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**Supporting material:**



**National Diversity Under Pressure: Group Composition and Expedition Success in  
Himalayan Mountaineering**

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**4/4/13**

## **National Diversity Under Pressure: Group Composition and Expedition Success in Himalayan Mountaineering**

### **Abstract**

Understanding how a task group's demographic composition influences its effectiveness requires considering situational demands. We explore this insight in a high-pressure situation, Himalayan mountain climbing. We hypothesize that the distribution of members' nationality within climbing expeditions is a meaningful basis for ingroup categorization, and that national heterogeneity within expeditions is associated with intragroup competition manifested through climbers' propensity to take more risk to reach the summit. We test this hypothesis using an archival dataset comprised of 2,756 non-commercial Himalayan expeditions undertaken from 1950 to 2010. Our results show that nationally diverse expeditions are more likely to experience a climber injury or death but also that a greater proportion of their group will reach the summit of their target mountain. We also conduct individual level analyses to better understand how relative demography—being part of a more or less heavily represented nation in the expedition— influences climbers' likelihood of being injured or killed and summiting. We discuss the implications of our findings for group demography research and consider how they might extend to work groups that operate in other types of high-pressure environments.

Organizational scholars have developed theories to help understand the relationship between work groups' composition and their collective outcomes (e.g., O'Reilly, Caldwell, and Barnett, 1989; Smith et al, 1994). This research has uncovered conflicting findings, with some studies showing that diversity is beneficial to groups and others that diversity reduces effectiveness (e.g., Mannix and Neale, 2005; Joshi and Roh, 2009). Two primary theories have been used to frame this research: self-categorization theory (Turner, 1987), which suggests that demographic diversity increases the salience of attributes that differentiate members, thereby reducing cohesion and coordination (e.g., Hogg and Terry, 2000), and the informational view, which focuses on how diversity increases access to non-redundant information and perspectives, thereby enhancing group performance (e.g., Jehn, Northcraft and Neale, 1999; Reagans and Zuckerman, 2001).

Many researchers have suggested that addressing the tension between the self-categorization view, often considered a pessimistic perspective on diversity, and the information approach, which is more optimistic in its orientation, requires greater attention to situational details (Williams and O'Reilly, 1998; Johns, 2006). Some researchers have gone so far as to suggest that theory and practice would be more informed if scholars abandoned the search for direct links between diversity and performance and instead focused on analyzing certain types of diversity within specific social contexts (van Knippenberg, De Dreu, and Homan, 2004). Identifying how contextual characteristics influence group composition and effectiveness is critical because it may uncover more predictable social psychological processes (Carpenter, 2002) while enabling researchers to more consistently anticipate the relationship between group composition and group outcomes (e.g., Chatman and O'Reilly 2004). In particular, identifying demographic attributes that are likely to be relevant in specific contexts may not only increase our ability to

predict which social categories will become a basis for differentiation but also help determine whether the informational variation that is presumed to exist as a result of demographic diversity will be relevant—and thus beneficial—to accomplishing the group’s objectives. Unfortunately, as Joshi and Roh (2009) note, researchers have been insufficiently attentive to such situational considerations.

We investigate groups in the somewhat unusual context of Himalayan mountaineering. We focus on this setting for two reasons. First, we suggest that high pressure situations involving significant consequences provide a revealing picture of human responses to demographic differences—responses that may be devoid of the politically correct editing that often permeates ordinary social exchange (Gardner, 2012). At the same time, pressure is a nearly ubiquitous feature of socioeconomic life (Perlow, 1999). At some point during the course of their careers most workers will experience periods of intense job-related pressure (Beehr, 1995) and thus, understanding how group composition affects group performance under such conditions is useful theoretically and practically.

We begin by discussing the importance of social context for the value-in-diversity debate. Accordingly, we evaluate the impact of high-pressure situations generally, and Himalayan mountaineering specifically, on climbers’ cognitive load and propensity to focus on dimensions of their team’s demographic composition. We then use the self-categorization and information/decision making perspectives to identify climber nationality as a significant attribute in this context, and we consider how the intra-group competition derived from nationality diversity may influence expedition success. Our hypotheses address the primary indicators of effective performance in this context—safety (concluding the climb without climber injury or

death) and summiting (reaching the top of a mountain)—using archival data that tracked 2,756 non-commercial expeditions undertaken between 1950 and 2010.

### **WHICH DIFFERENCES MAKE A DIFFERENCE? IT DEPENDS**

Demography scholars drawing on the self-categorization perspective suggest that people automatically use observable symbols of identity—such as gender or race—to categorize and favor ingroup members (e.g., Pelled, Eisenhardt, and Xin, 1999). This process can reduce social cohesion and increase conflict within demographically diverse groups, causing them to perform worse than their homogeneous counterparts on some types of tasks (e.g., Abrams et al., 1990). In contrast, the information perspective suggests that diverse groups of people possess a wider breadth of experience, resources, and insight that enhances performance, particularly on creative or cognitively challenging tasks (e.g., Triandis, Kurowski, and Gelfand, 1994; Ely and Thomas, 2001). As Loyd and her colleagues (2012) noted, researchers who make this link often presume that informational or experiential diversity corresponds, at least to some extent, with demographic diversity.

