Routledge
Taylor & Francis Group

Journal of Risk Research

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rjrr20

# Liking and perceived safety across judgments of distinct instances of a category of activity

Matthew B. Stephensen & Torsten Martiny-Huenger

**To cite this article:** Matthew B. Stephensen & Torsten Martiny-Huenger (2021): Liking and perceived safety across judgments of distinct instances of a category of activity, Journal of Risk Research, DOI: 10.1080/13669877.2021.1905693

**To link to this article:** https://doi.org/10.1080/13669877.2021.1905693



Published online: 03 May 2021.

JOURNAL OF RISK RESEARCH
https://doi.org/10.1080/13669877.2021.1905693



# Liking and perceived safety across judgments of distinct instances of a category of activity

Matthew B. Stephensen and Torsten Martiny-Huenger

Psychology Department, UiT The Arctic University of Norway, Tromsø, Norway

**ABSTRACT**

Prior research on the affect heuristic demonstrated that the more a person likes an object or activity, the safer and more valuable it is judged to be. That relation was found when judging stimuli at the categorical level (e.g., nuclear power, airplane travel, heart surgery). Yet risk judgments and decisions usually pertain to specific instances of an object or activity rather than their categorical representations. We examined whether the relation between liking and perceived safety holds across multiple judgments of specific instances of an activity distinguished by contextual information. In four studies ($N = 372$), participants with domain-specific experience (backcountry skiers) completed multicue risk judgments under high uncertainty (judging the avalanche risk in backcountry skiing scenarios) and reported their degree of liking the scenarios. We demonstrate that the positive relation between liking and perceived safety holds across multiple judgments of specific instances of the activity. Furthermore, the liking-perceived safety relation (i.e., judging liked slopes to be safe, judging disliked slopes to be unsafe) held among backcountry skiers who like the activity and consider it safe at the categorical level. We discuss these findings from the perspective that contextual valence and perceived risk can dynamically diverge from categorical valence and perceived risk when perceiving specific instances of that category. These findings have implications for research on attitudes toward risk in extreme sports and other high-risk activities. Although it has been proposed that participants in extreme sports like risk and the thrill it provides, we found that backcountry skiers exhibit a healthy positive relation between liking and perceived safety when judging specific instances of skiing in avalanche terrain.

**ARTICLE HISTORY**
Received 15 September 2020
Accepted 22 February 2021

**KEYWORDS**
Affect heuristic; risk judgments; decision making; uncertainty

## The affect heuristic across judgments of distinct instances of a category of activity

Standing atop a snow-covered mountain beyond the groomed slopes of a ski resort and the watchful eye of its ski patrol, a backcountry skier contemplating a ski descent is faced with the complex task of judging the risk of avalanche in a highly uncertain environment. Affective processes have been shown to play a role in a range of judgments (Blanchette and Richards 2010; Damasio 1994; Lerner et al. 2015; Loewenstein et al. 2001; Schwarz 2012; Slovic et al. 2004; Wardman 2006; Zajonc 1980) and risk judgments are no exception. Research found that the

CONTACT Matthew Stephensen matthew.stephensen@uit.no; matthew.stephensen@gmail.com Faculty of Health Sciences, Department of Psychology, UiT The Arctic University of Norway, Postboks 6050 Langnes, Tromsø, 9037, Norway.

more a person likes an object or activity, the safer and more valuable it appears, whereas the more a person dislikes an object or activity, the more unsafe and less valuable it appears (Alhakami and Slovic 1994; Finucane et al. 2000; Slovic et al. 2002). The positive relation between liking and perceived safety was found when judging categorical representations of objects (e.g., chemical plants, pesticides, nuclear power, and menopause drugs) and activities (e.g., cigarette smoking, heart surgery, airplane travel, and surfing) independent of specific contextual information, details, or constraints. Although our skier likes to ski in the backcountry and generally considers it a safe activity at the categorical level, sentiments that have certainly influenced her decision to be atop the mountain, she must now selectively attend to affective and cognitive information cues to judge the risk of her specific situation. Does the positive relation between liking and perceived safety (alternatively, disliking and perceived danger) found when judging categorical representations hold when our skier perceives a specific instance of backcountry skiing distinguished by contextual details? What the research on the liking-perceived safety relation has not adequately examined is whether that relation is dependent upon the level at which the target of judgment is perceived, be it the abstract, general level of categorical representations (e.g., backcountry skiing) or at the level of a distinct, context-specific instance of that category (e.g., skiing a specific mountain under certain conditions).

Both liking and safety can be judged either at the level of a distinct instance of an activity or at the level of a prototypical, categorical representation of that activity (Medin 1989; Yee and Thompson-Schill 2016). For example, the *category* valence of an activity is the positive or negative affective response evoked when considering a general, categorical representation of that activity (e.g., I like backcountry skiing). By contrast, we define *contextual* valence as the affective response evoked when perceiving a specific instance of that activity that is distinguished by context-specific information (e.g., I like to ski this specific mountain under these particular conditions). Research on approach-avoidance motivations and emotions found that the categorical valence of a stimulus that is (relatively) isolated from a contextual situation and the contextual motivational valence of a stimulus that is determined by contextual affordances and constraints are distinct evaluative responses that do not necessarily converge (Elliot, Eder, and Harmon-Jones 2013; Moors and De Houwer 2001). This evidence raises an important issue concerning liking, perceived safety, and the relation between the two. Although it is reasonable to assume that affective evaluations and risk perceptions can similarly differ between levels of perception, what is presently unclear is if both contextual valence and contextual perceived risk diverge from categorical perspectives in a way that defies or upholds the positive relation between liking and perceived safety.

Category-level and context-level judgments can diverge in various ways that have implications for the robustness of the relation between liking and perceived safety. It is possible that judgments of specific instances of an object or activity defy the positive relation between liking and perceived safety found for judgments of categorical representations. For example, our backcountry skier who likes that category of activity and generally considers it to be safe could maintain that category-level liking and have a similarly positive affective evaluation of a specific instance of backcountry skiing despite judging it unsafe. Or she could dislike a specific instance of backcountry skiing while maintaining her category-level perspective of safety, thereby judging the disliked instance to be safe. Both cases represent context-level judgments diverging from categorical perspectives in a way that defies the positive relation between liking and perceived safety. Alternatively, the liking-perceived safety relation found for judgments at the categorical level could hold across multiple distinct instances, despite both contextual judgments failing to converge with the established valence and perceived safety of that activity at the categorical level. Our skier might dislike a specific instance of an activity and perceive it to be unsafe despite generally liking that category of activity and considering it safe. In the present research, we tested evidence for the latter reasoning that would indicate that the positive relation between liking and perceived safety holds across judgments of specific, distinct instances of an activity.

## The conceptualization of affect

The affect heuristic theory is one of several theories that explain the role of affective evaluations in guiding judgments and decisions. The affect heuristic theory proposes that feelings of goodness or badness reflect the positive and negative qualities associated with a stimulus. Such affective responses occur rapidly and automatically before more elaborate cognitive processes occur. Consequently, people rely on these affective evaluations as a valuable and compelling orienting mechanism for quick and efficient judgments (Finucane et al. 2000; Slovic et al. 2002, 2004). Other theoretical frameworks that describe the role of affect in judgments and decisions are, for example, the feelings-as-information hypothesis (Schwarz 2012; Schwarz & Clore, 1983, 2007), the risk-as-feelings hypothesis (Loewenstein et al. 2001), and the somatic marker hypothesis (Damasio 1994). A key point on which these theories all agree is that the affective response to a stimulus influences the ensuing judgment of that stimulus. In our present research, the affect heuristic theory serves as a representative case of those various theories describing the role of affect in guiding judgments and decisions. We privilege the affect heuristic theory because our conceptualization of affect reflects the way in which it is regarded in the affect heuristic theory. The various theories describing the influence of affect on judgments and decisions disagree about how affect is conceptualized, with several of the theories regarding affect as equivalent to emotions or feelings (for a detailed discussion, see Wardman 2006). By contrast, Slovic and colleagues (2004) regard affect as "*a faint whisper of emotion*" (p. 312) rather than a complex range of visceral emotions. In accordance with the affect heuristic theory, we conceptualize affect as a generalized positive or negative response to the target of judgment. Although we align our research with the affect heuristic's conceptualization of affect, our findings are relevant for the various existing theories on the role of affect in guiding risk judgments and decisions.

