DECISION-MAKING PRACTICES IN ALASKA'S DYNAMIC MOUNTAIN ENVIRONMENTS: A STUDY OF PROFESSIONAL MOUNTAIN GUIDES

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ABSTRACT: Avalanche professionals make dozens of decisions each time they step into the field. The best practices for decision-making in high-risk, dynamic environments are widely researched and discussed in the community of snow professionals. Although a great deal of attention has been paid to the effectiveness of various decision-making tools and the ways in which professionals—specifically guides—differ from novices, previous research has failed to address the different ways in which male and female guides gather information and make decisions. This study sought to better understand the influence of an individual's gender identity on their decision-making and risk tolerance. A survey was administered to professionals employed by companies with concessions to guide in Denali National Park. Respondents answered questions pertaining to the factors that influenced their decision-making and risk tolerance, as well as their perceptions of those qualities in their coworkers. Responses were used to better define and understand the possibility of a "gender heuristic trap," a previously absent component of the Human Factor, and thereby contribute to a more holistic picture of the risks faced by recreationists and professionals in high-risk, dynamic mountain environments. Responses were analyzed using Excel for potential correlation between participants' genders and their decision-making patterns, as well as their perception of others' decision-making patterns. Results suggest that Denali guides do their jobs in largely the same way, regardless of gender identity. However, a large gap in numbers of male and female respondents indicates that the gender heuristic is a very real possibility.

KEYWORDS: decision-making, risk tolerance, gender

1. INTRODUCTION

Best practices for decision-making in the mountain environment are widely discussed among avalanche professionals. Previously, research has focused on practices for avalanche accident prevention (Adams 2005) and on the differences between decision-making practices of experts versus novices (Atkins and McCammon 2010).

Despite the wide array of research on both recreational and professional decision-making, a dearth of information exists on the influence of an individual's gender identity upon their decision-making practices.

This lack of insight as to gendered decision-making is perhaps due in part to the historical disparity between numbers of male and female climbers. For example, female climbers attempting to climb Denali between 1999 and 2012 have never made up more than 13% of the total number of climbers on the peak, and that percentage has frequently been closer to 7%. A survey of *The American Alpine Journal*, the American Alpine Club's annual publication of trip reports on "the world's most significant climbs," showed that between 2003 and 2013, fewer than 5% of nearly 3,300 total reports were authored by women.

No physiological reason for this participation gap appears to exist (Bhaumik et al. 2008), and phenotypic selection for ability to perform at altitude does not seem to have a correlation to an individual's sex (Huey et al. 2007).

If biological makeup does not, by necessity, prevent presence in such high-risk, dynamic environments, the historical gender gap in the mountains is apparently more tied to an individual's internal makeup than to a physical self.

Some anecdotal data on the different dynamics of backcountry ski groups made up exclusively of male participants, exclusively of female skiers, and of mixed gender has been collected (Wheeler 2008), and has suggested the possibility of a "gender heuristic trap"—the idea that a group's gender makeup and dynamic might influence the way its members make

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decisions. The definition and subsequent understanding of a gender heuristic trap is absent from our community's current understanding of the Human Factor. Thus, the goal of this research was to better understand the influence of an individual's gender identity on the decision-making process; results seek to better define the possibility of a gender heuristic trap.

2. METHODS

Data were collected using a voluntary online survey made available to all guides employed by five of the six mountain guiding companies with concessions to guide on Mount McKinley in Denali National Park. Most companies had policies preventing the researcher from contacting employees directly, so permission to administer the survey to guides was first requested via the companies' respective owners. A link to the survey was then distributed to companies who granted permission.

Responses (n=48) were gathered during the spring and summer of 2014. No identifying information about guides' employers was collected. The survey was anonymous, though basic demographic information about each respondent was gathered (see Fig. 1).

2.1 Survey

Demographic information—participant's age, gender, level of avalanche training, years of professional experience, and other professional certifications—was collected at the beginning of the survey. Questions were fill-in-the-blank, or when multiple choice, an open-ended "other" option was provided.

