



RESEARCH ARTICLE

Waylosing and wayfinding in the outdoors: a typology of wayfinding approaches to problem-solving when temporarily lost

Ole Edward Wattne,*  and Frode Volden

Department of Design, Faculty of Architecture and Design, The Norwegian University of Science and Technology (NTNU), Gjøvik, Norway.

*Corresponding author: Ole Edward Wattne; Email: ole.wattne@ntnu.no

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Abstract

This paper presents the findings from a survey conducted in Norway to study the process of recovering from temporary disorientation in outdoor environments. The survey, with 693 respondents, investigated how individuals navigate and regain their bearings after getting disoriented for a short period of time. By collecting data on duration of disorientation and descriptions of participants' recovery experiences, we conducted both qualitative and quantitative analyses to establish a typology of spatial problem-solving [Downs, R. M. and Stea, D. (1977). *Maps in Minds: Reflections on Cognitive Mapping*. New York: Harper & Row, p. 55] approaches employed in wayfinding after becoming temporarily lost in outdoor settings. The research systematically explores the use of materials and approaches described by respondents when re-establishing their bearings. The existing research literature lacks comprehensive reporting on people's strategies for solving the problem of being disoriented in the outdoors, which motivated us to conduct this study. The resulting typology gives an overview of approaches employed to solve the problem of being lost in the outdoors and contribute additional details and insights to the understanding of individuals' wayfinding behaviours and reorientation processes.

1. Introduction

The situation of getting lost is commonly experienced as disadvantageous across contexts, and in nature it can potentially also be a critical situation due to exposure to severe weather conditions and other threats (Angier, 1956; Hill, 2011; Sava et al., 2016; O'Connor, 2019; Dacey et al., 2023). People's different efforts and use of tools to solve this situation without involving search and rescue operations is, to our knowledge, not well explored in the literature. Mollerup (2005, p. 43) states that: 'Travellers typically practise *random seeking* when they have lost their way and don't have the faintest idea where they are.' [our emphasis]. Jeffrey (2019) suggests the term *waylosing* as an antonym to wayfinding and has researched why people get lost in buildings (see also: Dudchenko, 2010). In our research, we have not looked into *why* people get lost in the outdoors, but we have collected numeric data and descriptions on how they solved the situation, and thus went from what can be described as a state of waylosing back to a state of wayfinding. We name this process *recovery* (from disorientation).¹ We have collected descriptions of how the respondents have recovered from being temporarily disoriented in the outdoors and then managed to establish their bearings again. The focus is on wayfinding and

¹ *Reorientation* is a term that could be used synonymously with recovery in our typology: achieving reorientation is effectively what takes place when the respondents describe recovery from losing the way.

reorientation in an outdoor setting in Norway across the seasons, and other locations and contexts are not covered. From the collected descriptions, we have established a typology of approaches where we show that the disorientation is resolved with a large variety of techniques, behaviours and tools. Our collected descriptions and typology are an attempt to systematically expand and nuance the definition of lost people's approaches as 'random seeking'. By basing the typology on empirical data, we contribute to existing scientifically based descriptions of behaviours in wayfinding situations.

The paper contains a theory part which discusses theory on losing and finding the way, a part with the methods we have used to collect data and to structure and present our findings, an analysis of the findings, a discussion of the results, and finally a conclusion.

2. Theory and research on losing and finding the way

The phenomenon of getting lost in general has been described in the literature (e.g. Jonsson, 2002; Nokia, 2008; Carlson et al., 2010; Dudchenko, 2010; Ellard, 2010; Mandel, 2012; Ulrich et al., 2019), and the behaviours of lost and disoriented people in the outdoors are also described in previous literature (see for example Hill, 1998a, 2011; Koester, 2008; Sava et al., 2016; Schwartz, 2022; Dacey et al., 2023). Downs and Stea (1977, p. 53) provide a definition of the state of being lost: 'Orientation refers to the tie between our knowledge of the spatial environment and the environment itself, between cognitive map and real world. We are lost when we are unable to make the necessary link between what we see around us and our cognitive map.' Hill (1998b, p. 2) describes being lost as: 'the lost person is unable to identify or orient his present location with respect to known locations and has no effective means or method for reorienting himself.' This is a definition of being lost without a time limit and with 'no effective means or method for reorienting' oneself, where we can assume the lost person would be dependent on being 'found' by someone else to recover. Hill's research is based on data from search and rescue missions, whereas the descriptions we have collected are from situations of being lost which are *temporary* and thus not so absolute. The situations our respondents describe they have recovered from should therefore be seen as a state of disorientation lasting for a certain period of time. This state is the opposite of what Angier (1956, p. 167) coins as 'staying found': 'We stay found by knowing approximately where we are every moment'. Hill (1998b, p. 3) sums up what it means to be 'found' in more everyday circumstances: 'Much of the time, being spatially oriented means merely that we know the right route to travel in order to get home, such as the correct sequence of turns on city streets. In this case, "knowing where you are" actually means "knowing the way," rather than being able to pinpoint your location on a map.' To separate our findings from Hill's strict definition of being lost, we have qualified them by using the terms *temporarily lost* or *disoriented*. We can define it as the respondents' subjective experience of being temporarily lost or disoriented (see Appendix, Table A3 for details on duration), and where they managed to find effective means and methods to reorient themselves and recover the situation. Furthermore, Hill's (1998b, pp. 3–4) definition that "'knowing where you are" is a *psychological state* that may include certain perceptual experiences (recognising scenes or landmarks), beliefs (often erroneous but unchallenged) concerning the direction and distance of known locations, knowledge of how to navigate to another location, and feelings of security and safety with respect to staying on route or being able to recover the route, if necessary' [our emphasis], has been used in our definition and analysis of the respondents self-reported *experience* of being temporarily disoriented.

There is an extensive literature on general wayfinding behaviour and wayfinding strategies as employed by people in different wayfinding situations. Tasks, behavioural strategies and the use of a wide range of tools in different circumstances have been described and sorted into categories. In the following, we will describe the literature we have used to build our typology. In the handbook 'Wayshowing: A guide to environmental signage principles & practices', Mollerup (2005, p. 42) describes nine wayfinding strategies: track following, route following, educated seeking, inference, screening, aiming, map reading, compassing and social navigation. Mollerup does not reveal how he has defined the categories, nor if his strategies are based on rigorous research – we presume they draw on his experience as a designer and on historical sources – but his strategies are clearly described, sensible and have been influential in the field of wayfinding design. As stated also by Barker (2019, p. 541), they have influenced

our work with building a typology. Carpman and Grant (2002, p. 431) uses Weisman (1982) to suggest four wayfinding strategies or styles: seeing the destination and moving steadily towards it, following a path that leads to a destination, using environmental elements like signs and landmarks, and fourth, forming and using a mental image or cognitive map of the environment at hand. Wiener et al. (2009, p. 156) establishes a taxonomy of what they define as wayfinding tasks. ‘Navigation’ on the top level of the taxonomy is broken down into the two categories of ‘locomotion’ and ‘wayfinding’. Wayfinding is then in turn broken down into aided and unaided wayfinding, and unaided wayfinding is in turn broken down into tasks on three specified levels of knowledge: destination knowledge, route knowledge and survey knowledge.

