UiT The Arctic University of Norway

Institute of psychology

Buried alive:

A qualitative study of avalanche survivors' learning experience after an avalanche accident

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Preface

Our own enthusiasm for backcountry skiing served as the source of inspiration for this thesis. We reside in a region of Norway where backcountry skiing is a popular winter activity. However, this results in numerous avalanche accidents and, in some cases, fatalities every year. Therefore, as psychology students, we decided to investigate this topic in the manner we are familiar with, through the individual's feelings, thoughts, and experiences. We wanted to examine what lessons avalanche survivors take away from the incident, how avalanche accidents have affected people who have experienced them, and what variables could affect the outcome of this possible experience-based learning.

In recent years, the University of Tromsø' Center for Avalanche Research (CARE) has distinguished itself for interest and work in avalanche research. Therefore, even before the thesis was started, we wanted to get in touch with them to explore the prospect of a collaboration. When we got in touch with Audun Hetland and CARE they were just about to start a project that we were allowed to join. Through their network, we gained access to people we could interview, and our thesis-journey started. The research has been a thrilling breath of fresh air in the field of psychology and has given us a comprehensive understanding of a subject that is becoming more and more pathology focused.

First and foremost, we would like to express our gratitude to our supervisor, Audun Hetland, for his extraordinary subject expertise, insightful perspective, and unwavering commitment. A special thanks also go out to Christin Schulze, Andrea Mannberg, and Gerit Pfhul for contributing their ideas, opinions, and knowledge on the matter. Additionally, we would also like to thank Geir Lorem for his assistance with the analysis. We could not have finished this thesis without your help. Last but not least, a heartfelt thanks to all the participants who shared some of their most profound experiences with us. We have been able to freely delve into their experiences, evaluations, and feelings, which has given us an insight into psychology, friendship, and not to mention the beauty and joys of skiing in beautiful nature. You made this research possible, and we hope that this thesis will advance knowledge, comprehension, curiosity, and a desire to enhance avalanche education.

Both authors contributed equally to the thesis; however, Thea Kristensen had a greater overview of the introduction and method, while Iselin Hielm had a greater overview of the analysis and discussion, but both contributed to all areas.

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Abstract

With the growing appeal of backcountry skiing, there has been a rise in interest and research into avalanches and people's embedded role in these. Avalanche terrain presents a complex learning environment as the feedback one receives from the terrain can be both misleading and non-existent. Previous accident studies in particular along with avalanche literature at large has been conducted using quantitative methods. Presenting a range of unanswered questions on how previous avalanche accidents affects victims' future thoughts, feelings and behaviour. This study provides an in-depth investigation into backcountry riders' avalanche experiences through a qualitative lens, to more openly explore victims' personal experiences and learning processes. Avalanche survivors (N=26) were recruited and questioned about their accident through a semi-structured interview. It is a qualitative study utilizing a phenomenological method where data was analysed using a thematic approach. Participants described increased awareness to risk along with emotional alterations that seemed to have led to more conscious risk assessments, new preferences and increased awareness to own mental fallacies after the avalanche accident. Participants also mentioned increased knowledge seeking, new perspectives on own abilities, awareness to group dynamics and consequences along with increased planning, attentiveness and information updating out in the terrain. Further, analysing and reflecting on the avalanche accident were important for some participants learning and healing process. Findings underlined that these personal experiences presented powerful learning outcomes for the participants, incorporating several adaptive changes in behaviour and decision-making. However, participants responses were on some areas largely heterogenous and a few perspectives could present challenges for future joyful and safe backcountry skiing. Further research could, among other things, investigate the features and alterations within people's mental models of risk following an avalanche accident to further develop avalanche education and prevent future accidents.

Keywords: Avalanche accident, decision-making, risk taking, risk assessment, learning, experiential learning

Introduction

There has been an increase in popularity and number of people using the mountains for recreational activities in western countries over the last decades. Backcountry skiing has become a widespread activity for both professional skiers and the average person (Grímsdóttir & McClung, 2006; Hallandvik, et al., 2017). This increase and frequent activity in the backcountry are undesirably making people more exposed to avalanches. For an avalanche to be released an interaction between the four main factors; terrain, weather, snowpack and a trigger must take place (McClung & Schaerer, 2006). Unlike other natural hazards like floods, storms or volcanic eruptions fatal avalanche are in most cases triggered by humans, making humans a central part of these catastrophes. Around 150 people lose their life to avalanches every year in Europe and North America (SLF, 2018; Techel et al., 2016), and an unknown amount of people are left injured.

Today, assessing and minimizing avalanche risk prominently means looking into recent avalanche activity, studying the weather and the snow to select safe terrain based on this information (Thumlert & Haegeli, 2018). In the early years of avalanche research, the focus remained on terrain, weather, and snow conditions where several rules of thumb have been developed to deal with its complexity. However, studies have shown that in avalanche accidents about 80 to 90 percent of the time the victim itself or someone in its group serve as the avalanche trigger (McClung & Schaerer, 2006; Schweizer & Lütschg, 2001). This has led to an increasing interest and research into people's role in avalanches (McCammon, 2009) as understanding the rationale behind people's decision-making and actions can provide important insight and leverage to prevent these accidents from happening (Brattlien & Hansson, 2012; McCammon, 2000).

Interestingly, recent studies have shown that 38% of individuals who have experienced an avalanche are caught several times (Johnson et al., 2020). This makes us wonder, what sort of experiences and insights are avalanche victims left with after an accident? And how do they make use of this experience when returning to the mountains after an accident? Logan and Atkins (1996) claim that most avalanche incidents may be avoided as the same mistakes are made repeatedly by different individuals. Nevertheless, avalanche terrain is a complex decision environment and presents difficult learning conditions. People seldom get feedback on their decisions and may therefore often falsely believe they have made a good decision. Previous findings suggest that performing the right evaluation at the right time could be crucial to minimize risk in avalanche terrain (McCammon, 2000).

However, people often misinterpret, overlook, or overestimate their ability to assess avalanche risk and there are series of studies that point out that we fall prey to overconfidence and heuristic traps (Johnson et al., 2020).

Interestingly, avalanche victims often have the skills, the relevant knowledge and are to some extent experienced enough to make informed choices (Johnson et al., 2020). Many victims have gone through avalanche courses, and we know that avalanche education has the potential to influence risk perceptions while also providing practical knowledge (Greene et al., 2022). For example, looking at avalanche victims from Norway the last five years, most of them have been somewhat to very experienced (Aasen, 2019). Still, even experienced people with years of avalanche training make mistakes, suggesting that there often seems to be a general problem with judgement and not necessarily knowledge (Atkins, 2000). In avalanche terrain the situation can change from safe to dangerous in a short amount of time or from one place to the next, where cues revealing these changes might be difficult to spot and would require attentiveness and frequent information updating from surroundings (Landrø, 2021). Consequently, investigating avalanche accidents is no longer solely about weak layers and slope angle, it is related to how our cognitive skills, information processing and decision-making can operate as the leading cause of accidents (Atkins, 2000; McCammon, 2009). In this study we have therefore investigated individuals who have received solid feedback from avalanche terrain; the avalanche victims. Aiming to explore how and what people learn from these experiences.

Experiential learning in a wicked learning environment

Learning is a central part of survival. By developing our skills, correcting our behaviour, and updating our knowledge we tend to be better adapted to our environment. For this learning and adaption process to take place, we require fast and reliable feedback from our environment. Psychological learning theories state that learning is more efficient when we make mistakes and actively learn from mistakes because they aid a faster change in behaviour as we naturally want to avoid being lessoned again (Ellis et al., 2014). Thus, feedback seems to be a crucial element in learning as it gives us the opportunity to react, change or modify our strategy (Stewart et al., 2012). The problem then arises in environments with very little, inadequate, or completely absent feedback, as for example avalanche terrain (Hogart et al., 2015), making it difficult for people to develop the relevant skills through experiential learning.

Kolb's (1984) model on experiential learning suggests that the results from a decision are used to inform better decision-making. This feedback can in some cases induce changes in mental models, where there can be changes in the structures, strategies, and decision-rules that control the decision-making processes. However, Kolb (1984) suggests that humans are very defensive about altering their mental models (Argyris, 1986), and change is often resisted until their actions or decisions produce profound negative outcomes (Proust, 2004).

Decision-makers discover the outcome of their chosen alternative, however potential outcomes of alternative decisions are not revealed. The decision influences the payoff and the information used to guide future decisions. This might result in different processes than those observed in settings with complete feedback. Backcountry recreationalists might therefore develop a false sense of confidence in their risk management and assessment skills because yet so often wrong or flawed decisions provide positive feedback; no avalanche triggered and great skiing (Stewart et al., 2012). This positive result, however, is not necessarily attributable to a high-quality decision, but rather a strike of luck. This is the reason for avalanche terrain being termed *the wicked learning environment*, as feedback of our actions in this terrain might be non-existent, incorrect or based on how you interpret the outcome. Further, the outcome of our behaviour might even create a template for future decisions, and inferences can be based upon decision by others who are observing you (Fazey et al., 2005). Skiers get positive experiences with good skiing, and when our amount of experience grows so does the probability for doing the same activity again as we naturally seek out activities of positive emotional character (Hertwig et al., 2018). The focus might drift in the direction of testing our skiing abilities, as when the skiing abilities increases so does the need for challenges. This focus might overrule the humbleness to the mountain and snowpack (Nes, 2013).