Respondents were then asked to rank a list of ten potential factors that might influence their decision-making while guiding (see Fig. 2). The choices provided were based on the responses given by participants in an earlier pilot study, and were randomized for each taker of the survey. Respondents could replace any of the choices with a fill-in-the-blank "other"

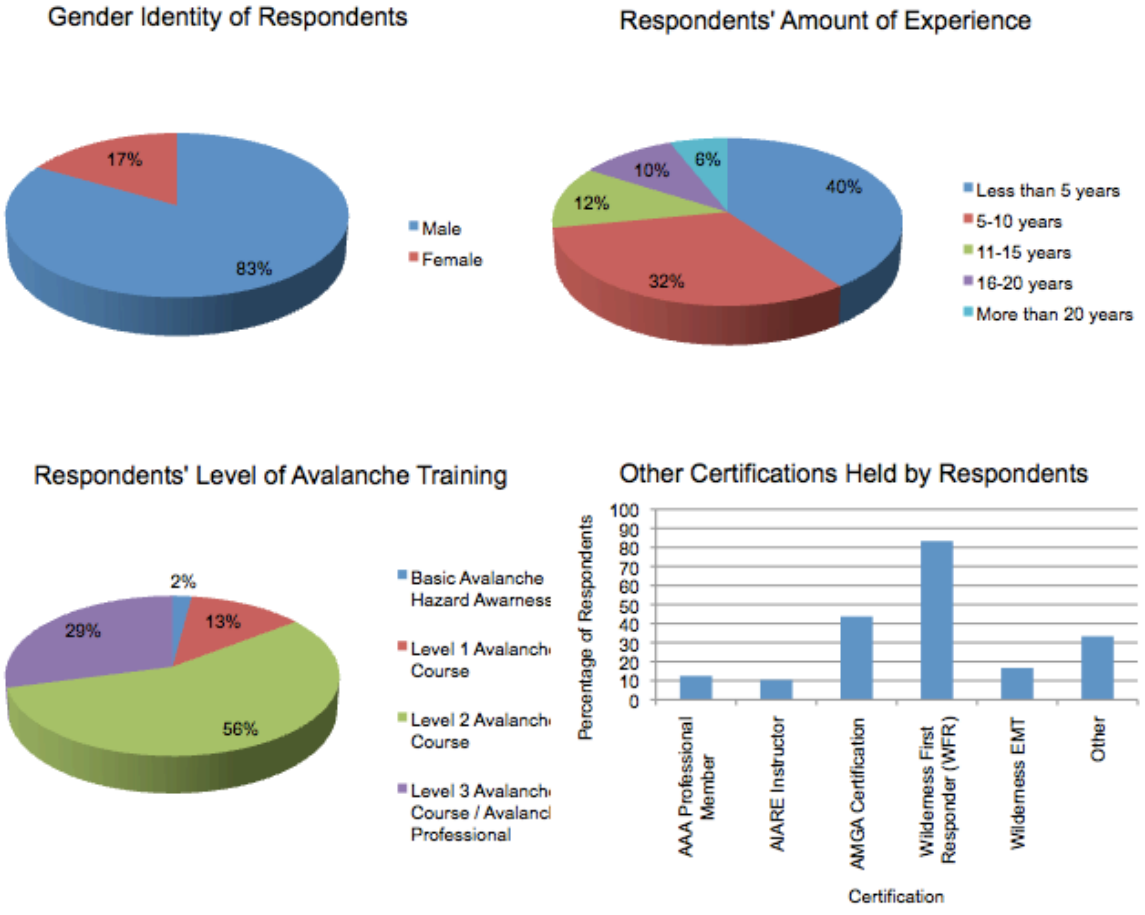

Fig. 1: Demographics of survey respondents.

