

# Getting Even or Being at Odds? Cohesion in Even- and Odd-Sized Small Groups

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We propose that even-sized small groups often experience lower cohesion than odd-sized small groups. Studies 1 and 2 demonstrate this effect within three- to six-person groups of freshman roommates and sibling groups, respectively. Study 3 replicates the basic even/odd effect among three- to five-person groups in a laboratory experiment that examines underlying mechanisms. To account for the even/odd effect, Study 3 focuses on the group's ability to provide members with certainty and identifies majority influence as the key instrument. We argue that groups struggle to provide certainty when they lack majorities (e.g., deadlocked coalitions) or contain unstable majorities (i.e., where small changes in opinion readily overturn existing power arrangements). Member uncertainty mediated the effects of coalition structure on cohesion. The results link structural variables (i.e., even/odd size and coalition structure) to psychological outcomes (i.e., member uncertainty and relational outcomes).

*Key words:* group size; coalitions; majority influence; cohesion

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## Introduction

Everyone knows that two heads are better than one. We also know that two is company and three is a crowd. We try our best to remain “even-keeled” when we are “at odds” with someone. We seek friends and lovers with whom we are “two peas in a pod,” and we laugh at the “odd couples” whom we encounter. Although *even* and *odd* are simply mathematical concepts, common idioms reveal that even numbers carry positive connotations and odd numbers carry negative connotations (Hines 1990, Nishiyama 2006). Their very definitions reflect these undertones: the word *even* is synonymous with “balanced, stable, placid, and calm” (Dictionary.com), whereas *odd* means “awkward, irregular, peculiar, strange, bizarre, eccentric, and incomplete” (Dictionary.com). Given these associations, managers may intuitively expect that even-sized groups are more harmonious than odd-sized groups.

In contrast to conventional wisdom, this paper argues that very often, three is company and four is a crowd. We study three- to six-person groups and propose that, when small groups break into two coalitions, even-sized groups are less cohesive than odd-sized groups because of the structural disadvantage of deadlock, which provokes uncertainty. Specifically, when small groups break into two coalitions, even-sized groups can experience deadlock (Murnighan 1978, O’Leary and Mortensen 2010, Polzer et al. 2006, Shears 1967), whereas odd-sized groups fracture into a minority and a majority,

offering the group a clearer direction (Asch 1951, Hastie and Kameda 2005, Wittenbaum et al. 1996).

By analyzing the even/odd phenomenon, we more generally identify uncertainty as a critical issue for groups research (Heider 1958, Hogg and Abrams 1993). We show that specific coalition structures within groups elicit member uncertainty about the group’s power arrangements and direction, thereby undermining cohesion. To develop this argument, we move beyond deadlocked coalitions to consider other coalition structures within even- and odd-sized groups. Groups that have a majority can still become uncertain and tense when that majority is unstable, i.e., where small changes in opinion among the group members can readily overturn majorities and destabilize the group (Latané and Wolf 1981, Prislin and Christensen 2005, Prislin et al. 2000). We empirically test these arguments, linking structural variables (i.e., a group’s even or odd size and its coalition structure) to psychological outcomes (i.e., member uncertainty and relational outcomes within the group).

## Uncertainty and Cohesion in Even- and Odd-Sized Groups

Classic social psychological research has frequently examined the effects of group size on performance, cohesion, and member satisfaction (Cummings et al. 1974, Frank and Anderson 1971, Hackman and Vidmar 1970, Murnighan and Roth 1980). Although we did not locate a single study that featured even/odd effects as the focal topic, a few of these early studies observed that

even- and odd-sized groups differed (Bales and Borgatta 1955, Cummings et al. 1974, Frank and Anderson 1971, Maier 1972, O'Dell 1968). Frank and Anderson (1971) found that people in odd-sized groups (three or five people) were more satisfied than people in even-sized groups (two or eight people), and they attributed this to majority influence. Similarly, Bales and Borgatta (1955) studied two- to seven-person groups and suggested that odd-sized groups function more smoothly, although O'Dell (1968) criticized their confounded design, statistical errors, and sample with only four groups of each size. Finally, contrary to his initial predictions, Maier (1972) found that triads were more harmonious than four-person groups, although this could have been because of coordination issues within the larger four-person groups rather than because of an even/odd effect.

Despite this early interest in group size and preliminary evidence that even- and odd-sized groups might differ, current research shows little interest in the topic. When we surveyed dissertations from the past 20 years, we found only one small-groups dissertation that featured the term *group size* in its title. Both methodological and theoretical challenges have undermined group size research. First, for methodological convenience, various paradigms in small groups research almost exclusively employ a single group size (often three people; see Murnighan 1978, Phillips et al. 2004 for discussions). Second, critics of group size research noted that it waned because of its unsystematic progress, atheoretical focus, and lack of consensus (Hackman and Vidmar 1970, Thomas and Fink 1963). For instance, because prior researchers noted even/odd differences tangentially, they posited a post hoc mechanism (majority influence) and did not examine it in depth. We address this theoretical gap by exploring how even- and odd-sized groups differ in their effectiveness in using majority influence and hence, the uncertainty they provoke. Before we can revisit these themes and build a theory about even- and odd-sized groups, however, we must define our scope and identify the types of challenges that arise.

### Key Research Assumptions

*Coalition Emergence.* Our research does not aim to predict which coalitions emerge within groups, because coalitions can emerge for so many different reasons. The distribution of opinions in a group may be because of chance (e.g., randomly assigned groups), general frequencies in the population (e.g., the number of Republicans and Democrats in Congress), or managerial choices (e.g., creating geographically dispersed teams that vary in size; O'Leary and Mortensen 2010, Polzer et al. 2006). Although we cannot predict which coalition structures will emerge, we study the possible coalitions within a particular group size and assess their stability.

*Small Groups.* We restrict our conclusions to the small group sizes that we empirically examine (three to six members). Although some of our studies discuss dyads, our primary analyses concern groups with a minimum of three members, given that both theorists (Simmel 1950) and groups researchers (Levine and Moreland 1990) typically consider the triad to be the smallest structure within which group processes operate. In her discussion of small workplace groups, Thompson (2008, p. 17) notes, "The modal team size is 5. These numbers can be compared with the optimum team size... teams should generally have fewer than 10 members—more like 5 or 6." Given this, our focus on three- to six-person groups is relevant for understanding the dynamics of small groups in general. We further acknowledge that even/odd effects may diminish within larger groups given past research that indicates that small and large groups differ in structure and behavior (Levine and Moreland 1998, Simmel 1950).

*Majority Influence.* Because our key argument is that the presence of a majority and its size influence its ability to offer groups certainty and cohesion, we expect even/odd effects to emerge only when majority influence matters. We focus on situations where groups contain two coalitions that contest for a majority rather than when they fragment into smaller subgroups. This narrowing of our scope is reasonable because researchers note that, even when group decision making begins with multiple options, groups inevitably narrow their decisions to two options (e.g., Hoffman and Stein 1983, Stasser et al. 1989). Further, Duverger's (1972) law in political science contends that two-coalition structures are inevitable under plurality voting systems, which do not allow for proportional representation. Finally, the majority rule dominates other decision rules (e.g., two-thirds approval), not only as an explicit rule but implicitly as the standard of fairness when groups lack a salient decision rule (Cialdini 2001, Davis 1973, Hastie and Kameda 2005, Kerr et al. 1979, Rico et al. 2008, Stasser et al. 1989).<sup>1</sup> Next, we develop theory to explain why odd size might confer an advantage over even size when majority influence matters.