Reflection on critical experiences is taken to be an important aspect of both individual learning and the development of a professional knowledge base (Schön, 1987). Learning can be both adaptive and maladaptive and is qualitatively better through embodied experience (Hertwig et al., 2018; Hofmann, 2018), which is particularly important in outdoor life and risky activities such as backcountry skiing (Magnussen, 2013). It is therefore established that learning is best done by experience. However, experience-based learning entails that earlier experiences guide future behaviour and decisions (March, 2010). This proposes a challenge because learning from experience in avalanche terrain is dangerous and can at worst be fatal (Faarlund & Nordby, 2015). Is there another way to learn?

Two ways of learning

As humans we have two modes of learning. We can learn from our own experience, like all animals, or we can learn from description, which is a learning strategy only humans hold. For many years, even decades, these two modes of learning were treated identical, especially in economics and psychology (Hertwig, 2015). The reason for this was that, in theory, one can acquire the same information by description learning as by experience learning. For instance, if detailed and precise enough, an individual should be able to get the same information by reading a report from an accident as the person who experienced the accident. Psychologically however, this is not the case. Experience does in fact have several components that affect learning that we cannot find in description, such as emotion, cognitive processes and subjective interpretations (Hertwig et al., 2018; March, 2010). We know today that emotions affect our decision-making (Loewenstein & Lerner, 2003). Current research shows that decisions made from the background of these two learning modes lead to different outcomes (Hertwig et al., 2004). This is referred to as the *descriptive-experience gap* (Hertwig et al., 2004).

It is now widely accepted that decisions based on descriptive and experienced based learning lead to different behaviours (Hertwig, 2012; Hertwig et al., 2018). Research done on gamblers shows that this difference becomes particularly evident in relation to "rare events" (Hertwig et al., 2004). A plane crash is an example of such a rare event, as statistically, the probability of dying as a result of a plane crash is very low. Despite this, most people who only get information and not experience tend to think the probability is higher than it actually is; they overweight the rare event. Individuals who have much experience with flying without ever encountering incidents will rate the probability as lower than it actually is; they underweight the rare event (Erev et al., 2008; Hertwig, 2012; Hertwig et al., 2004). The gap between overweighting and underweighting the rare event is the *descriptive-experience gap*. Thus, how you learn affects how you perceive risk. One could say that experienced-based learning leads to bigger risk-taking behaviour due to underweighting. A reason for this is the *recency effect*, which is that recent events are weighted more heavily than events occurring a long time ago. As rare events occur more seldom than common events, rare events are less likely to affect the decision-making, due to lack of recency.

Even when the individual knows the statistical probability of a rare event, they are likely to underweight the probability during the decision-making, due to lack of recent experiences with this behavior (Hertwig et al., 2004). Optimistic bias also affects decision-making in a way that does not represent the real statistical probability. When it comes to personal risk, a lot of people underestimate the risk. When asked about the odds of being

affected by a risky event, most people say they are less likely to be affected than their peers. This is problematic because it leads people to being unaware and hinders risk-reducing behavior (Weinstein, 1989). As they tend to be overoptimistic and most likely do not have recent experiences with avalanches, it is conceivable that they are taking risky decisions in avalanche terrain.

Knowing about these two modes of learning, it is interesting to look further into how and when we use them. Descriptive learning differentiates us from animals and enables us to spread knowledge across the world (Boyd & Richerson, 2005). Because of this we can summarize collective and individual experiences which compiled represent a very effective source of information (Frey et al., 2021). Simply put, we can learn from other people's mistakes. Furthermore, it makes it possible for us to imagine events we have not experienced ourselves (Gregory et al., 1982), which is also an ability only humans indulge in (Boyd & Richerson, 2005).

Notwithstanding all the benefits of descriptive learning, it is commonly known that experience will precede descriptions in decision-making, and individuals will even ignore knowledge gained from description learning in decision-making if they have acquired relevant information from experience (Erev et al., 2017; Lejarraga & Gonzalez, 2011; Weiss-Cohen et al., 2016). The more complex the task, and thus the task descriptions, the less impact description will have on the decision-making (Weiss-Cohen et al., 2016). This is relevant for research on learning in avalanches, as avalanches must be seen as extremely complex (Landrø, 2021; Landrø et al., 2022; Weiss-Cohen et al., 2016). The subjective reality of an avalanche, and thus the learning outcome, will depend on the individual's interpretation of the experience which can be ambiguous (March, 2010). For example, noise from experience may occur due to errors in observation, thus the wrong conclusion is drawn. What is also important to acknowledge is the value of learning from actual situations, but also the potential situations that did not occur.

Combined, this makes us very intrigued to know more about how people think, behave and feel and what they learn after being caught in an avalanche. One can assume that individuals with positive experiences from skiing in avalanche terrain will continue to ski in such places, as Denrell and March (2001) find that having positive experience with a situation will increase the probability that this behaviour is chosen in the future. They further find that having negative experience with an option will decrease the probability that this option is chosen in the future. This is interesting in the context of our research as we are investigating

what and how individuals learn, and if and how they change behaviour after being involved in an avalanche.

Purpose and research question

The examination of current literature has revealed a greater understanding for why accidents happen. However, there is a knowledge gap concerning how people are reflecting upon their accident in terms of its prominent learning potential. Further, there is limited research and exploration concerning aftereffects on how an avalanche accident change people's thoughts, emotions and behaviours in the mountains. The participants have received very powerful negative feedback on their decision-making in a wicked learning environment that could potentially have killed them, which makes us wonder, what people are left with after these experiences? Does this experience affect their decision-making or behaviour today? Avalanche accidents are fortunately infrequent but so are the follow up investigations and reports, thus an in-depth interview might be the best method to give insights to how victims are reflecting upon their accident and what they have learned from the experience.

Aim of the study

This study aims to exploratory tease out how people think, behave and feel viewed through the lens of learning after experiencing an avalanche accident. This can give important knowledge that might to some extent be generalized and used to prevent accidents in the future. Our research questions are 1) How do avalanche survivors reflect upon their accident retrospectively in terms of learning? And 2) What do avalanche survivors experience when going back to recreational activities in the mountains?

Method

Design

Given the exploratory nature of the study, a qualitative method was chosen. As opposed to a quantitative approach this allows for a more open investigation of the participants' thoughts, behaviour, emotions, and background (Kvale et al., 2015). By conducting personal interviews, we were able to gather in depth and subjective information from each participant (Bradford & Cullen, 2012). An interview is well suited to bring out the meaning of people's experiences and reveal their experiences and knowledge (Kvale et al., 2015).

This study intends to deepen our understanding by describing and exploring the individual experiences each participant had as precisely as possible. Specifically, how they make meaning of their experience and how this affects them (Edmonds & Kennedy, 2016). Thus, a phenomenological approach was taken (Kvale et al., 2015). Phenomenology is the description of individuals' immediate experiences, how they make meaning of it, and the impacts it has on them (Edmonds & Kennedy, 2017). Central to the phenomenological approach is to meet participants' reflections with openness and to recognize them as being the expert on their own experiences (Kvale et al., 2015).

Semi-structured interviews were conducted to best take account of the central aspects of the phenomenological approach. The interview guide was developed by researchers from the *Center for avalanche research and education* (CARE) at UiT – The Artic University of Norway (Appendix 1). The interview guide was used as the main tool for gaining insight into the participants' personal experiences and thoughts. This secured consistency throughout the interview and across interviews. It further gave us the possibility to explore emerging themes and viewpoints that appeared during the interviews (DiCicco-Bloom & Crabtree, 2006).

Participants and recruitment

26 participants were recruited in autumn 2022. Of these we had 25 male and 1 female. The criteria for participation in the study were direct or indirect experience with one or several avalanches. Some of the participants had themselves been taken by an avalanche, and some were in the same touring group as people taken by an avalanche where they had taken part in the rescue operation. The participants were mainly off-piste and backcountry skiers located in Norway, although one of the participants had been in an accident involving a snowmobile.

Recruitment of participants was mainly done by using the CARE panel. The CARE panel is a co-hort study with 3200 backcountry skiers. Among them 52 reported having been in an accident where someone was completely buried, injured, or killed. Of these, 18 agreed to be interviewed. In addition to this, participants were recruited using the snowball effect, as some of the people recruited from the CARE panel had friends or acquaintances who had also been involved in avalanches. We further used our own network to recruit participants by posting on Facebook about our research and need for participants. This message reached an unknown number of people and reached further than our own network as it was also shared by others. In total 26 people agreed to be interviewed. For those who accepted the invitation to participate in the study, a timeslot was arranged to conduct the interview individually.

Material - the interview guide

The interview guide was developed to ensure we covered the core themes of interest. We first asked the participants to describe their avalanche experience in as much detail as possible. We wanted to trigger their thought process and association paths related to the incident so that details of the incident become easier to recall. We then followed up with more specific questions regarding the participant's decision-making, emotions, thoughts, risk evaluation, behaviour, and group dynamics. Further, we asked the participants to elaborate on topics and reflections that emerged during the interview. At the end of each interview, we asked the participants "In your opinion, is there anything other skiers/recreationalists can learn from your accident? Or do you have any tips for skiers who travels/moves in avalanche terrain?". This question gave them the chance to emphasize aspects from their learning process.

Interviews

The interviews took place during August, September and October of 2022 and lasted between 20 minutes to two hours, where most lasted around an hour. There were two distinct research groups exploring two different themes using the same data, thus the interviews were conducted by two separate groups. Our group conducted 15 of the interviews while the other group conducted 11. Our research groups used data from all 26 interviews. One student was responsible for leading the interview, while the other student observed and asked follow-up questions if necessary. The students switched between every participant on who was the primary interviewer.