Factor	Male Average	Female Average	Overall Average
(1) My own assessment of current avalanche hazard	2.65	3.29	2.74
(2) Environmental concerns	2.93	3.14	2.96
(3) Clients' skill levels, experience, and risk tolerance	4.63	5.43	4.74
(4) My own ability	5.4	4.86	5.32
(5) My personal risk tolerance	6.1	2.86	5.62
(6) Others' assessment of current avalanche hazard	6.15	6.29	6.17
(7) The protocols of my employer	6.25	6.71	6.32
(8) Time pressures	7.18	6.57	7.09
(9) Group dynamics among today's clients	7.58	7.86	7.62
(10) Clients' satisfaction	8.28	9.43	8.45
(11) Other	8.88	9.57	8.98

Fig. 2: Data table of decision-making factor rankings.

option. Guides also ranked their respective risk tolerance in personal and professional settings.

Participants were then asked to rank the heuristic traps in McCammon's classic "FACETS" acronym (2004) from most to least personally challenging.

Finally, guides were asked to envision the individual with whom they felt safest traveling in the backcountry, indicating their ideal partner's gender, experience level, age, risk tolerance, and level of avalanche training.

3. RESULTS

3.1 *Demographic information*

A total of 48 usable responses were gathered. Participants ranged in age from 21 to 57 (median age 33). Eighty-three percent of guides (n=40) were male. Professional experience levels ranged from one season to 25, with a mean experience level of 8.2 seasons. One guide was entering their first season as a professional, and another was about to begin a twenty-fifth season as a professional. Participants' collective experience totaled 395 seasons.

Most guides held a Level 2 avalanche certification (n=27, or 56%) or above (n=14, or 29%). In addition, guides had a wide variety of other certifications, including Wilderness First Responder (n=40, or 83%), an AMGA certification (n=21, or 43%), AAA professional membership (n=6, or 12.5%), and AIARE instructor training (n=5, or 10%).

3.2 *Decision-making factors*

Guides ranked a set of ten factors that might influence their decision-making while in the field from 1-10, one being the most important, and ten being the factor that least influenced their decisions. Respondents' rankings for each factor were then averaged to determine overall rankings (see Fig. 3). Because rankings closer to 1 meant a factor was more important in the decision-making process to an individual, lower average rankings indicate factors of higher overall importance. Guides reported their own

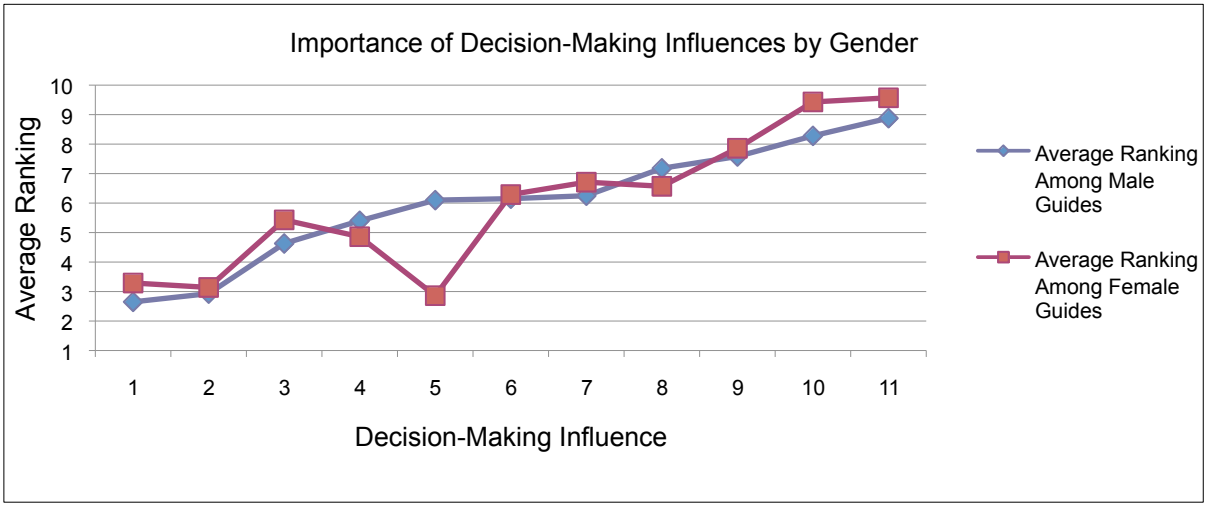

Fig. 3: Importance of Decision-Making Influences by Gender. Decision-making influences correspond to the numbered factors in Fig. 2.

personal assessments of current avalanche hazards to be the factor that most influenced their decision-making with a score of 2.74, followed closely by environmental factors (2.96).