Self-categorization theory defines an attribute as salient if it influences a focal person's perceptions and behavior or others' perceptions of and behavior toward the focal individual (Turner, 1987: 36). This level of generality is problematic because while any demographic characteristic can reasonably be positioned as salient by influencing how a person or a group perceives or treats a focal individual (e.g., Brewer, 1981), such characteristics are subject to a hierarchy of relevance that can vary dramatically across social contexts. For example, Chatman et al (1998) demonstrated a functional antagonism between demographic attributes and organizational culture such that certain cultural norms (collectivism) reduced the salience of differences among members on certain demographic attributes (sex and race). And Homan and

her colleagues (2008) showed that crossing demographic attributes with rewards led mixed-sex teams to prioritize a superordinate team-based identity rather than gender-based identities. Such evidence challenges the assumption that easily accessible demographic attributes are equivalent to one another in their impact on groups.

The information perspective has been guided by Triandis and colleagues' (1965: 33) logic that heterogeneous groups have access to a broader range of information, which is useful both for problems having multiple solutions and those with one correct solution: in both cases, "heterogeneous groups are more likely to 'hit' this solution than are homogenous groups." More recent studies have attempted to advance this view by focusing on the processes that amplify or attenuate a group's propensity for elaborating task-relevant information (e.g., Argote and Ingram, 2000; Wiersema and Bantel, 1992). Yet, as with the salience of demographic traits, the relevance of this presumed informational variation is contingent on contextual characteristics such as the group's objectives and the structural constraints of the group's social environment. Without specifying the attributes that are most likely to generate diverse information and perspectives on relevant tasks, it is less likely that researchers will find connections between diversity and group outcomes (e.g., van Knippenberg and Schippers, 2007). In the section below we evaluate the high-pressure context of Himalayan mountaineering so that we are able to subsequently predict which demographic attribute is likely to become salient and the nature of information it provides to climbers.

### **Social Category Activation Under Pressure**

Pressure has been characterized as, "any factor or combination of factors that increases the importance of performing well on a particular occasion" (Baumeister, 1984: 610). The high-pressure context of Himalayan mountaineering is relevant to understanding how group



composition influences group outcomes for two reasons. First, the existence of pressure suggests that the outcomes produced by a group's collective effort are substantively important (e.g., Pearsall, Ellis, and Stein, 2009). In the case of mountaineering, most climbers train for years before attempting a serious Himalayan peak, as the conditions are grueling and life threatening even for the most capable climbers (Tarbox, 2012). Second, and perhaps most important, high-pressure, stress-inducing situations, whether in the context of general social interaction, work groups, or climbing expeditions, may influence cognitive processes similarly. Pressure narrows members' cognitive processing abilities (e.g., Staw, Sanderlands, and Dutton, 1981; Richeson and Trawalter, 2005) and reduces their ability to translate expertise into task-relevant behavior (e.g., Steele, Spencer and Aronson, 2002; Ellis, 2006).

In effect, situational pressure can cognitively overload people, who adjust by limiting their attention to one or two salient attributes (e.g., Gladstein and Reilly, 1985). For example, the Navy Cadets studied by Driskell, Salas, and Johnston (1999) exhibited an increase in self-focus and a corresponding loss of team-level perspective during a stressful simulation, which reduced group performance. Bigley and Roberts' (2001) and Klein and her colleagues' (2006) offer evidence of the cognitive and physiological strain that high-pressure environments place on fire fighters and surgical trauma teams, respectively. Pulling people from burning buildings or using the "jaws of life" leave "few cognitive resources available for the situational awareness demanded by mutual accommodation" (Bigley and Roberts, 2001: 1291).

Research in management and psychology has long characterized individuals as limited information processors, even under ideal conditions (Simon, 1956). In addition, people find it particularly difficult to evaluate others in terms of multiple category memberships (Rosch, 1975;

Zuckerman et al, 2003). Taken together, this logic suggests that under pressure, group members will classify one another on the basis of one or a very few obvious or accessible attributes. This is consistent with research that views social categories as hierarchically organized, such that those at the top of the hierarchy are more likely to be activated, contingent on situational specifics (e.g., Hughes, 1971; Stryker, 1987).

It is also likely that the attribute that becomes the basis for categorization will not necessarily be the one that is most directly relevant to the group's task. Gardner (2012) conducted a study of how high-pressure situations influence team performance and found evidence for a "double-edged sword"; while pressure increased work groups' motivation to succeed, it also affected the type of expertise on which groups relied. Specifically, in the consulting context that Gardner studied, groups under pressure favored members who could provide general expertise over those with potentially more relevant domain-specific expertise. Although Gardner (2012) did not focus explicitly on group composition, her finding is relevant to demography research as it suggests that members of groups in high-pressure situations may favor attributes in their teammates that are more accessible but not necessarily related to task success. Supporting this logic, Chatman and colleagues (2008) conducted a laboratory study of mixed-sex groups, and found that women and men who were in the numeric minority of their work group were viewed by their teammates as performing less well on tasks that were less typical of their gender (e.g., men and verbal tasks) even when the focal man or women had significant expertise on the counter-stereotypic task.

Thus we suggest that under pressure, cognition will be taxed and group members will attend to a smaller number of demographic attributes, or even a single attribute, to categorize others into ingroups and outgroups. We also suggest that the attribute that becomes salient may do so on the basis of accessibility and stereotypic congruence, as opposed to potentially more germane

information about task expertise that is correspondingly more difficult to elucidate. We next consider nationality as a primary salient attribute in Himalayan mountaineering.