Prior to the interviews all participants had to read and sign a consent form (Appendix 2) that explained the main purpose of the study and informed them about the storage of audio recordings and the privacy regulations. Except for three, all interviews were conducted online using Microsoft Teams as the participants and interviewers were at separate locations. Time of the day varied depending on what was suitable for the interviewees and interviewers. Some participants were more open than others, and when participants answered vaguely, short or they misunderstood the question, the questions were repeated or sometimes modified. We occasionally experienced problems with the internet connection and signal. This problem became less frequent when disabling the camera function. All interviews were conducted in Norwegian. The audio was recorded via Microsoft Teams and securely stored using OneDrive.

Facilitating interviews for research purposes is a challenging task as it is critical to obtain high quality. To the best of our ability, we have acted as to meet the requirements Kvale and Brinkmann (2015) highlights as important in order to conduct high-quality interviews.

Research ethics

The research project was approved by Norwegian Centre for Research and Data (NSD-733888) prior to the start of the recruitment process. This reassured us that guidelines for material safekeeping were up to standard.

When entering the research project, all participants were informed about their anonymity and how the information they provide will be handled with confidentiality. They had to sign a consent form which served as an assurance to us that they had read and understood the information. We emphasized to all participants that they were able to withdraw their participation and consent at any time, including after the interviews were conducted.

As we are clinical psychology students we frequently work with vulnerable people and talk about difficult subjects. This has provided us with an awareness about what we say, how we say it, and how it might affect how the patient, or in this case the interviewee, is feeling during our conversation. Such awareness translates to the fact that an avalanche experience can be challenging and emotional for people to talk about, especially since some of our participants had friends who were killed or severely injured in the accident. We are not blind to the fact that talking about this might trigger undesired emotions or feelings in our participants. During the interviews we used techniques which we have acquired throughout studies of psychology to make them feel safe and understood. Using our competence, we balanced the need for empathy and understanding, while still digging for valuable information where necessary and appropriate.

None of the participants were compensated and participation was based strictly on voluntariness.

As aforementioned, data collected through this research project might be of value for researchers in the future. As such, participants must be prepared for the fact that the information they provide might be used in other research projects. All participants are informed about this through the consent form, and we therefore consider this well within reasonable ethical bounds.

Data analysis

A phenomenological approach as described by Brinkman and Kvale (2015) was chosen as we wanted to explore our participants' personal understanding and descriptions of their avalanche accident. We let our participants openly describe the process from planning stage to the avalanche accident and further the final learning potential, as our goal was to understand their own perspectives from the accident. The analysis was focused on extracting meaning by categorizing data and identifying themes, thus a thematic analysis with an abductive approach was used. We used an exploratory design in which our path selection and the choices we made were created during the process and not before our study. There were five phases in the analysis.

Step 1. Working through the transcriptions

The interviews were audio recorded and transcribed to text by a professional third party. In the first phase transcriptions were divided into meaning units, which is a sentence, phrase or a paragraph that describes a specific theme. The meaning units were then condensed, which allowed for a more structured and "to-the-point" overview of data. The condensation was a part-by-part summary of the transcribed interviews written in our own words. Keeping in mind that data was collected not exclusively for our research purpose, this research condensed only parts of the data being related to participants avalanche experience in terms of their learning process.

Step 2. Transforming meaning condensations to descriptive codes. To analyse the data material a computer program called NVivo was used. In the second phase the condensed meaning units were uploaded from MS Word to Software NVivo 12 where we reviewed all the condensations to find common features within the different transcriptions. We made descriptive codes dividing distinct parts of the transcriptions. Themes were named in ways that captured their essence and complied with their content. To create a better understanding of how the different interviews illuminate the research question, the main codes were narrowed even further by dividing the meaning units into categories and sub-categories.

Step 3. Post coding. We placed all the codes separately in Memos which is a working place in NVivo, where each code and subcode was described along with connected quotes. The purpose of post-coding was to clean out excessive information and to further look for similarities, nuances and different perspectives within the same theme.

Step 4. Creating a table of the main and subthemes. The fourth step in the analysis was to create a table with the abstracted themes and subthemes that summed up the findings from the data.

Step 5. Finding quotes. The fifth and last step of the analysis was to find particularly relevant quotes describing the illustrated abstractions. Tentative markings of potential quotes were made throughout the analysis but was not chosen until the final findings section was written. Quotes were then translated from Norwegian to English.

Findings

The data collection resulted in a substantial amount of material which contained large stretches of nuances within themes and subthemes. Two main themes related to participants learning process emerged from the thematic analysis of the transcribed interviews: participants' experience of returning to the mountains after an avalanche accident and reflections on the avalanche accident as a learning experience. The two main themes further contained following themes and subthemes. Direct quotations translated from Norwegian to English are provided to support the content. Themes are presented in table 1.

Table 1.

Overview of themes and subthemes described by the participants

Theme	Findings
Participants experience of returning to the mountains after an avalanche accident	• **Risk perspective** Reality check, willingness to take risk, risk awareness, risk acceptance • **Attentiveness** Updating, overview and planning • **Awareness to consequences** • **Emotional aftereffects** Trauma and self-imposed exposure therapy, a feeling • **New preferences** Avoidance, turning around and route selection • **Awareness of misjudgments** Mental fallacies, solutions and rules • **Perception of abilities** A warning, active evaluation and self-doubt • **Seeking knowledge**

	• **Awareness to group dynamics and ski buddies**
Reflections on the avalanche accident as a learning experience	• **A profound experience, talking about the accident, interpretating and analyzing the accident, sharing experiences**

Participants experience of returning to the mountains after an avalanche accident

Risk perspective

All but one of the participants stated that they had become more aware of their own death, the risk of avalanches or that bad things can happen to them after the avalanche accident. All these participants further stated that they had experienced an enhanced awareness and attentiveness to risk after the accident. Twenty-four participants explained that their increased risk awareness seemed to have changed their overall perception of risk to some extent. However, participants gave a broad range of different responses and nuances in relation to their new perception of risk, where a few also mention other contributing factors to this change, such as increasing age, responsibility and experience.

Reality check. Fourteen participants described their avalanche accident and changes in risk perception altogether as some sort of reality check. Some of the participants who experienced an increased awareness of risk further explained that they knew about the risk of avalanches prior to the accident but that it became more apparent in a way that is hard to explain and understand hypothetically. A few of these participants stated that this realization and experience would be difficult for others who have not experienced an avalanche themselves to understand. A large part of these participants further emphasized that this realization changed something unexplainable in them, illustrated by the following two statements:

> *(..)It is different to see the powers live in action. It is different from just hearing about it and thinking about it. In that moment, when I was caught by the avalanche, I was pulled down and I thought now it's my turn to die. This is it.. I am actually going to die. Luckily, I got out, but I got so angry with myself, why the hell did I expose myself to this, it was so stupid. I knew it was dangerous, but that was the first time I actually*

> *realized I was going to die. The threat became so much more real because now I had experienced it. That is what stuck with me. (…) In these situations, one experience it as much more real, I don't think people realize it can happen to them, you sort of know it, but you haven't taken it in.*
>
> *(..) That feeling is stuck with you. I know what it feels like to be under the snow and get snow shoved down my throat. I have felt what it's like to not be able to control the situation. So, I think that helps. It does something.*

One participant explains that this reality check moves in cycles, as a close call reminded him of a risk he had underestimated.

> *Then you get a sort of reality check, and then oh shit and then you pull yourself together. It moves in these cycles.*

Willingness to take risk. Under half the of the participants expressed that they still take the same amount of risk, and above half of the participants expressed a decreased willingness to take risks after the accident. One participant explained his decreased willingness to take risk in this way:

> *Now I wouldn't have taken that risk. I think it's a little bit about that invulnerable feeling that you can..that at least I had before. It doesn't happen to me. Whereas now I don't think that anymore.*

Further, three of the participants elaborated that the changes they experienced related to risk could be due to increased age, more experience in the terrain or changes in their life situation rather than the avalanche accident.

> *It* (risk-taking*) has changed over the years. At that time we were without kids and in a different life situation. So, it has become more conservative now, we still do some exposed skiing but it's a bit different (..) one has become more conservative and careful over the years.*

Risk awareness. Participants who stated that they are more aware of risk but still take the same amount of risk as prior to the accident often explained that they now experience their risk-taking as better calculated. These participants explained that they experienced increased awareness of the uncertainty that avalanche terrain holds and more often imagined the consequences and took additional precautions. These reflections indicate that they did experience some change in their risk perception that gave them the possibility of more conscious and informed decision-making, although they still state that their willingness, acceptance, and preference of risk remained unchanged. One participant illustrates this in the following way:

> *It has not changed my willingness to take risk as I might even take more risk now by skiing in high consequence terrain, but it has changed my understanding of risk, the awareness around it because when I was avalanched, I didn't think I was taking any great risk.*

Risk acceptance. A few of the participants who reported unchanged willingness to take risk stated that skiing in avalanche terrain gives them so much joy that it is worth the risk. They explain that they are still in avalanche terrain not because of the risk, but despite it as skiing gives them joy that surpasses the possible negative outcomes. Two participants illustrate it in this way:

> *I wish I could say that it* (level of risk-taking*) has changed but it hasn't. (..) I basically have the same urge to ski steep, I do. So, this winter I skied the craziest line I've ever done.*

> *I fear that the experience of being in the mountains, the feeling of untouched powder is so amazing that it outshines all..or in many cases the potential risk that lies behind it so that it sorts of gets disguised. How that psychologically works there are people who know more about than me, but in my case there are so many positive associations and experiences related to these types of activities that one somehow neglects the risk.*

One participant stated that the accident did not really change anything in terms of his risk perception as he had thought about it and accepted the risk prior to the accident.

> *Risk is something I have thought quite a lot of before, and I think the same conclusions that I got before the accident still apply. And in that sense the accident didn't change anything. It is something that I in a sense was already prepared for*.

