SOCIAL – A GROUP CHECK TOOL

Benjamin Zweifel *
WSL Institute for Snow and Avalanche Research SLF, Davos, Switzerland

ABSTRACT: Despite the fact that recreationists in avalanche terrain usually travel in groups empirical research on group phenomena is still sparse. We propose a group check tool based on relevant literature from avalanche safety research but also on existing concepts from sociology and social psychology. Important additional input on content and form of the tool was given by a focus group discussion of the Swiss *Snow Sport Avalanche Accident Prevention* core training team. The resulting group check tool SOCIAL summarizes the most important group factors: ***S**kills* of group members should be in accordance with the demand of the trip; ***O**rganization* should set course for basic group characteristics such as group size and roles of group members; ***C**ommunication* is THE instrument enhancing group performance; ***I**dentification* of group members with trip goals, expectations and decisions taken; one should always screen for ***A**nomalies* in group behavior like risky shift or heuristic traps; and finally one should critically question ***L**eadership* issues. In analogy to established support tools concerning avalanche risk we assume SOCIAL to reduce the risk of unwanted group effects.

KEYWORDS: human factors, group dynamics, group check tool, avalanche prevention

1. INTRODUCTION

Winter backcountry recreationists travel usually in groups (Zweifel et al., 2012). While these groups show a wide variety of size, type, leadership styles or decision making strategies they are all faced with avalanche hazard and therefore have to find a way to deal with it.

The majority of research related to human factors concentrates on decision making strategies and pitfalls (e.g., McCammon, 2002; McCammon et al., 2008; Haegeli et al., 2012) or analysis of human risk factors (e.g., Sole, 2008; Procter et al., 2013) including investigations of safety equipment (e.g., Brugger et al. 2007; Haegeli et al., 2014). While there is surprisingly little empirical research on group phenomena (e.g., Bright, 2010; Zweifel and Haegeli, 2014), there is evidence from high profile avalanche accidents but also from group dynamic concepts for group factors to be crucial while traveling in avalanche terrain.

In group interviews in winter 2012-2013 we found that most groups used a variety of strategies in planning, leadership and decision making, usually with the goal to reduce avalanche risk (Zweifel and Haegeli, 2014). However, there was no structured way how groups dealt with group related factors. In contrast, the value of simplified tools for decision making has been indicated theoretically (e.g., Haegeli et al., 2010) and practically with avalanche awareness course attendants (Haegeli and Haider, 2008). Zweifel and Haegeli (2014) found that recreationists usually did not use decision aid tools explicitly, i.e. in the way they were supposed to be used, but that "most groups did use at least some of the decision rules promoted by these tools in the form of simple heuristics" (p. 23). This means that these tools rather have an educational value than that they are a real decision aid. Nevertheless, it is beyond controversy that a structured approach in the decision making process supported by simplified tools and/or checklists is superior to an unstructured approach as often found in practice.

Our goal is therefore to propose a simple group check tool which facilitates the planning and management of group phenomena. The tool should on the one hand include the most important group factors influencing avalanche risk and on the other hand stay as simple as possible in order to not burden recreationists. We followed therefore the two research questions: (1) Which is the most important content of a group check tool and (2) how should such a tool look like in order to be valuable in practice?

* *Corresponding author address:* Benjamin Zweifel, WSL Institute for Snow and Avalanche Research SLF, Flüelastr. 11, CH-7260 Davos, Switzerland; tel: +41-81-4170128; fax: +41-81-4170110; email: zweifel@slf.ch.

2. METHODS

In order to reveal the most important group factors influencing avalanche risk we reviewed avalanche safety literature as well as existing concepts from sociology and social psychology. We framed the factors we found in structural, psychological and communication elements.

To evolve content and practical requirements of a group check tool we conducted a focus group discussion with 15 members of the *Swiss Snow Sport Avalanche Accident Prevention* core training team during a workshop on human factors on 12 May 2014 in Innertkirchen, Switzerland. The focus group discussion was taped and additional notes were taken. Focus groups have been seen as an interview technique notably useful in studies with exploratory character (Denzin and Lincoln, 1994) and have recently been applied in the avalanche context (Adams, 2005; McCammon et al., 2008). A further benefit of this focus group was the inclusion of key avalanche community people from the very beginning of the development of the group check tool. Past avalanche safety initiatives have shown the importance of including key avalanche experts in the initial stage of tool development to promote acceptance.

Finally, we combined findings from the literature review with results from the focus group to develop a group check tool.