Barker (2019) presents an elaborate and overarching taxonomy of 12 different categories of wayfinding behaviours with associated wayfinding information types, which are sorted into three main groups: Social, semantic and spatial behaviours. Barker’s taxonomy consists of generalised categories across the contexts of environmental space, paper documents and on-screens, and Barker names them ‘seeking–finding behaviours’, defined as ‘the continuous, recursive series of choices made when an individual purposefully seeks and progresses towards a defined objective. The process is taken to be constructive, dynamic, responsive, and interactive’ (Barker, 2018, p. 16). Barker’s definitions and resulting taxonomy should therefore facilitate fine-grained comparisons of wayfinding behaviours and information types in any of the three given contexts and situations.

Rinne et al. (2022) draw on previous research and summarises five distinct *cognitive* strategies for finding our way. Three egocentric strategies: the sequential strategy, the associative cue strategy and the beacon strategy, and two allocentric strategies: the relative location strategy and the cognitive map strategy. The authors (Rinne et al., 2022, p. 529) also write that other wayfinding strategies might exist and that travellers may ‘use more than one strategy on a given walk’. We can switch between strategies and it has been suggested that the most effective wayfinders are those who can easily switch between strategies (Harris et al., 2012; Colombo et al., 2017). This is in accordance with Mollerup (2005, p. 69), who suggests people employ a mix of his nine defined strategies, depending on the situation and available information.

2.1. Waylosing and lost person behaviour

There is also research literature analysing how people behave when lost, often described as ‘lost person behaviour’. In our work with this paper, we have not been able to find *extensive* literature on this subject, and more specific literature concerned with people experiencing disorientation in the outdoors appears to be lacking. We have found literature concerning *spatial disorientation*, but it is linked to other research areas like the study of neurodegenerative disorders (for example Monacelli et al., 2003; Tu et al., 2015; Cammisuli and Crowe, 2018; Puthusserypady et al., 2022), other transport contexts like aviation and pilot training (for example Benson, 1973; Pike, 1992; van Erp et al., 2006; Lewkowicz and Biernacki, 2020; Hao et al., 2022), experiments in simulation or controlled laboratory settings (for example Dariusz, 2018; Lewkowicz and Kowaleczko, 2019; Landman et al., 2022) or within specific activities or even animal navigation (for example Walsh and Martland, 1993; Matthews, 1997).

We rely on Hill (1998a, 1998b, 2008, 2011) and Koester (2008) as our main literature sources for research on lost people behaviour. Hill (1998b, p. 7) describes a number of what he calls ‘reorientation strategies’, by which lost people attempt to find their way out of the woods, and how they were sampled and defined: ‘This information comes from structured interviews with rescued lost persons, conducted soon after (sometimes during) their recovery, and tested through survey research and interviews with 120 deer hunters in Nova Scotia (Hill et al., 1993).’ The strategies are summarised like this by Hill (1998b, p. 15): ‘(1) *random traveling*,... (2) *direction traveling*,... (3) *route sampling*,... (4) *direction sampling*,... (5) *view enhancement*,... (5) [sic!] *backtracking*,... (6) *using folk wisdom*,... and (7) *staying put* until searchers arrive.’

Hill’s is a systematic description of the behaviour of (truly) lost persons. Koester (2008, p. 58) presents a bar chart ‘ISRID strategies and survival’ over lost persons’ behaviours based on data collected in the International Search & Rescue Incident Database (ISRID) project, with 50,001 cases compiled in 2007.

With the majority of data collected from the United States (91%), followed by New Zealand (5%), Canada (2%) and the United Kingdom (1·4%) (Koester, 2008, p. 23), the chart includes the following (mixed) approaches: ‘Stayed put, Travel aid, Wandered, Route sampled, Direction traveling, Landmark, Back tracking, View enhancing, Direction sampling, Panicked, and Evasive’. We have used the described strategies from Hill (1998b, 2008) and Koester (2008) to inform the sorting and naming of categories in our typology. Some of them match our collected material, while others are not identified by us in our material, and some are unique for our material. While the material used by Hill and Koestner is based on incidents that have triggered search and rescue operations, it is important for us to emphasise that no descriptions in our material indicate this from our respondents. Our respondents have not been ‘lost’ in Hill’s strict definition of the term; they have been disoriented or temporarily experienced to lose their way – and have been able to solve the situation without having to be rescued or found by others. While Hill does not describe the duration of being lost in his findings, we are interpreting the described situations and following defined strategies as of longer duration than the duration of lost-situations in our sample material (Appendix Table A3).

3. Methods and research design

3.1. Survey

Through an online questionnaire, we asked about people’s (self-assessed) skills, strategies, preferences and use of technology when navigating and finding their way in the outdoors (in nature). The tool *Nettskjema* (<https://nettskjema.no/>), developed and run by the University of Oslo, was used for questionnaire development and data collection. The questionnaire was available in both an English and a Norwegian language version. A large majority used the Norwegian version of the questionnaire (622 out of the total 693 respondents). In addition, we asked if the respondents had ever experienced being lost in the outdoors. If the respondents answered either ‘seldom’ or ‘often’, we asked them if they could remember for how long the experiences lasted. Those who reported to have lost their way were asked to describe their procedures for recovery through reorientation. These descriptions were in turn analysed and categorised in cooperation between the two authors of this paper. By doing this, we have collected the respondents’ self-reported descriptions of how they recovered from being temporarily lost, and we would like to emphasise that we have not monitored their behaviour or approaches in the actual situations. The empirical material is thus based on self-reporting and have been coded, sorted and categorised by us. No formal inter-rater reliability testing was performed. We acknowledge the existence of author biases as this is a vulnerability in qualitative research. We nevertheless believe the methods applied in this research give reasonable and valid categories and terms to shed light on wayfinding behaviours.