### Odd and Even Size and Group Uncertainty

So far, we have identified a gap in the literature whereby researchers have occasionally observed even/odd size effects but have not analyzed them in depth. However, we have not yet established why this issue matters for groups research more generally. Our key theoretical point of departure is that cohesion arises when groups offer their members certainty, and majority influence is a key instrument that groups use to provide members with certainty and cohesion. A group's even/odd size is the context in which coalitions emerge and majority influence operates. As such, analyzing even/odd size enables us to

generate and test nuanced predictions about how majority influence operates and how outcomes such as member certainty and cohesion emerge in response. This perspective offers two theoretical departures from previous groups research.

First, whereas past research often maligns the majority's tendency to dominate minorities (Asch 1951, Cialdini 2001, Janis 1982), we explore one potentially beneficial consequence of majority influence: its power to offer groups clarity and certainty. Consistent with the long line of psychological research showing that people need certainty, stability, and order (e.g., Heider 1958), groups researchers argue that people prefer groups with clear boundaries (White and Langer 1999), identities (Hogg and Abrams 1993, Tajfel 1982), and power arrangements (Prislin and Christensen 2005, Prislin et al. 2000). By certainty, we refer to group members' confidence about what decisions should be made, how they should be made, and who has the power to make them. Unless these basic questions are clearly resolved, we contend that groups struggle to accomplish their goals and people fail to cohere within them.

We focus on two structural features of groups that respectively eliminate or diminish the majority's power to offer certainty: deadlock (i.e., evenly balanced coalitions) and unstable majorities (i.e., majorities that can readily lose power). The focus on stable versus unstable majorities offers a second important departure from past research, which typically considers majority influence in broad strokes (e.g., Moscovici 1985, Nemeth 1986). Our analyses of even/odd effects build on more nuanced studies that explore how the majority's relative size shapes its capacity to influence the group and offer it clear direction (Latané and Wolf 1981, Clark and Maass 1990). We propose that when majorities can be readily overturned by small changes of opinion, they face challenges in influencing group members as compared to majorities that require larger changes to disrupt their control (Prislin and Christensen 2005). We next consider how these two structural factors (deadlock and the majority's stability) shape a group's capacity to offer certainty.

*Uncertainty from Deadlock.* When two balanced coalitions vie for power, both lack the numerical strength to compel the other side to give in, so the opposing subgroups remain entrenched in their positions. The conflicting subgroups remain in limbo, unable to move forward and attain certainty about decisions and direction (see Lau and Murnighan 2005, Philips et al. 2009). Moreover, because of the entrenched disagreement, even when these groups come to a final decision, they might experience less certainty and cohesion as a result of the contentious process of coming to a final decision than groups that can use majority influence.

To show the relationship between even/odd size and deadlock, we draw from George Simmel's (1950) insight

that dyads and triads differ in their capacity for majority influence. Whereas each member faces only one other in a dyad, a triad is the simplest structure that allows some members to form a coalition to overrule others and thus bring more certainty to the group (Simmel 1950). Moving from dyads and triads to even- and odd-sized groups, we hypothesize that majorities might similarly stabilize odd-sized groups. By contrast, deadlocked bipartisan coalitions can emerge within even-sized groups (e.g., one versus one in dyads, two versus two in four-person groups; Murnighan 1978, O'Leary and Mortensen 2010, Polzer et al. 2006, Shears 1967).

*Uncertainty from Unstable Majorities.* We also recognize that both even- and odd-sized groups can sometimes provoke uncertainty. When groups contain unstable majorities (i.e., a majority that can be readily overturned based on small changes in opinion; Prislin and Christensen 2005) that majority commands less numerical strength and struggles to influence the group and provide it with certainty and order (Latané and Wolf 1981, Clark and Maass 1990). In response, minorities aggressively hold onto their position, recognizing that they could readily gain power with small shifts in opinion. As in deadlock, both sides stridently defend their turf, and the group moves toward disunity. When majorities are uncertain about their level of control, both majorities and minorities experience lower group identification and prefer to leave the group (Prislin and Christensen 2005). By contrast, overwhelming majorities face fewer uncertainties about who has power. Minorities accept the overwhelming majority's legitimacy and compromise more, allowing the majority to behave more receptively (Prislin and Christensen 2005) and the group to cohere.

One question that arises in defining the stability of the majority is whether numbers (e.g., changing a single person's mind, regardless of group size) or proportions (e.g., changing 33% of the group) matter. We test both alternatives but predict that proportions matter (at least in the contexts we study, where groups do not count votes explicitly and need to establish consensus informally). This is not to treat group members as "fractional" people. Instead, drawing from social impact theory (Karau and Williams 1993, Latané and Wolf 1981), we suggest that proportional representation can subtly shape a person's impact within the group. That is, when the majority can shift based on a single person who changes their mind, it matters whether that person constitutes a third of a group rather than a fourth of the group. In social impact theory's terms, a person who constitutes a third of the group can exact more social pressure and has more influence. Because that person has a greater social impact, the minority that needs to change a third of the group (versus a fourth) experiences a more daunting task, and the group therefore has greater stability.

The reasons why proportions versus numbers matter become most clear when examining the dynamics

within two-versus-one groups. In this group, although the majority appears narrow in terms of numbers (one person switching sides can overturn the majority), the psychological impact of that one change (33%) is greater than in other groups that require a single change to shift the majority (e.g., three versus two). Consider the dramatic impact if one member of the majority switches sides in two-versus-one groups, as compared to if this change occurs within larger groups (e.g., three versus two). First, because the majority only consists of two people, the dissenter has fewer targets for persuasion than in larger groups. Additionally, as compared to larger groups, which are more unstable because of their impersonal, diffuse relationships (Riker 1962), the decision to switch sides in a pair is personal, with consequences not only for the group dynamics but also for the interpersonal relationships between each of the group members. The decision of one member of the majority pair to abandon the other not only relegates that individual to minority status but also causes them to become the new isolate in the group. Finally, the dissenter lacks another ally, which encourages them to use less aggressive strategies (Schopler and Insko 1992). Because of the dramatic impact of this shift in power, the group preserves its stability, with the majority maintaining their strong bond together and integrating the more conciliatory dissenter. To connect these dynamics to uncertainty, the group coheres to avoid destabilizing new dynamics where anyone could risk becoming the potential isolate.

So far, our arguments generally suggest that groups with deadlock or readily shifting majorities should be more likely to experience tension, independent of odd-versus-even size. To understand how this nuance affects our predictions about odd- and even-sized small groups in particular, Table 1 shows the specific two-coalition structures underlying three- to six-person groups and indicates the proportion of the group that would have to change their minds to overturn power arrangements (i.e.,

to a new majority or to balance). In particular, the arguments suggest that four-person groups are structurally unstable. Four-person groups can either divide into deadlocked two-versus-two coalitions or three-versus-one coalitions (where the minority simply needs to recruit a second ally [25% change] to cause a power shift to deadlock). By contrast, in a two-versus-one group, this other ally constitutes a higher proportion of the group (33%). The prospects are more daunting in a four-versus-one group, where two out of five members (40%) must change for the lone dissenter to sway the group's course.

When odd-sized groups contain unstable majorities that can readily overturn existing power arrangements, they too should experience decision-making tensions. For instance, three-versus-two groups are the only contentious odd group in Table 1 where a single change of opinion (20%) could overturn the group's power. Note that, although we do not predict which coalitions are likely to emerge in a given situation, every other coalition within three-person (two versus one) and five-person (four versus one) groups is stable and cohesive, whereas both four-person coalitions (two versus two and three versus one) are unstable.