### **The Case for Nationality as a Salient Demographic Category in Himalayan Climbing**

Scholars have shown that common membership within a superordinate identity such as nationality can reduce the salience of subordinate differences and increase the likelihood that a person will be considered an ingroup member (Hewstone, Rubin, and Willis, 2002). Research has also suggested that when task group members vary in their nationality, nationality is likely to serve as the primary basis of differentiation regardless of the distribution of ancillary demographic attributes such as sex, race, or educational attainment (e.g., Hambrick et al., 1998; Dahlin, Weingart, and Hinds, 2005).

Two primary psychological mechanisms underlie this link. First, nationality often determines communication patterns and interaction styles (Mesquita and Frijda, 1992; Earley and Mosakowski, 2000: 29). Second, nationality and culture influence personality and behavior more generally (e.g., Gelfand et al, 2002). For example, McCrae and his colleagues (2010) showed that personality attributes among young adolescents were more similar within than across national cultures. And Liu and colleagues (2012) showed that people from the same nationality shared certain mental models, or psychological representations of a situation, and that these representations substantively influenced negotiation outcomes.

To this general reasoning, we add two specific explanations for why nationality may be the most salient demographic attribute in the context of Himalayan mountaineering. First, anthropological investigations of Himalayan mountaineering suggest that nationality is a distinguishing characteristic among climbers. As Ortner (1999: 33) describes, “National differences are quite

salient in Himalayan mountaineering in a number of ways ... Do the British, or the Americans, or the Germans, or the Koreans organize expeditions differently, and / or treat the Sherpas differently because of their own cultural styles? It is certainly the case that both [climbers] and Sherpas *think* these are relevant factors; almost everyone has his or her own stock of ethnic and national stereotypes about everything from expedition food to gender to authority relations.”

Second, climbers’ nationality is amplified because Himalayan mountaineering has traditionally involved a strong national orientation in which climbers, typically sponsored by their home country, seek glory not only for themselves but for their countries as well. Earlier expeditions were labeled in terms of their national identity, for example, “The British Mount Everest Expedition,” the “German Kangchenjunga Expedition,” and the “Japanese Dhaulagiri Expedition” (Ortner, 1999: 32). The history of mountaineering is replete with examples of expeditions that were undertaken for purely nationalistic purposes. For example, the 1934 German expedition to Nanga Parbat, the ninth-highest mountain in the world, was financed by the Nazi government in an overt effort to demonstrate German superiority to the world (Neale, 2002). Similarly, Hansen (1995: 322) describes how mountaineering became intertwined with the impulses of Victorian imperialism, demonstrating the vigor of the British national character to foreigners and legitimizing “exploration and the broader imperial expansion by transforming imperialism from an abstraction into something tangible and readily accessible to ambitious professional men.” More recent examples include Poland’s concerted effort to achieve more consecutive winter eight-thousander ascents than any other nation and a Nepalese climber’s attempt to become the youngest to ever summit Everest because he believes that Nepal should hold all the records pertaining to the world’s tallest peak (Szalay, 2010).

If national diversity is salient within expeditions, how might it affect climber interaction? Brewer

(1981: 356) has shown that the reflexive liking engendered by ingroup categorization “can serve as a rule for defining the boundaries of low-risk interpersonal trust that bypasses the need for personal knowledge and the costs of negotiating reciprocity with individual others.” This trust is based on shifting from the personal level to the social group level of identity, and enables people to engage in depersonalized trust based only on category membership. The presence of this trust, and corresponding feelings of familiarity and liking that a shared social identity promotes, make it more likely that climbers of the same ingroup will be more attentive to one another’s well-being under duress (Driskell, Salas, and Johnston, 1999; Chattopadhyay and Tluchowska, 2004).

These social dynamics are likely manifest in several ways that contribute to the coordination, cohesion, and therefore the safety of mountaineering expeditions. Specifically we expect that, compared to those in more nationally heterogeneous groups, climbers in nationally homogenous expeditions will perceive themselves as ingroup members and will be more invested in one another’s safety by, for example, sharing useful information with colleagues (Makela, Kalla, and Piekkari, 2007) and ensuring the welfare of their climbing group (Chattopadhyay, 1999). Though our data do not allow us to directly measure specific supportive actions undertaken by teammates within climbing groups, the institutional details of our research setting suggest that relevant behavior includes being more vigilant in monitoring each others’ oxygen regulation, equipment use, nutrition, hydration, and perhaps most importantly, being attentive to symptoms of hypothermia and altitude illness in others, which often manifest as exhaustion and are easily overlooked yet present the greatest threat to human safety in Himalayan mountaineering. Such attentiveness makes the climb safer for those at risk by increasing the chances that other climbers will come to their aid and even potentially forego their own summiting aspirations to ensure another persons’ safety (Henley, 2012). More formally, we predict that:

**Hypothesis 1 (H1):** Mountaineering expeditions that are more homogeneous with respect to nationality will be less likely to experience a climber injury or death than will expeditions that are more nationally heterogeneous.

### **The Benefits of Intragroup Competition**

In addition to the negative effects of diversity, it is also possible that reflexive ingroup categorization can produce a competitive effect that boosts performance by motivating people to expend greater effort to do better than outgroup members (Erev, Bornstein, and Galili, 1993; Lount and Phillips 2007). For example, Kilduff, Elfenbein, and Staw (2010) found that rivalry among NCAA basketball teams was associated with better performance derived from competing players expending more effort to beat each other. Similarly, Worchel et al (1998) demonstrated that individuals in groups worked harder and performed better on a task when working in closer proximity to another team.