## The present studies

Backcountry skiing in avalanche terrain is a useful context for examining if the relation between liking and perceived safety holds when judging specific instances of an activity. We interpret backcountry skiers' prior behavior of going backcountry skiing as indication that they like the activity and consider it safe at the categorical level. This reflects the positive relation between liking and perceived safety that Alhakami and Slovic (1994), Finucane et al. (2000), and Slovic et al. (2002) proposed under the affect heuristic theory. What is important for our investigation, however, is that skiing in avalanche terrain is objectively risky under certain circumstances (Engeset et al. 2018; Niedermeier et al. 2019). Avalanche terrain is a complex and highly uncertain environment, where poor decisions are seldom marked by valid feedback, making it extremely difficult for even the most experienced backcountry skier to judge avalanche risk (Ebert 2019; Hogarth, Lejarraga, and Soyer 2015; Zweifel and Haegeli 2014). It is therefore possible to examine whether objectively uncertain or dangerous instances of backcountry skiing are disliked and perceived as unsafe, in accordance with the liking-perceived safety relation, despite the population liking the activity and perceiving it as safe at the categorical level.

Across four studies, we presented participants with a series of specific instances of backcountry skiing scenarios. We employed a method similar to that used by Alhakami and Slovic (1994) of directly measuring valence and perceived safety. Participants judged the safety of each scenario in terms of the avalanche risk, henceforth referred to as *judged safety*, and reported their degree of liking each scenario, henceforth referred to as *scenario liking*. We define liking as a generalized positive or negative affective response associated with a stimulus (Alhakami and Slovic 1994; Finucane et al. 2000; Winkielman, Zajonc, and Schwarz 1997; Zajonc 1980). Through our use of the term liking, we distinguish our valence-based measurement of the positive-negative evaluative dimension of affect from more emotional responses such as happiness and

sadness (see Sjöberg 2006, and Wardman 2006 for a more detailed discussion). Participants in Study 1 included a mix of student participants and backcountry skiers in order to obtain a broad range of participant experience. The participant samples for Studies 2, 3, and 4 were exclusively recruited from among active backcountry skiers.

In addition to examining the liking-perceived safety relation when judging specific instances, we attempted to test the causal direction associated with the affect heuristic (see Finucane et al. 2000; Slovic et al. 2002; Slovic et al. 2004). To test whether liking influenced judged safety, we included a within-subject manipulation in each of the studies with the aim of manipulating scenario liking while holding constant the objective risk level of each scenario. We attempted to manipulate the attractiveness of the scenarios by subtly including cues that the slopes were either untracked or had recently been skied (Studies 1-3), or through a more salient manipulation of presenting the slopes in sunny, high contrast or cloudy, low contrast conditions (Study 4). Anecdotal evidence (McCammon 2002, 2004) suggests that backcountry skiers value access to untracked slopes and should therefore prefer scenarios without tracks. As for the weather manipulation, the results of pre-testing indicated that scenario photos with a background of sunny, clear blue skies were preferred to otherwise identical scenario photos with a background of overcast, cloudy grey skies. Unfortunately, the manipulations did not successfully influence scenario liking and we were unable to test for a causal effect. Nonetheless, this failure provides valuable insight into the theoretical framework that dominates avalanche research and education, to which we return in the General Discussion. Importantly, the failed manipulations did not adversely affect our main focus of presenting evidence of the positive relation between liking and perceived safety.

We confirm that at the time of writing, the four studies reported here are all the studies we conducted on the relation between liking and perceived safety. We report all measurements assessed and all manipulations implemented in each study. These studies were conducted in accordance with the ethical research protocols of UiT The Arctic University of Norway and the Norwegian Center for Research Data (NSD). Study 4 was pre-registered. The data, R script for data processing and analysis, the pre-registration of Study 4, and the scenarios used in the studies are available on the Open Science Framework (https://doi.org/10.17605/OSF.IO/VA28N).

## Study 1

In an internet-based study, a mixed sample of participants were presented four scenarios of backcountry skiing in avalanche terrain. Participants reported judged safety and scenario liking for each scenario.

### *Method*

**Participants.** Forty-six participants (18 self-identified as male, 28 as female, $M_{age} = 26$, range 18-52, $SD = 8.34$) were recruited from a psychology course (63% of participants), receiving course credit for participation, and recruited from among backcountry skiers in Norway (37% of participants). We did not conduct a priori power analysis because of the difficulty of estimating power for linear mixed models (Johnson et al. 2015; Westfall, Kenny, and Judd 2014). We instead set the minimum sample size at 40 and recruited as many participants as possible within a predefined 4-week period for data collection. We did not commence analysis before completing data collection. Participants could complete the study in Norwegian or English.

**Materials.** We conducted the study online and used the jsPsych programme (de Leeuw 2015) to control the stimulus presentation in the web browser. We developed six hypothetical scenarios each depicting a distinct backcountry ski descent on a snow-covered mountain slope (i.e., avalanche terrain, see Figure 1 for an example). Each scenario began with a description of the

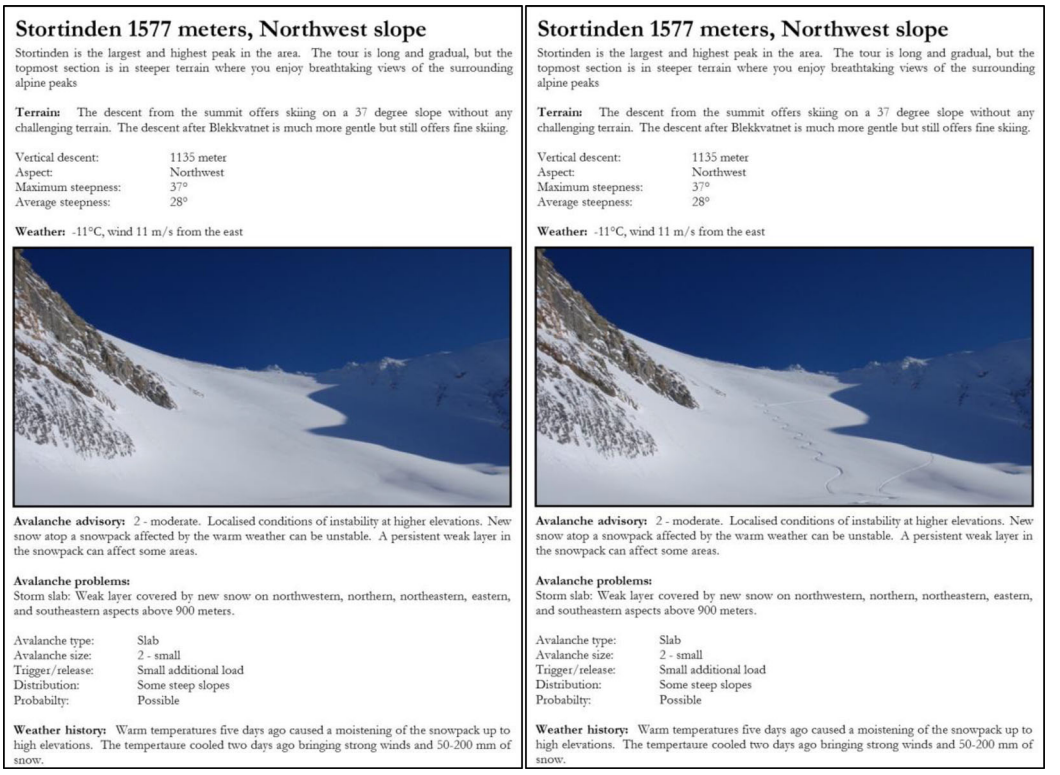


**Figure 1.** Example of the backcountry skiing scenarios judged by participants. There were two versions of each scenario: one version included ski tracks in the photo whereas the photo in the second version was untracked. Participants were presented with only one version of the scenario.

