THE EVOLUTION OF RISK PERCEPTION ASSOCIATED WITH LOW-PROBABILITY-HIGH-CONSEQUENCE EVENTS INTERNATIONAL SNOW SCIENCE WORKSHOP 2023, BEND, OREGON

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ABSTRACT: During the 2022-23 winter in western Canada, most avalanche fatalities were attributed to the early season, deeply buried persistent weak layer (PWL). Certain human factors papers have examined the impact of adjusting components of the risk perception and hazard mitigation equation while others have focused on biases and heuristics. As far as we know, studying how one's risk perception evolves over time and through a winter season has not been studied. Specifically, this study explores how one's perception of the probability and the size of a low-probability-high-consequence (LPHC) avalanche problem evolves, particularly when presented with false-negative hazard assessments. As the winter season evolves and evidence or clues of a LPHC avalanche problem become less frequent, at what point does a risk that was unacceptable earlier become acceptable, if at all? How and why can someone start perceiving a '*considerable'* day as if it was a '*moderate'* day? The study focuses on three factors that affect risk perception over time: internal events and experience, external information and media, and group debriefs. The paper proposes a model to represent how the perception of risk evolves. Due to the inherent nature of avalanches, with more false negatives than false positives, and how information is obtained, there is a bias towards perceiving the situation as less dangerous. We conclude by offering policy proposals to aid individuals in maintaining a perception closer to the actual danger rather than relying on unfortunate events to bring their perception of danger back in line.

KEYWORDS: Risk Perception, Negative Event Feedback, Avalanche Education, Decision Making, Trend Effects, Human Error

1. INTRODUCTION

Over the years, there has been a growing literature on human factors in avalanche terrain. These studies have shed light on cognitive biases inherent in most backcountry users, building frameworks to avoid these biases, and help users be cognizant of them. Otherwise, without tools, just like visual illusions knowing that they exist is not enough to stop seeing them.

The motivation behind this study came when speaking to a friend about their ski trip to Revelstoke. The insights that came from that discussion was that although conditions and avalanche problems stayed steady throughout the trip, their perception of risk went down over time meaning that the areas that they avoided skiing at first were free game by the end. In this study, McClung's (2002) definition of risk as the probability that exposure to a hazard will result in damage, injury, or loss of life will be used. In other words, we will consider lower risk as a situation where the probability of triggering a deadly avalanche is lower. Thus, we are aiming to investigate why the perception of risk went down over time although the actual risk did not change with regards to the avalanche danger level and the avalanche problems present.

The problem with skiing avalanche terrain versus learning to drop a cliff on skis, for example, is that people may interpret lucky moments, that lead to negative event feedback, as making the right decision when that is false. Learning to drop a cliff will be easier to learn by trial and error as errors will lead to immediate feedback. However, with avalanches that are Low Probability High Consequence (LPHC) events, if you act inappropriately, you are not certain to receive feedback highlighting that poor decision. This lack of frequency may lead to more interpretation errors. Hogarth et al. 2015 and Einhorn and Hogarth (1978) investigated how the feedback on assessment and decisions can be lacking or misleading and coined this a wicked learning environment. This wicked learning environment mainly happens in situations with high uncertainty where individuals may develop confidence in their judgment due to being lucky and start interpreting false positives and false negatives for true positives and true negatives. These results can be linked to the misrepresentation of chance (Kahneman et al., 1982).

This study will aim to bring awareness to the various factors that may lead individuals to perceive an

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identical situation as safer over time. Section 2 will overview the relevant literature. Then, section 3 will build a model to explain how perceptions are revised from one period to the next and add the layers of poor internal perception revision due to negative event feedback, the lack of representative external information, and improper debriefing. Section 4 will offer policy recommendations to help alleviate some of the erroneous risk perception. Finally, section 5 will offer concluding remarks.