3. LITERATURE REVIEW

Group phenomena can be arranged in three main characters: (1) Structural attributes such as group size, skills of group members, organization of leadership or the type of the group (e.g. family, couple, group of friends), (2) psychological attributes such as the decision making process and its difficulties, goals and expectations of group members, the leadership style or the influence of the environment on the group and (3) communication as THE instrument enhancing group performance.

3.1 Structural attributes

Group size has been the most discussed group risk factor with an agreement that large groups have a higher avalanche risk than small groups (see, e.g., decision aid tools such as the Graphical Reduction Method (GRM), Snowcard or Avaluator). Harvey et al. (2012) related the higher avalanche risk of large groups on the one hand to snowpack parameters such as a higher probability of triggering an avalanche and on the other hand to group related parameters such as a slower decision making process or the risky shift effect. In sum the message from an avalanche safety perspective is clear: keep groups small. However, this may be challenging especially for professionally guided groups due to commercial interests.

Leadership is a second crucial factor in group performance. Statistics have shown that groups without a guide produce more accidents than professionally guided groups (Harvey and Zweifel, 2008). However, since these analyses do not include backcountry activity as information on the control group, a real risk assessment is impossible. Further, accident data distinguish only guided and non-guided groups and no information on informally guided groups is available. However, empirical studies showed that a majority of groups traveling in avalanche terrain is informally guided (Bright, 2010; Zweifel and Haegeli, 2014). In their qualitative study on group dynamics, Zweifel and Haegeli (2014) concluded that non-guided groups are the ones most at risk, while in informally guided groups the main question is whether the guide is the right person and has appropriate avalanche expertise. Do (2014) also mentioned groups without a leader or moderator as a risk factor in a human factor red flag list. Although guided groups have been seen as the most favorable ones they are not free of any negative group aspects, especially if there is no bond of trust between the guide and the group members.

Moreover, backcountry recreationists are characterized by its *group type*. Regarding activity type, off-piste skiers are generally seen as higher risk takers than backcountry skiers. However, there is no empirical evidence for this believe. Procter et al. (2013) found snowshoers are less aware of avalanche danger than backcountry skiers. Regarding group structure, Tremper (2008) mentioned mixed groups of men and women a dangerous combination, “especially when men are trying to impress woman in the group” (p. 287). Further, it would be interesting whether families and couples behave differently than a group of friends. To our knowledge there are no empirical studies on this topic and additional research is necessary for a meaningful inclusion of group type in a group check tool.

Group members are also characterized by their skills, either skiing *skills*, physical constitution or

avalanche expertise. While it has been seen as favorable when the group is homogenous in skiing skills and physical conditions it is not necessary that all group members have considerable avalanche expertise. However, it is of great importance to choose a tour which does not overburden any group members (Volken et al., 2007; Fredston and Fesler, 2011; Harvey et al., 2012).

In avalanche education *safety equipment* has been regarded as an important factor. Groups should completely be equipped with transceivers, shovel and probe and the use of this equipment should be trained (Harvey et al., 2009; CAA, 2010; AIARE, 2011). Another established safety measure is to check transceivers of all group members at the trailhead, before the trip starts (see, e.g., McClung and Schaerer, 2006; Tremper, 2008; Fredston and Fesler, 2011; Harvey et al., 2012).

3.2 Psychological attributes

Compared to the structural attributes, psychological group characteristics are less investigated. Most attention was put on the *decision making* process and its difficulties. McCammon (2001) distinguished analytic decision making, heuristic decision making and decision making built on expertise. While he concluded that a fully analytical approach is not practicable due to the complexity of decisions in avalanche terrain, he considered heuristic decision making and decision making built on expertise to be valuable approaches in general although they have their shortcomings. McCammon (2002) paid attention to these shortcomings by crystallizing six main heuristic traps which in the meantime have widely been established in avalanche safety literature (Volken et al., 2007; Tremper, 2008; Harvey et al., 2012). Further, the role of decisions based on intuition was discussed. Following the explanation of Stewart-Patterson (2008) and Zweifel and Haegeli (2014) intuition is a highly questionable strategy due to the “wicked” learning environment in avalanche terrain (Hogarth, 2001). In addition, Zweifel and Haegeli (2014) found that groups who either trivialized or even avoided decisions adopted an unfavorable strategy.

