & Bresman, 2013).

Measurement issues

To capitalize on this more fine-grained view of team size and to meaningfully integrate relative team size in empirical studies, however, it is necessary to specify adequate measures for this construct. In contrast to absolute team size, this proves more difficult, as reflected in the variety of operationalizations used for relative team size in extant empirical studies (e.g., Ganster & Dwyer, 1995; Greenberg et al., 1982; Sebok, 2000). As pointed out by Hudson and Shen (2015), one issue in this regard stands out, that is, whether relative team size should be measured based on objective or subjective assessments. Most experimental research in this field operationalized relative team size in an objective way. This operationalization was based on variations in absolute team size along numbers of team members defined as corresponding small, large, and adequate team staffing levels in settings where all teams were assigned to an identical (unitary) task, for which the staffing level could be clearly determined a priori (e.g., Greenberg et al., 1982; Sebok, 2000; Wicker et al., 1976). In contrast, most survey studies in the organizational context operationalized relative team size in a subjective way. These subjective operationalizations build on team members' evaluations of team staffing levels regarding how adequate the number of a team's members is perceived to be by its members, given the team's task assignments and objectives (e.g., Campion et al., 1993; Ganster & Dwyer, 1995; Vecchio & Sussmann, 1981). As such, it seems important to take into consideration team members' subjective perceptions of relative team size, since research in cognitive psychology suggests that exactly these subjective perceptions are actually determining patterns of individual and team behavior (Clarkson, Hirt, Jia, & Alexander, 2010). Thus subjective measurement approaches using Likert-type items, as used by Campion and colleagues (1993; 1996) or by Ganster and Dwyer (1995), appear not only appropriate to

apply in surveys, they are also likely to capture best what is actually intended to be measured as relative team size.

That being said, the benefits of such subjective measurement also come at a cost. First, it might create problems of cause and effect when a performance outcome is chosen, as team members might rate the relative team size based on past performance or include the (in)adequate staffing level in their evaluation of team performance. For example, members of teams that perform below expectations might indicate that the relative team size is lower only because of their perceptions of past performance. This kind of hindsight bias (Hawkins & Hastie, 1990), which threatens to plague studying the performance relationships of many other subjectively measured constructs as well (e.g., stressors, personal resources), needs to be kept in mind when setting up studies examining relative team size.

Second, in an analogy to perceptions of other types of resources (Weiss et al., 2014), there might be conditions under which team members are more likely to perceive being understaffed, for example, certain attitudes, or forms of organizational and team cultures. On the one hand, such differential perceptions actually represent an argument in favor of using the perceptual operationalization. This is because the mechanisms expected to result from varying levels of relative team size are triggered by people *perceiving* their team being understaffed or overstaffed, and not by some kind of objective rating of the relative team size for a given task. Still, it appears important to know such conditions, especially regarding the practical implications that follow for the set-up of teams for innovative tasks. In order to being able to configure the relative team size of a team it is necessary to know what actually drives team members' perceptions of relative team size. Therefore, future research into antecedents of relative team size perceptions appears warranted in order to advance theory building on the relative team size–innovation relationship. On the other hand, this means that when using perceptual measures of relative team size it is of key importance to examine whether actually a shared team perception of relative team size emerges with regard to the relative size of the team, which is signaled by indices of interrater agreement and/or interrater reliability (Biemann, Cole, & Voelpel, 2012; James, Demaree, & Wolf, 1993). In intact teams, one can expect that team members' judgments on relative team size tend to converge with progressing work on a task (Lester, Meglino, & Korsgaard, 2002), which led Hudson and Shen (2015) to the expectation that subjective perceptions of staffing levels in teams are likely to be shared across team members. If still low interrater agreement and reliability within teams are detected, however, they might either call into question whether the concerning teams represent "real" teams, or point to potential antecedents of relative team size that are independent of assignment:team size ratios and other shared team perceptions (such as personality traits) and that could then be tested. In such situations, for example some may perceive the team to be understaffed because they feel that they have to do a lot of work (i.e., high individual workload), whereas others may perceive the team to be overstaffed, perhaps because they feel that they can easily do the work assigned to them (i.e., low individual workload). Such tests can base, for example, on multilevel methods that take individual differences into account and do not require aggregation (Snijders & Bosker, 2012). Moreover, in such situations when team members may not agree, levels of dispersion may also be interesting to explore regarding their effects on the different mechanisms and outcomes.

