Powder!
Avalanche danger?
Impress my friend!
Fear...
☑
☐
no go

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Wow, that was nice....

...but how stable was this slope?
Avalanche risk in recreational activities: how people deal with uncertainty

Benjamin Zweifel, Avalanche forecaster
CRAG – IRGC Symposium, 20 November 2013
Agenda

1. Uncertainty in avalanche terrain
   - Uncertainty from human factors
   - Uncertainty from physical factors

2. How people deal with uncertainty
   - Four different strategies

3. Overconfidence
   - Why are people overconfident with their decisions
   - How to overcome overconfidence
The hidden weak layer in a slab avalanche

**Slab avalanches are:**
- Fast
- Large scaled
- Dangerous

**For a slab avalanche we need:**
- Steep terrain (> 30°)
- Slab (bonded snow)
- Weak layer
- Trigger

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Hot spots – or why stability tests don’t work

Campbell and Jamieson, 2004

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Literature on human factors in avalanche terrain

- Engler & Marsch, 2001
- McCarmon, 2001a
- McCarmon, 2001b
- McCarmon, 2008
- Trumper, 2001
- Atkins, 2001
- Mutter, 2002
- Mutter, 2003
- Haegeli & McCarmon, 2006
- McCarmon et al., 2007
- McCarmon et al., 2008
- McCarmon et al., 2009
- Braght, 2010
- Haegeli et al., 2010
- Furman et al., 2010
- Proctor et al., 2012
- Zwiefel et al., 2012
- Harvey, Rhyner, & Schweizer, 2012

Uncertainty

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Herding instinct, risky shift effect → example of group dynamics

„I think the bigger the group, the more dangerous it is, because you get a sense of safety and you don't question things the same way as when you are traveling in a group of two. “

Backcountry skier, group interview 2013
Familiarity → heuristic traps

„This is the twelfth time we are doing this trip. I have been to Eggberg I don't know how many times. We don't need to plan anything anymore.“

Backcountry skier, group interview 2013
Munter introduces a paradigm change in decision making (1997)

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Fatalities</th>
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<tr>
<td>18/04/85</td>
<td>Samnaun (Val Gravas)</td>
<td>6</td>
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<tr>
<td>01/04/88</td>
<td>M.S. Lorenzo (Val S’charl)</td>
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<tr>
<td>04/05/88</td>
<td>Monte Sissone (Forno)</td>
<td>5</td>
</tr>
<tr>
<td>28/12/89</td>
<td>Simplon (Nanztal)</td>
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<td>05/05/90</td>
<td>Gauli (Urbachtal)</td>
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<td>08/03/91</td>
<td>Gr. St. Bernhard</td>
<td>7</td>
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<tr>
<td>12/07/07</td>
<td>Jungfrau</td>
<td>6</td>
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<tr>
<td>03/01/10</td>
<td>Drümännler</td>
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</tr>
<tr>
<td>26/03/11</td>
<td>Tsandéserte (Valsorey)</td>
<td>5</td>
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Four different decision strategies

- Rule-based
- Intuition / Heuristics
- Avoid / trivialize
- Delegate
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- Rule-based
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“I think we want to do this properly. We live here, we are locals, we know the hazard and we know what we can trigger.”

Ski instructor, group interview 2013
Overconfidence = f(Feedback)

Ski a potential avalanche slope

Avalanche
No avalanche

Murphy and Winkler (1984)
Christensen-Szalanski and Bushyhead (1981)
## Two advises to face overconfidence

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<td>1</td>
<td>Decide <strong>rule-based</strong>, don’t rely on intuition</td>
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</table>
| 2 | Make a **debriefing** after the trip:  
   *How safe was that trip?*
   *Did we have any safety margin?*
   *Was the trip at the limit of our accepted risk?* |
Summary

- Sources of uncertainty from physical and human factors
- Human factors are under-researched
- Paradigm change in decision making from physical understanding toward more strategic thinking
- Four decision making strategies: (1) rule-based, (2) intuition or heuristic based, (3) trivialize or avoid decisions and (4) delegate decisions
- Overconfidence in decision making is a basic challenge if we want to further improve avalanche safety