2. LITERATURE REVIEW

A wealth of research exists in explaining why individuals take poor decisions in the backcountry, especially in poorly evaluating avalanche risks. The primordial research that stands out in explaining poor decision making are heuristic traps introduced by McCammon (2002). Although Johnson et al. (2020) may argue that McCammon's (2002) method includes biases and should be more standardized, most avalanche courses include a discussion on the heuristic traps. McCammon's (2002) research has sprouted many other articles that verify the presence of some of the traps described and expands on others.

Eyland (2016) through a survey and Furman et al. (2010) through a factorial survey design found that seeing other groups increased the likelihood to skiing a slope. The actual underlying causes are still unclear. Hypotheses could be that seeing other individuals gives a false sense that the conditions are stable, or they are lured into competing for a scarce resource. Otherwise, they could also become inspired to show off. Mannberg et al. (2021) tested the desire to gain social status and found that riders that seek an upgrade in status are more likely to take on a potentially risky ride, despite their avalanche training. Sole et al. (2010) looked at the impact of having women in a group and found that men take on less risk in the presence of a woman in the group. Eyland (2016) and Haegeli et al. (2020) found that using an airbag can lead to people skiing in more dangerous conditions due to their risk compensation in line with risk homeostasis (Wilde, 1982).

Above from external factors, there can also be internal factors such as optimism bias or overconfidence, that influence risk taking. Simpson-Housley and Fitzharris (1979) suggest that repression, sensitization, and optimism may block perception in such a way that a climber aware of an avalanche may consider them unlikely while they are on the mountain. The authors believe that rationalization, repression, and denial are the defense mechanisms to deal with the anxiety involved with risks associated to avalanches that are too large to knowingly live with. Bonini et al. (2019) show how a group of overconfident skiers always see a scenario as less dangerous compared to others.

The main literature that looks at the 'evolution' of risk perception with avalanches looks at the impact of training. McCammon (2000) found that out of all groups, including those with no avalanche training, victims with basic formal avalanche training are the ones that exposed themselves the most to avalanche hazard. In practice, some individuals with basic avalanche training will perceive certain situations as more dangerous and other individuals will perceive those same situations as safer due to training. It can go either way. The danger remains with individuals that are unaware of just how deficient their expertise is or the "ignorance of ignorance", which is referred to as the Dunning-Kruger effect (Dunning, 2011). Those deficits prevent them from recognizing when they are making mistakes. Ebert and Photopoulou (2013) discuss the *illusion of competence* and demonstrate statistically how non-reckless incompetent decision-makers can manage to avoid avalanches. These results can lead incompetent individuals to offer reasons and explanations of why they are competent because they managed to avoid avalanches for a long period. The authors argue that competent decision-makers know how to minimize risk, while avoiding bad outcomes is no proof of being competent. Greene et al. (2022), on the other hand, found participants to be more conservative in their decision to ski after the training. The perception confidence went up, especially for women, novices, and risk averse skiers. The results suggest that avalanche education may impact risk perceptions and confidence in those assessments. The issue is whether they are more confident in faulty assessments as they do not know what they do not know. Professionals, on the other hand, tend to seek feedback regarding both stability and instability and have a higher tendency to review past experiences (Atkins and McCammon, 2004).

Although an 'evolution' of perception has changed after training, we consider these studies to be more cause and effect then how the actual perception changes over time with no significant changes in training/knowledge. Terum et al. (2022) looked at the impact of avalanche danger trends and how that trend was communicated on perceptions and found that having a positive or negative trend influences the perception of an identical day. Nonetheless, our goal with this study is to look at how the perception of risk evolves over time in the absence of a change in avalanche hazard. One study unrelated to avalanches looked at the evolution of expectations. When looking at gambling, Holden et al. 2022 found that luck in previous games influenced the gamblers' expectations and increased their risk-taking behaviour. For a more thorough review of human

errors, see Bruce Kay's (2016) *Autonomy, mastery in the avalanche patch* book.

Through this literature review, we have seen that people may poorly evaluate avalanche risks based on heuristic traps, adjustments, training level, poor perception of danger ratings, and more. We are however interested in filling a gap in the research, by looking to see how the perception of a given day evolves over time without its actual danger changing.