### Group Cohesion

Our key dependent variable is group cohesion, which Festinger (1950, p. 274) defined as “all the forces acting on members to remain in the group.” Drawing from Festinger's original conceptualization, more recent research identifies three components of cohesion: *interpersonal attraction* (shared liking for or attachment to group members), *task commitment* (shared commitment to group tasks), and *group pride* (shared importance of group membership; Beal et al. 2003). Although there has been some debate as to the role that these components play in predicting various outcomes, we follow most past researchers (e.g., Schachter 1951) who treat cohesion as a unified construct (Mullen and Copper 1994).

The meta-analyses also note other issues in the operationalization of group cohesion (Beal et al. 2003, Mullen and Copper 1994). The construct has been criticized because it encapsulates both individual- and group-level features (Gully et al. 1995). Additionally, cohesion has been measured in a variety of ways when studied in diverse contexts (e.g., different types of items are necessary to measure cohesion within long-standing work groups, group project teams, and sports teams; Beal et al. 2003, Williams and Hacker 1982). Although this paper cannot resolve these debates, our goal will be to measure cohesion in a way that captures a group's likelihood to cohere in diverse contexts. In a study of college freshman roommate groups, we operationalize cohesion as the likelihood of the group to choose to stay together as a whole in the second year rather than to disband. In a study of sibling groups, where disbanding is a rare occurrence, we assess both the group's average closeness and its range of

**Table 1 Predictions: Coalitions in Even-Sized vs. Odd-Sized Groups**

Coalition structure	Proportion of the group that could cause power to change	Predictions about decision making
2 vs. 1	Three-person groups 1/3 (33%)	Cohesive
	Four-person groups 1/4 (25%)	
3 vs. 1	1/4 (25%)	Contentious
2 vs. 2	1/4 (25%)	Contentious
4 vs. 1	Five-person groups 2/5 (40%)	Cohesive
	3 vs. 2	
5 vs. 1	Six-person groups 2/6 (33%)	Cohesive
	4 vs. 2	
3 vs. 3	1/6 (17%)	Contentious

closeness—that is, whether people gravitate to particular members or to the group as a whole. Finally, in studying short-term laboratory groups, we measure individual members' attachment to the group, drawing items from the three cohesion components above.

Researchers have traditionally assumed that cohesion matters to groups because it motivates members to perform well and coordinate their work (Cartwright 1968). Hackman (2002) encapsulates satisfying relational outcomes into his measure of team effectiveness, showing how these social and relational processes set the stage for great performance. Recent meta-analyses describe a more nuanced link between cohesion and performance, indicating that cohesion is particularly likely to affect performance when that group's tasks involve effort, motivation, and commitment rather than accuracy (Beal et al. 2003, Mullen and Copper 1994), and other research notes how too much cohesion can cause decision-making biases such as groupthink (Janis 1982). We recognize these caveats but contend that cohesion matters to group outcomes at the most basic level, because unless groups remain together and work together, they cannot achieve their goals and do not have a long-term future.

## Overview

In sum, we predict that when small groups break down into two coalitions, groups with deadlocked or unstable majorities cohere less. These nuanced structural differences confer a perceptible disadvantage to even-sized small groups in specific types of decisions and situations. Their coalitions evoke greater uncertainty, which mediates lower group cohesion. Building on past research that has often regarded dyads and triads as the building blocks of social relationships (Caplow 1968, Simmel 1950), this paper proposes that odd and even group size can likewise offer a fruitful starting point to think about coalition structures and cohesion.

We examined these predictions in three studies that involved multiple methods (a natural experiment, a survey, and a laboratory experiment), groups in various contexts (families, undergraduate roommates, and undergraduate and graduate discussion groups), and different tasks (long-term living arrangements and short-term discussion groups).

Although past research hints at an even/odd effect, given the lack of systematic empirical study on the topic, our first two studies establish the basic phenomenon that odd-sized groups exhibit more cohesion than even-sized groups. Study 1 considered a natural experiment at Harvard University, where the administration assigns first-year students to roommate groups that contain between one and six people. We examined how initial freshman group size affected whether a group dissolved or endured in the second year. To explore cohesion within another context, we surveyed people about

relational outcomes within their sibling groups (two to six siblings).

Whereas these studies show evidence of the even/odd effect in diverse natural contexts, the final study moves from demonstration to mechanisms in a laboratory experiment that explores the underlying structures within odd- and even-sized small groups and their psychological consequences. We randomly assigned participants to three-, four-, and five-person groups that varied in coalition structure. We tested for both the basic even/odd effect and the nuanced predictions about how coalition structures can provoke uncertainty. We predicted that uncertainty would mediate the effect of coalition structure on group cohesion. Whereas Study 1 examined a behavioral outcome that reflects cohesion (whether the group remains together), Studies 2 and 3 examined group members' perceptions of relationships to assess cohesion.

## Study 1: Cohesion Among Harvard Freshman Roommate Groups: A Natural Experiment

We first examined a unique natural experiment at Harvard University in which students made meaningful decisions about their living arrangements. The university administration assigns freshmen to roommate groups that vary in size. In their second year, students select their own roommates. Given that this is a voluntary decision, it speaks to the level of cohesion among the roommates. We therefore examined how a group's even or odd size affects its likelihood to stay together.

### Research Context

Before incoming Harvard freshmen arrive on campus, they answer questions about their habits (e.g., neatness, smoking) and interests (e.g., sports, music). The university uses this information to match personally compatible students in ethnically integrated groups of one to six people. Although this means that assignments are not perfectly randomized, it is unlikely that students request an even- or odd-sized roommate group. In their sophomore year, students choose up to 20 people to live with and move into one of 13 "houses" where sophomores, juniors, and seniors live together.

We infer that people who choose not to room together have often experienced negative or neutral rather than positive relationships. When students decide to maintain relationships in the sophomore year, they ensure that they can remain in the same house for the next three years. By contrast, when people decide not to live together in the second year, there is a 12 in 13 chance they will be assigned to separate houses, reducing their likelihood to dine together or even see each other regularly, especially if they live at opposite ends of the campus.

## Creating the Data Set

To create the data set, we used the freshman phone directory and the annual yearbooks to identify freshman and sophomore roommate groups in Harvard's class of 1995. We recorded each freshman roommate group as a case and coded whether the entire group remained in the same house in the second year or split into different houses. We next coded student ethnic information based upon the yearbook photographs and coded whether the group was ethnically homogeneous or diverse. We included ethnic diversity as a control because past research suggests that it is a key determinant of college friendships and roommate relationships (Marmaros and Sacerdote 2006, van Laar et al. 2005).

This process yielded 1,597 students (the official university count for students in the class was 1,609). The sample was 58.4% male, and 60.6% white, 18.6% Asian, 8.5% black, 5.8% Hispanic, 3.7% Indian/Middle Eastern, and 2.6% "other" or mixed race. Our yearbook sample yielded comparable percentages to the university's official statistics.

These students were distributed across 514 freshman roommate groups (52 single rooms, 135 two-person rooms, 105 three-person groups, 167 four-person groups, 37 five-person groups, and 18 six-person groups). We excluded students who resided in single rooms because they lacked roommates. Additionally, because the triad is typically considered to be the smallest structure within which group processes operate (Levine and Moreland 1990, Simmel 1950), our primary analysis considered three- to six-person rooming groups. We included dyads in a follow-up analysis.

*Limitations.* Two limitations arise from the indirect route necessary to collect data: coding dorm placement and coding ethnicity. Specifically, because the university keeps information such as roommate selection and student ethnicity private, we had to make inferences based on available data.