tour that included basic information on the terrain, elevation, average and maximum slope steepness, and the current weather; information that is relevant for judging the avalanche risk. We presented the tour description according to the format and content of local backcountry skiing guidebooks. A photograph of the mountain slope was located below the tour information. Beneath the photograph was the forecasted avalanche danger, the current avalanche problem(s) caused by the combination of weather and snow conditions, and the weather history. We based the content and format of the avalanche hazards information on historic avalanche forecasts from the Norwegian Avalanche Warning Service (Varsom, n.d.). We did not include any extreme indicators of either very low or very high risk levels in the scenarios; by design, all scenarios were highly uncertain. We prepared two versions of each of the scenarios—one version included the clearly visible ski tracks on the mountain slope in the scenario photograph, whereas there were no ski tracks in the photograph of the other version (see Figure 1 for an example).

**Procedures.** Participants accessed the online study via a web browser at a time and device of their choosing. All participants indicated their informed consent to participate by first checking a confirmation box and then clicking a button to proceed to the study. They were then instructed to read the scenario information and answer the questions for each scenario. The questions were presented immediately below each scenario and participants viewed them by scrolling down the web page. All the questions for each scenario were presented simultaneously on the same page and could be answered in any order.

For the safety judgments, participants answered three questions following the general statement "*Regarding the avalanche risk…*": 1) *"Is it safe to ski the slope in these conditions?"* 2) *"Is it dangerous to ski the slope in these conditions?"* 3) *"Is the snowpack stable enough to ski this slope?"* on a 7-point scale labeled "*Not at all*" and "*Very much*" at the extreme points. For the degree of liking the

scenario, following the general statement "*Regarding your desire to ski this slope, the slope appears…*" participants rated the scenario according to the following three adjectives: 1) *"Attractive", 2) "Uninteresting",* and *3) "Enjoyable"* on a 7-point scale labeled "*Not at all*" and "*Very much*" at the extreme points. A third set of three questions concerned participants' degree of confidence in their safety judgment. We measured confidence for purposes unrelated to the focus of the current article and do not investigate or discuss the measure here. Participants were required to answer all questions on judged safety, scenario liking, and confidence to proceed with the study.

Each participant judged four scenarios. The selection of four scenarios from the available six, which scenarios were presented with or without tracks, and the order of presentation were randomly determined for each participant. Upon completing four scenarios, participants reported their age and gender. Participants then reported their skiing ability, avalanche training, years of backcountry skiing experience and average number of backcountry skiing days per season, each of which was measured on a 7-point scale. For exploratory purposes unrelated to the current article, we measured participants' past exposure to avalanches and their use of backcountry ski guides. Upon completing these questions, participants were asked to answer an open question about the purpose of the study to check if they had identified the manipulation; no participant identified the manipulation.

**Data preparation and analysis.** We calculated mean scores for judged safety (3 items, the question on danger reverse-coded, Cronbach's alpha = .90, $N = 184$, $M = 3.45$, $SD = 1.40$) and for scenario liking (3 items, the question on uninteresting reverse-coded, Cronbach's alpha = .92, $N = 184$, $M = 4.59$, $SD = 1.63$) per participant and scenario. We calculated a mean experience score per participant from the measurements of skiing ability, avalanche training, years of backcountry skiing experience and average number of backcountry skiing days per season (4 items, Cronbach's alpha = .92, N = 46, $M = 3.21$, $SD = 1.88$). Two participants did not respond to all four measures of experience. We calculated their mean experience scores using the available measures for those two participants (Schafer and Graham 2002).

We used R (R Core Team 2017) and the *lme4* package (Bates et al. 2015) to fit linear mixed models to predict judged safety, estimated using maximum likelihood and Nelder-Mead optimization. We included intercepts for participants and scenarios as varying effects, thereby accounting for by-subject and by-scenario variability. We report the intraclass correlation (ICC) for the varying effect participant as an indication of the amount of variance in judged safety accounted for by individual difference between participants. Similarly, we report the ICC for the varying effect scenario as an indication of the amount of variance in judged safety accounted for by objective differences between scenarios. We used the *lmerTest* package (Kuznetsova, Brockhoff, and Christensen 2017) with Satterthwaite approximations to obtain *p*-values. After fitting the regression models, we analyzed the observations ($N = 184$, 1 observation per scenario per participant) for outliers using the *LMERConvenienceFunctions* package (Tremblay and Ransjin 2020). We excluded three outlier observations with a standardized residual value greater than 2.5 standard deviations from 0.

## *Results and discussion*

Scenario liking predicted judged safety, $b = .46$, $SE_b = .06$, *95% CI* [.34, .58], $p < .001$, with an effect size *std.* $b = .53$. Consistent with the findings from prior research (Alhakami and Slovic 1994; Finucane et al. 2000; Slovic et al. 2002), scenario liking positively relates to judged safety. The more a participant liked a backcountry ski tour, the higher that participant judged avalanche-related safety. Importantly, in contrast to prior research in which participants judged categorical representations of objects and activities, we found this relation across multiple judgments of specific instances of an activity for a range of scenario liking (1.00 to 7.00) and judged safety (1.00 to 6.33) scores. 27.9% of variation in judged safety was attributable to the

difference between participants, $\chi^2$ (1) = 15.55, indicating that participants' safety judgments were not stable but differed (72.1% within participant variance) between judgments. Moreover, 2.9% of variation in judged safety was attributable to the difference between scenarios, $\chi^2$ (1) = 2.35, indicating that each scenario did not elicit a stable judgment of safety. Judged safety varied greatly for each scenario according to subjective interpretation of the characteristics.

Student participants had less experience with both the activity depicted in the scenarios and the judgement task (63% of the sample, student subgroup $M_{experience}$ = 2.13 with a possible range from 1 to 7) than the backcountry skier participants did (37% of the sample, skier subgroup $M_{experience}$ = 5.01). Yet analysis for a moderation effect by experience indicated that an interaction between scenario liking and experience, $b = -.02$, $SE_b = .03$, *95% CI* [-.09, .04], $p = .518$, did not predict judged safety. There was no evidence that the relation between scenario liking and judged safety differed between the less experienced student participants and the more experienced backcountry skiers. Finally, the presence or absence of tracks did not influence scenario liking, $b = .00$, $SE_b = .16$, *95% CI* [-.31, .33], $p = .965$, or judged safety, $b = -.14$, $SE_b = .15$, *95% CI* [-.44, .15], $p = .344$. The failure of this manipulation to affect scenario liking made it impossible to test for causality in the liking-perceived safety relation. We next sought to replicate these findings in a study with a sample of exclusively backcountry skiers for whom the categorical valence and categorical perceived safety of the activity are established.

## Study 2

We tested the relation between scenario liking and judged safety with a non-student sample of exclusively backcountry skiers who like the activity and judged it to be safe and valuable at the categorical level. We conducted this study with the identical design, materials and procedures used in Study 1. In what follows, we only report the unique aspects of this replication.