Attentiveness

All but two of the participants mentioned that they look at the terrain, weather, snow, and surroundings with increased attentiveness after the avalanche accident. The factors that they stated they were more attentive to were often specific features that were present at the day of their accident, and these participants perceived these features as important contributing factors to their avalanche accident. Illustrated by these two participants:

> *Would probably look for the cues that were present when it happened. I am probably looking for that, so there is a certain learning effect of it, it is. You remember what went wrong. For example, the wind, I am really alert to that.*

> *I am much more skeptical to steep terrain and more focused on runout zones. Especially these hanging wind packed areas you get really.... when you first get hit in the face by this you are going to be so much more attentive to it. So yes, I am. One becomes more attentive.*

Updating. Participants stated that they now look more closely and more often update their current understanding of their surroundings. They report having a higher information updating frequency to identify cues of avalanche danger as terrain traps, slight changes in weather, temperature, snowpack and wind, some also check and dig in the snow more often.

> *It (*avalanche accident*) has shown me..or reminded me that my ability to take in or read the warning signals are not good enough, and that you have to spend more time, you must look.*

Some of the participants stated that this new substantial information collecting process has given them a more nuanced and informed picture of their surroundings and has led to better decision-making after the accident.

I think that I am better at working with the information that's around me and available to me in avalanche terrain. And I work much more systemized with this information to make good decisions.

Overview. Twenty-three participants stated that they are more attentive and have an increased awareness to update their current information from their surroundings throughout the whole trip, where some explain that this gives them a better overview. Illustrated by two participants in this way:

When you take the wrong route further down, one exposes oneself to a large risk as you don't have a complete overview of the mountain, you had just been focused on yourself and what you think is difficult, and you forget that the trip actually lasts all the way down to the car. So that was an important lesson for me, to have this complete overview.

And a really important lesson that I have taken with me is that when you are in the mountains you have to stay attentive, you have to stay present the whole way down.

Planning. Eleven of the participants explained that they were more focused and attentive already from the planning phase, which included checking the weather, map and avalanche forecast more often, and in more detail closer to departure.

I spend more time looking at and updating my knowledge about how the weather is and how it has been. So, it's the ongoing collection of weather observations.

Awareness of consequences

Thirteen of the participants explained that they now think more actively about consequences and different outcomes both out in the terrain and when planning prior to the trip. Some of these participants described that this consequence thinking is related to their increased awareness of the potential risk. Some participants also explained that they use their increased attentiveness to cues to think about and imagine the potential outcomes and consequences of being there. Some participants stated that their thoughts on consequences led to preventing actions, including everything from first aid gear and abilities, wearing helmets

from start, taking action to prevent hypothermia, awareness to cellphone service and their ski friends' rescue abilities.

> *I look at the terrain differently now. I look more at..I am always thinking what if there is an avalanche here (..) thus more of the consequences if there was going to be released an avalanche. I don't only do it in big scary terrain (..) and I am thinking, at least up the couloirs and stuff that its quicker to just put your helmet on and reflect on it, because of the consequences if it releases here. So, helmet, maybe a jacket thinking about hypothermia and stuff. So not just necessarily focus on the snow but also more trauma preventing practices.*

> *You must have a constant awareness of where you are, where you are going and the consequences of being there.*

Emotional aftereffects

Trauma and self-induced exposure therapy. Six of the participants explained various degrees of trauma affecting them years after the accident, most of these participants described it as panic or strong fear related to the terrain and sounds that remind them of the avalanche. A few had experienced nightmares and three participants described panic attacks related to the specific weather or conditions present on the day of the accident. Participants who experienced these strong emotional responses seemed to have been using some sort of self-induced exposure therapy over several years to get comfortable enough to ski in the mountains again. Some experienced these aftereffects over several years, illustrated by these two participants:

> *A couple of years after the avalanche I was very determined to do this self-imposed exposure therapy and it was really scary. At one time I had a flashback where there was a train coming into a train station. I didn't understand where the sound was coming from and then I saw an avalanche in front of me, but I was standing in the ski lift line (..) I dreamt a lot about it for a couple of years. Those years were really hard (..) I remember going on these completely safe trips where I was constantly afraid that there was going to be an avalanche. It was hard, but also sort of interesting and instructive.*

It has changed me. I had a large trauma after it. And for many, many years after and to this day, I can still feel some sort of panic, or anxiety when I am in avalanche terrain. If I at any point feel some sort of uncertainty, and it doesn't have to be reasonable, the conditions might be very good and there is no problem, but you can never know. Even when I am as safe as I can be in avalanche terrain I can still..I get an anxiety attack, panic attack. So that's..Yes I still have that.

A feeling. Most of the participants did not experience aftereffects to this extent, however the majority described their emotions in the terrain afterwards as more frequently having a bad feeling, being uncomfortable, unsure, tense or a bit scared. For most participants these changes in emotions were solely linked to the exact terrain they were avalanched in, as stated by this participant:

After the avalanche accident I didn't feel any more fear compared to before the accident. But that's probably because I am not a very neurotic person. (..) It's hard to say, but I feel like it's more of this feeling of being in a couloir, that is something I would really dread going into. I think that is what I have felt the most.

Participants further explained that these changes in emotions seemed to be of importance after the accident as judgement and decision-making prior to skiing a line or selecting a route were in many cases guided by these gut feelings or emotions.

I hope that there is something that will make my stomach hurt, so then I'll figure out that today it's not worth it or I'm not doing it, that I'm at the wrong place at the wrong time. This is not where I'm supposed to be. Yes, I hope so.

There is something about that gut feeling, it does count for something. At least in that case. I should have trusted it more.

New preferences

All but two of the participants stated that they have changed their skiing behavior to some extent after the avalanche accident where a range of different reactions and changes in behaviors were described. Participants generally reported changes in their route selection, how often they turn around and what terrain they would prefer to ski after the accident.

Overall, participants' changes in behavior seemed to be described as a result of the emotional changes they had experienced, along with increased risk awareness and consequence thinking. Almost all reported their new preference in terrain as related to characteristics of their specific avalanche accident. A few of the participants further mentioned that increased age, changes in their life situation and lifelong experience in the terrain were important contributors to this changed behavior.

Avoidance. Ten participants stated that they had decreased or stopped skiing in avalanche terrain, and some explained that there were years right after the accident where they did not ski as much as they used to. Six participants stated that they had stopped skiing the specific terrain present at their avalanche accident and twelve of the participants stated that they evaluate this decision more thoughtfully.

> *I dread going into big couloirs. Because you are so committed when entering those. (..) So I haven't skied any big couloirs. I dread that. I will not do that. I will not.*

Some of the participants associated this change in behavior with a change in what terrain they feel safe enough to ski in. Depending on the terrain of their avalanche accident some would now prefer big open terrain instead of couloirs or terrain with high forest density, whereas others have the opposite preference, illustrated by these two participants:

> *So, I ski much more in the forest and smaller terrain. I wish I could ski more big and open terrain, but I am more afraid of that. I feel like it makes sense, in my head it makes sense that the big open terrain has bigger potential, there are more masses, more weather, everything.*

> *The forest looks safe. But it is not safe at all if there is released an avalanche there. And the trees do not have to be big before they hurt when you hit them. So that's mainly my lessons from it.*

Some would also prefer to ski late in the spring as their avalanche accident happened on layered winter snow.

> *I am more able to wait until the spring to ski the very steep stuff, mostly, and avalanche terrain above trees is not happening. I can't stand that.*

Whereas another participant explained that he has experienced a change in his relationship to spring skiing.

> *I always had this relaxed relationship to spring conditions. Because then you can let loose and ski steeper. But that has changed.*

Turning around. Thirteen participants reported that they turned around more often after the avalanche accident. Some of those participants explained that this decision felt easier to go through with as they were more aware of the risk and potential consequences. A few of these participants further explained that this choice or behavior was guided by negative emotions or a bad gut feeling.

> *So, for example on a trip this winter we were supposed to ride a steep line. I had gotten up early in the morning, I spent hours getting to the top of the line and I stood there, and I felt like, no this does not feel right today. I am going to save it for another day. So, I feel like it's easier.. That experience has made it easier to make these kinds of decisions. To always be prepared to turn around, even if you have gotten all the way to the top of the line.*

Three participants also stated that the ability to turn around or choosing not to ski a line was followed by the feeling of pride. Illustrated by one participant in this way:

> *I am so much prouder to make that kind of decision* (turn around*). Even if it went well anyway (..) the couloir did not fall out that day. But to me, to stop and make that decision and stand for it, and the trip was nice after that as well. Something has changed, it's something I would not have necessarily done if it weren't for that trip (*avalanche accident*). Because I know how important that choice is.*

Route selection. A few participants stated that their route selection and preference had changed as they now choose more wisely based on their obtained information. Some participants specifically mention that their new behavior was related to their increased risk awareness. Two of the participants explained that their changes in route selection might be more due to increased experience or age rather than the avalanche accident.