Winkler et al. (2012) described several factors for good decision making: (1) have the full freedom to decide, (2) decide deliberately and take the affordable time to decide, (3) make decisions transparent for all group members and (4) be courageous to make unpopular decisions such as turning-back without reaching a summit. Further, the benefit of decision aid tools such as the Graphical Reduction Method (GRM), the Snowcard or the Avaluator has been shown in different studies (McCammon and Haegeli, 2007; Haegeli and Haider, 2008; Haegeli et al., 2010). A common agreement on decisions was named as another factor leading to good decisions (McCammon, 2002). To reach agreement, discussion is necessary. Bright (2010) found that groups discuss regularly in early planning stages but only little in later stages of the trip and especially after the trip. However, recent literature suggests to de-brief after a trip and to discuss safety issues (Harvey et al., 2012).

In order that all group members enjoy the trip it is important to know and to adjust the *goals and expectations* of all group members, especially in newly formed groups (CAA, 2010; Harvey et al., 2012; Winkler et al., 2012). If goals and/or expectations of sub-groups diverge diametrically one should consider splitting-up the group.

Another important influence on group’s decisions comes from *environmental factors* like the influence of weather, snow conditions or other groups. Do (2014) mentioned that too much excitement can push groups towards more risk taking behavior. Such excitement can either come from blue sky and fantastic powder conditions but also from other groups who ski extreme terrain and therefore give a wrong sense of safety.

Several avalanche researchers mentioned the *risky shift effect* (Stoner, 1961) as an important group factor assuming large groups taking more risk than small groups (see, e.g., Munter 1992, Tremper, 2008, Harvey et al., 2012).

Beside of leadership organization (described above) the *style of leadership* plays an important role too. Tremper (2008) described the optimal leader as someone who seeks opinion from everyone. Adams (2005) and Bright (2010) also pointed on the advantages of this consultative leadership style. However, in professionally guided groups with a considerable difference in avalanche expertise between the guide and the group members, the autocratic style seems to be more common and is certainly adequate in critical situations when clear instructions may be vital (Winkler et al., 2012). In any case decisions should be clear for all group members (Tremper, 2008; Winkler et al., 2012, Harvey et al., 2012).

3.3 Communication

Communication skills are regarded as crucial for groups to perform effectively not only in winter backcountry activity (see, e.g., Adams, 2005; Tremper, 2008; Fredston and Fesler, 2011; Harvey et al., 2012) but also in other outdoor recreation settings (see, e.g., Priest and Gass, 1997) and in organizational settings (see, e.g., 2008; Garicano and Wu, 2012). On the other hand, poor communication has been identified as an important factor causing avalanche accidents (Atkins, 2001). Di Salvo et al. (1989) found group communication as a main pitfall in group decision making. Adams concluded in her study on avalanche experts that "environments that encouraged effective and open communication resulted in improved judgment and decision actions, and reduced subjective biases that may have been present in an individual decision-maker" (Adams, 2005, p. 213).

However, to find recommendations for effective communication one has to review other research fields than avalanche safety. Bischof and Eppler (2011) proposed the CLEAR formula for clarity in communication. The CLEAR formula promotes to communicate **C**ontextualized, **L**ogically structured, **E**ssential, **A**mbiguity-free and **R**esonating. However, similarly to the enhancement of avalanche expertise, to enhance communication skills needs training and exercise.

4. FOCUS GROUP DISCUSSION

First, participants of the focus group elaborated recommendations for the key elements leadership, decision making, group structure and motivational factors (Table 1). For an effective leadership the meeting phase where group members get to know each other was seen as important and a round of introductions was mentioned as requisite. Participants further pointed on the importance of communication and that an open communication should lead to a climate of trust in the group. Discussing decision making the group concluded that anomalies can be spotted when the risk behavior of the group does not correspond to the willingness to take risk of any of the group members. Leaders should further always screen for anomalies like heuristic traps (McCammon, 2002). As structural factors participants pointed out the importance of gender and age distribution and proposed to make a list of unfavorable group settings concerning negative group dynamics. Furthermore, one should consider group size and clarify roles with respect to responsibility. Concerning motivational factors, leaders should know skills and fitness of each group member and check their goals and expectations.

Second, the focus group worked on formal requirements of a group check tool. Participants suggested the tool to be simple and easily usable. Several focus group participants proposed the use of key words, mnemonics or acronyms.

Table 1: Key elements and important factors as elaborated in the focus group of the Swiss *Snow Sport Avalanche Accident Prevention* core training team.