3. MODEL

For getting in the mindset of this proposed model, it is convenient to think of a situation where we may not be a subject expert. It does not mean that this research is focused on beginner recreationists but rather that it is a good starting point to build on. Imagine a young first-time traveler is planning a trip to country X, where they may be concerned about theft or violence. They may go blindly without any research, or they may be inclined to look through the various travel advisories. After some research they may choose to change destination as it is in the "Avoid non-essential travel" category in favor for a country in the "Exercise a high degree of caution" which is the 2nd safest level on 4 compared to the 3rd level. Having not yet travelled they may feel that this country is not the safest, but also not in the most dangerous and be accepting of the risk they are taking on. This feeling is based on their individual risk tolerance. This travel advisory rating serves as a form of starting point to manage expectations and thus it has an impact on what people expect to encounter. Danger ratings such as the example given exist all around, from the rating of fire hazard to avalanche danger. Typically, participants initially anchor their perceptions of what to expect from that danger rating (if available) as a form of reference point. An individual may also have an erroneous impression about what the stated danger represents. Morgan et al. (2023) looked at how individuals interpret the North American avalanche danger scale. They found that many lower-end recreationists, do not distinguish between 'high' and 'extreme'. Eyland (2018) recommends removing the '5' or 'extreme' danger rating because it is almost never used and gives the impression that a '3' or 'considerable' is not that dangerous compared to if it was a '3' danger rating on a total of 4. Over time, with experience the perception of those various ratings may change. Some individuals may start to change their belief of what a level '3' or 'considerable' rating looks like. The ideal, would be that the perception remains aligned with the actual risk over time.

To evaluate the evolution of danger perception relative to an actual danger it is easiest to have a Groundhog Day type analogy. Mimicking a situation where the slope, snowpack, danger level (i.e., a '3' or 'considerable'), … do not change. It is easier to visualize this story with a 'considerable' danger rating as it has a lot of uncertainty. A danger rating of '5' has a high certainty that something will happen and a danger of '1' or 'low' has a high certainty that very little, if anything, will happen. Thus, we are abstracting from fresh snow or other factors that would alter the benefits. Everyone has their personal danger threshold (risk tolerance is exogenous). The precise threshold is irrelevant in analysis as we are interested in the evolution of the perception relative to the actual danger. If your perception remains in line with the actual risk, then there is no problem. The further perception is from reality the greater the surprise factor. Perception evolves over time and can be seen as following an evolutionary approach where it is constantly revised with new information.

$$P_{t+1}^{i} = P_{t}^{i} + [\dots] \quad (1)$$

P_{t+1}^{i} : The perception differential of individual i at time t+1 (tomorrow) is based on their perception today P_{t}^{i} and is revised by some added factors to come in the following sections.
If $P_{t+1}^{i} = 0$ perceived danger is the same as actual danger.
If $P_{t+1}^{i} > 0$ perceived danger is greater than actual danger (i.e., exaggerating the danger).
If $P_{t+1}^{i} < 0$ perceived danger is smaller than actual danger (i.e., letting your guard down).

Hence, what are the factors that can influence the risk perception differential of visiting country X? An individual could imagine getting robbed/attacked or they could learn of this danger from external sources like the media or a discussion with friends. We can separate the main types of impacts into internal events/experience, external events/information, or group level debriefs.

Thus, our perception of the danger/risk today is based on our perception yesterday that is revised by new information obtained. From one day to the next, if there is no new information perception should not change. New data can be in the form of internal, or external events, or group debriefs, or a combination of the three. For instance, someone may never have surfed in Australia but their perception of shark danger may change if they witness a fatal shark attack. Grim news and media bias can make the perception of the danger be greater than the actual danger due to the availability heuristic (Tversky and Kahneman, 1973). For some individuals, news of avalanche deaths may have the same impact of creating phobias or excessive fear.

In this study, we want to highlight how the perception of risk may evolve to be substantially different to actual risk and the tools we can use to mitigate some of the problems that this may cause. All in all,

people anchor and adjust, which can be for the better or worse.