Awareness of misjudgments

Mental fallacies. All but two of the participants gave statements reflecting some increased awareness upon their own mental fallacies after the avalanche accident. These statements were largely concentrated on awareness of how their information processing and decision-making were precluded by them feeling safe, lack of awareness, a strong wish to ski a line or witnessing others ski cool lines, illustrated by these two participants:

> *You get so, oh you really want to ski there, and you see everybody else skiing all kinds of things. People ski all sorts of weird things all the time. Nothing happens to them, it's completely fine, so then let me have my fun too. So sometimes, one can just forget about it, or push aside that it's really, that it really can happen.*

> *I'm thinking, the thing I have reflected upon the most afterwards that has given me the most is this thing about not getting caught in the moment. To take a step back and reflect upon what I'm about to do, what are the risks and hazards. Not just focus on the physical performance, but that there is more to it and other assessments as well. I think more people would benefit from getting out of their heads before dropping into something, not just thinking about that turn, keeping balance there, but taking with you all the other things that can happen which are not related to your physical performance, that's important too.*

Solutions and rules. Many of these statements and reflections of their own misjudgments were linked to characteristics of their specific accident where they explained their own misinterpretations and connected these to their behavior in the terrain today. Some of these participants outlined solutions and actions to prevent these errors from precluding their decision-making. Some participants presented rules prior to trips that they must follow so they won't talk themselves into making a decision that is favoring their wish to ski, and some suggested a day off when becoming too used to the risk and exposure. Others presented a flexible mindset or a flexible plan to be able to turn around or choose safer terrain, and one suggested that we need more information and knowledge about our own psychology to prevent these mistakes. Two participants exemplify it in this way:

I hope I wouldn't do the same again, that I am more aware. I think I am more aware to not mess up (..) If I have planned a trip where I am crossing something and I am afraid something is going to fall out, snow or a shovel, if I'm not there to cross in time then it's not happening. Previously I was more prone to get pushed into it or talk myself into crossing (..) it's easier to get carried away and pulled into something if you allow yourself to make the decision there in that moment.

Because the thing is, when you think this is probably fine, that means I'm taking a risk that is not necessarily based upon information from my surroundings were I'm doing things, but based on me wanting to do something, which becomes more important than letting the facts or my decisions control what I'm doing. If that makes sense? It hurts to answer this honestly, but I've been thinking.. I always doubt myself. Am I making a good decision? Have I gone through everything I need to? Because it was like that in the accident. I really knew better. It was just my wish to ski was overruling the cues available to me. So that part scares me, and it has made me doubt myself.

Perception of abilities

Eight of the participants explained that they experienced that the view they had about their own abilities to make good decisions in avalanche terrain had increased after the accident whereas thirteen of the participants explained that their view of their own abilities had decreased. **Warning.** What seems to be important for some of the participants' perception of increased or decreased decision-making abilities is whether they had a bad feeling warning them about the potential threat or not, or if an active decision was made prior to the avalanche. Two of the participants explained that they did experience a bad feeling warning them about a danger or threat prior to their accident, one explain it in this way:

The avalanche really just confirmed what we were scared of that day. Exactly what we were scared of actually. I thought it was unsafe in that area, and then the avalanche released in that exact place. I felt like there was an important lesson in that. (..)so yes, I do feel more confident in my own avalanche assessments.

Active evaluation. Two participants also stated that whether there was an active evaluation taking place prior to the accident or not would affect the perception of their own abilities afterwards and the accident's learning potential.

I think things would have changed a lot more, and I would have doubted my own decisions afterwards if I had made an active decision that I felt was right in that situation and still ended up in the accident.

Self-doubt. A few participants stated that how much their self-confidence gets crumbled affects how much they learn from the avalanche accident. Those who did not experience some sort of bad gut feeling warning them in their avalanche accident explain that their gut feelings can't be trusted and have statements that express more occurrences of self-doubt.

You are a bit more sceptic to your own evaluations all the time. Because you never get the answer if you're doing it wrong or right before something bad happens. You just get the wrong answers all the time. That day we didn't even try to get the answers, we didn't know. So, there was a time afterwards where you doubt yourself all the time.

Seeking knowledge

Eleven of the participants stated that they had been seeking more information, experience and knowledge after the accident to be better able to perform good avalanche assessments and decision-making in avalanche terrain. Exemplified by one participant in the following way:

When you get this reprimand so early in your skiing career it affected me to spend more time acquiring knowledge about being in avalanche terrain. For some, this experience might make them less interested in skiing, but it hasn't changed my wish to be out in the mountains. However, it has changed me in that I realized that I needed more knowledge, and I need a greater awareness to what I'm doing.

Awareness to group dynamics and ski buddies

20 participants stated that their accident had affected who they go on trips with, specifically who they go skiing with when and where. Some of the participants stated that they now have an increased awareness of group dynamics and the importance of clear responsibility and communication within the group. Most of these participants stated that they can go skiing with anyone, but not anywhere, and they especially choose more wisely

when skiing in high consequence terrain. Some of them stated that they now prefer to ski with somebody who has trained with their rescue gear, has a similar attitude towards risk and is mentally and physically able to rescue them. One participant illustrates his experience in the following way:

> *It has changed everything really. (..) it has changed who I go with, who I go with where and how many I want to go with (..) I can go with anyone, it can be my girlfriend, father-in-law or friends, it just depends on where we are going. It's a lot about personality, skiing abilities, knowledge, and attitude. There are people I won't go with because I don't like the way they think, I think they are taking way too much risk. And there are people I won't go with in avalanche terrain because they have nothing there to do, because they have no idea, they just want to a be out on a stroll and take a picture for Instagram and then go home.*

Reflections on the avalanche accident as a learning experience

A profound experience. Ten of the participants specifically gave statements on their avalanche accident as a somewhat positive and important learning experience. Three participants stated that their learning outcomes could be intertwined with increasing age and experience and are not necessarily solely due to their accident. Other stated that the accident had a profound impact on them, exemplified by one participant in this way:

> *Yes, it has changed a lot. It has made me interested in everything that has to do with skiing really, first aid, snow, group dynamics, everything. So, then things will change. My backpack probably weighs 10 kilos more now than it did back then.*

Two participants specifically stated that their acquired learning and lessons from the avalanche experience had saved them in later avalanche situations.

> *I have taken with me a lot of lessons, it's those sorts of lessons that have saved me in later avalanche situations.*

Talking about the accident. A little under half of the participants mentioned that how we talk about avalanche accidents in hindsight is important in terms of acceptance and reflection to heal from the accident. Two participants illustrate it in this way:

> *That debrief was the absolute best thing to do after a situation like that. It's not enough to go through it on your own (..) That's the best advice I can give. When you're done with an experience like that, as quickly as possible work through it with people who have been there or know what it's like. Because that puts things into perspective, it opens your mindset and keeps you from getting trapped in your own head. Most likely you are not alone.*

> *At the hospital I decided that this should become a history of success for me, if not it becomes a trauma. I got a really good tip from a friend, and he suggested that I should talk about it. So, I talked, and talked and talked, until it became a situation I could accept.*

Interpretating and analyzing the accident. Two participants stated that as they were highly experienced prior to the accident there was less potential for learning as they were confident in how they did things both prior to and after the accident and outlined that their thoughts and behavior hadn't changed much. Two other participants interpreted their avalanche as a random naturally released avalanche, where this interpretation was established in a group discussion shortly after the avalanche. Some of these statements held views displaying that there wasn't much that could have been done differently leading up to the accident. These participants focused mainly on risk acceptance and first aid, containing less reflections on learning, introspection and changes in behavior compared to other participants. However, most participants emphasized that reflection, introspection and accident analysis were important to be able to learn from the accident.

> *I managed to analyze my way to why it went wrong because then you can learn from your mistakes. And I have, I've become aware of what created that dangerous situation at that point.*

Sharing experiences. A few stated that sharing and reflecting on the avalanche experience could be painful. One participant explained that negative feedback on Facebook stopped him from sharing his trips on social media platforms and his avalanche experience in general. A few participants stated that their group avoided talking about or sharing the avalanche experience with others: "*we didn't really talk about it afterwards either. I felt like it*

was like..this is something that shouldn't be mentioned". Another participant stated:*" We obviously kept our mouths shut, very few knew about this"*. However, most of the participants stated that they wish for others to learn from their experience and that it feels meaningful to share their lessons and insights from the accident. This was illustrated by two participants in this way:

> *I am happy I can share my experience at least. That is what makes most sense in my..that one can learn from it. There is no use in learning from it if one can't share the lessons.*

> *Really all the things I've been talking about now, what I've learnt. I have always been open about this accident and told people in my social circle about the accident and all the mistakes we made. Because there is so much to learn from it. I did a sort of an enumeration once, I felt like there was 6-7-8 points one could learn from it. I have experienced in my community that people have, when they have heard that story, they thought that it might as well been them.*

Discussion

The purpose of this study was to get a view into avalanche victims' experience of returning to the mountains after an avalanche accident to explore how victims reflect upon their avalanche accident retrospectively in terms of learning. The sum of presented statements outlines that avalanche accidents along with participants accident analysis and sensemaking hold a variety of personal perceptions and nuances that can result in a range of different learning outcomes.

Nonetheless, the majority of participants described an increased awareness to risk along with emotional alterations that seemed to have led to more conscious risk assessments, new preferences and increased awareness to own mental fallacies after the avalanche accident. Participants also mentioned increased knowledge seeking, new perspectives on own abilities, awareness to group dynamics and consequences along with increased planning, attentiveness and information updating out in the terrain. Further, some of the themes and subthemes seemed somewhat intertwined as participants often described increased attentiveness to risk and alterations in emotions as the reason for their new preferences, planning, information updating, knowledge seeking and consequence thinking.

Some participants further underlined that their accident analysis, reflection and debrief were central parts of their healing and learning process where some felt like it was meaningful to share their experiences with others. In the following sections the findings are discussed more thoroughly. We examine participants' new perspective on risk, look closer at participants' different interpretations of contributing factors and discuss participants' reported changes in behaviour. Lastly the importance of reflection and shared knowledge after the accident are outlined.