In order to determine significant differences between male and female guides' rankings of these factors, a "male average" and "female average" were determined for each. The standard deviation was determined for both male and female rankings of that factor. Finally, a two-tailed, two-sample t-test assuming unequal variance—

$$H_0: \mu_{male} = \mu_{female} \; ; (1)$$

$$H_a: \mu_{male} > \mu_{female} \text{ or } H_a: \mu_{male} < \mu_{female} \; (2)$$

--was used to determine whether significant differences in male and female rankings of a given factor existed. P-values, calculated by the aforementioned test, were then compared to the alpha value. Any p-values lesser than the alpha value of 0.05 were considered significant.

Only two factors produced significantly different male and female averages: clients' satisfaction ($p = 0.004$) and a guide's own personal risk tolerance ($p = 0.021$).

In order to better understand the reasons for these significant differences, the authors ran a test to determine a Pearson product moment correlation coefficient, which describes the linear quality of relationships between data sets. Correlation coefficients were determined for relationships between a respondent's ranking and their age, their ranking and number of years of professional experience, and their ranking and level of avalanche training. None of these relationships produced a statistically significant relationship (values closer to 0 indicate weaker relationships) so the authors determined the coefficient of determination (r^2 value)—the portion of data whose deviance from the line of best fit can be otherwise explained—for each. Again, very small values indicated that these relationships could not be used to predict future outcomes.

Other possible explanations for these differences are elaborated upon in Section 4.

3.3 Heuristic trap susceptibility

A subsequent survey question asked participants to rank the heuristic traps in the well-known FACETS acronym (see Fig. 4). The same system was used: rankings were averaged overall, as well as for male and

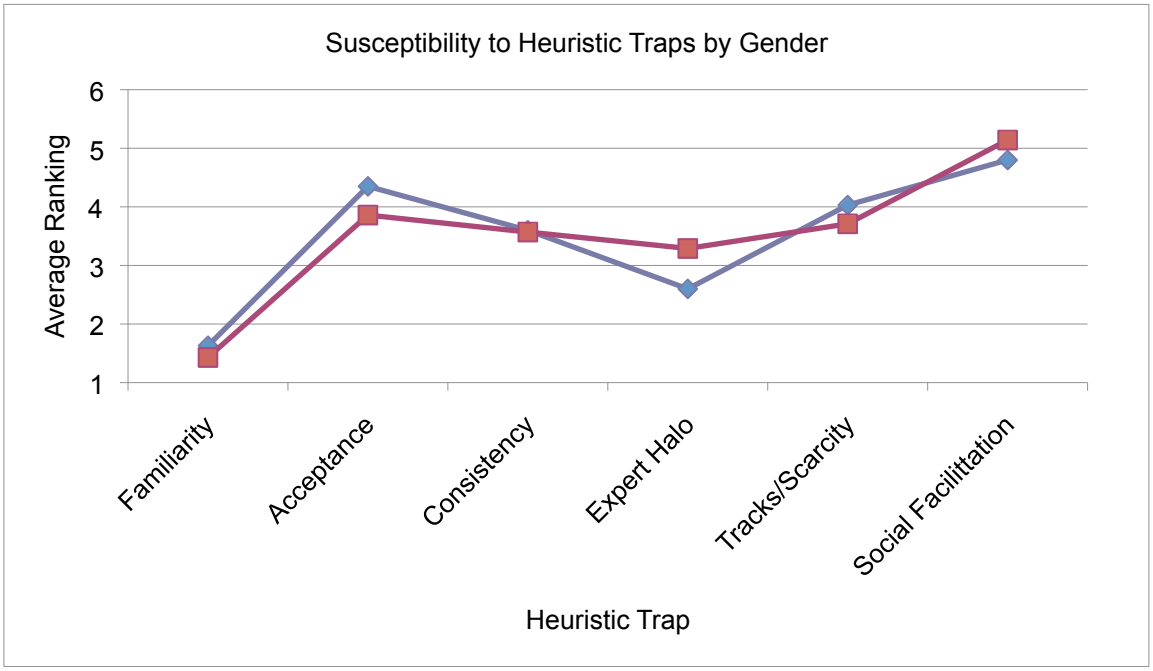

Fig. 4: Susceptibility to Heuristic Traps by Gender.