Going forward we will evaluate scenarios from a situation with the least amount of external information to more external inputs.

a) Absence of external information, only internal events/experience.
b) Addition of external events/experience, such as access to social media and news (without interaction).
c) Addition of group debriefs or discussions with friends.

3.1 Internal events/experience

Although, it was established that the danger perception may evolve due to various factors, we believe that it makes most sense to analyze the evolution from an internal standpoint first. One reason being that someone with little experience is highly influenced by their initial experiences. In addition, anywhere that avalanche terrain can be explored, an individual is bound to gain experience regardless of what outside information is available for that location. To understand how your perception evolves in the absence of external information, assume a situation where you either go in the backcountry or have a good line of sight into the back bowls from in-bounds.

4 possible outcomes from experience

1. An event is expected to be seen; it occurred; no surprise, perception remains the same.
2. An event is not expected to be seen; it didn't occur; no surprise, perception remains the same.
3. An event is expected to be seen; it didn't occur; surprised, reduce expectation of danger.
4. An event is not expected to be seen; it occurred; surprised, increased expectation of danger.

Assumptions

- Shifts towards safer perspective always move in small increments whereas shifts towards risky perception can be in bigger increments.
- The more situation X is perceived as safer than before, the more situation Y which is slightly more dangerous than X is perceived as safer than before.

Outcomes 1 & 2 where events are in line with expectations will not warrant a modification of the participants expectation. For example, if someone is skiing 45 degrees on storm snow, they should not be surprised to see some sluffing. Outcomes 3 & 4 will have perceptions change to an extent. This change in perception may be warranted (i.e. a decrease in the perception was too high) or it can be a faulty adjustment (i.e. a decrease in the perception after a non-event day due to luck). The "lucky/unlucky" of "false negative/false positive" outcome that is possible in outcomes 3 and 4 lead to the same belief update than a true positive or true negative. Seeing that false negatives are more prevalent in wicked environments, such as backcountry skiing, perceptions that a situation is safer than the actual risk are likely to be widespread.

Below is a mathematical representation of the adjustment process (with only personal experience)

$$P_{t+1}^i = P_t^i + \delta_t^i S^i(P_t^i) \quad (2)$$

$\boldsymbol{P_t^i}$ **:** Perception of the risk relative to actual at the beginning of period t by person i.
$\boldsymbol{\delta^i S^i(P_t^i)}$**:** Impact of the personal surprise that you lived during period t by person i, the degree to which it affects you is dependent on δ which depends on you as an individual (based on experience, quickness to change your perception…) Getting a negative surprise, the impact will increase your perception of the danger (i.e. caught in small avalanche) $\delta^i S^i(P_t^i) > 0$ and if you get a positive surprise (super stable when expected instability) then the perception of danger will fall $\delta^i S^i(P_t^i) < 0$. $\boldsymbol{S^i(P_t^i)}$ is dependent on P_t^i as the surprise is greater, the further away individuals' perceptions are from the actual danger. It is also a random element meaning that it is not because an individual is downplaying risk that they will suffer a negative surprise.

Imagine that based on their personal risk aversion an individual would only go out up to danger levels of 30/100 (or an explicit danger rating of *moderate*) and they only ski at that riskiness or below. Overtime, either because nothing happened at 'level 30' days or that they ventured out by accident at a 'level 40 day' and nothing happened, their perception of the danger would lower. If it lowers by a 10, they would perceive a 30 as a 20 and an actual riskiness of 40 would be perceived as a 30. They could then be skiing on a '40' day although it is beyond their risk preference. In practical terms, an individual may begin only skiing *low* or *moderate* avalanche danger days, but as time goes by, they may then start skiing *considerable* days. This pattern is in line with the study of Damasio et al. (1991), who found that positive past experiences may create somatic markers influencing decisions under similar situations in the future. If a skier has a non-event day when skiing a slope, then that person may believe that that slope is stable. This process highlights the danger from treating a lucky non-event day as the norm as it uses erroneous historical data to establish a reference.