*Coding Dorm Rooms.* We did not have direct access to students' choices. We simply examined whether the students lived in the same or different dorms as sophomores. Students who request to remain together are automatically assigned together. Thus, if first-year roommates were not in the same second-year dorms, we know that they chose to separate. However, even if first-year roommates chose to separate, there was a small chance (1 in 13) that the housing lottery randomly assigned them to the same dorm. This random process should not affect even- and odd-sized groups systematically.

*Coding Ethnicity.* Without access to university records, we coded ethnicity using students' photos from their freshman and house yearbooks. Thus, if people appeared black or white in their photographs although

they were actually mixed descent, we coded them according to their appearance. Additionally, because the sample contained relatively few minorities, the categories combined multiple ethnicities (e.g., black included American, Caribbean, and African; Asian included American, Korean, Chinese, Japanese, etc.). An independent coder validated the first author's coding, and high interrater reliabilities emerged (whites: 87%, Asians: 97%, and blacks: 86%). All disagreements were resolved through consultation among the coders and the first author.

*Data Analysis.* The level of analysis was the rooming group. The dependent variable was whether the room as a whole cohered (1) or disbanded (0). We coded the group as disbanded when any of the individual members chose to live in other dorms. We predicted that odd-sized groups would cohere more often than even-sized groups.

## Results

We first performed binary logistic regression among three- to six-person groups with group outcome (cohered versus disbanded) as the dependent variable, even/odd size as the independent variable, and group size, ethnic heterogeneity (0 = homogeneous, 1 = heterogeneous), and gender (1 = male, 2 = female) as controls. Even/odd size was significant,  $B = 0.96$ ,  $SE = 0.36$ ,  $p < 0.01$ , but group size,  $B = 0.32$ ,  $SE = 0.23$ , n.s., gender,  $B = 0.061$ ,  $SE = 0.32$ , n.s., and ethnic heterogeneity,  $B = 0.48$ ,  $SE = 0.40$ , n.s. were not.<sup>2</sup>

To explore the even/odd main effect further, we cross-tabulated group size and group outcome. Three-person groups stayed together more than four-person groups (three-person: 30 stayed, 75 disbanded; four-person: 17 stayed, 145 disbanded),  $\chi^2(1, n = 267) = 14.35$ ,  $p < 0.01$ ; and five-person groups stayed together more than six-person groups (five-person: 7 stayed, 28 disbanded; six-person: 0 stayed, 18 disbanded),  $\chi^2(1, n = 53) = 4.15$ ,  $p < 0.05$ .

These effects could simply reflect group size, because larger groups have to maintain more linkages. Therefore, we also examined the situation where the larger group is odd sized and the smaller group is even sized (five versus four). We found a nonsignificant trend whereby five-person groups stayed together more than four-person groups did,  $\chi^2(1, n = 197) = 2.43$ ,  $p = 0.12$ . Note that this was an especially stringent test of the hypothesis, because five-person groups have more linkages to maintain than four-person groups.

Even though dyads differ from groups (Levine and Moreland 1990), we also followed up this analysis by comparing dyads and triads, because this is yet another situation where the larger group is odd-sized. First, contrary to the even/odd hypothesis, two-person groups stayed together more than three-person groups (two-person: 57 stayed, 70 disbanded; three-person: 30 stayed,

75 disbanded),  $\chi^2(1, n = 232) = 6.52, p = 0.01$ . However, a post hoc examination reveals that group heterogeneity moderated this effect. Although dyads cohered more than triads when the groups were diverse (two-person: 39 stayed, 46 disbanded; three-person: 22 stayed, 58 disbanded),  $\chi^2(1, n = 165) = 5.98, p = 0.01$ , when groups were ethnically homogeneous, two- and three-person groups were equally likely to cohere (two-person: 18 stayed, 24 disbanded; three-person: 8 stayed, 16 disbanded),  $\chi^2(1, n = 66) = 0.58, n.s.$ <sup>3</sup>

## Discussion

Whereas groups research often employs laboratory experiments with short-lived groups (see Moreland et al. 1994 for a discussion), this study examined people in real even- and odd-sized groups. Although it might seem intuitively obvious based on simple base rates that smaller groups would cohere more than larger groups, this study reveals that a group's oddness and evenness matters. First, three- and five-person groups were more likely to cohere than four- and six-person groups, respectively, but four- and five-person groups did not differ. Further, although dyads were more likely to cohere than triads, upon examining this effect further, this only held true for heterogeneous groups.

Although this study enables us to examine a key behavioral measure (i.e., whether students preserve or disband the group) within a naturalistic context, we know very little about how the outcome emerged. For instance, the data set makes it impossible to discern which parties disbanded a relationship, why it disbanded, whether the process was amicable or hostile, or how students subjectively perceived group members. The next study begins to explore members' subjective perceptions.

## Study 2: Relationships Within Even- and Odd-Sized Sibling Groups

To provide further evidence of even-sized groups' instability within another context, we next examined sibling groups. Although researchers have speculated about birth-order effects for decades (Galton 1874, Sulloway 1996) and sociologists have examined family structure extensively (Caplow 1968, Grusky et al. 1995), the family is often understudied in groups research, which emphasizes laboratory-created groups and work teams instead (see Baer et al. 2005 for an exception). Sibling groups offer an important data source for organizational studies. First, people's roles and behaviors within sibling groups parallel their subsequent behaviors in groups and organizations (Baer et al. 2005). For instance, Baer et al. (2005) studied undergraduate small groups and found that firstborns were rated as more creative when they were raised in a large group of siblings who were opposite sex or relatively close in age. Additionally, given that groups research has long ignored group size because of

the methodological inconvenience of collecting data from groups of various sizes, sibling groups could offer a less costly means to test such hypotheses and at least gain convergence for hypotheses pertinent to organizations.

Even though organizational theories of groups should generalize to other types of human groups, siblings are unique in many ways. Unlike formal work groups, sibling groups lack an explicit purpose. However, they might possess implicit purposes (e.g., similar to roommate groups, they might manage living arrangements and make decisions about social activities). Further, unlike randomly assigned roommates and strangers in the laboratory, sibling groups often share history, culture, and future interaction. Although it is possible that siblings' general concern for all group members, common bonds, and intense relationships could overwhelm a variable as subtle as even/odd size, we hypothesize that a sibling group's even or odd size still shapes relational outcomes because sibling groups share common tasks, make decisions, and manage disagreements.

Facing greater uncertainties in managing disagreements, we expected that even-sized sibling groups (like even-sized roommate groups) would experience lower cohesion. Whereas the dependent variable of Study 1 (disbanding or maintaining the group) offers a direct measure of cohesion, abandoning one's siblings is a severe, rare outcome. Thus, we considered two potential perceptual measures of cohesion: average closeness among siblings and the range of closeness among the siblings. We did not expect average closeness to fully capture the differences that might emerge in sibling groups. Whereas students seeking affiliation have other students on campus as comparable alternatives to their roommates, people seeking affiliation from their families have other siblings as comparable alternatives. Thus, people in tense sibling groups may turn to particular siblings, gravitating to those they happen to share natural commonalities with and either avoiding or directly clashing with the others. If they exhibit more closeness to those individual siblings whom they happen to agree with and more negativity toward those whom they do not, average closeness would not capture the distribution.

To capture this distribution in a simple fashion, we examine the range participants reported between their most and least close sibling, predicting that even-sized groups would exhibit a pronounced gap between the two because of the greater difficulties in managing tensions. We expected that odd-sized groups would exhibit a smaller range between their most and least close siblings, because they are more likely to cohere as a whole group. Thus, although people might still feel close to certain siblings regardless of even or odd size, this measure captures whether relationships are skewed toward particular siblings and away from others rather than more evenly directed to the group as a whole. Although this measure does not capture midrange relationships in the

groups larger than three, it does parsimoniously indicate that siblings might have found cohesion with particular siblings rather than within the group as a whole. To support this measure with a measure that does capture mid-range relationships, we also examine the average differences in closeness between all siblings in the group.