3.2. Participants, recruitment and ethics

The questionnaire was distributed among 71 Master’s students attending a university course in scientific methodology. Each student was given the task to recruit 15 respondents from their network in addition to answer the survey themselves. Invitations were instructed to be personal, and not just general invitations posted on social media. This gave a total number of 1,136 potential respondents ($71 \times 15 = 1,065 + 71 = 1,136$). The survey finally received a total of 693 respondents which gives a response rate of 61%. Based on the method of recruitment, we consider it likely that the participants in the study are biased towards an above average educational level, and given the number of respondents using the Norwegian language version of the survey, there is a Norwegian cultural bias. The study also came out with a clear age bias. The ages 20–29 and 30–39 are the largest brackets with a combined 67·68% of the total respondents, and we can speculate that the reason that the age 50–59 is larger than 40–49 with 13% and 8·8% accordingly, might be due to recruitment among parents of the students. (The detailed age distribution among the respondents in our survey is displayed in Table A1 in the

Appendix). The gender distribution among the respondents is as follows: 382 (55·1%) *male*, 305 (44%) *female*, 2 (0·29%) *other* and 4 (0·58%) *prefer not to answer*.

From this population of respondents, 427 answered that they *had* experienced being lost while in the outdoors by choosing either ‘seldom’ or ‘often’ as an optional answer. 392 respondents answered ‘seldom’ and 35 ‘often’ giving a total of 61·79% of the respondents having experienced losing their way (see Appendix Table A2 for detailed numbers).

In question 13.1, we asked the respondents who had chosen ‘Seldom’ or ‘Often’ the following follow-up question: ‘Can you remember for how long you experienced not knowing your precise location and what direction you needed to move in?’. We received 426 answers with the majority reporting being disoriented for 30–60 min (46%) or for a few minutes (42%) (see Appendix Table A3 for detailed numbers). Participants who reported to have lost their way when in the outdoors were then in turn asked to describe how they recovered and re-established their bearings again in question 13.2: ‘Can you remember how you established your bearings and no longer felt lost?’. We received 283 written descriptions to this question (see Appendix Table A4 for examples of collected descriptions).

The answers were anonymous, as the recruiters never had access to answers from the participants they recruited, and no direct or indirect identifying data were recorded. Participants were informed about the purpose of the study, voluntary participation and anonymity before being directed to the online survey.

3.3. Qualitative and quantitative analysis

Participants who reported to have lost their way when in the outdoors were asked (in question 13.2) to describe how they recovered. These descriptive, written responses ($n = 283$) were coded, analysed, and sorted into categories based on how they described their approaches and ways of establishing their bearings again. The suggested categories and category names were then linked to previous theory and descriptions as found in the literature on wayfinding and lost people strategies and behaviour. The coding, analysis, sorting, categorising and naming of categories were done by the authors of this paper.

The method for building this typology of categories – and naming them as concepts – is based on a deductive, inductive method for qualitative research defined and described as SDI² (*Stegvis-deduktiv induktiv metode* in Norwegian; Stepwise deductive inductive method in English [our translation]) by Tjora (2021). With this method, findings are coded and described from what is found in the empirical material through induction in a bottom-up approach from raw, empirical data to concepts and theories, and then in turn top-down through deduction by comparison between theories and the empirical material (Babbie, 2007, pp. 380–381; Jonathan and Lance, 2008; Tjora, 2021, p. 20). In a third phase, concepts are developed and defined through abductive reasoning and synthesis (Shank, 1998; Pollock, 2008; Kolko, 2010; Cramer-Petersen et al., 2019; Chew, 2020). This can, according to Tjora (2021, p. 247), be achieved by asking the question ‘what is this a case of?’, in an attempt at defining meaning through a more creative development of concepts. Tjora (2021, p. 247) goes on to state that neither induction nor deduction is especially creative and that concept *development* will be better served by abduction. Even so, the authors would like to emphasise the fact that our suggested categories in the typology is derived from checking against existing literature as discussed above. The quantitative aspects of the collected data have been analysed after the results were coded and categorised, and we have applied a simple univariate analysis of distributions (Babbie, 2007, pp. 405–411) for the different categories of descriptions, and percentages of total for the relevant numerical categories.

4. Results

The collected descriptions of the problem-solving approaches to being temporarily lost have been categorised and sorted into a *typology of descriptive categories of procedures for recovering from being temporarily lost in the outdoors*.

²SDI is a developed variant of so-called ‘Grounded theory’ as introduced in social research by Glaser and Strauss (1967).

Table 1. Typology of descriptive categories of approaches for recovering from being temporarily lost in the outdoors.

Strategy:	a) Recovery by the use of materials, tools and technology	b) Recovery by reading and interpreting the surroundings	c) Recovery by movement	d) Recovery by using existing knowledge and memory (individual or shared)	Uncategorised
Tactics and moves: ^a	Recovery by using digital maps (64/22 · 6%)	Recovery by using terrestrial landmarks (58/20 · 5%)	Recovery by general movement (43/15 · 2%)	Recovery by social navigation (30/10 · 6%)	Accidental recovery (1/0 · 4%)
	Recovery by using maps (42/14 · 8%)	Recovery by reading the terrain (33/11 · 7%)	Recovery by following a trail (31/11%)	Recovery by using memory (6/2 · 1%)	
	Recovery by following marks or signs ^b (15/5 · 3%)	Recovery by ascending to higher ground for view enhancement (15/5 · 3%)	Recovery by backtracking (24/8 · 5%)	Recovery by following their dog (3/1 · 1%)	
	Recovery by using a compass (12/4 · 2%)	Recovery by reading cardinal directions from the sun (13/4 · 6%)	Recovery by ascending to higher ground for view enhancement (15/5 · 3%)		
	Recovery by using other technologies (4/1 · 4%)	Recovery by reading weather phenomena (4/1 · 4%)	Recovery by moving in circles (2/0 · 8%)		
		Recovery by using sound (3/1 · 1%)			
		Recovery by using stars (1/0 · 4%)			
<i>Total descriptions</i>	137	127	115	39	1

^aNumber of responses and percentages of total ($n = 283$) in parentheses.

^bWe are aware that marks and signs can function as, and thus be categorised as, navigational landmarks, but we have decided to sort them in a separate category. Marks and signs in outdoor environments are mostly put in place as *intended* wayfinding and navigation aids, whereas landmarks might exist without this design intention. We therefore think it is important to keep them as a distinct category to add detail to the typology.