We just highlighted how lucky days may reduce someone's perception of danger, but they are situations where the perception of danger may increase. Small events like an unexpected miniature wind slab releasing may increase the perception of danger a little (could still be perceived as safer than actual). A friend getting partially buried will lead to a larger perception adjustment and a friend dying in an avalanche in front of their eyes will lead to a very large increase in danger perception. To the point where it may take the individual many years of venturing out at only the safest conditions to consider re-doing that same run in those same conditions.

Possible scenarios

1) An individual has little experience and adjusts their perception rapidly as they have less history. They ski many days in the presence of a deep persistent slab problem and see nothing as they are lucky. They progressively take on more risk (i.e. higher danger days or more complex terrain) until the day they trigger a large avalanche.
2) An individual has little experience and adjusts their perception rapidly as they have less history. They ski many days in the presence of a wind slab problem and some days they see nothing and others they trigger very small wind slabs. The perception remains close to the actual level as the visual clues are more frequent and apparent.
3) An individual is timid in their adjustment. They ski many days in the presence of various avalanche problems. Some of those days they see signs of instability. The perception remains close to the actual level as the downward trend in perception is slow allowing more time to observe the visual clues and readjust upwards.

From these examples, we can see that although everyone should enjoy being lucky from time to time, sustained luck can be quite dangerous. The longer an individual is lucky, the more that person will lower their guard and open themselves up to greater potential surprises. Training increases the potential for individuals to notice signs of instability. The issue with recreationists, with low training, is that they need to be looking for signs of instability and not just signs to 'confirm' that it is stable to allow them to ski the line that they are seeking.

It is important to remember that a bad decision does not necessarily lead to a bad outcome. When someone misinterprets a lucky day as safe and that feeling influences future similar days, then it becomes an issue. There are two possible problems from having an erroneous perception of risk. Firstly, the danger level may be within that individual's threshold, but the lower perception makes them drop their guard when it should remain up (i.e. improper spacing). Secondly, venturing out when the danger is above that person's threshold is undesired (i.e. someone is only comfortable to head out if no avalanches are expected or the likelihood of burial is improbable, but ends up skiing in conditions where full burials are likely). Next, we will see how external information can impact perceptions.

3.2 External events/information

In this section, we will add the impact of external information, but at this stage it is only the reception of this information. There is no conversation taking place. Like with internal experience only, we assume that individuals accessed their local avalanche center danger rating and avalanche problems to anchor their initial expectations. The adjustment is based on the perception of that given day. Like internal events, the impact of an event on perception is based on whether it is expected or not. Hence, if someone was expecting a certain bowl to avalanche on a given day and there are many social media posts of people riding that bowl that day without triggering an avalanche, it will surprise that person and lower their expectations if this day were to repeat itself. If on the other hand, someone thought that danger was negligeable, did not trigger an avalanche but heard there was an avalanche on a nearby slope with the same aspect and elevation, it would also surprise that individual and increase their perception of danger if this day were to repeat itself. Common stories exist where someone skis at a rating of 'only' *considerable* and hesitates between two runs. They choose one and nothing happens prompting them to think they made the right decision about the danger but to then realize that the other slope avalanched. Normally, people only get immediate feedback when they are in trouble but seldomly get that feedback through other people's lived events.

Thus, the updated perception evolution equation may look like this equation.

$$P_{t+1}^i = P_t^i + \delta^i S^i(P_t^i) + \alpha^i N^i(P_t^i) \quad (3)$$

Where $\alpha^i N^i(P_t^i)$ represents the impact on future perception of this external news event. This news event $N^i(P_t^i)$ is once again based on an individual's expectations, so if there is no surprise in what they see $N^i(P_t^i) = 0$. And α^i is the adjustment parameter based on that news. For some people α^i will be substantially smaller than δ^i as they take events, they hear about with a grain of salt versus events that they observe themselves. Nonetheless, we expect external information to have an impact.