A new perspective on risk

Almost all participants reported an increased awareness to risk after the accident where they explained that the avalanche worked as a strong warning, reminding them that they are exposed to accidents, injuries and even death. Almost all participants experienced small to profound changes in their risk perception and above half of the participants explained that it was this change in risk perspective and heightened risk awareness that changed their willingness to take risks. Participants new perspective on risk were often outlined as an explanation for changes in thoughts, behaviour and decision-making, resulting in more cautiousness when exposing themselves to risk after the accident. Previous studies have found that perception of risk can operate as an important determinant of risk-exposure (Weber & Milliman, 1997), where this pattern seems to be coherent with some of the participants' statements in this study. Importantly, this alteration in risk perception and awareness could be beneficial for the participants in the future if it leads to a better understanding of the uncertainty and risk avalanche terrain holds (Borchers, 2005), and it seems to have provided insight to consequences and the importance of precautionary behaviour for the participants. One could further speculate if participants experience an enhanced risk calibration to some extent, however the study highlights that there seems to be large heterogeneity in terms of risk taking and risk acceptance after an avalanche accident.

Interestingly, viewing the participants statements through the lens of previous risk research, participants emphasized that the reality check the avalanche gave them is hard to explain and understand in a hypothetical way. These statements suggest that their avalanche experience is different from a description of it. Participants explain that they already knew about the risk of avalanches prior to the accident, but that it became more evident to them in a way that was hard to describe. Participants emphasized that their increased awareness to risk and avalanches might not be possible for others to understand, it has to be experienced. As mentioned in the introduction, a substantial amount of research has underlined that learning

from a description of risk versus the experience of risk can differ substantially in both process and outcomes. Importantly, peoples' risk perspectives based on a description of risk versus an experienced risk can lead to systematically different decision-making (Frey et al., 2021), which seems to be congruent with participants statements in this study. Participants exemplify that their new risk perspective led to the reported changes in thoughts, emotions and behaviour, constructing interesting questions on how participants learn from descriptions of avalanches, as for example in avalanche courses versus a hands-on experience out in the terrain. Recent research has suggested more practical training within avalanche education (Landrø, 2021), which seems to be supported by the participants' statements in this study.

Worth noting is that all participants in this study have continued to or plan to ski after their avalanche accident. It is reasonable to assume that their risk profile might be on average inherently different than for individuals who have quit skiing after an avalanche experience. Further research could possibly control for this aspect and involve participants who have decided to stop skiing to determine the role of inherent risk preferences.

Avoidance and new preferences

Most of the participants outlined an interpretation of specific weather, snow conditions or terrain as the main or at least contributing factor to their accident and gave statements indicating increased awareness towards these specific characteristics as a direct consequence of their accident. Most participants further stated that they experienced a range of negative emotions towards these cues and would dread going into the specific terrain or conditions they were avalanched in, where some had stopped skiing in these altogether. Further, participants explained that they viewed these characteristics as more unsafe compared to other cues present in the terrain.

Pervious research indicates that behaviours or decisions that lead to a negative outcome will decrease in frequency, whereas behaviour or decisions that lead to a positive outcome will increase (Holland, 1996). A large part of previous research refers to this phenomenon as *the hot stove effect* (Denrell & March, 2001), which seems to be in line with what some participants outline in terms of changes in emotions and behaviour after the accident. *The hot stove effect* suggests that when a behaviour generated an extreme outcome it can give rise to strong biases that prevent the person from repeating the behaviour that led to poor outcomes (Denrell & March 2001). These changes are mostly resourceful and adaptive behaviours, however, on a few occasions the biases that occur towards similar alternatives as the one experienced might not always be representable of reality (Denrell & March, 2001).

In our study a few participants gave statements indicating that they felt safer and were more willing to ski terrain, weather or snow conditions that were systematically different from the ones they were avalanched in. For example, one participant stated that he now would prefer to ski large open terrain compared to terrain with trees, whereas another participant stated that he would rather ski terrain with trees compared to large open terrain. Some of the participants realized and reflected on this mental controversy, whereas a few didn't. These new preferences could potentially give rise to new dangerous situations for the latter if they develop a false sense of security to cues that are invariably different from the ones present in their accident. In this way, some might underestimate risk after their avalanche accident if they feel safer in their newly preferred terrain or conditions depending on the characteristics of their previous avalanche experience. Importantly, this newly preferred terrain could potentially give rise to a new objective and underestimated avalanche danger.

This might be particularly worrying in these low feedback environments where there are few chances to update existing interpretations and break reinforcing cycles of perception to correct these misinterpretations (Denrell & March, 2001). Nevertheless, this aspect was only mentioned by a few participants as most participants only stated what terrain they would dread going into or stopped skiing, not what they would prefer to ski after their accident. The extent of these interpretations is therefore unknown, but based on participants diverse statements it underlines that an avalanche accident can result in a variety of different outcomes on preferences and risk perspectives as it appears to be initiated by participants personal accident experience and their following interpretation.

Previous studies have suggested that if an action resulted in harm there is a higher chance for the person to be alert and outweigh risk for a certain period (*the experiential refractory period,* Hertwig, 2021), where this timespan can be affected by the magnitude of the experienced harm. Previous studies on car accidents have found that in the third month after the accident risky behaviour rebounded significantly, however, psychological distress was found to be elevated for up to 3 years, especially in events with personal injuries (Hertwig & Wulff, 2022). Frey (2021) further suggests that the psychological impact of an event wanes as people experience safe encounters with the activity. These aspects of presented theory seem consistent with several of the participants statements in this study who explained that their avalanche served as a powerful negative reminder which created undesirable emotions making them avoid specific terrain or skiing altogether for a period after the accident. However, participants outlined that these emotions and avoidant behaviours often faded after an amount of time, along with repeated exposure to these cues. Future

research on presented findings could potentially give more answers to how people's mental models of risk change with time and exposure, seemingly relevant as some people appear to be caught by avalanches several times.

Interpreting the accident

Participants in this study presented a range of varied factors such as own mental fallacies, specific terrain, weather, snow conditions and group dynamics to further outline changes in thoughts and behaviour based on the interpretation of how these factors had caused their accident. As mentioned, some of these statements implied that participants' personal accident analysis determined their specific learning outcome, where this analysis in some cases were settled shortly after the accident and agreed upon in the immediate conversation within the group.

Two participants in the study explained that they interpreted their accident as a random natural released avalanche in their group shortly after the accident, and there was consensus that their position in it was mainly due to bad luck. Implying that this instant conversation or accident analysis was central for interpreting the avalanche accident, and possibly prone to group factors. These participants' statements seemed to contain less potential for introspection and learning as participants believed that there was little that could have been done differently in their accident. They believe they had few ways to control or change the outcome and expressed low perception of personal responsibility, and their stated learning outcome was mainly concentrated on risk acceptance and first aid. Some accidents are caused by natural released avalanches, which might have been the case here. However, this interpretation phase could be crucial for future avalanche assessments if one experience and interprets avalanches as completely random events this might result in less effort to seek out relevant factors when assessing avalanche risk on future trips (Dunlap & Stephens, 2016; Pfuhl et al., 2011; Stephens, 1991). Additionally, these might miss out on broader aspects of the inherent learning potential these accidents may offer.

Notably, how people attribute cause and responsibility in an accident may be affected by their inherent *locus of control,* which can be seen as a belief about whether the outcomes of our actions are contingent on what we do. Research outlines that people with higher *internal locus of control* believe they can control events that impact their life, and as a result they are more likely to take on personal responsibility for these (Duttweiler, 1984; Norman, 1998). Whereas people with higher *external locus of control* are more likely to blame external factors for their given circumstances, and therefore do not feel like they can control or

determine the outcome (Duttweiler, 1984; Norman, 1998). Importantly, Terum & Svartdal (2019) has suggested that changes towards more careful behaviour are caused by the amount and intensity of negative emotions in a situation, such as discomfort along with regret and personal responsibility. The latter could give rise to a hypothesis suggesting that some might not be as cautious or perform the required adaptions after an accident to the same extent as others who feel a greater amount of personal responsibility and regret (Brown et al., 2020; Zeelenberg & Pieters, 2007).

Some of the participants in the study who encountered an emotional warning before the accident mention that they have experienced the importance of their gut feelings or emotions notifying them of a potential danger and some outlined that they more often trust and rely on these cues to give them a heads up or guide them in the terrain today. Some studies have shown that as expertise develops, intuition becomes a more refined tool and is used more extensively (Kahneman & Klein, 2009). However, the challenge with this interpretation could be to not become overly reliant on these emotional cues as it could make it harder to take on an analytical approach, where the latter is crucial in these ambiguous environments (Landrø, 2021). The sum of presented statements outlines that the participants accident analysis, sensemaking and interpretations can be complex heterogenous processes, giving rise to a broad range of learning outcomes.

Attentiveness and effective updating

Participants in this study underlined several important and adaptive changes after the avalanche accident such as increased attentiveness to surroundings, a flexible plan and mind along with more frequent information updating out in the terrain. These three factors are seen as crucial in decision-making in avalanche terrain, and studies done by Landrø (2021) have found that these features are often used and emphasized by avalanche experts. Landrø (2021) further states that avalanche experts are open to change their plans, they use a broad range of information in their decision-making process and frequently update their present comprehension from cues in their surroundings. Thus, there seems to be some similarities in the change's participants in this study report after an avalanche accident and what research outlines as critical parts of decision-making in avalanche terrain.

Most participants in this study emphasized the importance of having an open mind to be able to switch from their original plan, where they experience it as easier to change their preferred route or slope based on their new understanding of risk. A large part of participants outlined an increased ability to turn around or select routes based on the conditions and the

information they gather along the way as they had experienced the consequences of not choosing to do so. Some participants further expressed that they had developed rules to support and control their own decision-making, especially if they interpreted their accident to be completely or partly caused by their own mental fallacies. Participants stated that they were more aware of their own biases, blind spots, and desires where they developed rules and took action to help themselves maintain an open mindset. Previous research has proposed that being aware of one's own biases and further helping people overcome these are crucial parts of avalanche training (Landrø, 2021), which seems to be an aspect these participants experience an increased awareness to as well after their accident.