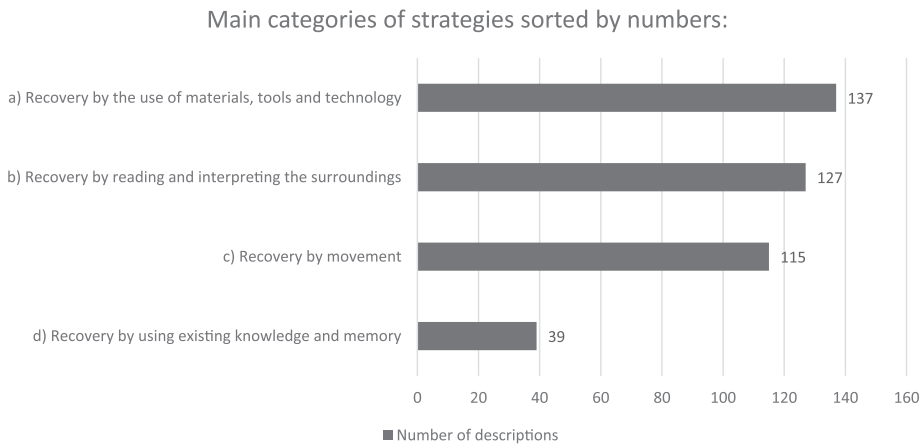


Figure 1. Main categories of strategies from the typology in Table 1 ordered by numbers (decreasing).

4.1. Typology of descriptive categories

The approaches for recovering as described by the respondents are many and diverse. On an overarching level, we have established and sorted them into the following typology of main categories of *strategies* (see also Section 6.2):

- a) Recovery by the use of materials, tools and technology (137)
- b) Recovery by reading and interpreting the surroundings (127)
- c) Recovery by movement (115)
- d) Recovery by using existing knowledge and memory (individual or shared) (39)

Each of these main categories contain more specific sub-categories where the descriptions are sorted with a finer granularity into *tactics* and *moves* (Marchionini, 1995). Some of these sub-categories align with previously described strategies and behaviours for wayfinding and lost people behaviour in the literature, whereas others are of a more novel nature. Since each description might contain mixed approaches, collected answers are sometimes sorted into multiple categories. For example, the description: ‘Looked at the surroundings to find landmarks, zoomed in on the digital map, then verified the landmarks on the digital map’ is sorted both under *Recovery by using digital maps* and *Recovery with the use of terrestrial landmarks*, as we interpret the respondent describing both using a digital map and referring to landmarks in the surrounding landscape. Additionally, the description ‘Backtracked to known landmark, then used a map and analogue compass’ [our translation] is sorted into the four categories: *Recovery by backtracking*, *Recovery with the use of terrestrial landmarks*, *Recovery by using maps* and *Recovery by using a compass*. Table 1 is a tabular overview of the sub-categories identified in the respondents’ answers sorted under the four main categories, with distribution numbers indicating rate of occurrence, and with number of responses and percentages of total ($n = 283$) in parentheses (see Figures 1 and 2).

5. Description and analysis of main findings

In the following, we will analyse the individual sub-categories of our typology as sorted under the main categories:

Main Category: A) Recovery by the use of materials, tools and technology.

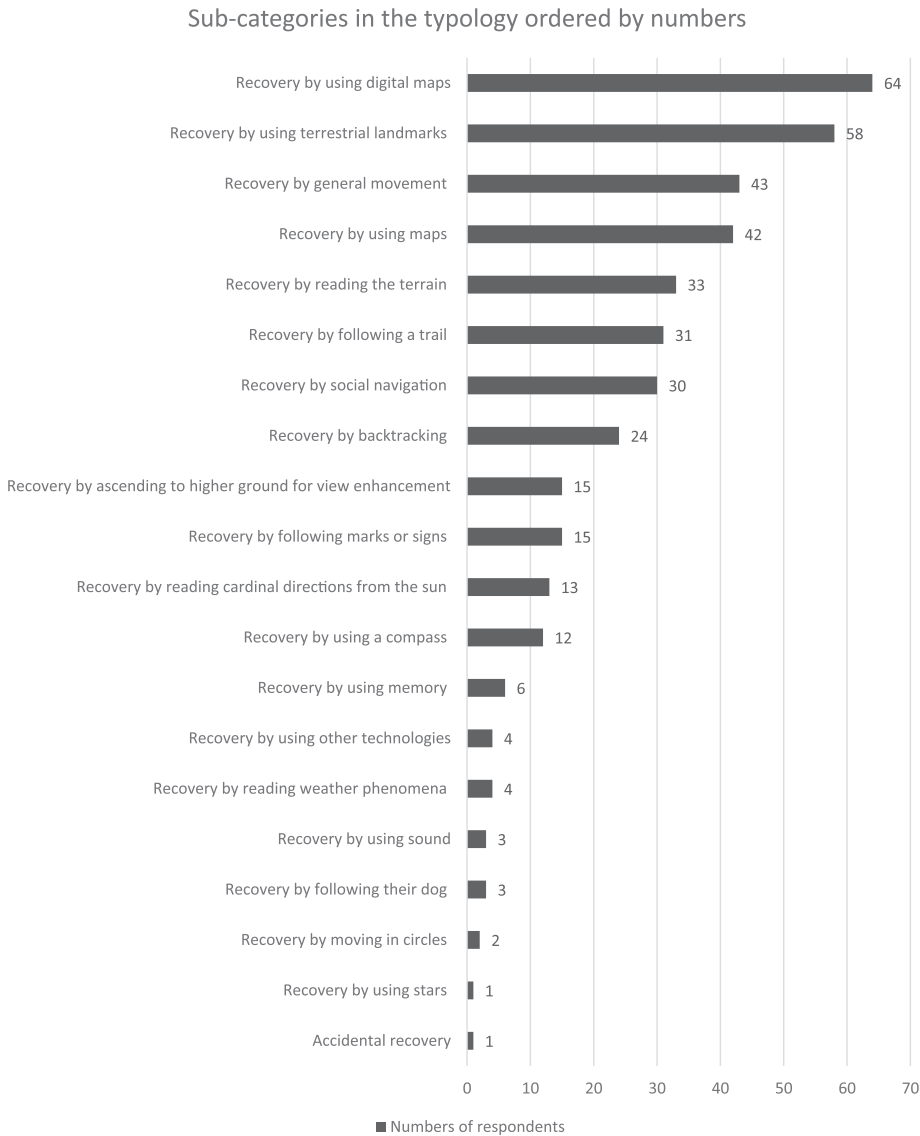


Figure 2. *Sub-categories of tactics and moves from the typology in Table 1 ordered by numbers (decreasing).*

5.1. Recovery by using digital maps

The respondents describe that they used a digital map service, like Google maps, to recover from being disoriented. In this category, we have included all described use of digital map services, locational services (including ones embedded in social media services and apps such as SnapChat), both on smart phones and more specialised devices like hand-held GPS-units.