**Participants.** Fifty-four participants (41 self-identified as male, 13 as female, $M_{age}$ = 32, range 17-54, $SD = 9.68$) were recruited among backcountry skiers in Norway. We announced the study to the attendees at two avalanche safety seminars in February 2018, inviting them to participant at any time during the following 3 weeks. The minimum sample size was set at 40, as per Study 1. There was no upper limit on the number of participants in the study; we recruited as many participants as possible during the predefined 3-week period for data collection. Participants had on average more experience with backcountry skiing and avalanche safety judgments than participants in Study 1 (Study 2, $M_{Experience}$ = 4.96 with a possible range from 1 to 7, as compared to Study 1, $M_{Experience}$ = 3.21). Notably, the topic of the seminars from which we recruited participants was improved decision-making in avalanche terrain, where they were instructed on the correct methods and potential errors when judging avalanche risk. We did not commence analysis before completing data collection. The study was conducted in Norwegian.

**Data preparation and analyses.** We prepared and analyzed the data according to the same methods reported for Study 1. We calculated mean scores for judged safety (Cronbach's alpha = .92, $N = 216$, $M = 3.34$, $SD = 1.43$) and for scenario liking (Cronbach's alpha = .89, $N = 216$, $M = 5.29$, $SD = 1.50$) per participant and scenario, and a mean experience score (Cronbach's alpha = .77, $N = 54$, $M = 4.96$, $SD = 1.11$) per participant. Two observations were identified as outliers (standardized residual value greater than 2.5 standard deviations from 0) and removed from the data.

### *Results*

Consistent with the results of Study 1, scenario liking predicted judged safety, $b = .18$, $SE_b = .07$, *95% CI* [.05, .30], $p = .008$, with an effect size *std.* $b = .20$. Scenario liking positively corresponds to judged safety across multiple judgments of specific instances of an activity, for a range of

scenario liking (1.00 to 7.00) and judged safety (1.00 to 7.00) scores. 15.2% of variation in judged safety was attributable to the difference between participants, $\chi^2$ (1) = 6.34, while 5.5% of variation in judged safety was attributable to the difference between scenarios, $\chi^2$ (1) = 5.71. Judged safety was not stable for each participant. Nor was it stable for each scenario. Analysis to test for a moderation effect by experience indicated that an interaction between scenario liking and experience, $b = -.09$, $SE_b = .06$, *95% CI* [-.22, .03], $p = .144$, did not predict judged safety. Overall, the results of Study 2 provide further evidence of a positive relation between scenario liking and safety judgments at the contextual level, qualitatively replicating the results of Study 1. Finally, unlike in Study 1, the presence of tracks increased scenario liking, $b = .30$, $SE_b = .15$, *95% CI* [.00, .60], $p = .050$, contrary to the direction of effect we predicted for the manipulation. Despite that effect on scenario liking, neither the main effect tracks, $b = .09$, $SE_b = .17$, *95% CI* [-.24, .43], $p = .591$, nor an interaction between scenario liking and the tracks manipulation, $b = .07$, $SE_b = .12$, *95% CI* [-.17, .30], $p = .569$, predicted judged safety. To investigate whether the smaller effect size in Study 2 was in any way specific to the population of backcountry skiers, we conducted a third study with a sample of exclusively backcountry skiers in a different country using new scenarios adjusted for that new population.

## Study 3

We conducted a direct replication of the previous study with a sample of exclusively backcountry skiers recruited from a different population. Participants in Studies 1 and 2 were recruited in Norway, reflecting a Scandinavian perspective on backcountry skiing and avalanche risk. Participants in Study 3 were recruited from the USA, reflecting a North American perspective on backcountry skiing and avalanche risk. Otherwise, we conducted this study with the identical design and procedures used in Studies 1 and 2 using new scenarios that were conceptually the same but adjusted to the norms of the population. In what follows, we only report the unique aspects of this replication.

**Participants.** Forty-one participants (29 self-identified as male, 12 as female, $M_{age} = 26$, range 15-50, $SD = 7.85$) were recruited via an email announcement sent to backcountry skiers in the western USA in March 2018. We obtained the email addresses from a registry of individuals who, when registering to attend an avalanche seminar, indicated their willingness to participate in studies on avalanche safety. Participants who completed the study were eligible to register for a prize draw to win one of six USD 50 gift certificates for an online store. The minimum sample size was set at 40, as per Studies 1 and 2. We recruited as many participants as possible during a predefined 4-week period for data collection. We completed all data collection before beginning analysis. The study was conducted in English.

**Materials.** We used six new scenarios of the same design as those previously reported, but with new content suited to the norms of the target population. We developed six hypothetical scenarios using measurement units (e.g., Fahrenheit), geography, tour descriptions and photographs familiar to a population in the western USA. We changed the scenario photos to depict terrain similar to that of the Rocky Mountain region from where participants were recruited. We based the tour descriptions – both content and language – on descriptions found in American backcountry skiing guidebooks for that region. We based the weather, avalanche danger forecast and avalanche problems in each scenario on historic avalanche forecasts from local avalanche warning services (Colorado Avalanche Information Center, n.d.; Gallatin National Forest Avalanche Center, n.d.; Utah Avalanche Center, n.d.). A senior avalanche researcher at Montana State University reviewed all the scenarios to ensure that their content was suitable for the target population. We did not include any extreme indicators of either very low or very high risk levels in the scenarios. By design, the avalanche risk in all scenarios was uncertain.

**Data preparation and analyses.** We prepared and analyzed the data according to the same procedures reported for Studies 1 and 2. We calculated mean scores for judged safety (alpha = .93, $N = 164$, $M = 3.07$, $SD = 1.43$) and for scenario liking (Cronbach's alpha = .84, $N = 164$, $M = 5.46$, $SD = 1.29$) per participant and scenario, and a mean experience score (Cronbach's alpha = .60, $N = 41$, $M = 3.92$, $SD = 1.00$) per participant. One participant did not answer all questions measuring experience and we calculated the mean experience score for that participant using the available measures. Two observations were identified as outliers (standardized residual value greater than 2.5 standard deviations from 0) and removed from the data.

### *Results*

Consistent with the results of Studies 1 and 2, scenario liking predicted judged safety, $b = .15$, $SE_b = .08$, *95% CI* [.00, .30], $p = .050$, with an effect size *std.* $b = .18$. Scenario liking positively relates to judged safety across multiple judgments of specific instances of an activity, for a range of scenario liking (1.00 to 7.00) and judged safety (1.00 to 6.33) scores. 20.5% of variation in judged safety was attributable to the difference between participants, $\chi^2$ (1) = 13.82, while 27.0% of variation in judged safety was attributable to the difference between scenarios, $\chi^2$ (1) = 51.74. Judged safety was not stable for each participant. Nor was it stable for each scenario. Analysis to test for a moderation effect by experience indicated that an interaction between scenario liking and experience, $b = .04$, $SE_b = .07$, *95% CI* [-.09, .19], $p = .502$, did not predict judged safety. The results of Study 3 provide further evidence of a positive relation between scenario liking and safety judgments at the contextual level, replicating the results of Studies 1 and 2. Replicating this result within a different population and with new materials indicates that the results of the previous two studies were not unique to the population or to the materials and manner in which they were presented in Studies 1 and 2. However, although we adjusted the scenarios used in Study 3 so that their content would be suited to the target population, it is possible that any unforeseen mismatch between scenarios and the real-world decision environments that are familiar to the participants could limit the comparability and generalizability of the studies.

The presence of tracks did not influence scenario liking, $b = .12$, $SE_b = .14$, *95% CI* [-.16, .40], $p = .394$. However, unlike previous studies, the presence of tracks increased judged safety, $b = .31$, $SE_b = .15$, *95% CI* [.00, .61], $p = .049$. Moreover, there is some evidence that an interaction effect between scenario liking and tracks predicted judged safety: scenario liking, $b = .04$, $SE_b = .09$, *95% CI* [-.14, .23], $p = .645$; tracks, $b = -.96$, $SE_b = .69$, *95% CI* [-2.32, .40], $p = .170$; and their interaction, $b = .23$, $SE_b = .12$, *95% CI* [-.01, .48], $p = .064$. This suggests that the relation between scenario liking and judged safety was stronger for scenarios with tracks. Nonetheless, we were unable to examine causality because our manipulation did not affect scenario liking as expected.