Participants in this study emphasized the importance of maximizing their current information prior to all parts of decision-making, minimizing risk and uncertainty by engaging in additional planning where they check the weather, avalanche report and map in greater detail and more frequently up until departure. Most participants seemed to have learned to be more attentive to cues and had changed their updating effort and frequency after the avalanche. Some participants further explained that they were more attentive and updated their information more often even when they felt like they had passed parts where this attentiveness and updating was crucial. As an avalanche often come as a shock to the ones caught, this might have triggered some prolonged hypervigilance initiating the participants need for attentiveness and frequent updating (Balderston et al., 2017).

As mentioned, avalanche experts deliberately use frequent information updating as a factor to assess the avalanche danger (Løland & Hallgren, 2022), where the last update is essential for reversing unsuccessful methods of actions (Rudolph et al., 2009; Weick et al., 2005). Research proposes that effective updating as identification of signals, investigating cues, and assessing changes over time can make the chance of worst-case outcomes smaller (Christiansson, 2019). The perception of elements in our environment, the comprehension of their meaning and projection of their future status are well known features of good decision-making. When satisfactorily applied, effective updating can be a useful tool for avoiding catastrophic consequences (Christiansson, 2019), especially during an unexpected and rare event (Weick & Quinn, 1999; Schweizer, 2008), such as an avalanche. The sum of these statements might give us the impression that the avalanche accident is making some of the participants in this study move in a direction of more informed and improved decision-making through increased planning, attentiveness and information updating.

Reflection as a part of the learning process

Some participants emphasize that reflecting, analysing, and talking about their accident were both difficult and important to them. One participant stated that he talked and talked about the accident until it became something he could accept, and another participant stated that he had analysed his accident to understand what went wrong to further be able to learn from it and prevent future avalanches. These statements coincide with previous research who suggests that working through experiences are not only important steps for the participant's mental wellbeing (Pennebaker, 2000), but also a central phase for further reflection and learning to take place (Kolb, 1984). Weick and Sutcliffe (2001) underpin that replicating experiences repeatedly without reflection on those experiences is no guarantee for expertise if one doesn't acquire the inherent learning potential these experiences offer. For a change in action to take place one needs to review and reflect upon experiences, seek out and take different perspectives to create a comprehensive understanding of the accident. This could further create a possibility for better adapted decision-making and actions later on (Kolb, 1984).

The ability to assess and evaluate own skills, actions, and decision-making along with openness to criticism and change are crucial in terms of creating good learning cultures in these wicked learning environments, and avalanche education may benefit from focusing on these specific abilities (Landrø & Pfhul, Norman et al., 2019). Hertwig & Wulff (2022) further suggests on a general level that reflecting upon situations that did not involve extreme outcomes could provide important insights and diminish future accidents. Thus, the community could facilitate these processes by highlighting and welcoming faulty decisions, turning around, misinterpretations and mental fallacies.

When information flows into a group through individuals with hands-on experience these are interpreted collectively through interactions between the members of the group and can provide notable aspects of learning (Fazey et al., 2005). Shared insight and knowledge could be fundamental for others to acquire aptitude without putting themselves through the necessary hours, exposure and risk these experiences require to become skilled decisionmakers in avalanche terrain. Thus, through shared reflections a whole community might gain from the knowledge, wisdom and insight a few people acquire from these experiences. Presenting a suitable way for the community to take action towards these wicked learning environments where little to no feedback is provided and each experience and situation can present itself differently.

Learning about the possible consequences of actions without paying the price of experiencing it is one of the key engines of evolution and is crucial for the development of

human adeptness (Boyd & Richerson, 2005; Frey et al., 2021). If only hands-on experience led to learning it would leave little room for survival, thus vicarious approaches might be a way to proceed in this difficult learning environment as it appears to recruit neural processes similar to those involved in the primary experience (Blagov & Singer, 2004). Further studies have suggested that vicarious approaches (Skversky-Blocq et al., 2021), or "simulated experiences" (Hertwig & Wulf, 2022) could present itself as a more appropriate option than simple descriptions of risk which is predominating avalanche education today. It would require effort from individuals and groups to share their acquired experiences, misinterpretations and reflections, though it might be highly beneficial for fellow backcountry riders. Nonetheless, both society and the community have a job to do assisting this learning culture to take place by forming safe environments where people can share their experiences and lessons without judgement and discredit.

Limitations

The results from this research should be seen in light of some limitations. Firstly, although a qualitative phenomenological approach is a useful way to understand subjective experiences and to gain insights around individuals' actions and motivations (Holloway & Galvin, 2016; Rodriquez & smith, 2018), certain limitations must be acknowledged. This study includes interviews from participants who have experienced an avalanche a short time ago but also participants who experienced an avalanche 30 years ago and most of them in between these time intervals. According to Kahneman and Riis (2005), retrospective reporting is affected by the fact that participants' retrieval and temporal integration of emotional experiences are subject to mistakes which might also be present in this study. However, the time between the accident and the interview has also allowed the participants to reflect over the accident to a degree they would not have been able to if we interviewed them immediately after the accident. Questions in the interview guide were often formulated as a question of how the individual felt at the time. However, it is reasonable to assume that the answers were not free from post-rationalization, and therefore not merely a reflection of how they felt at the time, but rather how they think they felt at the time, which we can call choice-supportive bias or post-accident rationalization (Lind et al., 2017; Mather & Johnson, 2000).

Furthermore, the method used to analyse the data in this study depend on researcher interpretations, which may be biased leading the research to have lower levels of validity and reliability compared to quantitative research (Holloway & Galvin, 2016; Rodriquez & smith 2018).

Additionally, some of the participants might be classified as experts whereas some might be classified as intermediate or beginners, this can give quite different outcomes and statements in terms of learning and the changes they have experienced after the accident. As we do not have a baseline of the typical backcountry skier there is no way to control if our sample is representable. Further, our study includes only 1 female, making our sample highly skewed gender wise.

Participants might have experienced a certain pressure to have changed or improved in some way, where we force through reflection from them to do things differently now than when they were avalanched. We also saw a distinction between in-person and online interviews. Firstly, the length of the interviews was shorter during the online interviews than they were in person, there were more interruptions and they felt less personal. Secondly, during the physical interviews we felt more connected to the participants, had a better understanding of humour, understanding when they needed time to think versus being done talking and body language, which could have affected the quality of the interviews (Thunberg & Arnell, 2021).

Due to the requirement that CARE-panel participants reply to a proposal, there is a chance that this sample will be skewed toward those who have had exceptionally favourable or unfavourable avalanche experiences. Although the effects of this could not be accounted for during participant recruitment, they were considered during the data collection and analysis. The framework of the analysis process was designed to present complex and impartial viewpoints. Also, though there is no reason to doubt the participants' sincerity, we had no way of checking for it.

Finally, the interviews themselves should be scrutinized when evaluating the quality of the research. Although striving to meet the requirements Kvale and Brinkmann (2015) highlights as important, in order to conduct high-quality interviews, one cannot ignore the fact that we as interviewers are inexperienced and that each interview introduce novel situations. We find that facilitating interviews according to mentioned requirements were easier with talkative individuals who were in touch with their feelings compared to more closed ones. The quality of interviews may therefore vary with different personalities.

Implications and further research

Despite the aforementioned limitations, this study may have some interesting implications. First off, the sample used in the current study only includes Norwegians (except for one), so the participants thoughts and feelings are based on the Norwegian culture and

way of thinking. Other nationalities and cultures might have other attitudes that make them reflect differently on the topic. Additionally, the participants' experience with avalanches comes mostly from Norway, which emphasizes the need for a broader sample even more, especially given that the terrain for backcountry skiing in Norway is significantly different from that in other well-known places, such as the Alpes (Schweizer & Jamieson, 2001).

Secondly, several of the participants mentioned that they have noticed a change in their behaviour after the incident, such as willingness to take risk. However, they themselves reflect around whether the change has happened because of the incident or if there might be other reasons such as increased experience or age. Further studies could investigate more throughout how and to what extent people's mental models of risk are affected by an avalanche accident.

Finally, all the study participants were involved in an avalanche accident, yet none of them gave up skiing. Therefore, it would be intriguing to hear more about individuals who stopped skiing after the avalanche encounter and explore why the outcomes are so different.

Conclusion

The presented study provides an exploratory overview of some of the learning processes and aftereffects avalanche victims encounter after experiencing an avalanche accident. Participants in this study mainly reported enhanced awareness towards important aspects of safe backcountry skiing, as increased awareness of risk, misjudgements, and consequences along with increased planning, attentiveness, and information updating out in the terrain. Participants also mentioned increased knowledge seeking, new perspectives on their avalanche assessment abilities along with increased awareness to group factors. The study emphasizes that accident experiences present powerful learning outcomes for some of the participants, incorporating several adaptive changes to their behaviour and decision-making.

However, participants occasionally outlined heterogeneous thought processes and interpretations, based on different perspectives and nuances related to the specific features of their accident, where some of these perspectives could present challenges for adequate decision-making in the future. Suggesting that the learning process avalanche accidents offer not automatically lead to improved avalanche assessments and decision-making. Thus, this study underlines that avalanche accidents, people's interpretations, and mental models of risk are intertwined by a variety of still unknown factors resulting in different learning outcomes. The study emphasises the importance of investigating the possible impact avalanche accidents

and following interpretations have on succeeding decision-making, as it could present a possibility to prevent faulty decisions and accidents in the future. Additionally, the participants' ability to learn and parts of their healing processes depended on their ability to analyse, reflect and talk about the accident. Suggesting that avalanche victims, avalanche education, and the backcountry community could benefit from an open and accepting learning environment where insight and experiences are shared freely.