Key Element	*Recommendations*
Leadership	▪ Let everyone introduce himself so that group members get to know each other. ▪ Stimulate a climate of trust within the group with an open communication.
Decision making	▪ Check for anomalies; are there any heuristic traps (McCammon, 2002) present? ▪ Check whether the risk behavior of the group corresponds to the willingness to take risk of the individual group members.
Group structure	▪ Consider group size. ▪ Clarify roles of group members with respect to responsibility. ▪ Check for unfavorable structures (gender, age) with respect to negative group dynamics.
Motivational factors	▪ Check skills of group members. ▪ Harmonize goals and expectations of group members.

The benefit of acronyms has been shown in learning as well as motivational aspects (Stalder, 2005). For this reason we based our group check tool on an acronym related to the topic of groups and human factors.

5. GROUP CHECK TOOL *SOCIAL*

Following the different approaches and concepts reviewed above, we propose the following S-O-C-I-A-L acronym for checking groups traveling in avalanche terrain. To help backcountry enthusiasts to check group relevant factors with respect to avalanche safety, they can also ask themselves the diagnostic check questions which correspond to each group element. Further, we proposed related recommendations (Table 2).

The explanation for the elements behind this acronym can be summarized as followed: *Skills* – be it skiing skills, skills in avalanche hazard evaluation, skills in the use of avalanche safety equipment or physical constitution – are a basic characteristic of every group member. The overall goal for a safe trip is thereby to harmonize skills of all group members with the difficulty of the planned trip. *Organization* sets the course for group characteristics such as group type and group size but also clarifies roles and responsibilities of group members. *Communication* should be open and clear for a good group performance; lack of it is often causing poor decisions. *Identification* of group members with the goals and expectations of the other group members and/or the organization is a prerequisite for groups to harmonize. All group members and leaders in particular should pay attention to any *Anomalies* to normal, “healthy” group behavior such as risky shift, heuristic traps (McCammon, 2002) or influencing environmental factors. Finally, *Leadership* is the controlling factor of all group phenomena and in optimal case sensitive to any group dynamics and facilitating group performance but in the worst case can lead the group into a disaster.

6. CONCLUSIONS

We reviewed existing literature on group phenomena among recreational groups traveling in avalanche terrain with the goal to propose a group check tool and summarized the six most important elements of group phenomena – skills of group members, organization, communication, identification, anomalies to “healthy” group behavior and leadership. The devoted acronym SOCIAL should help recreationists traveling in avalanche terrain to structure group related processes and decisions and therefore to be less susceptible to unwanted group effects.

Since such a tool has to be simple enough to be practicable in real life situations with limited time and limited capacity of individuals it is per se limited in content. For sure, many further topics such as conflict, power (Forsyth, 2010) or personal mastery (Adams, 2005) are of interest in group management and could be further investigated. However, we assume the form and applicability of a practice tool at least as important as its content. We therefore encourage researches to explicitly pay attention to these aspects in future.

During winter 2014-2015 we plan to test the group check tool SOCIAL with different user groups such as backcountry skiers, off-piste skiers, recreational groups, mountain guides, ski instructors, freeride guides or snowshoers and to collect their feedback. We will seek insight into the usability of the single factors of the tool in regard to the trip phases according to Munter’s (1992) 3-by-3 matrix (planning at home, evaluating conditions on-site and deciding at the slope-scale). With adaptations based on users’ feedback our tool will be publicized to winter backcountry recreationists in the fall 2015.

ACKNOWLEDGEMENTS

I would like to thank the members of the *Swiss Snow Sport Avalanche Accident Prevention* core training team for their contribution during the focus group discussion. I also thank to Jürg Schweizer and Frank Techel for their valuable comments on the manuscript.

Table 2: Group check tool SOCIAL with six elements, corresponding explanations, key questions and recommended actions.