One of the issues surrounding recreationists is that the information they receive has a bias towards favorable news. On the contrary for Heli-ski guides in Canada that typically have access to the InfoEx, an

Information Exchange service that professional organizations may join. The InfoEx allows professionals from an organization to see what was observed at neighboring organizations. For example, a guide at X heliskiing caused a skier accidental avalanche of size 2 on NE slope at 2000m. Whereas a recreationist does not get access to this information but rather mainly sees social media posts about people heading out and having a good time. Part of this is because people try to show their best moments in posts. If we abstract from the danger in backcountry skiing, people are more likely going to post pictures of amazing powder days rather than rainy or blazing cold days with ice. There is the Mountain Information Network (MIN) report where recreationists may share in real-time location-specific information. Few recreationists use this information as it is patchy. For one, many recreationists do not broadcast information when they trigger an avalanche because they fear shaming. Especially if with hindsight they can clearly see that they should not have been in that area on that day. Secondly, some do not want to share for fear of sharing their secret spot. As for what is broadcasted in the general news is normally only when there are fatalities. Any event less tragic rarely makes it to the news. Thus, as the information received by recreationists is skewed towards positive events, via Instagram or Facebook, it has a stronger tendency to lower the perception of danger.

Now, that we investigated the impact of external information, let's look at how we would expect perceptions to change in a group context with a moment to debrief on expectations.

3.3 Group debriefs

When adding group dynamics, perceptions of high risk will be tempered by perceptions of low risk. Let's analyze how perceptions would evolve by adding a group debrief element to the personal experience and external news elements and see some of the potential gains and pitfalls. We begin by analyzing a debrief session where only a numeric danger perception is given for the day.

$$P_{t+1}^{i} = \sum_{i=1}^{N} \beta^{i}[\, P_{t}^{i} + \delta^{i} S^{i}(P_{t}^{i}) + \alpha^{i} N^{i}(P_{t})] + \beta^{j\neq i}[\ldots] + \ldots + \beta^{N}[\ldots] \quad (4)$$

The revised perception will be a weighted average of the pre-meeting perceptions of all participants in the debrief.

Where $\beta^{1} + \beta^{2} + \ldots + \beta^{N} = 1$

N being the number of people in the debrief session

Where […] is the perception by player i pre-debrief.

If there are no subject experts in the group and all perceptions are weighed equally $\beta^{1} = \frac{1}{N}$ then the perception of person i becomes an equally weighted average of all the perceptions. If some members in the group are subject experts, then then weight of that opinion will be greater than $\frac{1}{N}$ and the weight of 'non-experts' will be smaller.

Putting the equation into perspective, if we start with a group of differing views but no one with more expertise, we expect perceptions to move towards the middle. If an individual trusts their opinion more than others, the weight attributed to their own opinion would be greater reducing the impact of others opinion.

Some possible scenarios:

1. A group where some perceived a higher danger than the actual level and some a lower danger it would be beneficial to debrief as it would bring the revised perception closer to the actual danger.
2. A situation where one perceives the danger exactly as it is, but the rest of the group perceives the situation as safer. The person who accurately perceived the danger will now start perceiving it as safer than it is, which is not good.
3. Everyone in the group perceive it as safer than the actual danger. The revised perceptions will not differ much from before the debrief and it will lead to some confirmation bias.

From these scenarios, it demonstrates the advantages of debriefs (i.e. getting a more accurate perception when the group has diverse opinions), while highlighting some of the situations to be wary of when in group such as the tendency for people to favor information that conforms to their beliefs. Previous studies highlighted the positive impact of women in a group (Sole et al. 2010) which can partly be because they have more conservative views with respect to danger.

The presence of an 'expert' can help or worsen the situation. If there is an expert in the group, the weight of the expert's perception β^{i} will be greater. The perceptions of the group will gravitate towards that opinion, which is great if the expert has a perfect perception of the actual danger, but not so great if that expert has an erroneous impression. Smutek (1980) highlighted that experts are likely to be caught in avalanches due to their subtle subconscious conditioning over time as avalanches are not happening. He mentions that experts tend to gradually let their guard down until they are unfortunately caught in a large avalanche. We discussed this negative event feedback earlier and covered this evolution in the internal experience section. This 'error' reminds us that experts are not sheltered from letting their guard down and that although they have a lot of training and experience individuals in a debrief

session should not simply conform to the expert's opinion.