## Method

**Participants.** The participants were 274 undergraduates from two comparable midwestern universities, 38% male, who were on average 21 years old. To reduce family structure complexity, we screened participants by asking whether they had siblings, whether they grew up in a nuclear family, and whether they grew up in a family with stepchildren or adopted children. We only surveyed participants from nuclear families who had siblings.

The sample included 131 people who grew up in two-child families, 100 in three-child families, 34 in four-child families, 5 in five-child families, and 4 in six-child families. Christians comprised 30.5% of the sample, 20% were Catholic, 20% reported no religion, 7.6% were Jewish, 5.8% were Hindu, and the rest reported other religions. Whites were 57.5% of the sample, Asians were 19.3%, blacks were 12%, Hispanics were 5.9%, and the rest reported “other.” We paid participants \$3 to participate.

**Procedure.** The level of analysis in this study was the individual participant. Participants completed a survey in which they identified their sibling group and completed basic demographic information about each sibling (i.e., gender and birth year). They then rated their closeness to each sibling: “I felt close [i.e., warm] towards this person when we were growing up” (1 = *not at all*, 7 = *very much*).

We used these items to compute participants’ average closeness to each of their siblings, and the range of closeness in the group (i.e., we identified the siblings towards whom participants felt most and least close and subtracted the ratings to establish the gap between them). We expected the closeness gap to be highest in even-sized groups and smallest in the odd-sized groups. (We excluded two-person groups from this analysis because this gap requires more than one sibling.)

Additionally, as mentioned previously, one issue with the range measure is that it excludes intermediate ties. Although there are no intermediate ties in a three-person group, there are intermediate ties in four- to six-person groups. To support the range measure with an additional measure that captures intermediate ties, we computed the mean difference in closeness between siblings, i.e., the average pairwise distance between the participants’ closeness ratings for each sibling.

Participants answered several other control items: their gender (1 = *female*, 0 = *male*), their rank in birth order (1 = *oldest*, 2 = *second born*, etc.), and the percentage

of women within the sibling group (0%–100%). Because a large age difference between siblings could effectively change a group’s even/odd status, we created a dummy variable that indicated whether the sibling group contained any siblings with a difference of seven or more years between them (0 = small age differences, 1 = large age differences). A difference of seven years between siblings was over one standard deviation from the mean age difference in the sample ( $M = 3.66$ ,  $SD = 2.20$ ) and meant that the siblings would not overlap in school. Finally, because ethnicity and religion can affect both family size and group dynamics, we included dummy variables to control for ethnicity (white, black, and Asian) and religion (Christian, Catholic, and Jewish). We did not ask participants about income to reduce the sensitivity of the survey. After participants completed the survey, we debriefed and paid them. Although participants knew that we were studying family dynamics, the even/odd comparison was not obvious to them.

## Results

We first examined whether group size affected the average closeness between siblings. We performed regression with average closeness as the dependent variable, dummy variables for group size as the predictors (the two-person sibling group was the omitted variable), and the controls. Average closeness did not differ among two-, three-, four-, five-, and six-sibling groups (Table 2).

To follow up this analysis, we examined the gap between participants’ most and least close siblings. Because the gap between most and least close siblings requires, at minimum, three siblings, the three-person sibling group was now the omitted variable. We also controlled for mean closeness to show the effect of range over and above average closeness. As predicted, significantly smaller gaps emerged among three siblings than four and six siblings, but not five siblings (Table 2). No other significant differences emerged between groups.

Consistent with the range finding, we found similar patterns when we examined the mean difference in closeness between siblings, a measure that accounted for intermediate ties. As compared to three-person groups, four-person groups exhibited significantly more variation,  $B = 1.03$ ,  $SE = 0.28$ ,  $p < 0.01$ , and five-person groups exhibited no differences,  $B = -0.74$ ,  $SE = 0.70$ , n.s.. Although in the correct direction, the difference between three- and six-person groups did not reach significance,  $B = 0.36$ ,  $SE = 0.70$ , n.s., perhaps because of the small sample. Five-person groups also exhibited significantly less variation than four-person groups,  $B = -1.78$ ,  $SE = 0.72$ ,  $p < 0.05$ . No other significant differences emerged. These patterns are consistent with the notion that even-sized groups may contain ties that bind certain group members together but fail to connect others.

**Table 2 Regression Analysis Predicting Mean Closeness and Gap Between Most and Least Close Siblings**

Predictor	Closeness <i>N</i> = 252 2–6 siblings	Closeness gap <i>N</i> = 137 3–6 siblings
	<i>B</i> (SE <i>B</i> )	
Intercept	3.82 (0.37)**	2.73 (0.62)**
Three siblings	0.22 (0.14)	
Four siblings	0.15 (0.21)	0.63 (0.20)**
Five siblings	−0.32 (0.51)	0.45 (0.50)
Six siblings	0.33 (0.50)	1.27 (0.49)*
Age differences between siblings	−0.11 (0.18)	0.31 (0.23)
Respondent's gender	−0.011 (0.16)	0.033 (0.21)
Proportion of girls in sibling group	−0.20 (0.25)	0.046 (0.38)
Birth order rank	−0.11 (0.07)	0.011 (0.09)
Mean closeness		−0.50 (0.10)
Catholic	0.019 (0.18)	0.027 (0.23)
Christian	−0.011 (0.15)	−0.086 (0.23)
Jewish	−0.048 (0.25)	0.22 (0.46)
White	0.14 (0.24)	−0.01 (0.28)
Asian	0.32 (0.27)	−0.15 (0.34)
Black	0.13 (0.29)	0.33 (0.38)
<i>R</i> <sup>2</sup>	0.03	0.31

Notes. We also ran models with the other group sizes as the omitted variables. For mean closeness, there were no significant differences for any comparison. For the range in closeness, significant differences emerged between three-person groups and four- and six-person groups. No other significant differences emerged.

\* $p < 0.05$ ; \*\* $p < 0.01$ .

## Discussion

Study 2 offers further evidence that even- and odd-sized sibling groups might differ in their relationships. Participants within odd-sized sibling groups exhibited smaller gaps between their least and most close siblings, whereas participants within even-sized sibling groups demonstrated greater preferences for some siblings relative to others. Consistent with our argument that even-sized groups experience greater challenges to cohesion, people in even-sized groups felt less close to some siblings and gravitated towards other siblings.

One limitation is that participants recalled childhood relationships that they might have forgotten or misremembered. A systematic bias might have emerged if people retrospectively constructed dynamics consistent with their assumptions about odd- and even-sized groups. However, the survey did not directly ask participants whether their sibling group was even- or odd-sized, and the debriefing confirmed that participants did not realize that we were studying even/odd effects.

A second limitation is that, unlike Harvard roommate groups, sibling groups are not randomly assigned. To address this issue, we controlled for religion and race. Although these variables and socioeconomic factors (e.g., wealth) might all influence family size, we suspect that they are less likely to affect people's decisions to

build an even- or odd-sized family. Additionally, Study 2 only measures one member's impressions rather than surveying all members and, as mentioned before, does not precisely indicate the group's coalition structure. To deal with these limitations, Study 3 randomly assigns participants to groups, manipulates groups' coalition structures, and explores all members' subjective perceptions. Most importantly, this study tests uncertainty as a general mechanism that might help explain the advantage of odd size for group stability.