## Study 4

In Studies 1, 2, and 3, the questions on judged safety were presented before the questions on scenario liking. To test for an order effect, in Study 4 we counterbalanced the order of the liking and safety judgments so that half of the participants judged safety first while the other half judged liking first. Moreover, after the inconsistent effect of the tracks manipulation on scenario liking and judged safety in Studies 1 to 3, we used a more salient manipulation of weather in an attempt to affect scenario liking to test for a causal effect on judged safety. Pre-testing indicated that scenario photos with a background of sunny, clear blue skies were preferred to otherwise identical scenario photos with a background of overcast, cloudy grey skies.

## Methods

**Participants.** Two-hundred and thirty-one participants (162 self-identified as male, 68 as female, 1 as other; $M_{age} = 35$, range 19-62, $SD = 10.06$) were recruited via email announcements sent to backcountry skiers in Norway in January 2020. We obtained the email addresses from a registry of individuals who, when registering for an avalanche seminar, indicated their willingness to participate in studies on avalanche safety. Participants who completed the study were eligible to register for a prize draw to win one avalanche airbag and air cylinder. The minimum sample size was set at 105 based on a priori simulation-based power analysis using the smallest effect size measured in Studies 1, 2, and 3. We recruited as many participants as possible during a predefined 4-week period for data collection. We completed all data collection before beginning analysis. Participants could complete the study in English or Norwegian.

**Materials and procedures.** We developed four scenarios of the same design as those previously reported (all scenario photos were without tracks) for Studies 1 to 3. We prepared two versions of each scenario: the photo in one version had a sunny, clear blue sky and the mountain was brighter and in higher contrast, whereas the photo in the other version had an overcast, cloudy grey sky and the mountain was darker and in lower contrast. Each participant in the study judged four scenarios. The only fixed aspect was the ratio of two sunny scenarios and two cloudy scenarios per participant. Whether the scenarios were sunny or cloudy and their order of presentation were randomly determined for each participant. As per Studies 1 to 3, the three safety judgment questions and the three liking judgment questions were presented together on the same page below the scenario. However, the order of those question blocks was counterbalanced between participants. The three questions on rated liking were presented above the three questions on rated safety for even-numbered participants, and presented below the three questions on rated safety for odd-numbered participants.

**Data preparation and analyses.** We prepared and analyzed the data according to the same procedures reported for Studies 1 to 3. We calculated mean scores for judged safety (Cronbach's alpha = .88, $N = 924$, $M = 3.07$, $SD = 1.29$) and for scenario liking (Cronbach's alpha = .88, $N = 924$, $M = 4.94$, $SD = 1.54$) per participant and scenario, and mean experience score (Cronbach's alpha = .73, $N = 231$, $M = 4.53$, $SD = 1.08$) per participant. Nine observations were identified as outliers (standardized residual value greater than 2.5 standard deviations from 0) and removed from the data.

## Results

Consistent with our previous results, scenario liking predicted judged safety, $b = .22$, $SE_b = .03$, *95% CI* [.17, .28], $p < .001$, with an effect size *std.* $b = .26$. A higher value of scenario liking relates to a higher value of judged safety across multiple judgments of specific instances of an activity, for a range of scenario liking (1.00 to 7.00) and judged safety (1.00 to 6.33) values. This replicates the results of Studies 1 to 3. 29.1% of variation in judged safety was attributable to the difference between participants, $\chi^2$ (1) = 89.59, while 2.1% of variation in judged safety was attributable to the difference between scenarios, $\chi^2$ (1) = 17.42. Judged safety was not stable for each participant. Nor was it stable for each scenario. Analysis for a moderation effect by experience indicated that an interaction between scenario liking and experience, $b = -.03$, $SE_b = .02$, *95% CI* [-.09, .01], $p = .147$, did not predict judged safety. Analysis for an effect from the order of the questions revealed weak evidence that the order of the questions influenced judged safety, $b_{order} = .21$, $SE_b = .11$, *95% CI* [-.01, .43], $p = .067$, effect size *std.* $b = .16$. Judged safety was on average higher when safety was judged before scenario liking. More importantly, however, an interaction between scenario liking and question order did not predict judged safety, $b = -.02$, $SE_b = .06$, *95% CI* [-.13, .09], $p = .709$. There was no evidence that the order of the questions influenced the magnitude of the relation between scenario liking and judged safety. Finally,

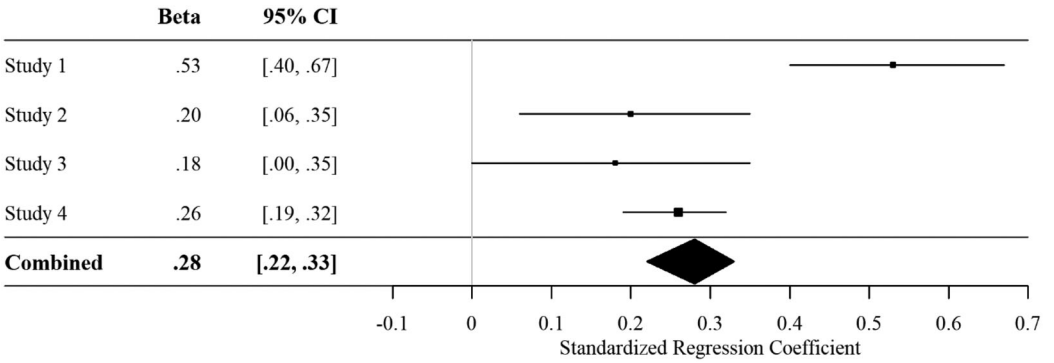


**Figure 2.** Standardized regression coefficients and 95% CI for scenario liking predicting judged safety for Studies 1-4 and the combined data.

despite being more salient than the subtle tracks manipulation used in Studies 1 to 3, the weather condition of the scenario photo did not influence judged safety, $b = .00$, $SE_b = .07$, *95% CI* [-.14, .14], $p = .988$, or scenario liking, $b = .01$, $SE_b = .07$, *95% CI* [-14., .15], $p = .915$. Failing to manipulate scenario liking as expected, we were again unable to test the causal direct of the relation between affective evaluations and risk judgments.

## Synthesis of evidence across studies 1 to 4

We used the meta-analytic *Q* test with studies as a fixed effect to assess the magnitude of variation in the effect sizes across the studies (Schauer and Hedges 2020). Although the effect parameters in all four studies are all in the same direction (i.e., there is a positive relation between liking and judged safety) with *p*-values equal to or less than the conventional inference threshold of .05 for null hypothesis significance testing, the *Q* test revealed evidence of heterogeneity of effect size, $\chi^2$ (3) = 15.42, $p = .002$, across the studies. We measured a larger effect size in Study 1 (see Figure 2). To synthesize the evidence across all studies, we combined individual participant data from the four studies (372 participants, 1472 observations) for pooled analysis to more accurately estimate the effect parameter of the relation between liking and judged safety (da Costa and Sutton 2019). As described for Study 1, we fitted linear mixed models using maximum likelihood to predict the outcome variable judged safety. To account for the heterogeneity of effect parameters between studies, we assigned a varying intercept for studies when estimating all models (in addition to varying intercepts for participants and scenarios). Analysis of the combined data indicates that scenario liking predicted judged safety with an effect size *std.* $b = .28$, $SE_b = .03$, *95% CI* [.22, .32], across all four studies. These effect parameters are identical to those obtained by calculating the average weighted effect size using the effect parameter results from each study. 23.9% of variation in judged safety was attributable to the difference between participants, $\chi^2$ (1) = 128.54, 13.2% of variation in judged safety was attributable to the difference between scenarios, $\chi^2$ (1) = 90.70, and 1.1% of variation in judged safety was attributable to the difference between studies (apart from the different scenarios), $\chi^2$ (1) = 1.00.