Element	*Explanation*	*Key questions*	*Action*
Skills	Skills of group members (skiing skills, skills in avalanche hazard evaluation, skills in the use of avalanche safety equipment and physical constitution) should match the difficulty and conditions of the planned trip.	▪ What are the skills of the weakest member in the group; is he able to follow the planned trip? ▪ Is there a considerable gap in skills between the group members? ▪ Are all group members equipped with avalanche safety equipment and trained in the use of it?	▪ Clarify skills of group members. ▪ Adapt the trip, route selection or time planning. ▪ Plan time for safety equipment instructions.
Organization	In the planning stage important group factors such as group size or type, roles and responsibilities of group members can be influenced.	▪ Do group members know each other? ▪ How large is the group and does the group size fit with the planned trip (time, difficulty)? ▪ Are the roles of the group members clear?	▪ Plan a timeslot for a round of introductions. ▪ Split the group or use risk reduction strategies (keep distances, stay in a specified corridor). ▪ Clarify roles of group members.
Communication	The group should cultivate an open communication and a climate of trust. The communication should be CLEAR (**C**ontextualized, **L**ogically structured, **E**ssential, **A**mbiguity-free and **R**esonating).	▪ Are decisions concerning avalanche hazard discussed in the group? ▪ Does everyone in the group understand the decisions? ▪ Would everyone voice his concerns at any time?	▪ Stimulate discussion on avalanche hazard relevant decisions. ▪ Ask for confirmation. ▪ Ask everyone for concerns.
Identification	Each member of the group can identify himself with the tour goal and with the expectations of the other group members. Furthermore, group members can always identify with the taken decisions.	▪ Are expectations of each of the group members clear? ▪ Does a reasonable alternative exist in case of disagreements? ▪ Is everyone happy with the decisions taken?	▪ Discuss expectations with all group members. ▪ Plan alternatives. ▪ Make a de-briefing after the trip.
Anomaly	Group members should permanently search for anomalies to normal, “healthy” group behavior such as heuristic traps (in particular expert halo, familiarity, social proof and consistency), risky shift effects or environmental factors which mislead the group to unwanted behavior.	▪ Would everyone make the same decision if he would travel alone? ▪ Is an expert halo, a familiarity, a social proof or a consistency trap present? ▪ Does anyone try to impress others (on individual or group base)? ▪ Are any love stories going on in the group? ▪ Are many other groups present?	▪ Imagine traveling alone and make decisions accordingly. ▪ Use rule-based tools to check decisions. ▪ Make defensive decisions in the presence of anomalies that cannot be cured.
Leadership	One should be aware whether one travels in a group with a professional guide, with an informal guide or without a guide. Group members should be critical with their leader and the leader should be critical with himself.	▪ How is the group guided and is the leader the best suited person in the group for this job? ▪ Does the leader communicate openly and clearly? ▪ Would everyone always voice concerns to the leader?	▪ Determine a leader. ▪ Change the leader. ▪ Ask the leader to explain his decision..

REFERENCES

Adams, L., 2005: A systems approach to human factors and expert decision-making within Canadian avalanche phenomena. MA Thesis, Royal Road University.

AIARE, 2011: Field book. The American Institute for Avalanche Research and Education.

Atkins, D., 2001: Human factors in avalanche accidents. Proceedings of the *International Snow Science Workshop*, Big Sky, MT, 46-51.

Bischof, N., and M. J. Eppler, 2011: Caring for Clarity in Knowledge Communication. *Journal of Universal Computer Science, 17*(10), 1455-1473.

Bright, L. S., 2010: Group dynamics and decision making: Backcountry recreationists in avalanche terrain. PhD Thesis, Colorado State University, Fort Collins, CO.

Brugger, H., Etter, H.J., Zweifel, B., Mair, P., Hohlrieder, M., Ellerton, J., Elsensohn, F., Boyd, J., Sumann, G., and M. Falk, 2007: The impact of avalanche rescue devices on survival. *Resuscitation, 75*(3), 476-483.

CAA, 2010: Avalanche Operations Level 2. Canadian Avalanche Association.

Denzin, N. K., and Y. S. Lincoln, 1994: *Handbook of qualitative research*. Thousand Oaks, CA: Sage Publications.

Di Salvo, V. S., E. Nikkel, and C. Monroe, 1989: Theory and practice: A field investigation and identification of group members' perceptions of problems facing natural work groups. *Small Group Research, 20*(4), 551-567.

Do, A., 2014: Perspective from a humbled skier: Lessons learned from the Pucker face avalanche. *The Avalanche Review, 32*(4), 20-22.

Forsyth, D. R., 2010: *Group Dynamics*. 5 ed., Belmont, CA: Wadsworth/Cengage Learning.

Fredston, J., and D. Fesler, 2011: *Snow sense: A guide to evaluating snow avalanche hazard*. Vol. 5, Anchorage, AK: Alaska Mountain Safety Center.

Garicano, L., and Y. Wu, 2012: Knowledge, Communication, and Organizational Capabilities. *Organization Science, 23*(5), 1382-1397.