## Study 3: Manipulating Coalitions in Three-, Four-, and Five-Person Groups

Study 3 employed a controlled experiment to replicate Studies 1 and 2 and establish mechanisms. First, we sought to replicate the basic even and odd pattern among three-, four-, and five-person groups, relying once more on group members' perceptions of cohesion. Additionally, we manipulated coalitions by forming groups based on participants' initial opinions on a decision topic. To test the hypothesis that deadlocked coalitions would produce more uncertainty than other structures, we formed balanced four-person groups (two participants held one initial opinion on a discussion topic and two held the opposite opinion) and compared them with the other groups.

In addition to deadlocked (two versus two) coalitions, we examined other two-coalition structures within three- (two versus one), four- (three versus one), and five-person groups (three versus two, four versus one). We expected that three-versus-one and three-versus-two groups would be especially prone to experience uncertainty and tension because these groups involved the most unstable majorities (see Table 1). These coalition structures additionally enabled us to test whether numbers or proportions better measured the impact of group members. If merely numbers matter, then two-versus-one, two-versus-two, and three-versus-one groups should display similar tensions because a single individual could overturn the group's power in each of these cases. However, if proportions drive cohesion, two-versus-one groups should exhibit less tension than three-versus-one and two-versus-two groups, because a higher proportion of the group would have to switch sides (33% versus 25% of the group). We predicted that two-versus-one groups would be more cohesive because proportions shape an individual's impact. Our predictions for five-person groups are consistent with these arguments (see Table 1). Finally, we tested whether uncertainty would mediate the effects of both even/odd group size and coalition structure on identification with the group.

A final concern is the relationship between cohesion and group performance. So far, our research has explored dependent variables associated with cohesion only. Various meta-analyses indicate that cohesion has a small

effect on performance, and these effects are likely only when performance relies on effort and commitment to group, rather than accuracy (Beal et al. 2003, Mullen and Copper 1994). Given that the task involves decision accuracy, we did not expect performance effects.

## Method

**Participants.** The participants were 205 students from a midwestern university (58.4% male). Of these, 147 were MBA students who participated in a class exercise, and 58 were undergraduates whom we paid \$10 to participate in the lab. We pooled MBA and undergraduate data because the groups did not differ in their response patterns.

**Procedure.** All participants read the Carter Racing case (Brittain and Sitkin 1988), in which they assumed the role of an automobile racing team manager who decides whether to race (and potentially win a large endorsement) or not race (because of a potentially disastrous engine failure). Participants could not adopt a neutral stance: They selected the option either to race or not, leading to a bipartisan coalition. Although most participants tend to select the risky option (racing), the correct choice is not to race. Among the participants, 138 elected to race, and only 67 chose not to race.

Next, we randomly assigned MBA and undergraduate participants into three- and four-person groups that varied in coalition structure. The design contained three alternative coalition structures: (a) three-person group, two *race* and one *not race* ( $n = 11$ ); (b) four-person group, three *race* and one *not race* ( $n = 9$ ); and (c) four-person group, two *race* and two *not race* ( $n = 8$ ). Because most participants elected to race, we could not assign nonracers to the majority due to sample size limitations (they were either in the minority or in balanced two-versus-two groups). We performed a second wave of data collection in which we assigned MBA students to five-person teams with two additional coalitions: (a) four *race*, one *not race* ( $n = 10$ ); (b) three *race* and two *not race* ( $n = 10$ ). The five-person groups help rule out the alternative explanation present in past studies pertinent to even/odd dynamics (e.g., Maier 1972) that, relative to triads, quads simply face more coordination issues because of their size. For instance, it might be more difficult to listen to and manage all opinions in a four- or five-person group than in a three-person group, given the time pressure, which might undermine group process. Participants discussed the decision for 20 minutes within their small groups, submitted a group decision to the experimenter, and then completed a final survey.

**Uncertainty.** After the group discussion, participants rated their confidence with the decision: How confident are you about your decision to race or not to race? They rated their confidence on an 11-point scale with 10 percentage point increments from 0 to 100 (0% = *not*

*confident at all*, 50% = *moderately confident*, 100% = *completely confident*).

**Cohesion.** The key dependent variable was participants' perceptions of group cohesion. Although much past research studies cohesion in various contexts (e.g., sports teams, long-standing work groups; Beal et al. 2003, Mullen and Copper 1994), many of these items are adapted to those particular contexts. Therefore, we adapted 20 questions about cohesion and other aspects of group dynamics (e.g., conflict management) to our short-term task in the laboratory context. We performed a Varimax factor analysis of these 20 items. One factor emerged, and its eigenvalue explained 26.4% of the variance. We created a six-item composite of group cohesion based on these six items ( $\alpha = 0.89$ ), which captured key aspects of group cohesion: *group pride* (I feel good about the group), *interpersonal attraction* (we felt comfortable working together, I felt strong ties with this group, I identified with this group, we were a cohesive group), and *task commitment* (I am satisfied with our decision-making process).<sup>4</sup>

**Accuracy.** We examined whether the groups ultimately selected the correct choice, not racing (2) versus racing (1).

**Data analysis.** We measured individual perceptions of the group as a whole. Individuals were nested within discussion groups, so we used multilevel analyses (Linear Mixed Models procedure in SPSS 16) to account for the interdependence between group members (Kreft and DeLeeuw 1998).

## Results

**Uncertainty.** We first examined how uncertainty varied based on coalition structure. We performed a Linear Mixed Models procedure with uncertainty as the dependent variable, four-person groups as the omitted variable, and racer/nonracer status as the control. As predicted, participants in four-person groups reported more uncertainty than participants in the three-person groups;  $F(1, 194) = 8.07$ ,  $p < 0.01$ . Five-person groups fell between these groups, given that they contained groups with both coalitions that we predicted would be more cohesive (four versus one) and less cohesive (three versus two). They did not differ from four-person groups ( $F(1, 194) = 1.39$ ,  $p = 0.24$ ), but were more uncertain than three-person groups ( $F(1, 194) = 4.15$ ,  $p < 0.05$ ). See Table 3 for all means.

To understand the mixed findings for the five-person groups, we next explored the specific coalition structures within three-, four-, and five-person groups, checking our more nuanced assumptions (listed in Table 1) that proportions would be associated with uncertainty. We performed the same analysis as above with the three-versus-one, two-versus-two, three-versus-two, and four-versus-one coalitions as independent variables, two-versus-one groups as the omitted variable, and racer or

**Table 3 Group Size and Coalition Structure Predict Cohesion and Uncertainty**

Coalition structure	Cohesion		Uncertainty	
	M	SD	M	SD
Three-person groups				
Two vs. one	7.46	1.09	85.15	16.03
Four-person groups				
All four-person	6.40	1.33	74.11	20.81
Three vs. one	6.23	1.38	75.00	20.07
Two vs. two	6.58	1.31	73.75	22.97
Five-person groups				
All five-person	6.83	1.18	77.69	16.40
Three vs. two	6.68	1.19	76.25	15.66
Four vs. one	6.94	1.17	78.30	16.89

nonracer status as the control. As predicted, compared to two-versus-one groups, the unstable majority groups were significantly more uncertain (three versus one,  $F(1, 185) = 5.11, p < 0.05$ ; two versus two,  $F(1, 185) = 6.74, p = 0.01$ ; and three versus two,  $F(1, 185) = 4.83, p < 0.05$ ). Also in line with the predictions, the two stable majority groups (four versus one and two versus one) did not differ from each other;  $F(1, 185) = 1.35, n.s.$  No other comparisons were significant, and the participants' racer/nonracer status was also nonsignificant;  $F(1, 185) = 0.83, n.s.$

**Group Cohesion.** To analyze the key dependent variable, group cohesion, we performed a Linear Mixed Models procedure with four-person groups as the omitted variable and racer/nonracer status as the control. Replicating the basic even/odd effect, we found that both three-person ( $F(1, 196) = 15.64, p < 0.01$ ) and five-person ( $F(1, 196) = 4.09, p < 0.05$ ) groups reported higher cohesion than four-person groups, controlling for racer/nonracer status;  $F(1, 196) = 4.55, p < 0.05$ . Three-person groups were also more cohesive than five-person groups;  $F(1, 196) = 6.52, p = 0.01$ .