One might reasonably assume that the larger, heterogeneous effect size in Study 1 was caused by 63% of participants being students who had less experience with the activity depicted in the scenarios and the risk judgment task. We therefore included experience in the pooled analysis. We fitted a model with the effects scenario liking, participant experience, and their interaction to assess whether it predicted judged safety. Multicollinearity between scenario liking and participant experience was high (VIF = 18.80) so we standardized the predictor and response variables. The combined data indicate that an interaction between scenario liking and participant

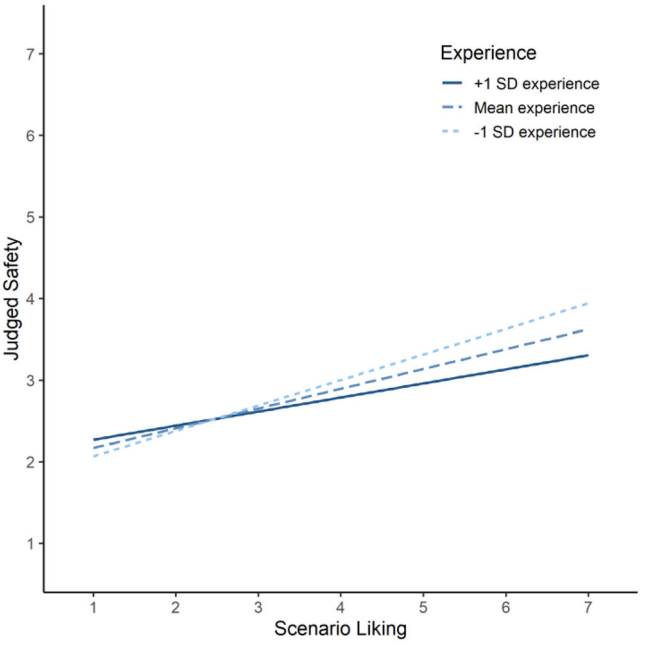


**Figure 3.** Scenario liking as predictor of judged safety at +1 SD, mean, and -1 SD participant experience scores.

experience predicted judged safety: scenario liking, $b = .28$, $SE_b = .03$, *95% CI* [.23, .33], $p < .001$; experience, $b = -.13$, $SE_b = .03$, *95% CI* [-.20, −.07], $p < .001$; and their interaction, $b = -.08$, $SE_b = .02$, *95% CI* [-.13, −.03], $p = .001$. 23.1% of variation in judged safety was attributable to the difference between participants, $\chi^2$ (1) = 119.94, 13.9% of variation in judged safety was attributable to the difference between scenarios, $\chi^2$ (1) = 91.83, and 0.0% of variation in judged safety was attributable to the difference between studies (apart from the different scenarios), $\chi^2$ (1) = 0.00. There is evidence in the pooled data that participant experience moderates the relation between scenario liking and judged safety: the magnitude of that relation was lower when participant experience was higher (see Figure 3). However, the size of the interaction effect is extremely small.

## General discussion

Across four studies, we found evidence that higher self-reported liking of backcountry ski scenarios corresponded to judgments of higher avalanche safety. This aligns with earlier research using judgments of categorical representations of stimuli (Alhakami and Slovic 1994; Finucane et al. 2000; Slovic et al. 2002). Our present research extends those prior findings by demonstrating that the liking-perceived safety relation holds across multiple judgments of highly uncertain, specific instances of an activity that are distinguished by contextual information. Furthermore, the liking-perceived safety relation was found to hold when individuals for whom the activity has established categorical valence and safety judged multiple distinct instances of that activity. Despite the facts that backcountry skiers like backcountry skiing in avalanche terrain and deem the activity to be safe, specific instances of backcountry skiing assumed a negative contextual valence and were perceived as unsafe in accordance with the liking-perceived safety relation. Echoing findings from the field of approach-avoidance motivation and emotion (Elliot, Eder, and Harmon-Jones 2013; Moors and De Houwer 2001), our results show that categorical valence and contextual valence (and, similarly, categorical perceived safety and contextual perceived safety) are distinct judgment processes that do not necessarily converge. The relation between liking

and perceived safety holds at the contextual level of perception, even when the valence and perceived safety of a specific instance of a stimulus conflicts with the established valence and perceived safety of that category of stimulus for the decision maker.

All experiences of phenomena are marked, to varying degrees, with affect. Those positive and negative affective markers are aggregated to create an "affect pool" that provides an affective frame of reference for interpreting any new phenomena a decision maker encounters (Slovic et al. 2004; see also Schwarz 2007, for a similar argument in the context of attitude construction). A categorical representation has an affective value or valence that reflects the aggregated positive and negative markers of prior experiences of specific instances of that category of phenomenon. In that way, a categorical representation is a prototypical expression of the affective frame of reference. By contrast, a distinct, context-specific instance of that category will be marked by a unique array of affective characteristics. The affective response that that distinct instance of a phenomenon evokes depends upon the salience of those affective characteristics and the ease with which the decision maker interprets or maps them according to the affective frame of reference for that category of phenomena (Slovic et al. 2004; Wardman 2006; Wilson and Arvai 2006). A specific instance of an affect-rich phenomenon such as backcountry skiing can include certain affective characteristics that a decision maker does not include in the mental image of a categorical representation, or may lack other affective characteristics typically associated with the categorical representation. When those differences in affective characteristics are great enough, the valence of a distinct, context-specific instance of a phenomenon will diverge from the valence of that category of phenomena. Risk perceptions can differ between levels of perception in similar manner. Because the salient affective qualities and risk characteristics of each scenario differed (to lesser or greater degrees) from participants' categorical representations of backcountry skiing, contextual valence and risk perception diverged from categorical valence. This resulted in dynamic changes between contextual judgments of specific instances.

The focus of our research on contextual judgments of specific instances of a phenomenon is not a methodological contrivance. We believe that such contextual judgments are a common aspect of daily life and, as such, are ecologically valid representations of real-world decisions. Although judging the risk, benefit, and degree of liking an activity in general – such as backcountry skiing – is a valid and realistic judgment task, it is a very different task from judging the risk, benefit, and degree of liking a specific instance of that activity. The salience of affective qualities and risk considerations will be different between the two judgment tasks, despite one target of judgment being a categorical representation of the other. That contextual judgments should diverge from judgment of categorical representations, and differ between distinct contextual judgments, is both natural and beneficial. When faced with a specific potential hazard and high uncertainty, people should ideally decide behavior based on a contextual judgment rather than their general, category-level orientation. Otherwise, decision makers would find themselves trapped by their category-based judgments, doomed to repeat the affective response and risk perception irrespective of contextual characteristics.

### *The moderating effect of experience*

We found evidence that a decision maker's prior experience with the stimulus activity and risk judgment task appears to moderate the relation between affective evaluations and judged risk. As participant experience increased, the magnitude of the relation between scenario liking and judged safety decreased. This moderating effect of experience was found in the analysis of the combined data from all four studies but was not found in any of the individual studies. However, the size of that effect was very small, making its practical relevance questionable. Care must be taken to not overemphasize the moderating effect of experience found in the pooled data, and further research is required to determine whether that observed effect is meaningful.