female respondents. Familiarity scored a 1.6, by far the highest score. Expert Halo (2.7), Consistency (3.6), Tracks/Scarcity (3.98), and Acceptance (4.28) are listed here from highest to lowest. Social Facilitation received the lowest overall ranking, 4.85.

Again, a two-tailed, two-sample t-test assuming unequal variance was performed to determine whether significant differences exist between male and female respondents' rankings. None of the heuristic traps produced significantly different responses based on gender.

3.4 Trusted partners

The trusted partner described by respondents was, in 87% of cases, male. Most guides reported that their partners had more experience than they did (78%), were older than the respondent (57%), had more training (53%), and had a risk tolerance similar to that of the respondent (66%).

4. ANALYSIS

4.1 Decision-making factors

The broadest deduction to be drawn from guides' rankings of decision-making factors is that male and female guides use essentially the same process to do their jobs on Denali. Certainly, a conclusion to this end is outside the scope of this research. It is unsurprising to consider that highly trained guides of the caliber to take clients on a high-altitude climb would do the same job, regardless of their gender identity.

Still, a lingering question remains: *why do male and female guides' rankings of the importance of clients' satisfaction and personal risk tolerance differ so widely?*

On average, female respondents to the survey rank clients' satisfaction as one of the least important factors in their decision-making process—the average score was 9.43, nearly the lowest possible. (Male guides gave it an overall 8.28, more than a full ranking higher.) The low overall priority given to clients' satisfaction was forseeable given the excellent reputation of the guiding outfits given concessions to guide in Denali National Park. Since each company places such an emphasis on safety, and, anecdotally speaking, is more willing to turn clients around than see them suffer injury or death, a clients' satisfaction takes a backseat to his or her safety. This mentality is not an indicator of poor "customer service," but of the burden taken on by guides of getting their clients safely up and, more importantly, down the mountain. Female guides in this study placed significantly less weight on the idea of client satisfaction than did their male counterparts.

The decision-making factor question also included an open-ended "Other" option. Nine respondents included an "Other" response in place of one of the listed factors. Five of these guides answered "Other" as their #1 ranked factor, three as #2, and one as #8. Some of these responses were broader versions of the listed factors, such as "Clients' safety" and "Managing objective and subjective hazards." One guide listed "Gut intuition" as their #1 factor and included a short explanation: "Don't disregard a bad feeling about something. No second-guessing a decision." Finally, the most unique open-ended response was that there was "no way to rank" the factors listed, elaborating, "It is all dependent on the situation." Further studies would do well to address these "Other" factors by allowing a focus group to discuss each factor in greater depth.

A guide's personal risk tolerance differed significantly among male and female respondents. Male guides, overall, ranked personal risk tolerance at 6.1, while their female colleagues gave it a much higher-priority 2.86. Again, ranking of personal risk tolerance did not appear to correlate with any significance to age, years of professional experience, or level of avalanche training. A Pearson product moment correlation coefficient test was also run to determine the possibility of a link between a guide's ranking of personal risk tolerance as a decision-making factor and the description of their risk tolerance. Again, weak relationships existed between these two factors, and the apparent determining factor for ranking of personal risk tolerance remains a guide's gender identity. Further study is needed to determine whether a gap truly exists in terms of the importance of personal risk tolerance in a guide's decision-making process.

4.2 *Heuristic trap susceptibility*

It was predicted that male and female guides would not differ significantly in their perceived susceptibility to heuristic traps. The same trend was true of both male and female guides, and because no significant differences existed between the two, no further testing was run.