We next performed the same analysis but the independent variables were the specific coalition structures. Paralleling the results for uncertainty, unstable majority groups were significantly less cohesive than two-versus-one groups (three versus one,  $F(1, 190) = 18.18, p < 0.01$ ; two versus two,  $F(1, 190) = 6.87, p = 0.01$ ; and three versus two,  $F(1, 190) = 7.32, p < 0.01$ ). Once again, the stable majority four-versus-one group did not significantly differ from the two-versus-one group;  $F(1, 190) = 3.29, p < 0.10$ . Three-versus-one groups were less cohesive than four-versus-one groups ( $F(1, 190) = 7.72, p < 0.01$ ) and marginally less cohesive than three-versus-two groups ( $F(1, 190) = 3.51, p < 0.10$ ). No other comparisons were significant.<sup>4</sup>

**Mediation Analysis.** Finally, we tested whether uncertainty mediated the effects of coalition structures on cohesion. When we simultaneously entered coalition

structures and uncertainty into the regression, uncertainty predicted cohesion ( $F(1, 176) = 4.94, p < 0.01$ ), but previously significant coalition structures were either no longer significant (two versus two,  $F(1, 176) = 1.96, n.s.$ , Sobel = 2.30,  $p < 0.05$ ; three versus two,  $F(1, 176) = 2.14, n.s.$ , Sobel = 2.01,  $p < 0.05$ ) or reduced in significance, reflecting partial mediation (three versus one,  $F(1, 176) = 13.73, p < 0.01$ , Sobel = 2.06,  $p < 0.05$ ).

**Accuracy.** Finally, note that the tests so far focus on cohesion, our key dependent variable. To also test accuracy, we used a logistic regression with the group's overall decision to race or not as the dependent variable. As compared to two-versus-one groups, two-versus-two ( $B = 0.69, SE = 0.95, n.s.$ ), four-versus-one ( $B = 0.18, SE = 0.88, n.s.$ ), three-versus-two ( $B = 0.18, SE = 0.88, n.s.$ ), and three-versus-one ( $B = -1.90, SE = 1.22, n.s.$ ) groups did not differ. However, three-versus-one groups were more likely to make the incorrect decision as compared to two-versus-two groups ( $B = 2.59, SE = 1.29, p < 0.05$ ) and marginally more likely to make the incorrect decision as compared to three-versus-two ( $B = 2.08, SE = 1.24, p < 0.10$ ) and four-versus-one ( $B = 2.08, SE = 1.24, p < 0.10$ ) groups. No other comparisons were significant.

## Discussion

Study 3 replicates the finding that odd-sized small groups (three- and five-person groups) experience greater cohesion than do four-person groups and suggests that the even/odd effect derives from the influence of coalition structures on uncertainty. In addition to further documenting the negative effects of balanced coalitions (e.g., two versus two, O'Leary and Mortensen 2010, Polzer et al. 2006), we also examined why other coalition structures might create instability (Mannix 1993). Whereas balanced groups polarize and lack a mechanism for dispute resolution (Murnighan 1978), groups with a majority can also provoke similar reactions if strong minorities could readily contest their power. Thus, we found that groups with a majority were less cohesive if minorities could overturn power by changing 25% or less of members (e.g., three versus one and three versus two). Groups that required that 33% or more of their members change sides to change the group decision felt more certain following their discussion (e.g., two versus one and four versus one; see Table 1).

Note that we define the majority's stability through proportions rather than numerically. Thus, although the two-versus-one group requires only one person to switch sides to overturn power, this single person formed a larger proportion of the group. These findings, which suggest that majorities operate differently as a function of their coalition structure, suggest more nuanced processes of majority/minority relationships (Levine and Thompson 1996, Loyd et al. 2008).

Finally, we show the links between even/odd group size, coalition structure, uncertainty, and cohesion. Uncertainty predicted cohesion among randomly assigned group members. Given that we also found even/odd effects among roommate and sibling groups, this relationship between uncertainty and cohesion could even persist in groups where cohesion derives from many other rich factors (e.g., personal attraction, family ties, common interests).

## General Discussion

Groups throughout society struggle to maintain cohesion. Ethnic subgroups in Iraq and the former Yugoslavia fight civil wars, “Red” and “Blue” American states hold incompatible values and lifestyles, and Congress stalls because of warring political parties. At a micro level, top management teams (Hambrick 1994, Peterson et al. 1998), work teams (Lau and Murnighan 2005, O’Reilly et al. 1998), judges (Sunstein et al. 2006), juries (Davis et al. 1975, Guarnaschelli et al. 2000, Hastie et al. 1983, Saks 1977), and families (Caplow 1968, Grusky et al. 1995) may contain subgroups in conflict. In all of these situations, groups experience considerable uncertainty as they struggle to manage disagreement and determine a clear direction. This paper examines how small groups fracture in distinctive ways because of a seemingly inconsequential but crucial factor: their even or odd size. We systematically replicate even/odd effects that appeared occasionally and tangentially decades ago in the group size literature and examine more nuanced predictions about how their underlying coalition structures shape their levels of uncertainty and cohesion.

In exploring the even/odd phenomenon, we hope to offer more general contributions to groups research. As a context in which majority/minority dynamics play out, even/odd group size offers nuanced insights about the majority influence. First, whereas past research has often emphasized the dysfunctional aspects of majority influence (Asch 1951, Cialdini 2001, Janis 1982), our research shows some of its decidedly positive consequences. In particular, by offering group members certainty, the presence of an influential majority enables group cohesion. Second, these effects are particularly pronounced when groups contain stable majorities. Rather than considering majority influence in broad strokes, this finding develops more nuanced predictions about how majorities operate as a function of their size and power. Consistent with past research (Latané and Wolf 1981, Prislin and Christensen 2005), we show how unstable majorities struggle to provide groups with certainty and cohesion.

Both of these arguments characterize groups as providers of certainty and identify majority influence as a key instrument. Our research suggests that odd-sized groups are more likely than even-sized groups to offer members

clear power arrangements and direction, meeting their members’ basic needs for certainty (e.g., Heider 1958, Hogg and Abrams 1993) and encouraging them to cohere together.

## Limitations

Although this paper draws from decades-old groups research that hints at an even/odd effect, these findings nonetheless represent a preliminary exploration of this complex but understudied issue. Therefore, we have deliberately defined specific and narrow conditions under which odd and even effects occur. However, a more parsimonious even/odd theory seems elusive, because member status (Thomas-Hunt and Phillips 2003), issue structure, and salient decision rules (Hastie and Kameda 2005) likely all moderate the effect. Further research should directly manipulate these factors to better understand crucial moderators.