### *Do skiers' preferences influence their perception of risk?*

We attempted to manipulate the attractiveness of the backcountry skiing scenarios while holding the risk level constant to test whether liking has a causal influence on perceived safety. Unfortunately, the failure of both manipulations to influence liking made it impossible to test causality. Nonetheless, those failed manipulations are relevant for the field of avalanche research and education. For the past two decades, a focus on erroneous decision heuristics (referred to as heuristic traps) has dominated examinations into the decision processes that result in avalanche accidents and fatalities (Johnson et al. 2020). One of the heuristic traps specified in that conceptual framework is the scarcity heuristic. It is based on the assumption that skiing untracked, fresh powder snow is so highly valued among backcountry skiers that they take greater risks to be the first to ski it (McCammon 2002, 2004). Evidence of the scarcity heuristic in previous research is conflicting. Furman, Shooter, and Schumann (2010) found evidence that an untracked slope was positively related to the likelihood of skiing that slope, whereas Marengo, Monaci, and Miceli (2017) found contradictory evidence that the presence of tracks increased the likelihood of skiing that slope. Our research found no evidence that the presence or absence of tracks influenced either liking or perceived safety. Another feature that avalanche experts believe influences the attractiveness of a ski slope and that they anecdotally associate with increased avalanche accidents is the sunny cloudless weather that can follow a night of snowfall, which skiers refer to as the highly prized *bluebird days* (Avalanche Canada 2016; Enright 2017; Morris 2016). Our research found no evidence that sunny versus cloudy skies influenced liking or perceived safety. These findings are applicable for the ongoing evaluation of the heuristic traps conceptual framework and its relevance for avalanche risk management strategies, tools and education (see Johnson et al. 2020). We recognize, however, that the task of judging avalanche risk may have focused participants' attention on risk to a greater degree than it would be in a natural situation. This increased focus on risk may have undermined any effect of their preference for the absence of tracks or for sunny blue skies. Future research could manipulate participants' focus on risk to test for an effect on liking.

### *Risk in extreme sports*

The backcountry skiing context and those who perform the activity together provide an intriguing opportunity to study a real-world case of individuals who appear to like a dangerous activity. A prominent theoretical perspective on extreme sports contends that these activities are synonymous with risk and that participation is about risk-taking and the thrill it provides (Brymer, 2010). Moreover, measures of attitudes toward risk such as self-report questionnaires and lab-based tasks generally involve measuring affective disposition toward risk as the degree to which one likes taking risk (e.g., General Risk Propensity Scale (Zhang, Highhouse, and Nye 2019), Domain-Specific Risk Taking (DOSPERT) scale). A consequence of both that theoretical perspective on extreme sports and such measures of risk preference is that some people are deemed to like risk, defying the positive relation between liking and perceived safety. However, our data show that even people who like and perform a risky activity (at the category level) such as skiing in avalanche terrain exhibit a healthy positive relation between liking and perceived safety when judging specific instances of that activity (at the contextual level), rather than liking it because it is risky. This findings aligns with an alternative perspective on extreme sport participation that contends that people recognize the inherent risk of the activity, acknowledging the possibility of injury or death, but that they like safety and seek to maximize it when performing the activity (Brymer 2010).

## Conclusion

Risk judgments and behavior decisions in the real world most often focus on specific instances of objects and activities rather than their categorical representations. Although prior research

demonstrated the positive relation between liking and perceived safety when judging categorical representations of stimuli, in the present research we have shown that that relation holds across multiple judgments of specific instances of an activity. Our findings contribute to understanding risk judgments and decision making as an interplay of cognitive and affective factors. That liking and perceived safety systematically vary, but that the positive relation between the two remains, when judging specific instances of an activity that a decision maker broadly likes and considers safe provides a dynamic picture of the degree to which cognitive and affective factors are intertwined.

## Disclosure statement

No potential conflict of interest was provided by the author(s).

## ORCID

Matthew B. Stephensen http://orcid.org/0000-0002-4562-3469
Torsten Martiny-Huenger http://orcid.org/0000-0003-3855-2890

## Data availability statement

All data and analysis scripts are available at: https://doi.org/10.17605/OSF.IO/VA28N

## References

Alhakami, A. S., and P. Slovic. 1994. "A Psychological Study of the Inverse Relationship between Perceived Risk and Perceived Benefit." *Risk Analysis : An Official Publication of the Society for Risk Analysis* 14 (6): 1085–1096. doi:10.1111/j.1539-6924.1994.tb00080.x.

Avalanche Canada 2016. Avalanche Rescue at Cherry Bowl: A Story that Needs to be Told. Retrieved from https://backcountryaccess.com/avalanche-rescue-at-cherry-bowl-a-story-that-needs-to-be-told/

Bates, D., M. Mächler, B. Bolker, and S. Walker. 2015. "Fitting Linear Mixed-Effects Models Using lme4." *Journal of Statistical Software* 67 (1): 1–48. doi:10.18637/jss.v067.i01.

Blanchette, I., and A. Richards. 2010. "The Influence of Affect on Higher Level Cognition: A Review of Research on Interpretation, Judgment, Decision Making and Reasoning." *Cognition & Emotion* 24 (4): 561–595. doi:10.18637/jss.v067.i01.

Brymer, E. 2010. "Risk Taking in Extreme Sports: A Phenomenological Perspective." *Annals of Leisure Research* 13 (1-2): 218–238. doi:10.1080/11745398.2010.9686845.

Colorado Avalanche Information Center. n.d. Forecasts. Retrieved from https://avalanche.state.co.us/

da Costa, B. R., and A. J. Sutton. 2019. "A Comparison of the Statistical Performance of Different Meta-Analysis Models for the Synthesis of Subgroup Effects from Randomized Clinical Trials." *BMC Medical Research Methodology* 19 (1): 198–198. doi:10.1186/s12874-019-0831-8.

Damasio, A. R. 1994. *Descartes' Error: Emotion, Reason and the Human Brain*. New York: Avon Books.

de Leeuw, J. R. 2015. "jsPsych: A JavaScript Library for Creating Behavioral Experiments in a Web Browser." *Behavior Research Methods* 47 (1): 1–12. doi:10.3758/s13428-014-0458-y.

Ebert, P. A. 2019. "Bayesian Reasoning in Avalanche Terrain: A Theoretical Investigation." *Journal of Adventure Education and Outdoor Learning* 19 (1): 84–95. doi:10.1080/14729679.2018.1508356.

Elliot, A. J., A. B. Eder, and E. Harmon-Jones. 2013. "Approach–Avoidance Motivation and Emotion: Convergence and Divergence." *Emotion Review* 5 (3): 308–311. doi:10.1177/1754073913477517.

Engeset, R. V., G. Pfuhl, M. Landrø, A. Mannberg, and A. Hetland. 2018. "Communicating Public Avalanche Warnings – What Works?" *Natural Hazards and Earth System Sciences* 18 (9): 2537–2559. doi:10.5194/nhess-18-2537-2018.

Enright, D. 2017. A Tragedy in the Japan Alps. Retrieved from https://www.evergreen-backcountry.com/a-tragedy-in-the-japan-alps/

Finucane, M. L., A. Alhakami, P. Slovic, and S. M. Johnson. 2000. "The Affect Heuristic in Judgments of Risks and Benefits." *Journal of Behavioral Decision Making* 13 (1): 1–17. %3C1::AID-BDM333%3E3.0.CO;2-S doi:10.1002/(SICI)1099-0771(200001/03)13:1.

Furman, N., W. Shooter, and S. Schumann. 2010. "The Roles of Heuristics, Avalanche Forecast, and Risk Propensity in the Decision Making of Backcountry Skiers." *Leisure Sciences* 32 (5): 453–469. doi:10.1080/01490400.2010.510967.

Gallatin National Forest Avalanche Center. n.d. Avalanche Forecast. Retrieved from https://www.mtavalanche.com/forecast

Hogarth, R. M., T. Lejarraga, and E. Soyer. 2015. "The Two Settings of Kind and Wicked Learning Environments." *Current Directions in Psychological Science* 24 (5): 379–385. doi:10.1177/0963721415591878.

Johnson, P. C. D., S. J. E. Barry, H. M. Ferguson, and P. Müller. 2015. "Power Analysis for Generalized Linear Mixed Models in Ecology and Evolution." *Methods in Ecology and Evolution* 6 (2): 133–142. doi:10.1111/2041-210X.12306.