Although this result fulfills the null hypothesis, the data trend is noteworthy—for both genders, Familiarity is by far the most commonly perceived weakness, ranked overall at 1.6 (the runner up, Expert Halo, is ranked at 2.7). (See Fig. 5.)

What does this mean for professionals in this context? Denali guides take clients up the same route season after season, and often more than once in a given season. This is a textbook instance of the Familiarity trap: despite changing conditions, decision-makers have a tendency to rationalize that because they are familiar with the terrain, they will not be caught in an avalanche.

While the Familiarity trend is initially unsettling, it is comforting to realize that respondents to this survey are aware of this weakness in their decision-making processes.

4.3 *Trusted Partners*

Interestingly, only male respondents reported that their preferred travel companion was female (n=6, or 12.7%). All female respondents reported a male partner as their preferred companion.

Of the preferred female partners cited by respondents, all were reported to have similar levels of experience and training to the respondent, but in 50% (n=3) of cases, were perceived to have lower risk tolerance. The other half of female partners were reported to have similar risk tolerance.

The Pearson product moment correlation coefficient was run to determine the strength of relationships between respondent gender and preferred partner gender, age, level of experience, level of training, and risk tolerance (five separate tests were run).

The strongest correlations existed between gender and partner gender (-0.16), where both male and female respondents preferred male partners, and between respondent gender and perceived partner risk tolerance (0.24), wherein male partners were perceived to have higher risk

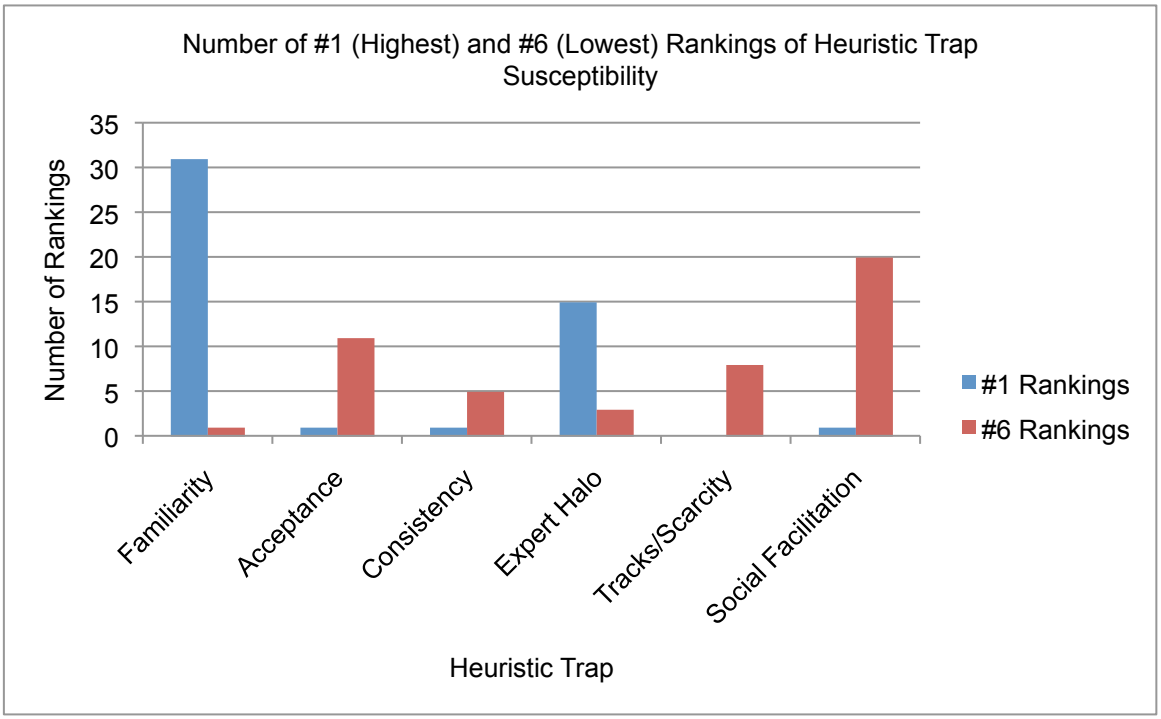

Fig. 5: Number of #1 (Highest) and #6 (Lowest) Rankings of Heuristic Trap Susceptibility. Note that Familiarity has both the most #1 and fewest #6 rankings.

tolerance.