Related to the issue of measurement discussed in the preceding paragraphs is the question whether relative team size actually represents a one-dimensional or two-dimensional construct. This is because there are two distinct aspects that might lead team members to perceive their team to be understaffed (Hudson & Shen, 2015). One relates to perceived understaffing

due to quantitative reasons, the other relates to perceived understaffing due to qualitative reasons. In the quantitative case, a team might feel understaffed because the workload is too high for the number of members in the team. In the qualitative case, a team might feel understaffed because individuals with certain important skills are not part of the team. Both cases are likely to contribute to perceptions of a small relative team size and might be related to each other (Hudson & Shen, 2015). However, depending on whether reasons connected to quantitative or qualitative aspects (or both) underlie differences in perceived relative team size might imply differing mechanisms following from them. In this regard, prior research did not explicitly differentiate between these quantitative and qualitative aspects of staffing levels. Laboratory research on the consequences of varying staffing levels used tasks where no specific knowledge or skills were necessary, thus focusing only on the quantitative aspect of staffing levels (e.g., Greenberg et al., 1982; Wicker et al., 1976). Field research carried out on divisible tasks in real-world organizational contexts, in turn, did not use measures detailed enough to identify whether quantitative or qualitative aspects of team staffing led to relative team size evaluations (Campion et al., 1993; Campion et al., 1996; Ganster & Dwyer, 1995). Given the lack of (empirical) research in this respect, finding out about the potentially differing consequences of these distinct aspects of staffing adequacy (for relative team size evaluations and the triggered mechanisms) and their interplay offers broad opportunities for future research.

Curvilinear effects of relative team size

Even though only a few studies on relative team size have focused on curvilinear effects, their discussion deserves some attention, especially for those mechanisms of small relative team size proposed by understaffing theory that entail positive consequences for the performance of teams with innovative tasks. It seems highly likely that these positive consequences have their limits and that ever smaller relative team sizes will not lead to ever more positive effects in this respect, even though our conceptualization of relative team size is already restricted to such relative team sizes that actually allow for carrying out the team tasks, that is, above the maintenance minimum and below the capacity limit (Wicker, 1973). Especially for the positive effects of small relative team sizes, it is of high interest to specify the optimum degree of understaffing (or at least the optimum region, as a precise measurement and a priori specification of such an optimum seems unrealistic to determine). Building on extant empirical results and understaffing theory, Hudson and Shen (2015) propose a curvilinear relationship between understaffing and desirable outcomes, with the optimum located in a region of mild understaffing. Even though these theoretical and empirical findings are not conclusive, as some studies failed to substantiate such a curvilinear effect (Ganster & Dwyer, 1995; Greenberg et al., 1982), and from other contexts than innovation, it should become clear when it comes to staffing teams with innovative tasks, establishing relative team size is always about striking a very delicate balance between too large and too small relative team sizes. Even positive effects of small relative team sizes are likely to have their limits when the pressure exerted on the team gets too high and future research might provide evidence where these limits have to be expected.

Conclusion

Overall, this article intends to create awareness that team size, as a variable in team research, goes well beyond just counting team members and assuming uniform effects. We thus pick up the thread of Hudson and Shen (2015), who pointed to the explanatory potential of understaffing theory, and take a step forward by specifying theoretical expectations regarding

consequences of varying levels of relative team size in a focused organizational setting, that is, innovation teams and discussed differences and commonalities with absolute team size. In so enhancing theorizing on team size and team staffing, we elaborate on differential effects of relative team size, depending on specific outcome dimensions, thereby offering a more focused and more fine-grained perspective. Most importantly, our theoretical considerations suggest that relative team size is a double-edged sword and the specific effect of relative team size on team performance of team with innovative tasks (whether positive or negative) highly depends on contextual factors, such as the outcome dimension focused on or on temporal aspects. As such, our discussions point to the importance of relative team size with regard to attitudinal, cognitive, and behavioral team processes and emergent states, and its likely differential effects on various performance dimensions of teams with innovative tasks following from these mechanisms (above and beyond the well-documented effects of absolute team size). This illustrates the broad range of consequences relative team size can entail for teams working on innovative tasks and the extensive potential for application of understaffing theory in research on team-level innovation. We thus provide a theoretical foundation for necessary further team research to better understand both absolute and relative team size effects, and also practical guidance for (temporally) staffing teams with innovative tasks, by outlining specific mechanisms expected to be unleashed by varying levels of relative team size. Given the specific (sub)task context and outcome focus of a team, managers may gauge the relative benefit and cost these mechanisms entail.

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