Thus, our second hypothesis suggests that diversity may in some ways enhance group performance. This relates to our first hypothesis by recognizing the tradeoff between safety concerns and intragroup competition. Specifically, we suggest that time spent monitoring or otherwise attending to the needs of a teammate on the basis of common ingroup membership is time not spent pushing harder or taking more risks to get to the top of the mountain. Thus, it follows that expeditions that benefit from the safety-enhancing effects of nationality homogeneity are likely to suffer with respect to their collective summiting accomplishments. More formally, we predict that:

**Hypothesis 2 (H2):** Mountaineering expeditions that are more homogeneous with respect to nationality will demonstrate a lower propensity to reach the summit of their target mountain than will expeditions that are more nationally heterogeneous.

## **METHOD**

### **Empirical Setting**

The Himalayan mountain range, which stretches across Pakistan, India, Nepal, Tibet, and China, includes the world's most imposing peaks. It contains one hundred mountains that are over 7,200 meters high, eight of the world's 14 "eight-thousanders," and Mt. Everest, the tallest mountain on Earth. This unparalleled concentration makes the Himalayas the most sought-after destination for accomplished climbers. Expeditions are exceedingly difficult. In addition to the daunting physical challenge of climbing, mountaineers routinely encounter treacherous cold, violent storms, and oxygen levels that, at the highest points, are only one-third of sea level. Despite these challenges, the number of climbers making Himalayan ascents has markedly increased over the last several decades: from 114 climbers in 1970 to 749 in 2010, with the number of non-commercial expeditions more than doubling from 50 in 1982 to 129 in 2010.

The earliest Himalayan climbing, for which tractable climber data do not exist, consisted principally of British and German expeditions to Everest and Kangchenjunga during the 1920s and 1930s. Large national expeditions began to regularly attempt to climb mountains in the region beginning in 1949, when Nepal opened its borders (Salisbury and Hawley, 2007). These attempts were characterized by large expeditions that relied on a substantial number of support personnel and a sizeable amount of equipment to facilitate each ascent. Around 1970, technological advances, such as more protective clothing and more portable equipment, contributed to the emergence of a new style—termed "alpine" climbing—in which mountaineers, less encumbered by their gear, moved up and down mountains more rapidly and with fewer fixed camps. Alpine climbing consists of establishing and spending time in up to four camps at increasingly higher elevations above base camp (the primary staging area on the mountain) to

acclimatize to the effects of high altitude before making a final attempt to reach the top of the mountain from the highest camp.

## **Data and Subjects**

We used the Himalayan Database (Salisbury and Hawley, 2007) to test our hypotheses. It is an electronic compilation of Elizabeth Hawley's exhaustively detailed expedition notes. The data on expeditions and expedition members cover 60 years of climbs, from 1950-2010. In total, the dataset includes information on 34,334 climbers comprising 4,703 expeditions. Its source, Elizabeth Hawley, has for decades served as the unrivalled chronicler of Himalayan expeditions (Jolly, 2010). Hawley was born in 1923 and moved to Kathmandu, Nepal, where she began recording mountaineering expeditions as a correspondent for *Reuters*. She is the subject of a full-length biography (McDonald, 2012) and a film project entitled "Keeper of the Mountains." In her role as the preeminent modern historian of the mountaineering subculture, she subjects Himalayan climbers to a detailed interview and post-climb debrief.

Hawley has performed over 15,000 interviews both pre- and post-ascent; climbers often refer to her post-expedition interrogations as a "second summit" due to their intensity (Hansen, 2011). For example, she relentlessly details facts such as the camps and porters used, the time it took to reach the summit and the exact view from the top (Jolly, 2010: 1). In this capacity, she has also played the role of arbiter for climbers whose successes are disputed—such as the ascent in 2009 of Kangchenjunga by a Korean who was attempting to become the first woman to summit all 14 eight-thousanders—and her verdict is considered final by most within the mountaineering community (Jolly, 2010). The statistics in the Himalayan Database were edited and digitized from Hawley's records by Richard Salisbury, a climber and database expert, and they have been



used for multiple medical investigations into the antecedents of high-altitude mortality (e.g., Huey et al., 2007).

We excluded three types of climbers or expeditions from our analyses. First, 2,127 climbers are coded as *bconly*, or “base camp only,” indicating that they only signed up to climb to the base camp of their intended mountain. Climbers may elect to go only so far as base camp for a variety of reasons: they may be journalists profiling expeditions or physicians serving as expedition doctor, as well as those who simply wish to get a taste of a famed peak such as Everest without subjecting themselves to the full experience or expense. Given our interest in summiting success and the social dynamics that occur in the high-pressure environment above base camp however, we removed *bconly* individuals from our analysis. Second, we did not include solo and two-person expeditions in our analyses, consistent with typical definitions of a group as having three or more members (e.g., Kashy and Kenny, 2000). This resulted in the exclusion of 1,839 climbers across 1,225 expeditions (611 solo and 614 dyadic).

Third, we excluded commercial climbs comprising 676 expeditions and 6,253 client mountaineers. Since the early 1990s, a robust commercial market for guiding services emerged in which guiding companies charge up to \$100,000 per client to lead amateur climbers to the top of the world’s tallest peaks. Commercial and non-commercial expeditions differ substantially in the way that they are populated and their social dynamics, however, rendering them difficult to compare. In particular, commercial expeditions are formed arbitrarily with potential clients choosing which expedition to join based on features such as price, reputation, and their record of successful client summits.