Based on this perception, we revisited guides' responses to the questions on risk tolerance. A two-tailed, two-sample t-test assuming unequal variance was run to determine whether a significant difference existed between male and female guides' personal risk tolerance. None existed ($p=0.45$).

It is also worth reiterating that the mean average age of participants was 33, and that over half of the participants (n=26, or 54%) were 30 or older. Half the trusted female partners (n=3) were reported by respondents under 30, and four of the seven female respondents were under 30. While more research is needed to confirm this possibility, perhaps this indicates a trend of female guides being introduced to the Denali scene.

5. DISCUSSION

The overarching hypothesis for this research was that no significant differences would exist between the ways male and female guides make decisions in high-risk, high-altitude mountain environments. However, it was predicted that respondents might *perceive* that decision-making and heuristic trap susceptibility were gendered, thus indicating the possibility of a "gender heuristic trap."

Though it will take a great deal more research to confirm and fully understand the idea of a gender heuristic, this research indicates that possibility. Despite that no significant difference was present between male and female guides' perception of their own risk tolerance, male travel companions were perceived to have higher risk tolerance than female partners in this survey.

This study presented a number of challenges. Little formal research has been done with respect to the possibility of a gender heuristic trap. The rather vulnerable nature of the topic—no professional wants to appear sexist or even insensitive—meant gaining permission from guide companies to survey their employees was, at times, a formidable task.

Originally, it was intended that this study would include responses from Denali guides and mechanized ski guides operating in Alaska. The research tool did not fit well with the schedule most of mechanized guide outfits, and the response rate was so low that the responses garnered did not comprise a pertinent sample of the population, and those responses were not used as part of the data set.

Proprietors occasionally responded to research requests for permission by assuring the primary researcher that no gender gap existed among their employees. Some companies declined to have their employees surveyed for this reason.

Once permission was obtained, the survey link was sent to proprietors, who distributed the survey to their employees via email. This process may have been too long and convoluted. Additionally, the itinerant lifestyle of many guides, with much of time is spent in the field, may have been a limiting factor in the number of responses obtained.

Further research would do well to employ a different method. Focus groups, each made up of a group of guides employed by a specific outfit or of male or female guides, could provide more specific and conclusive information about decision-making processes. In-depth interviews with guides, before and after their season would also provide additional insight into the potential of a gender heuristic trap. The survey used here, as well as these suggestions, could be expanded to a larger population for more conclusive results on the decision-making process.

A number of other studies have sought to address gender differences in largely male-dominated industries. Peer-reviewed studies among engineering students and medical professionals, for example, often include much smaller numbers of female responses than male responses, and such studies typically note whether the sample is representative of the population in that way.

The limiting factors listed above meant fewer subjects—especially female guides—were reached than originally hoped, and the data presented here are inconclusive without a greater number of subjects.

Despite this seemingly tiny sample size (n=48), it is important to note that approximately 150 guides worked on Denali during the 2013-2014 season; the study reached third of the total population. As female Denali attempts comprised just 7 to 13% of total summit attempts between 1999 and 2012—the small number of female

respondents (n=8, or 17%) to this survey is representative of the guide population.

6. CONCLUSIONS

A survey of Denali guides suggests that professionals use essentially the same decision-making process, regardless of gender identity. Few notable exceptions occurred between male and female decision-making tools, and no significant exceptions were found in guides' perception of their heuristic trap susceptibility.

Despite these similarities, the vast majority of guides surveyed preferred to travel with male partners, who were reported to have more experience, training, and risk tolerance. This evidence, which requires additional research to confirm, indicates that a "gender heuristic" may exist. Still, evidence suggests that a younger demographic of female guides is being introduced to the workforce, and this influx may help to close the gender gap.

7. ACKNOWLEDGMENTS

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