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Appendix 1

Intervjuguide - Læring fra snøskredulykker

Hovedspørsmål	**Potensielle oppfølgingsspørsmål**	**Kommentarer**
Du har fortalt at du har vært involvert i en skredulykke, kan du fortelle hva som skjedde? (Du kan starte fra da du begynte å planlegge turen)		Hensikten er å få deltakeren til å fortelle historien om ulykken. Vi vil gjerne ha hele historien - alt fra planleggingsprosess til etter ulykken.
	Fortell meg om planleggingen av turen	
	Hva var motivasjonen for turen? Hadde du vært på lignende type turer tidligere?	Høy eller lave ambisjoner - tydelig mål? Hverdagstur eller et større prosjekt? Bestemt på å komme seg til toppen?
	Hvordan var været og snøforholdene denne dagen?	Det er ofte enklere å få folk til å snakke hvis de kan starte å snakke om noe konkret.
	Fortell fra dere startet på parkeringsplassen og gikk videre oppover.	
	Observerte du noe på veien?	
	Hva snakket dere om i gruppen? *(Vurderte dere sjansen snøskred?)	Vi vil gjerne forstå fokuset de hadde. Fokuserte de på snøskredfare - eller fokuserte de på andre ting?
	Hvordan vil du forklare stemningen/humøret i gruppen?	Glade? Nervøse? Stresset? Engasjert?
	Når forsto du at du var i fare?	
	Hva eller hvem utløste snøskredet?	

	Kan du beskrive din opplevelse av å bli tatt/se snøskredet? Hva skjedde og hva følte du?	VIKTIG SPØRSMÅL
	Hva skjedde etter snøskredet hadde stoppet?	La de fortelle om redningen etter skredet så vi kan vurdere alvorlighetsgraden. Konsekvenser? • Behov for å bli gravd frem
Hva vil du si er hovedgrunnen til at du eller noen i gruppen endte opp i snøskredulykken?		VIKTIG SPØRSMÅL (uflaks eller feilaktige vurderinger?) Ikke prime de med dette.
Har skredet endret tilnærmingsmåten du har til frikjøring eller topptur (på ski) på noen måte?		
	Går du fortsatt på ski i skredterreng? Like mye som før? (mer/mindre)	VIKTIG SPØRSMÅL
	Har ulykken endret hvordan du (tenker før tur) planlegger turer? (hvordan du tenker før tur/ hva du mener er viktig å ta med i planleggingen)? På hvilken måte? (Om intervjuobjektet ikke nevner dette: Bruker du samme type informasjon i planleggingsfasen nå, eller har noe endret seg?) Har ulykken endret hvordan du tenker PÅ tur (hva du tenker er viktig å ta med i beslutningene)? • Hva legger du merke til? /Hvilken type	VIKTIG SPØRSMÅL

	informasjon ser du etter? • Hvor ofte innhenter du informasjonen? • Hvordan innhenter du informasjonen? (Hva/Når/Hvordan). Er det en forskjell fra før ulykken?	
	ATFERD Har skredulykken endret atferden din - eller hvordan du navigerer deg i skredterreng. Eksempler hvis nødvendig: • Mer konservative rutevalg • tryggere avstand • Stopper på trygge steder • Samler informasjon oftere - sjekke snøen osv.	VIKTIG SPØRSMÅL
	EMOSJONER Har ulykken endret måten du har det på når du er på ski i skredterreng? Føler du mer eller mindre frykt, glede, entusiasme, uro, årvåkenhet	
	RISIKO Har skredulykken endret din opplevelse av risiko? Eller hvor villig du er til å ta risiko i frikjøring?	VIKTIG SPØRSMÅL
	EVNE Har skredulykken endret hvordan du opplever din egen evne til å ferdes trygt i skredterreng Har skredulykken endret din opplevelse av hvor utfordrende det er å vurdere snøskredfare	VIKTIG SPØRSMÅL Er de trygge/sikre i sin skredvurdering?

Vil du si at denne ulykken har påvirket livet ditt forøvrig?	Hvis ja - På hvilken måte? Har ulykken endret villigheten din til å ta risiko på andre områder i livet?	Her vil vi gjerne vite om ulykken har endret verdier, holdninger på andre områder Det kan også reflektere alvorlighetsgraden av ulykken (mentale vs. fysiske arr)
Hvis det var en gruppe på tur: Kan vi gå tilbake til turen. • Kan du fortelle meg om gruppen/folka du var med?	BESKRIVELSE AV GRUPPEN Hvem var du med? Kan du beskrive dem for meg? Hvordan vil du beskrive skredkunnskapen i gruppen? Hvor godt kjente du dem? Hadde dere vært på toppturer sammen tidligere? KOMMUNIKASJON OG BESLUTNINGER Generelt, hvordan ville du beskrevet gruppedynamikken? Generelt, hvordan fungerte kommunikasjonen i gruppa? Hvordan ville du beskrevet kvaliteten på kommunikasjonen i gruppa? Hvordan vil du beskrive skredkunnskapene om skredterreng i gruppen? <u>Spør disse spørsmålene om de ikke allerede har svart på dem:</u> Hvem tok avgjørelsene i gruppen? Om ikke alle var involvert i beslutningene. Hvordan ble	Vi vil forstå om de er en etablert gruppe og hvor godt gruppen jobber sammen. DETTE ER ALLE VIKTIGE SPØRSMÅL VIKTIG SPØRSMÅL

	beslutningene delt eller kommuniserte til andre? Hvor mye bidro du beslutningsprosessen? I hvilken grad var du og de andre enige i beslutningen? Hvordan tenker du rundt ditt eget ansvar for sikkerheten og de beslutninger som ble tatt? Tror du at alle hadde den samme forståelsen av ansvaret for beslutningene og sikkerheten? <u>om de ikke deltok i beslutninger og ikke hadde ansvar:</u> Opplevde du at du ble dratt med på noe du ikke var forberedt til? Opplever du at gruppen havnet i en situasjon som var mer utfordrende enn dere hadde sett for dere? Tror du alle i gruppen forsto risikoen?	
Har ulykken endret HVEM du drar på tur med?		Bestemte mennesker eller mennesker med spesifikke evner. Eller noen de føler seg komfortable/trygge med eller kommuniserer godt med.
Sett tilbake på tiden før ulykken, så du det komme?	Følte du at du pushet grensene? Har du noen gang tidligere vært i skredulykker eller nær en ulykke? Tenker du at du var spesielt utsatt? Altså var det mer sannsynlig at ulykken skjedde deg enn andre?	Vi vil vite deres tidligere erfaringer. Hvis de trodde det var sannsynlig at de ville oppleve en ulykke, eller om det bare var uflaks.

Etter din mening, er det noe andre skigåere kan lære fra din ulykke?	Du er blant få som har opplevd et snøskred - hvis du skulle avslutte med et råd til andre som planlegger tur i skredterreng - hva ville det være?	
Kan vi kontakte deg i fremtiden for å se om tiden kanskje endrer opplevelsen du har av ulykken? (Kanskje bare relevant for folka som ble intervjuet kort tid etter ulykken.)		

Appendix 2

Informasjon til deltakere i intervju om skredulykker

Kompetansesenteret for snøskred (CARE) ved UiT Norges arktiske universitet ønsker å finne ut hvordan erfaringer av snøskred påvirker oss og hva vi lærer oss av erfaringen.

Du har blitt invitert å delta da du har erfaring av skredulykker.

Det er frivillig å delta og du kan avslutte intervjuet når du ønsker.

Intervjuet spilles inn og lagres i en lydfil som vil bli transkribert. Materialet er konfidensielt og vil kun være tilgjengelig for forskere direkte knyttet til dette prosjektet. Vi vil bare publisere anonymiserte data der det ikke er mulig å identifisere deg. Så lenge vi kan identifisere deg i datamaterialet kan du når som helst be oss om å slette, korrigere eller få utlevert informasjon om deg. Da tar du bare kontakt med oss.

Informasjonen du gir oss blir oppbevart i henhold til gjeldende reguleringer og føringer fra NSD. Og vi gir selvsagt ikke videre identifiserende informasjon til andre. Dataene vil bli lagret kryptert med to-faktor identifiseringstilgang frem til 2034. Etter dette vil dataene bli anonymisert.

Data fra undersøkelsene fra CARE vil kun bli brukt til vitenskapelig forskning. For å bidra til god vitenskapelig praksis vil vi gjøre de anonymiserte data vi bruker i våre undersøkelser tilgjengelig til andre forskere (for eksempel via UiT Open Research Data). Vi vil kun publisere anonymiserte data. Det vil aldri være mulig å identifisere enkelte personer.

Hvis du har noen spørsmål om denne undersøkelsen, eller om den forskning som bedrives på CARE generelt, får du gjerne kontakte enten Audun Hetland (audun.hetland@uit.no) eller Andrea Mannberg (andrea.mannberg@uit.no) Hvis du har spørsmål om dine rettigheter som deltaker eller synspunkter på hvordan vi samler inn og/eller håndterer data kan du kontakte NSD –Norsk senter for forskningsdata AS på epost: personverombudet@nsd.no eller telefon: 55 58 21 17.

Med vennlig hilsen,

Audun Hetland og Andrea Mannberg,

Forskningsledere, CARE

Jeg har lest og forstått informasjonen ovenfor og samtykker til å bli intervjuet.

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Sted og dato Signatur