Given the age distribution of the respondents and the fact that Norway is a country with a high digital penetration and use of Internet services – in the age range 16–79 years, 93% use the Internet several times a day (Statistics Norway, 2022) – it is perhaps no surprise that the highest number of respondents (64/22 · 6%) report that they turned to digital maps and systems when recovering from being lost. Many of the respondents report using Google maps. This is not necessarily an optimal service when it comes to map quality in the outdoors, but still it has been helpful for recovering the bearings for many of

the respondents. Google maps on contemporary smartphones also indicates moving/phone direction by displaying a directional pointer by the blue-dot indicator that shows location on the map. This is, of course, also helpful when setting direction.

5.2. Recovery by using maps

In this category, with 14·8% of the respondents, there are descriptions of the use of traditional, non-digital (paper based) maps for navigation to recover from being lost. When travelling and trekking in nature, there is a tradition for carrying and using paper maps, and there is also a general security recommendation in ‘the Norwegian mountain code’ (Mauren, 2015; The Norwegian Trekking Association, n.d.) to always carry these kind of maps as a back-up to digital ones, as digital maps are vulnerable to loss of battery power, loss of coverage or technological faults. We can speculate that this category being relatively low in numbers is due to the age range of the respondents, of paper maps not being seen as optimal for recovery, of the reported activities and trips being of too short duration to validate these kind of safety measures, or of a combination of these and other factors.

5.3. Recovery by following marks or signs

At 5·3% of total answers, the respondents in this category describe that they used signage, cairns or other man-made markings to re-establish location. We consider marks and signs as examples of wayfinding artefacts that are put in place to help people find their way and location. Marks and signs might then, of course, also be used if people *lose* their way and need to recover. The descriptions of this approach are quite low in numbers, and this can indicate that visible marks and signs prevent people from experiencing disorientation, but a mark, sign or cairn gives no guaranteed assurance for the user to experience certainty about direction or location. Also, as mentioned, marks and signs can act as *landmarks* in wayfinding processes, but we have chosen to sort them into a distinct category based on explicit mentions in the respondents’ descriptions, and the fact that they are put in place specifically for way-showing purposes, whereas landmarks (see Section 5.5) can be objects and features that are not man-made with the specific intention of showing the way.

5.4. Recovery by using a compass

The next category is connected to the reading of cardinal directions, but here a tool in the form of a compass – traditional or digital – is used, either on its own or in combination with a map, to set direction, and then this is used to recover by getting bearings and/or location. 4·2% of the respondents describe the use of a compass to re-orient themselves. Using a compass in combination with a map requires skills to be done in a precise way, whereas just reading out cardinal directions from the compass is quite easy to do. We do not have differentiators between these two ways of using a compass – as a standalone or in combination with a map – in the descriptions of recovery in our survey, but we have 328 respondents (47% of total) answering that they use a compass in combination with maps ‘sometimes’, ‘often’ and ‘always’ for *general* wayfinding purposes in nature.

Main Category: B) Recovery by reading and interpreting the surroundings.

5.5. Recovery by using terrestrial landmarks

This is the second largest category at 20·5% (58). The respondents have reported the use of any type of terrestrial landmark – natural or man-made – to recover. In wayfinding activities, landmarks can be of many forms and kinds, and we have specified them in our typology to be *terrestrial* as an intended pleonasm to separate them from, for example, celestial objects like the Polaris star, which might *function* as landmarks without being land-based (Richter and Winter, 2014). Richter and Winter (2014) refer to

WordNet (as a ‘a semi-formal ontology or lexicon of concepts’), and the level 0 definition of ‘landmark’ in WordNet is close to how we have interpreted the use of the term in our research and following typology.

- ‘S: (n) landmark (the position of a prominent or well-known object in a particular landscape) ‘the church steeple provided a convenient landmark’ (WordNet, n.d.).

From this, a landmark in our typology is ‘something’ conspicuous, land-based and external from the user that is used as a reference point for orientation, but which have not necessarily been purposefully set up as part of a signage and wayfinding system. Marks and signs (see also Section 5.3) can *function* as landmarks, but we have decided to isolate them in a separate category as we think this granularity is of interest, also since marks and signs in nature mostly are put in place for way-showing purposes, whereas a landmark can be any kind of – even moveable – object or phenomena (Barrie, 2020, pp. 17–19). We also find support for our definition of terrestrial landmarks in the following quote from Richter and Winter (2014, p. 6): ‘... landmarks are not special in this respect. Any classification of objects in geographic space is to some extent arbitrary, and has its prototypes and its boundary cases.’

The category includes both descriptions of natural landmarks like a prominent mountain peak, and man-made landmarks like a TV tower or a building. Landmarks as points of reference in wayfinding activities have been thoroughly described in navigation and wayfinding literature across contexts,³ and also in ‘survival guide’ books on how to stay safe in the outdoors (Angier, 1956; Brown, 1983). The importance of this category in our survey data can thus be seen as confirmation of earlier research on the use of landmarks in navigation and wayfinding.

5.6. *Recovery by Reading the terrain*

At a 11.7% response rate, the respondents describe that they have read the terrain around them to re-establish location and bearings. This might be in the form of seeing and recognising a landscape, seeing and following a stream, recognising a distinct type of vegetation, reading the angle of terrain incline in a white-out or angle of waves in a boat, in line with some descriptions by Gatty (1999 [1958]) and as displayed in illustrations in the guidebooks by Wainwright (2005 [1955]). These terrain readings are then in turn used for establishing location or direction. There can be overlap between these descriptions and the descriptions involving natural landmarks, but we have sorted them in this separate category when the descriptions are more general descriptions of ‘reading’ the terrain or the layout of the land, and not descriptions of orientation with prominent landmarks. Here are some examples:

‘I was out hunting, unknowingly I passed a post, I used the valley to find my way.’

‘Walked towards a stream and followed it.’

‘I stopped to read my surroundings and found myself (my position) on the map.’

‘I recognised the formation of the terrain.’

‘In a white-out while skiing, we oriented by the incline of the terrain to move from the mountains and down into the woods.’

‘Made sure that the waves hit the boat at a constant angle until I reached the shore.’ [Our translations.]

It follows from these descriptions that a reading of the terrain in most instances would need to be coupled with other kinds of knowledge to re-establish location. By, for example, seeing a valley with a river flowing in a direction, one would need to know that this river is flowing from or towards a known location or direction to use this terrain-information to establish certain knowledge of location; references in the terrain can be certain locations per se, but they can also be information that, coupled with other kinds of knowledge, leads to certain knowledge of location and/or bearings.