The formation of non-commercial expeditions, on the other hand, is driven by strong preexisting social ties between climbers who are prominent within their country of origin or within the mountaineering culture. Jon Krakauer, an experienced mountaineer who chronicled the disastrous 1996 season on Everest in the firsthand account *Into Thin Air*, described his perspective on participating in a commercial expedition for the first time (1997: 44):

I wasn't sure what to make of my fellow clients. In outlook and experience they were nothing like the hard-core climbers with whom I usually went into the mountains ... For the most part I attributed my growing unease to the fact that I'd never climbed as a member of...a group of complete strangers. In climbing, having confidence in your partners is no small concern. One climber's actions can affect the welfare of the entire team.

Finally, recorded age, one of our control variables described below, was missing for 254 climbers. These climbers were included in calculations of the control variable for the size of their group, but their age was coded as missing for the calculation of the control variable pertaining to the average expedition age. Eight expeditions were completely missing age data, however, and since we were unable to calculate an average age for these expeditions we excluded them from our primary analysis entirely. Our final sample consists of 2,756 expeditions and 20,041 climbers spanning sixty years. Our primary level of analysis is the expedition, though we also conduct additional analyses at the individual climber level.

## **Variables**

**Dependent Variables.** We investigated two objective measures of group performance: climber injury or death and group summiting success.

*Climber injury or death.* We coded the variable “accident” as a binary indicator of whether or not each expedition suffered at least one climber injury or death. Our analysis examined accidents and injuries as both are manifestations of coordination and teamwork failures within

groups. At the group level, 23.95% of expeditions experienced at least one climber injury or death, and 4.71% of the mountaineers in our sample were injured or killed while climbing. The causes of accidents were varied. In addition to well-known dangers such as falls and avalanches, two severe physical threats to climbers are High Altitude Pulmonary Edema (HAPE) and High Altitude Cerebral Edema (HACE). In both cases, fluid forms suddenly in the respective area—lungs or brain—causing a host of symptoms such as disorientation, tachycardia, vomiting, hallucinations, paralysis, blindness, and seizure; the only known treatment is to immediately descend to a lower altitude, which is of course not always possible. These two extreme forms of altitude sickness are often thought to contribute to death even when they are not the primary cause by, for example, physically weakening and confusing a mountaineer, thereby increasing the chances that he or she will experience a fatal fall. Other common death and injury classifications include exhaustion, falling rock or ice, disappearance, non-altitude illness (e.g., heart attack), and frostbite.

*Summitting success.* To assess summiting success, we calculated the proportion of climbers in an expedition who reached the top of their target mountain. Of the 20,041 climbers in our sample who attempted to reach the top of a Himalayan peak, 5,234 (26%) successfully did so. At the group level, the average expedition summiting ratio was 28.14% with a range of between 0% and 100% of climbers within an expedition reaching the top of their mountain.

### **Independent Variable**

*National Diversity.* The data include climbers from 83 different countries. We measured heterogeneity in nationality by constructing a Herfindahl index for each expedition. The Herfindahl index is often used as a group-level measure of diversity (e.g., Herfindahl, 1950;

Harrison and Klein, 2007). Here, it measures the sum of squares of the proportion of expedition members in each nation:  $H = 1 - \sum_{i=1}^N s_i^2$ , where  $s_i$  is  $i$ 's share of nationality in the group and  $N$  is the total number of categories. So that larger numbers would be associated with greater diversity, we subtracted each expedition's Herfindahl score from 1. Within our sample, the measure ranged from 0, indicating no national diversity, to 0.86. As an example, a four-climber expedition with one Russian and three Chinese climbers would have a Herfindahl score of .375 for nationality. The Herfindahl score for national diversity averaged .12 (s.d.=.20) across the 2,756 expeditions in our sample.

### **Control Variables**

We included a variety of control variables in our analyses. First, we used a set of variables associated with climber ability. Though the data do not contain direct measures of climber ability, we were able to measure climbers' experience in the Himalayas, which given the Himalayas' status as a uniquely challenging climbing region is highly relevant. Specifically, we constructed an experience ratio, or a measure of the proportion of climbers in each expedition that had attempted at least one prior Himalayan ascent over the total number of climbers in the expedition. The average group-level experience ratio was 33.08%, with a range that fell between 0% and 100% across the expeditions.

We also calculated the average age of climbers in each expedition, since beyond some ideal age for physical conditioning, being too old or too young could reduce summiting success and increase the chances for injury (e.g., Huey et al, 2007). Average expedition age was 35.95 years (s.d.=6.51 years). Finally, we controlled for the percentage of women in each group in case there was a discernible gender effect with respect to summiting and accident propensity. At the

expedition level the percentage of female climbers was approximately 8% (s.d.=15.29%) with a range between 0% and 100% per expedition.

Two control variables addressed climber support. First, we controlled for the group's use of bottled oxygen by calculating the ratio of climbers who used it during their ascent to the total number of climbers in the expedition. Using oxygen increases a climber's probability of summiting and likely results in safer outcomes, particularly with respect to the onset of hypothermia (although according to some (Krakauer, 1997), oxygen use can paradoxically be dangerous as it encourages less experienced climbers to attempt ascents that exceed their skill level). On average, 8.07% (s.d.=21.11%) of climbers within each expedition used oxygen, with a range that fell between 0% and 100%.