Likewise, although this paper restricts the conclusions to the small group sizes that we have studied empirically, the theoretical principles we identify could generalize to other group sizes. To best address this issue, we refer to past research that has found even/odd effects when comparing six- and seven-person groups (Bales and Borgatta 1955). Further, supportive evidence for the more nuanced predictions within our theoretical framework comes from O’Leary and Mortensen’s (2010) recent findings among six-person groups. Consistent with their findings, our theory predicts negativity among balanced three-versus-three groups and four-versus-two groups, where one change (i.e., 17% of the group) produces deadlock and causes the majority to lose power. Also consistent with their findings, we predict cohesion among five-versus-one groups, where a power shift is daunting because two people (or 33% of the group) must change sides.

This research emphasizes how groups experience uncertainty once they fracture rather than how they tend to fracture in the first place. Murnighan (1978) cited several studies that indicate that quads tend to split into two-versus-two groups (Shears 1967, Willis 1962) rather than into a three-versus-one coalition. Further research should consider how groups naturally split into particular coalition structures. For instance, how decisions are framed (e.g., yes/no) could influence these processes. Additionally, when decision rules involve majorities and pluralities, we expect that people would fracture into two coalitions rather than multiple smaller coalitions (Duverger 1972). Finally, coalition structures might emerge through managerial choices. When managers compose teams that are geographically dispersed in three locations, for instance, they might unintentionally create a three-coalition structure (O’Leary and Mortensen 2010, Polzer et al. 2006).

Although our primary argument emphasizes the uncertainty that arises from mathematical proportions, group members can experience other sources of uncertainty. As

we alluded to in Study 1, following Phillips (2003), we expect that more uncertainty would arise when homogeneous groups disagree, because people feel comfortable when they agree with those who are similar and disagree with those who are dissimilar. Thus, manipulations of identity (both the salience of the group's identity as a whole and the salience of within-group categories; Gaertner and Dovidio 2000) offer one way to vary uncertainty and moderate the even/odd effect. Although Study 1 examined ethnic heterogeneity that naturally occurred within roommate groups and Study 3 manipulated opinion heterogeneity, we did not directly manipulate social identity (Tajfel and Turner 1986). Priming within-group distinctions (race, gender, interests) should heighten uncertainty, weakening both majority influence and even/odd effects.

### Managerial Implications

*Expectations vs. Preferences.* As mentioned in the Introduction, language and culture imbue evenness with positive associations. As such, people might be more likely to create even-sized groups. For instance, marketers frequently sell products in even numbers (e.g., dishes, eggs, and baked goods) and might be well served in doing so because of the intuitive appeal of symmetry and balance. However, our research suggests that if people also compose social groups in even numbers, the outcomes could be more problematic.

Because of their negative associations with respect to oddness, people could also feel especially apprehensive when they enter odd-sized groups. When we presented this research at a conference, one professor observed that her daughter, an incoming college freshman, worried because the university had assigned her to a three-person dorm room. These expectations could affect how people explain and resolve conflict. For instance, if people in odd-sized groups expect conflict, they may emphasize situational rather than personalist attributions, which make conflict more easily resolvable (Morris et al. 1999).

Finally, people's expectations affect coalition strategies. If people assume that balance benefits groups, they might join weaker powers to create a countervailing force rather than *bandwagoning*, i.e., joining stronger parties to dominate weaker parties (Walt 1987). Although people might predict that balance leads to positive outcomes, these findings suggest that they actually prefer to interact within unbalanced coalitions.

*Designing and Forming Effective Groups.* The key implication of this research is that it is possible to manage a group's psychology (e.g., uncertainty, relational outcomes) through its size and coalition structure. Knowing a group's size could help predict the distinct dysfunctions that tend to emerge. Four-person groups might feel uncertain about their direction, whereas three-person groups may feel overly certain—suffering from group-think (Janis 1982). Perhaps the four-person group would

then benefit from “repairs” (Heath et al. 1998) such as assigning an expert to help resolve disputes, whereas three-person groups would benefit from introducing a devil's advocate (Janis 1982). Further, managers might selectively deploy three-person groups for tasks that benefit from harmony (e.g., implementation) and four-person groups for tasks that benefit from uncertainty and debate (e.g., brainstorming; Janis 1982, Peterson and Nemeth 1996, Sutton and Hargadon 1996).

Finally, in contrast to traditional group interventions such as discussing conflicts directly or enhancing morale through team-building activities, changes in group size offer a relatively simple and subtle means to alter group relationships (Moreland et al. 1996). For instance, although research has emphasized the challenges that newcomers face (Gruenfeld et al. 2000, Levine and Moreland 1991), adding newcomers to a deadlocked even-sized group could turn it into an odd-sized group and encourage conflict resolution through majority influence. Conversely, if a group relies on majority influence too readily, removing or adding a member can alter its makeup and increase debate.

### Conclusion

This research extends Simmel's (1950) theories about dyads and triads to odd and even small groups more generally. A simple quantitative feature—the group's even or odd size—powerfully shapes the dynamics that emerge. Indeed, precisely because odd-sized groups aren't evenly balanced, people within them frequently cohere, whereas people in even-sized groups are often at odds.

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### Endnotes

<sup>1</sup>Member characteristics can also attenuate majority influence and hence, even/odd effects, if they cause some members to exert more or less power than a single person would otherwise. For instance, if certain people hold leadership positions, veto power (Murnighan and Roth 1978), or status based on demographic characteristics, expertise, personality, tenure, or attractiveness (Ridgeway 1991), or hold strong opinions, they exert disproportionate influence on decision making (Thomas-Hunt and Phillips, 2003) and can impose conformity without majority influence, so that even/odd size becomes irrelevant. By contrast, people who are less influential, either because of their low status or weak opinion strength (e.g., neutral people who might not participate in coalitions), can similarly mitigate odd/even effects. Majority influence could likewise decline

in diverse groups if demographically diverse people feel less compelled to conform to the social majority, an issue we consider in Study 1 (Phillips 2003).

<sup>2</sup>We also explored the likelihood of subgroups of students to remain together as a function of odd and even group size. We performed an ordinal regression with the dependent variable being whether no, some, or all group members stayed together. The independent variables were the same as above. We did not find even/odd differences using these more nuanced categories;  $B = 0.26$ ,  $SE = 0.27$ , n.s.

<sup>3</sup>This unpredicted effect suggests that demography might importantly interact with even/odd group size. So far, our theoretical model has only suggested that uncertainty arises from the numerical proportion of the group that minorities must sway. However, past research shows how uncertainty also arises from demography (Phillips 2003). Because people feel more uncertainty when they disagree with similar people than with diverse people (Heider 1958, Phillips 2003, Phillips et al. 2004, Wittenbaum and Stasser 1995), homogeneous odd-sized groups should be especially cohesive because people are more likely to conform to a homogeneous majority. Such processes suggest a richer theory that moves beyond simple proportions and considers how structure and demography interact to influence people's social psychological motivations within groups.

<sup>4</sup>Further research should more precisely specify relationships between majority group members to capture the dynamics within each coalition structure. To preliminarily explore this issue, we examined racers' perceptions of group cohesion (excluding dissenters). Consistent with our theorizing about the cohesiveness of two-versus-one majorities, they indeed reported higher group cohesion than racers in the other groups (three versus one,  $F(1, 48) = 14.57$ ,  $p < 0.01$ ; two versus one,  $F(1, 37) = 6.69$ ,  $p = 0.01$ ; three versus two,  $F(1, 50) = 6.48$ ,  $p = 0.01$ ) and marginally higher cohesion than the four-versus-one group;  $F(1, 60) = 3.38$ ,  $p = 0.07$ . Racers in the four-versus-one group reported greater cohesion than racers in three-versus-one groups;  $F(1, 64) = 4.75$ ,  $p = 0.01$ . No other significant comparisons emerged.

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