³ see for example Lynch (1960), Siegel and White (1975), Sorrows and Hirtle (1999), Vinson (1999), Michon and Denis (2001), Raubal and Winter (2002), Rosset al. (2004), Waller and Lippa (2007), Xia et al. (2008), Snowdon and Kray (2009), Willis et al. (2009), Frankenstein et al. (2012), Sarjakoski et al. (2012), Tom and Tversky (2012), Richter (2013), Sarjakoski et al. (2013), Wither et al. (2013), Menozzi et al. (2014), Macfarlane (2015), Makri et al. (2015), Amirian and Basiri (2016), Schwering et al. (2017) and Sharma et al. (2017).

5.7. Recovery by using cardinal directions from the sun

Navigation by cardinal directions from the sun is a navigational method with a long history, but in our survey, it received relatively few descriptions with numbers at 13, or 4·6%. The respondents describe using the sun's position to set cardinal direction and then applying this knowledge of direction to re-establish bearings and place. By the descriptions gathered in our survey, knowledge of reading the sun for cardinal directions is something that the respondents brought with them into the situation of disorientation, and then applied successfully to recover. As such, it is a type of knowledge and approach that in some of the descriptions can be sorted in a broader category of 'natural navigation' (Gooley, 2010), where the interpretation of natural phenomenon is key, but where certain kinds of knowledge or skills need to be applied in the situation to be able to make use of these natural phenomena to establish direction and to reorient. (With this aspect – of bringing and using existing knowledge into the situation – in mind, the sub-category could also have been sorted in the *Main Category: D) Recovery by using existing knowledge and memory (individual or shared)*, but we have chosen the act of reading the sun's position as the main feature and accordingly sorted it under *Main Category: B) Recovery by reading and interpreting the surroundings.*)

Main Category: C) Recovery by movement.

5.8. Recovery by general movement

The third largest sub-category at 15·2% is reorientation by general movement. In this category, the respondents describe that they recovered by moving about in a general manner until they recognised their location or bearing, without specifying a certain intent, aim or direction of the movement. What can be interpreted from these descriptions is that the respondents continued to move about, and then recovered their location and/or bearings from 'stumbling upon' something that enabled them to recover, such as a trail, a sign or a landscape feature, without the respondents necessarily describing this as a targeted intention. As such, this category is perhaps the one that is most unclear. The respondents only describe 'some kind of movement' as their approach without necessarily providing any specific direction, aim, strategy or detail of the movement. We see in the collected descriptions that people actually (intentionally) use movement as a behaviour for recovery. Even though the movements are not described as specific or goal directed, they are described as the main actions that led to recovery. Here are some example descriptions where general movement is central:

'Walked around until I found someplace recognisable.'

'I think we walked in a direction until we stumbled on a walking path and followed that.'

'Keep moving forward. Eventually you'll end up in a circle and find your way back.'

'Just continued to walk until I found something I recognised.' [Our translation.]

'Continued to move in assumed correct direction. It proved to be correct even though I had moved away from the original path.' [Our translation.]

Since it is the third largest sub-category in our sampled material, it has also influenced our decision to establish *Recovery by movement* as a main category on a strategical level in the typology. Both the main category and the sub-categories under it are also influenced by Wiener et al. (2009, p. 156) breaking navigation into the category 'locomotion' (along with 'wayfinding'), and by Barker (2019) defining 'spatial behaviour' as one of three wayfinding behaviours (along with 'semantic' and 'social').

5.9. Recovery by following a trail

This category amounts to 11% of the responses. The respondents describe that they have recovered by following one or several trails in the landscape until they could re-establish their positions. We can presume that the respondents might not have a certain sense of location or direction even while being on a trail, but by following a trail, it led to re-establishing this sense.

5.10. *Recovery by backtracking*

In this category, 8·5% of the respondents describe that they retraced – or backtracked – their previous movements to return to their last known location. This described retracing might be in the form of following the trail backwards, or moving back to a known landmark or other point of reference to establish location. This approach can be likened to the concept of leaving and following breadcrumbs; as described in the fairy tale of Hansel & Gretel,⁴ and more recently used analogously as a navigational design pattern in graphical user interfaces and on web pages. The responses are sorted into the *Main Category: C) Recovery by movement*, but could also be sorted into *Main Category: D) Recovery by using existing knowledge and memory (individual or shared)*, as they can be perceived to involve both movement (backtracking) and use of memory or other existing knowledge.

5.11. *Recovery by ascending to higher ground for view enhancement*

In this category, 5·3% of the respondents describe that they moved to higher ground, like a hilltop, to get a better overview of the surroundings and thus use the better view to establish location and bearings. This is an approach to vertically improve visual access – which is also described by Jeffrey (2019, p. 31) who refers to Hill (1998a), and by Gatty (1999 [1958], p. 71) – where the respondents use the terrain to their advantage, but which does not necessarily involve the use of tools or specific knowledge besides the fact that higher ground gives a better overview. Accordingly, moving to higher ground would be an approach that happens in combination with reading the surrounding landscape and/or using landmarks through the resulting improved visual access. As such, this tactic – moving to higher ground – is carried out first for then to enable a better reading of the surroundings. This sub-category can therefore be seen as a two-step process that we have sorted into the two strategies *Main Category: C) Recovery by movement* and *Main Category: B) Recovery by reading and interpreting the surroundings*.

Main Category: D) Recovery by using existing knowledge and memory (individual or shared).

5.12. *Recovery by social navigation*

In this category, with 10·6% of the numbers, the respondents describe that they recovered by some kind of interaction with other people as their approach. This might be in the form of asking other hikers for directions, seeing other people further on and following them, or calling someone on the phone for help with directions. Social navigation is described in previous literature (e.g. Mollerup, 2005; Haddington, 2013; Barker, 2018; Dalton et al., 2019; O'Connor, 2019), and it might be explicit like when asking for directions, or more implicit like when mimicking others' behaviour and movement. Since the collected descriptions are from situations in the outdoors – with most likely few other people around – we can speculate that instances of social navigation for recovery might be more frequent in more densely populated contexts.