Second, we controlled for each group's ratio of support personnel to climbers. Support personnel are comprised of high-altitude porters and Sherpas. Support personnel carry out critical duties, such as breaking trail and fixing rope ahead of the other climbers, as well as transporting supplies and guiding. Accordingly, a higher ratio of support personnel to climbers is likely to improve summiting success and safety. Since the distinction between Sherpas and porters was not always clear in the data set we treated all hired expedition members as support personnel and did not delineate between the two subgroups. Expeditions had an average ratio of support personnel to climbers of 10.16% (s.d.=21.01%), with a range that fell between 0 and 2 per climber.

We also controlled for the size of each expedition since group size has been shown to affect group performance (e.g., Harrison et al, 2002). In mountain climbing, for example, larger groups

can create bottleneck effects at certain points during an ascent that may influence climbers' odds of reaching the top. Expedition groups averaged 7.36 climbers (s.d.=4.60).

Finally, we used two approaches to account for the effects of the physical environment on summiting and safety outcomes. First, we controlled for the climbing season, using spring as the excluded category. The majority of ascents (94%) take place during spring or autumn, as the alternative seasons are either much colder or much windier and make climbing more difficult. Second, we included year and mountain dummy variables (fixed effects) in order to address unobserved heterogeneity between expeditions that elected to ascend certain mountains during certain time periods (Wooldridge, 2010). In other words, our models present differences in outcomes for expeditions that elected to ascend the same mountain in the same season of the same year.

We estimate the safety regressions using a Linear Probability Model (LPM), or a regression equation in which the dependent variable is binary (e.g., Waguespack and Sorenson, 2011). The LPM has the advantage of a much more straightforward interpretation than a logit model (though our results hold with a logistic specification as well). The LPM models the probability that  $Y_i = 1$  (e.g., that an expedition experiences at least one climber injury or death) as a linear function of the explanatory variables (Wooldridge, 2010: 561-563). We are primarily concerned with the response probability,

$$p(\mathbf{x}) = P(y = 1 | \mathbf{x}) = P(y = 1 | x_1, x_2, \dots, x_K),$$

which can be specified in the LPM as:

$$P(y = 1 | \mathbf{x}) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_K x_K$$

By default, the LPM violates two key assumptions regarding the error term: that it is normal and that it is homoscedastic (Allison, 2012). With respect to the first issue, our sample is large enough for the accurate calculation of  $p$ -values and confidence intervals even in the presence of an error term that is not normally distributed (Allison, 2012: 14). Regarding the second concern, we estimate and report robust standard errors to correct for heteroskedasticity. Further, because 68.84% of climbers appear only once in our sample, the serial correlation of standard errors across years is not a concern in either set of regressions.

## RESULTS

We present means, standard deviations, and correlations of our study variables in Table 1. Models 1 and 2 in Table 2 address Hypothesis 1, that nationally homogeneous expeditions will be less likely than diverse ones to suffer at least one accident in the form of a climber injury or death. Model 1 includes only control variables. Summer appears to be a marginally safer season for expeditions as compared to the omitted category of spring. Across all three models, higher average group age is marginally associated with a decrease in the probability of experiencing a climber accident. Conversely, larger groups are more likely to experience at least one injury or death.

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Insert Tables 1 and 2 About Here  
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In model 2, we included the Herfindahl index for diversity in nationality. The results of this model support Hypothesis 1, as a one standard deviation increase in diversity is associated with a significant 4.8% ( $p < .05$ ) increase in the probability of experiencing a climber injury or death.

Models 1 and 2 in Table 3 test Hypothesis 2: that, compared to nationally homogeneous expeditions, a greater proportion of climbers in nationally diverse expeditions will reach the summit of their target mountain. Model 1 provides the base equation. Interestingly, the percentage of female climbers within an expedition is not associated with the group's summing propensity across all three model specifications. Increases in average group age are negatively associated with summing success, while bottled oxygen use, a greater ratio of support personnel, and a more experienced team are positively associated with a group's summit ratio. Unsurprisingly, winter is a significantly more difficult season in which to summit than is spring.

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Insert Table 3 About Here  
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In model 2 we add the Herfindahl index for diversity in nationality. The results of this model offer modest support for Hypothesis 2, as a one standard deviation increase in diversity is associated with a marginally significant 3.4% ( $p = .07$ ) increase in groups' summing ratio.

### **Additional Analyses**

We conducted two types of additional analyses to add insight to our results. First, we examined the effects of specific distributions of nationality within expeditions. In addition, we examined the individual level effects of being more different from other climbers in an expedition with respect to nationality.

*Fine-grained analysis of national diversity.* Recall that 70% of the expeditions (1,924) in our sample are nationally homogenous. In order to gain a better understanding of the relationship between the amount of national diversity and accidents and summing success, we created dummy variables for each of the top three deciles of the Herfindahl index (70-79, 80-89, and 90-



100) representing expeditions that included climbers from multiple nationalities. The coefficients for the top three deciles of the Herfindahl therefore reflect differences in outcomes for expeditions with small, medium, and large amounts of national diversity as compared with the omitted category of nationally homogenous teams.

Expeditions in the 70 to 79 decile of the distribution typically included just one or two climbers of a different nationality and a larger number of nationally homogenous individuals. There were 274 such expeditions in our sample. A typical example can be found in the 1982 ascent of Ama Dablam by seven climbers from the U.S.A. and one from Switzerland. The middle decile (80-89) consisted of 285 expeditions. Groups in this category were moderately diverse, such as the 2010 attempt on Everest mounted by five Austrians and two Germans. The 90-100 decile is comprised of the 266 most nationally diverse expeditions in our sample. A typical example is represented by the 1984 attempt on Annapurna, the 10<sup>th</sup> highest mountain in the world and the peak with the highest fatality rate, by a group comprised of five Japanese climbers, four Czechoslovakian climbers, and one French climber. The most nationally diverse group in our sample was a 1997 attempt on Lhotse that included two climbers from the United States, two from the United Kingdom, two from Norway, one from Canada, one from Denmark, one from Australia, one from Italy, and one from Latvia.