Haegeli, P., and W. Haider, 2008: Evaluating the avaluator – First reflections on the Canadian decision aid. Proceedings of the *International Snow Science Workshop*, Whistler, BC, 455-464.

Haegeli, P., L. Strong-Cvetich, and W. Haider, 2012: How mountain snowmobilers adjust their riding preferences in response to avalanche hazard information available at different stages of backcountry trips. Proceedings of the *International Snow Science Workshop*, Anchorage, AK, 800-806.

Haegeli, P., W. Haider, M. Longland, and B. Beardmore, 2010: Amateur decision-making in avalanche terrain with and without a decision aid: A stated choice survey. *Nat. Hazards, 52*(1), 185 - 209.

Haegeli, P., M. Falk, E. Procter, B. Zweifel, F. Jarry, S. Logan, K. Kronholm, M.Biskupic, H. Brugger, 2014: The effectiveness of avalanche airbags. *Resuscitation. 85*(9), 1197-1203.

Harvey, S., and B. Zweifel, 2008: New trends of recreational avalanche accidents in Switzerland. Proceedings of the *International Snow Science Workshop*, Whistler, BC, 900-906.

Harvey, S., H. Rhyner, and J. Schweizer, 2012: *Lawinenkunde*. München, Germany: Bruckmann Verlag GmbH.

Hogarth, R. M., 2001: *Educating Intuition*. Chicago, IL: University of Chicago Press.

Harvey et al., 2009: Achtung Lawine!, 6th ed., Kern-Ausbildungsteam «Lawinenprävention Schneesport».

McCammon, I., 2001: Decision making for wilderness leaders: Strategies, traps and teaching methods. *Wilderness risk manager's conference*, Lake Geneva, WI, 16–29.

McCammon, I., 2002: Evidence of heuristic traps in recreational avalanche accidents. Proceedings of the *International Snow Science Workshop*, Penticton, BC, 244-251.

McCammon, I., and P. Hägeli, 2007: An evaluation of rule-based decision tools for travel in avalanche terrain. *Cold Regions Science and Technology, 47*(1-2), 193-206.

McCammon, I., P. Haegeli, and M. Gunn, 2008: Out-of-bounds avalanche awareness: Assessment, current practices, and future management. Proceedings of the *International Snow Science Workshop*, Whistler, BC, 490-497.

McClung, D., and P. Schaerer, 2006: *The avalanche handbook*. 3 ed., Seattle, WA: The Mountaineers.

Munter, W., 1992: *Neue Lawinenkunde: ein Leitfaden für die Praxis*. Bern, Switzerland: SAC Verlag.

Priest, S., and M. A. Gass, 1997: *Effective leadership in adventure programming*. 2 ed., Champaign, IL: Human Kinetics Publishers, 328 pp.

Procter, E., G. Strapazzon, T. Dal Cappello, L. Castlunger, H. P. Staffler, and H. Brugger, 2013: Adherence of backcountry winter recreationists to avalanche prevention and safety practices in northern Italy. *Scandinavian Journal of Medicine & Science in Sports*, (in press).

Sole, A., 2008: Human risk factors in avalanche incidents. MSc Thesis, University of Calgary.

Stalder, D. R., 2005: Learning and motivational benefits of acronym use in introductory psychology. *Teaching of Psychology*, *32*(4), 222-228.

Stewart-Patterson, I., 2008: The role of intuition in the decision process of ski guides. Proceedings of the *International Snow Science Workshop*, Whistler, BC, 530-537.

Stoner, J. A. F., 1961: A comparison of individual and group decision involving risk. MSc Thesis, Massachusetts Institute of Technology, Cambridge, MA.

Tremper, B., 2008: *Staying alive in avalanche terrain*. 2 ed., Seattle, WA: The Mountaineers.

Volken, M., S. Schell, and M. Wheeler, 2007: *Backcountry skiing: Skills for ski touring and ski mountaineering*. 3 ed., Seattle, WA: The Mountaineers.

Winkler, K., H.-P. Brehm, and J. Haltmeier, 2012: *Bergsport Winter*. 3 ed., Bern, Switzerland: SAC Verlag.

Zweifel, B., and P. Haegeli, 2014: A qualitative analysis of group formation, leadership and decision making in recreation groups traveling in avalanche terrain. *Journal of Outdoor Recreation and Tourism, 5-6*(0), 17-26.

Zweifel, B., F. Techel, and C. Björk, 2012: Who is involved in avalanche accidents? Proceedings of the *International Snow Science Workshop*, Anchorage, AK, 234-239.