5.13. *Recovery by using memory*

In this category, a total of six respondents (2·1%) describe that they have used memorised routes, terrains, landmarks or other features to recover from being disoriented. This category will thereby also include the active use of mental images or cognitive maps of the landscape at hand (Downs and Stea, 1977). Navigation by memory is accordingly an 'internal' procedure that individual respondents put to use – although a group of travellers might combine knowledge stored in individual memories to way-find (which would then also make it social). The respondents describe the use of memories from previous visits to the area to recover, or the use of memorised route, survey or destination knowledge (Wiener et al., 2009, p. 156). The memories might stem from route descriptions, maps or other sources

⁴https://en.wikipedia.org/wiki/Hansel_and_Gretel.

of information, even if it is their first visit to the area. These ‘mental models’ of the places, routes, landscape and surroundings can generally be in many forms, and the stimuli material will affect the formation of the memories and possible cognitive maps in the users’ minds. Even though they are not mentioned explicitly in the responses, the use of cognitive maps (Tolman, 1948; Tversky, 1992; Kitchin, 1994; Portugali, 1996; Schneider and Taylor, 1999; Bell, 2012; Eichenbaum, 2017; Hou et al., 2017; Moser et al., 2017; Nazareth et al., 2018) among the respondents would be sorted in this category. As documented in research (Eleanor et al., 2000; Spiers and Barry, 2015), the hippocampus is central in the handling of memories and in the formation of cognitive maps (O’Keefe and Nadel, 1978). Eichenbaum (2017) argues that the strength of the hippocampus in relation to the use of cognitive maps is the role of the hippocampus in organising experiences in *memory*: a cognitive map is something the user will ‘hold’ in memory. The idea of a ‘map’ is figurative in this sense; and these memories, or mental models – visual or in other modalities – can come in many shapes and forms among different persons and cultures (Downs and Stea, 1977; Widlok, 1997; Roberts, 2012; Walton, 2014; O’Connor, 2019).

5.14. *Miscellaneous descriptions*

The remaining categories are so small that they can be seen as more unusual or specialised tactics or moves. Category 5.14 *Navigation by other technologies* describes the use of other technological equipment than previously described in *Main category*: A) Recovery by the use of materials, tools and technology, such as military radio communications and wind indicators.

Category 5.15 describes reading (changing) weather phenomena, like waiting out the fog or a white-out, to re-establish location. In these descriptions, weather conditions are likely a contributing factor or what caused the respondents to get disoriented in the first place, so it can be argued that the weather conditions are not necessarily used for navigation, but the change in weather solves the issue of being lost for the respondents, by re-enabling orientation as in *Main category*: B) Recovery by reading and interpreting the surroundings.

Category 5.16 contains descriptions of actively using sound to establish location. Listening for the sound of a waterfall or distant traffic or other sounds stemming from a known location was used to set current location or bearing in relation to the direction of the sound. We humans are acutely aware of direction of sound through our auditory perception (Batteau, 1967) and the descriptions we have gathered describes how this ability is put to use for orientation as in *Main category*: B) Recovery by reading and interpreting the surroundings.

Category 5.17 is navigation by letting the dog lead the way and was perhaps the most surprising one: three respondents described that they had recovered by letting their dog take lead and guide them (back) to a known location. There are no descriptions in this category that detail whether they are describing actual guide dogs trained for visually impaired users or other purposes, but by the descriptions we are assuming that we are talking about ‘regular’ dogs. *Main category*: D) Recovery by using existing knowledge and memory (individual or shared). (In this case, we *assume* the dogs are using scent memory, scent trails and other sensory stimuli to find the way.)

Finally, two respondents described moving in circles as their approach, one described stellar navigation, and one described recovering by accident; i.e. no strategy, tactic or moves involved besides from perhaps trusting your luck.

6. Discussion

6.1. *Disorientation and duration*

Our respondents report that they have experienced a feeling of being disoriented for a certain period of time [i.e. not being in what Hill (1998b, pp. 3–4) describes as a psychological state of ‘knowing where you are’], but have then been able to re-orient themselves by a wide range of reported approaches. In this sense, our use of the term ‘lost’ in Question 13 (see Appendix Table A2) is in a more everyday

meaning, where one has temporarily ‘lost the way’. In the Norwegian language version of the survey, the idiom ‘*å gå seg vill*’ is used. This can be translated to the English term ‘to get lost’, or what Hill (1998b, p. 7) calls to be ‘turned around.’ Our respondents have managed to recover from this without being dependent on a search and rescue effort by others. In our research, the focus is consequently on how people describe to have *solved* the situation of being temporarily lost and have been able to reorient themselves. The clear majority (88%) of our respondents reported experiencing being lost for 60 min or less, thus the terms *temporarily lost* or *disoriented* seem fitting.

6.2. Behaviours, strategies or problem-solving attempts

Mollerup’s (2005) nine wayfinding strategies have been influential for our typology. Mollerup (2005, p. 43) states that his strategies are ‘primarily aimed at the built environment’, and as such, the identified approaches in our research of the outdoors might not be viewed as fully commensurable with Mollerup’s strategies. If we uphold a view of a *strict* division between built and natural environments, our findings of reported approaches can serve to confirm *similarities* between what is previously described for wayfinding in urban environments and what has been described in our context of more natural surroundings. The term ‘strategy’ implies an element of planning or strategical thinking.⁵ Mollerup (2005, p. 43) defines a (wayfinding) strategy as: ‘... a rational principle for search, decision, and motion. This definition includes intelligent seeking, but excludes random seeking. Travellers typically practise random seeking when they have lost their way and don’t have the faintest idea where they are.’ By this definition and description, Mollerup excludes the situation of being lost for a *strategic* approach to wayfinding. Adhering to Hill’s definition of being lost as discussed above and Mollerup’s exclusion of wayfinding *strategies* when lost, our interpretation of the descriptions we have collected is that they are of a spur-of-the-moment, spontaneous – and hence possibly not strictly speaking strategic – nature, and we see them as attempts at solving an immediate, spatial problem (Downs and Stea, 1977, p. 55) in a potentially stressful (Hill, 1998b, pp. 10–12) situation. As discussed by Barker (2019, pp. 540–541), behaviour can be examined at variable scales. Barker uses Marchionini (1995, pp. 72–74) to define that search behaviour can be viewed from four levels of detail and summarises them like this:

- Patterns (groups of strategies or tactics which a person applies to a particular category of problem)
- Strategies (the approach a person takes to a particular problem, ‘sets of tactics’)
- Tactics (‘discrete intellectual choices’)
- Moves (discrete actions such as clicking a mouse or walking to a shelf)

We have, like Barker, employed Marchionini’s levels of behaviour in our analysis. We consider the described approaches from our respondents to belong to the three bottom levels: Strategies, tactics and moves. This definition of behaviour scales in combination with the findings, as presented in our typology in Table 1, can thus be seen as self-reported evidence that Mollerup’s statement that ‘Travellers typically practise random seeking when they have lost their way . . .’ can be nuanced. Our respondents describe that they use available materials, tools, existing personal and collective knowledge, memories, sense-stimuli, terrain readings, and other ego- and allocentric approaches that go beyond the somewhat limited category ‘random seeking’, even when they are temporarily lost. We have chosen to let not only behaviours but also choice of materials, phenomena, tools and technology influence the categories we set up for analysis. For instance, there is one category for the description of the use of digital maps and another for the use of traditional, paper-based maps, because we think it is of interest to categorise with a high level of granularity. The respondents’ described actions are all labelled as *recovery* as this is what is achieved by the actions. Additionally, we consider it likely that available tools, materials and phenomena in combination with knowledge and skills will have influenced the respondents’ *actions* that lead to re-orientation. However, this is not something we have asked the respondents specifically about.