In model 3 of Table 2 we present our analysis of the particular levels of diversity that are associated with increased risk of climber injury or death. Model 3 demonstrates that minimally diverse groups, or those in the 70-79 percentile of the Herfindahl index, are associated with a 6.4% ( $p < .05$ ) increase in the probability of an accident as compared with nationally homogenous expeditions, or those below the 70th percentile of the Herfindahl index. Further,

expeditions with a large amount of diversity are associated with a 6.3% ( $p < .05$ ) increase in the probability of an accident as compared with the same reference category. Expeditions that fall within the 80th to 89th percentile of the diversity distribution are not significantly associated with greater or lesser accident risk.

In Table 3, model 3 includes the deciles representing small, medium, and large amounts of national diversity, as compared to the omitted category of nationally homogeneous expeditions in predicting summiting success. Medium levels of diversity (e.g., the 80-89 decile) are associated with a significant ( $p < .05$ ) 4.1% increase in their summit ratio as compared to homogeneous expeditions. There is no significant effect for small and large amounts of diversity with respect to summiting propensity.

*Individual level analyses: being different, accidents, and summiting success.* Our primary analyses evaluated the relationship between an expedition's national diversity and its performance at the group level. A central tenet of our theoretical reasoning was that diverse groups would engender greater internal competition and less cooperation, thus increasing the proportion of climbers who reach the summit while also increasing the risk of injury or death. If this reasoning is accurate, an individual climber's probability of both summiting and getting injured or killed should increase to the extent that they are more nationally distinct from the rest of their climbing group. To assess this directly, we conducted analyses at the individual level, reported in Table 4.

We calculated each climber's nationality distinctiveness from the climbers in their expedition using Euclidean distance (e.g., Tsui, Egan, and O'Reilly, 1992):  $[\frac{1}{n} \sum_{j=1}^n (S_i - S_j)^2]^{1/2}$ .

Each individual  $i$ 's distance from the rest of their group with respect to nationality is calculated by taking the square root of the summed squared distance from the focal individual to each other member of the group and then dividing it by the total number of climbers in the expedition. A higher Euclidean distance indicates that an individual is more nationally distinct from the rest of his or her group. The distance score can range from zero, for individuals in nationally homogeneous expeditions, to one, for individuals who are members of expeditions in which all climbers are from a different nation. In our sample, the average Euclidean distance score was 0.19 (s.d.=0.30).

Models 2 and 4 in Table 4, respectively, include all control covariates and the independent variable measuring Euclidean distance. Both models confirm our theoretical logic: a one standard deviation increase in national distinctiveness is associated with a 1.6% increase ( $p < .05$ ) in a climber's probability of being injured or killed and a 2% ( $p < .01$ ) increase in the probability of summiting.

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Insert Table 4 About Here  
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## **DISCUSSION**

We have developed a theory about how high-pressure situations constrain cognitive capacity and specifically affect people's focus on demographic categories as the basis of ingroup-outgroup differentiation. In Himalayan mountaineering, both the institutional details and prior organizational research suggest that the distribution of nationality within expeditions is likely to be salient and influence important outcomes. Using a comprehensive data set of Himalayan expeditions over a 60 year period, we found that expeditions characterized by greater nationality diversity among climbers were more likely to experience climber injury or death but displayed a

greater summitting propensity. Our additional analyses at the individual level suggested that climbers who were more different from others in their expedition were more likely to be injured or killed and also more likely to reach the summit, suggesting that our group-level findings were substantively driven by nationally distinct members within expeditions.

Though exploratory, our more fine-grained analyses of specific levels of nationality heterogeneity supported our general findings and also revealed interesting differences among expeditions characterized by specific nationality distributions. In particular, climber accidents were more likely to occur in expeditions with only one or two nationally distinct climbers or in highly diverse expeditions. In contrast, it was groups with a medium level of diversity (e.g., two climbers from one nation and four from another) that demonstrated a significantly higher summitting propensity than nationally homogeneous expeditions. Taken together, these analyses suggest that there may not be a true risk-reward tradeoff among nationally diverse climbing groups since the level of diversity associated with accidents was not the same as that associated with greater summitting success; expeditions with a more moderate amount of national diversity were associated with greater summitting success but did not also experience a greater chance of climber injury or death. Future investigations might undertake laboratory research to control the proportions of diverse group members and fully test all possible combinations of national diversity for a certain size group in order to better elucidate the internal dynamics of such groups (e.g., Chatman et al., 2008).

There are two ways to evaluate the importance of our effects. First, our effect sizes are comparable to those typically found in multicultural research (e.g., Chen, Leung, and Chen, 2009). Of course, in the absence of random assignment of climbers into expeditions, we cannot attribute a causal interpretation to our findings. Nevertheless, we believe that the use of non-commercial expeditions represents a conservative test of our hypotheses. Because climbers likely

select into expeditions on the basis of strong prior social ties with climbers whom they trust, the fact that there is still a “nationality effect” leading to greater accident risk is a substantive finding. Second, and perhaps more important, given the nature of our measure of injury and death, these effects are unambiguously consequential.