Johnson, J.,. A. Mannberg, J. Hendrikx, A. Hetland, and M. Stephensen. 2020. "Rethinking the Heuristic Traps Paradigm in Avalanche Education: Past, Present and Future." *Cogent Social Sciences* 6 (1): 1807111. doi:10.1080/23311886.2020.1807111.

Kuznetsova, A., P. B. Brockhoff, and R. H. B. Christensen. 2017. "lmerTest Package: Tests in Linear Mixed Effects Models." *Journal of Statistical Software* 82 (13): 1–26. doi:10.18637/jss.v082.i13.

Lerner, J. S., Y. Li, P. Valdesolo, and K. S. Kassam. 2015. "Emotion and Decision Making." *Annual Review of Psychology* 66 (1): 799–823. doi:10.1146/annurev-psych-010213-115043.

Loewenstein, G. F., E. U. Weber, C. K. Hsee, and N. Welch. 2001. "Risk as Feelings." *Psychological Bulletin* 127 (2): 267–286. doi:10.1037/0033-2909.127.2.267.

Marengo, D., M. G. Monaci, and R. Miceli. 2017. "Winter Recreationists' Self-Reported Likelihood of Skiing Backcountry Slopes: Investigating the Role of Situational Factors, Personal Experiences with Avalanches and Sensation-Seeking." *Journal of Environmental Psychology* 49: 78–85. doi:10.1016/j.jenvp.2016.12.005.

McCammon, I. 2002. "*Evidence of Heuristic Traps in Recreational Avalanche Accidents*." Paper Presented at the Proceedings ISSW.

McCammon, I. 2004. "Heuristic Traps in Recreational Avalanche Accidents: Evidence and Implications." *Avalanche News* 68 (1): 42–50.

Medin, D. L. 1989. "Concepts and Conceptual Structure." *The American Psychologist* 44 (12): 1469–1481. doi:10.1037/0003-066x.44.12.1469.

Moors, A., and J. De Houwer. 2001. "Automatic Appraisal of Motivational Valence: Motivational Affective Priming and Simon Effects." *Cognition & Emotion* 15 (6): 749–766. doi:10.1080/02699930143000293.

Morris, S. 2016. Multiple avalanches in the Alps, two fatalities [weblog comment]. Retrieved from https://wepowder.com/en/forum/topic/219836

Niedermeier, M., H. Gatterer, E. Pocecco, A. Frühauf, M. Faulhaber, V. Menz, J. Burtscher, M. Posch, G. Ruedl, and M. Burtscher. 2019. "Mortality in Different Mountain Sports Activities Primarily Practiced in the Winter Season—a Narrative Review." *International Journal of Environmental Research and Public Health* 17 (1): 259. (. doi:10.3390/ijerph17010259.

R Core Team 2017. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing.

Schafer, J. L., and J. W. Graham. 2002. "Missing Data: Our View of the State of the Art." *Psychological Methods* 7 (2): 147–177. doi:10.1037/1082-989X.7.2.147.

Schauer, J. M., and L. V. Hedges. 2020. "Assessing Heterogeneity and Power in Replications of Psychological Experiments." *Psychological Bulletin* 146 (8): 701–719. doi:10.1037/bul0000232.

Schwarz, N. 2007. "Attitude Construction: Evaluation in Context." *Social Cognition* 25 (5): 638–656. doi:10.1521/soco.2007.25.5.638.

Schwarz, N. 2012. "Feelings-as-Information Theory." In *Handbook of Theories of Social Psychology*, edited by P. A. M. Van Lange, A. W. Kruglanski, & T. Higgins, Volume 1, 289–308. London: Sage Publications Ltd.

Schwarz, N., and G. L. Clore. 1983. "Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states." *Journal of Personality and Social Psychology* 45 (3): 513–523. doi:10.1037/0022-3514.45.3.513.

Schwarz, N., and G. L. Clore. 2007. "Feelings and phenomenal experiences." In *Social psychology: Handbook of basic principles*, edited by A. W. Kruglanski & E. T. Higgins, 385–407. New York, NY, US: Guilford Press.

Schwarz, N., and G. L. Clore. 1983. "Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states." *Journal of Personality and Social Psychology* 45 (3): 513–523. doi:10.1037/0022-3514.45.3.513.

Schwarz, N., and G. L. Clore. 2007. "Feelings and phenomenal experiences." In *Social psychology: Handbook of basic principles*, edited by A. W. Kruglanski & E. T. Higgins, 385–407. New York, NY, US: Guilford Press.

Sjöberg, L. 2006. "Will the Real Meaning of Affect Please Stand up?" *Journal of Risk Research* 9 (2): 101–108. doi:10.1080/13669870500446068.

Slovic, P., M. Finucane, E. Peters, and D. G. MacGregor. 2002. "The Affect Heuristic." In *Heuristics and Biases: The Psychology of Intuitive Judgment*, edited by D. Griffin, D. Kahneman, & T. Gilovich, 397–420. Cambridge: Cambridge University Press.

Slovic, P., M. L. Finucane, E. Peters, and D. G. MacGregor. 2004. "Risk as Analysis and Risk as Feelings: Some Thoughts about Affect, Reason, Risk, and Rationality." *Risk Analysis : An Official Publication of the Society for Risk Analysis* 24 (2): 311–322. doi:10.1111/j.0272-4332.2004.00433.x.

Tremblay, A., and J. Ransjin. 2020. *LMERConvenienceFunctions: Model Selection and Post-Hoc Analysis for (G)LMER Models*. R package version 3.0. https://CRAN.R-project.org/package=LMERConvenienceFunctions

Utah Avalanche Center. n.d. Forecasts. Retrieved from https://utahavalanchecenter.org/

Varsom n.d. *Avalanche Bulletins for Norway*. Retrieved from http://www.varsom.no/en/avalanche-bulletins/

Wardman, J. K. 2006. "Toward a Critical Discourse on Affect and Risk Perception." *Journal of Risk Research* 9 (2): 109–124. doi:10.1080/13669870500454773.

Westfall, J., D. A. Kenny, and C. M. Judd. 2014. "Statistical Power and Optimal Design in Experiments in Which Samples of Participants Respond to Samples of Stimuli." *Journal of Experimental Psychology. General* 143 (5): 2020–2045. doi:10.1037/xge0000014.

Wilson, R. S., and J. L. Arvai. 2006. "When Less is More: How Affect Influences Preferences When Comparing Low and High-Risk Options." *Journal of Risk Research* 9 (2): 165–178. doi:10.1080/13669870500419503.

Winkielman, P., R. B. Zajonc, and N. Schwarz. 1997. "Subliminal Affective Priming Resists Attributional Interventions." *Cognition & Emotion* 11 (4): 433–465. doi:10.1080/026999397379872.

Yee, E., and S. L. Thompson-Schill. 2016. "Putting Concepts into Context." *Psychonomic Bulletin & Review* 23 (4): 1015–1027. doi:10.3758/s13423-015-0948-7.

Zajonc, R. B. 1980. "Feeling and Thinking: Preferences Need No Inferences." *American Psychologist* 35 (2): 151–175. doi:10.1037/0003-066X.35.2.151.

Zhang, D. C., S. Highhouse, and C. D. Nye. 2019. "Development and Validation of the General Risk Propensity Scale (GRiPS)." *Journal of Behavioral Decision Making* 32 (2): 152–167. doi:10.1002/bdm.2102.

Zweifel, B., and P. Haegeli. 2014. "A Qualitative Analysis of Group Formation, Leadership and Decision Making in Recreation Groups Traveling in Avalanche Terrain." *Journal of Outdoor Recreation and Tourism* 5-6: 17–26. doi:10.1016/j.jort.2014.03.001.