The possible convergence towards the 'experts' opinion is larger if instead of everyone simultaneously writing down their opinion, the process happens sequentially with the expert stating their opinion first. Some members of the group may decide to change what they will state when it is their turn to speak as can be seen in the Asch conformity experiments (Asch, 1956). Thus, we recommend everyone to write down their perceptions simultaneously in a debrief to avoid conforming to the 'experts'.

The above simplification is if all just shared a 'number' and did not share their reasoning. If there was a more extensive debrief where some "findings/observations" were discussed that others had not seen, the perceptions may shift more considering that information. Debriefs can be useful to have differing views of the same situation and they are also very useful when different people in the group have different data such as skiing different areas and accessing different external information. In the next section, we expand on solutions to minimize these erroneous perception issues.

4. POLICY RECOMMENDATIONS

Ideally, recreationists can tell the difference between a lucky day and a day that they took the right decision. To aid in making that distinction here are some policy recommendations for all aspects.

Internal events/experience

1. More discussion on how to interpret close calls, signs of instability (i.e. whumpfs).
2. Help people understand that a non-event from a bad decision will have a tendency to make them feel as though they took the right decision.
3. Have a discussion asking "Would you feel safe skiing this line if you turned off your transceiver?" "Do you know enough to really feel good about turning it off?" These discussions could change focus on the elements that confirm you should ski to the ones that confirm it is bad choice.
4. More case studies where students first believe something and then realized they would have made a mistake so that they can learn from their mistakes in a simulation setting. Balent et al. (2018) found that students were disconnected between the theory they learned and what they could apply. They reported that experience via case studies improved experience when covered early in the training.

External events/information

5. An 'InfoEx' type app for recreationists. An App that detects elevation, aspect, range, … and shares the results anonymously to reduce stigma of shaming and does not give away the spot.
6. More social media presence (Instagram, Facebook, …) by the avalanche centers that include avalanche images, daily tests, etc. This presence would partly be used for education purpose, but mainly used for people who do not take the time to go on the other websites on their days off. These posts would offer an alternate, and more realistic, view of the conditions to temper the sentiment induced by powder images from the local athletes.

Group debriefs

There are many tools and articles available in the avalanche journals for professionals or people seeking information. However, beginner recreationists are not necessarily exposed to proper debriefing methods. We recommend more debrief discussions to occur at the recreational avalanche course level. Discussions on what we expected to happen, what happened, why was the actual different than the expectations and how could we have done things differently are essential to establish how to do better. Without a debriefing discussion, it is hard to determine whether a given day was lucky and careless or the right decision was taken. As much as individuals learn from misses and accidents, good debriefs allow them to learn from others and revise their own assessments and decision making. It should be explained that debrief sessions should be in diverse groups and not only focus on the 'danger number', but rather discuss what was seen and heard to come to this decision, which would have been noted pre-discussion to avoid conforming to others' beliefs.

5. CONCLUSION

Through this study, we have looked at the main factors that have an influence over time on an individual's perception of risk keeping all other factors as constant (i.e. training level, having an airbag, etc.). The goal was to evaluate how a given individual may perceive an identical day over time through their internal events/experience, external information and group debriefs. We found that many factors can skew an individual's perception to believe that the conditions are safer than they actually are. To overcome these judgment errors, we have offered a list of policy recommendations in the hopes of helping individuals keep a perception of risk more in line with the actual risk level over time, especially in moments of deep persistent slabs which are a low probability high consequence avalanche problem. With the use of representative external data, and appropriate debriefs, we hope that people will better be able to distinguish between good decisions and lucky days. Especially in the case of non-

event scenarios, we hope that this extra information will help people keep their perceived danger closer to the actual danger minimizing the likelihood of large surprise events (i.e. burials and fatalities). This research applies to all, but professionals have more information, feedback, and debrief which usually keeps them more in line with reality. Going forward, we plan to work at testing this theory with a survey or a simulation.

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