This study makes several contributions to theories of demographic diversity and group performance. First, we have suggested that a critical step toward understanding the connection between diversity and group performance is recognizing the situational contingency of social category salience. This view is hardly novel; rather, it is reflected in some of the pioneering psychological and sociological thought on the nature of group membership (e.g., Allport, 1954; Merton, 1968). The challenge, however, is to systematically determine which traits will serve as the basis for differentiation given the composition of a group and the details of its social environment. As van Knippenberg and his colleagues (2004: 1014) note, it is surprising that researchers have not attended to the specific determinants of social category salience in greater detail. The result is a proliferation of studies that, as Spataro (2000: 3) laments, include “a somewhat arbitrarily selected (and increasingly standard) set of characteristics, often based on what is easily noticeable and measurable in the environment, rather than on what is meaningful or valued.” For example, our approach entailed a consideration of specific contextual details in order to determine which demographic characteristics would be considered meaningful within our particular research setting.

This study contributes to the value-in-diversity debate by demonstrating both the positive and negative influence of demographic dispersion. In our primary analysis, we found support that is broadly consistent with both the self-categorization and the information views of diversity. On

the one hand, greater national diversity was generally associated with higher accident risk, suggesting that climbers were less cooperative and helpful to one another in the presence of national differences. On the other hand, nationally diverse groups also demonstrated greater summiting success than their homogenous counterparts. We suggest that this pattern of results relates to internal competition in the presence of national distinctions (e.g., Lount and Phillips, 2006). This view is broadly consistent with research that examines the dynamics of identity divisions within groups (Lau and Murnighan, 1998; 2005). The primary theoretical advantage of this approach is that it does not make assumptions about the extent to which demographic diversity serves as a pipe for non-redundant information (Lawrence, 1997; Podolny, 2001), whether that information will be relevant to the group's task and therefore useful for accomplishing the group's goals, or whether individuals will be able to successfully elucidate the task-relevant and non-redundant information possessed by demographically dissimilar alters. Rather, we presume that the presence of pressure will lead individuals to consider one another in terms of a highly salient social category that may not function to provide specific information about how others are likely to perform the task at hand, but may instead be beneficial by engendering a depersonalized trust that positively affects certain relevant outcomes for the group while attenuating others (Brewer, 1981).

By positioning nationality as a superordinate attribute that is more likely to become salient in our research context we are not, however, suggesting that other demographic characteristics fail to register with group members. Our approach to identifying relevant attributes is simply a probabilistic one—we seek to assess which demographic trait is most likely to serve as a meaningful basis of differentiation for individuals in a particular social environment (e.g., Reagans, 2011). Indeed, it is possible (and likely) that all contexts are at least somewhat dynamic

in terms of demographic composition, making it important to consider both historical and present levels of diversity when determining meaningful markers of identity.

### **Study Limitations and Future Research**

A primary limitation of this study concerns the generalizability of our findings and the extent to which our results speak to the general psychological processes that contribute to group behavior under pressure. Climbers generally select into Himalayan climbing based on a longstanding passion for the outdoors and a drive to challenge themselves physically and mentally. In contrast, members of organizations often do not have the same aspirations and discretion in their work, and select occupations, at least in part, for more pragmatic reasons. That said Himalayan mountaineering is truly a high-pressure context that produces profoundly consequential outcomes. As such, it offers empirical leverage to study a level of pressure that may be difficult to unearth in the organizational context, simply because it is unlikely that organizations will open their doors to researchers seeking a granular analysis of critical outcomes during their most intense and difficult periods of operation.

On the other hand, the findings from this study might benefit from research that examines the mechanisms we have discussed in greater detail within a laboratory setting. For example, research could more precisely assess how cognitive load limits people's ability to process multiple demographic attributes in others and the extent to which multiple demographic categories can be salient simultaneously in high-pressure situations. Further, controlled experimental research could enable direct comparisons as well as possible tipping points for when more accessible but less relevant attributes (e.g., race) in others are likely to trump more relevant but less accessible attributes (e.g., expertise regarding the task at hand). Alternatively,

more finer-grained studies may be able to identify the ideal point at which social category competition ceases to benefit overall team performance and begins interfering with group performance.

A second limitation concerns the Herfindahl index, which we used to measure expedition diversity. Statistically, the Herfindahl treats all differences in nationality as equivalent regardless of the actual cultural distance between different nations. This is inexact since, for example, the social dynamics of an expedition with one Austrian climber and three Chinese climbers would likely differ from an expedition comprised of one Austrian climber and three Germans. Future research on diversity in high-pressure situations would benefit from a more nuanced analysis of which particular differences in nationality have more or less of an impact; to what extent the variation in this impact is predicated on differences in national culture; and whether a general history of antagonism or friendship between the countries in question influences group-level dynamics.

A third limitation involves our measure of climber skill. While previous experience in the Himalayas is informative, future research might attempt to construct more complete climbing histories, including climbs that occurred outside the Himalayas, perhaps for a smaller subset of mountaineers. Future research might extend the analysis of climbers' expedition history to try to understand the extent to which they have shared expedition history with others and how this influences outcomes. For example, the extent to which a common nationality serves as a proxy for the strength of social ties between climbers within an expedition could be directly tested. Further, objective physiological indicators of climber skill such as strength and lung capacity could be useful as well as climber personality attributes such as agreeableness or neuroticism, to see if these attributes reduce the impact of nationality diversity on expedition outcomes.