⁵The art or practice of planning the future direction or outcome of something; the formulation or implementation of a plan, scheme, or course of action, esp. of a long-term or ambitious nature. Also: policy or means of achieving objectives within a specified field, as *political strategy*, *corporate strategy*, etc. (Oxford English Dictionary, n.d.)

In this perspective, what we call a *strategy*, *tactic* or *move* – i.e. a scale of behaviours – are all considered behaviours whether they concern *asking* someone for directions, *ascending* to higher ground for view enhancement, *reading* the terrain, *identifying* landmarks, the *use* of materials, tools and technology, or *use* of knowledge and memory. These behaviours have, in turn, led the respondents to the ‘eureka moment’ where they no longer experience being disoriented.

6.3. Limitations, bias and movement as wayfinding behaviour

Even though it is useful to see our sampled descriptions as instances of a variety of types of wayfinding approaches among the respondents, we would like to reiterate the fact that what we have collected is not *observed* behaviours; they are self-reported from memory. Additionally, what is described is what the respondents remember to have done (i.e. their ‘behaviour’) to go from a state of experienced disorientation and to an experienced state of orientation. This experienced state of orientation can be achieved by different approaches where some will involve geographical movement (‘backtracking’, ‘move to higher ground’, ‘following a path’ etc.), whereas others experience orientation by behaviours that does not necessarily involve geographical movement (‘using a digital map’, ‘checking for landmarks’, etc.), where the respondents have re-established orientation without reporting to have moved about. Because of this, we think it is useful to define a strategic category where movement is identified as the reported activity that *changed* the experienced state from disorientation to orientation among the respondents. Also, as described by Koester (2008, p. 57), ‘staying put’ is a common safety recommendation if a person gets truly lost, and we therefore think it is of interest to have a separate category for the descriptions that says movement is what re-oriented our respondents.

The majority of our respondents used the Norwegian language version of the questionnaire (622 out of the total 693 respondents). The collected descriptions of approaches can accordingly be seen to have a Norwegian cultural bias. We did not include any geographical data in the questions about losing the way, so we cannot be absolutely sure about the location of the descriptions. The respondents *might* be describing situations occurring while being located inside or outside of Norway, and the 71 respondents using the English version of the questionnaire are most likely recruited by international students in the group. There is existing research carried out with the use of digital, videogames-based material on wayfinding, showing that the population in Nordic countries score high on navigational abilities (Coutrot et al., 2018). This research could indicate that the proportion of respondents answering that they had *never* or *seldom* been lost in our survey might have been lower in similar surveys carried out in countries outside the Nordic region (in accordance with scored lower navigational abilities by Coutrot et al., 2018). As referred to by Gatty (1999 [1958]) and also by Coutrot et al. (2018, p. 2864), there is a tradition of including the sport orienteering – including training in the use of a map and compass – in secondary school physical education in the Nordic countries. We can speculate that this, perhaps also in combination with a strong tradition for using nature for hiking (Ween and Abram, 2012), could heighten navigational abilities in the outdoors in the general population, and perhaps also give better skills in the use of map and compass, which in turn could influence the number of respondents reporting this in our survey. We consider that there is nothing in our research confirming or going against the results from Coutrot et al. (2018), but are aware that the cultural bias might affect our results.

7. Conclusion

The findings presented in this paper are concerned with descriptions of a specific setting (being temporarily lost) in a specific context (the outdoors). The proposed typology is a contribution towards describing and categorising wayfinding behaviours, approaches and use of materials employed as a form of problem solving. These descriptions cannot necessarily be replicated in, or be mapped onto, other settings, but we have established similarities between these reported behaviours and methods reported in the literature from other wayfinding contexts. Our typology of descriptions can serve as a contribution to knowledge about wayfinding behaviours, procedures, competences, and use of materials,

tools and technology. As a result, it can serve as knowledge in the form of possible patterns to address when designing wayfinding systems for the outdoors, and possibly also for other settings.

The described approaches and the popularity of them can also inform guidelines and educational material on safety procedures and outdoors training. Lunde (2016) found a sharp increase in rescue operations in the Norwegian mountains over the previous 10–15 years, and we think a contribution to understanding peoples' behaviour when temporarily lost can be of help to educate and train people to avoid getting more seriously lost, and in turn contribute to reduce the need for rescue operations. With the knowledge that the largest group of our respondents reported turning to digital maps when they got lost, we can inform and educate people about the possible benefits and risk of such approaches, and we can educate them about which digital services and tools can be helpful, and also increase their security while being in the outdoors. In addition to the popular Google maps, they can, for example, install more specialised map services, make use of the digital compass on the phone and make sure that they notice landmarks in the surroundings, both in the planning phases and while under way. Further research of this kind of problem solving in other settings could be undertaken: how people recover from being disoriented in cities, in airports, in hospitals and other complex environments, buildings and sites. By researching procedures from other settings, one might continue to identify context specific approaches and possible overlaps in approaches also between contexts. Also, navigational approaches from other settings have been used with success in designed wayfinding systems, like, for example, the use of cardinal directions in wayfinding for mass transport ('westbound trains'), or the use of 'artificial' landmarks for saliency and remembrance in otherwise anonymous hospital buildings.

Competing interests. The authors declare none.

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A. Appendix

Table A.1. Age distribution among respondents.

Age	Number	Percentage (%)
10–19	23	3·32
20–29	325	46·9
30–39	144	20·78
40–49	61	8·8
50–59	90	13
60–69	37	5·34
70–79	9	1·3
80 +	4	0·58
<i>Total</i>	693	

Table A.2. Distribution of answers to question 13.

Answer	Number	Percentage (%)
Never	219	31·69
Seldom	392	56·72
Often	35	5·06
Don't know/Not relevant	45	6·51
<i>Total</i>	691	

Have you ever been lost in the outdoors?.

Question 13: Have you ever been lost in the outdoors?

Have you experienced not knowing where you are or what direction you should move in, or in other ways lost your way in nature?

Table A.3. Distribution of answers to question 13.1 'Can you remember for how long you experienced not knowing your precise location and what direction you needed to move in?'

Answer	Number	Percentage (%)
Don't know/Can't remember	31	7·28
For several hours	21	4·93
30–60 min	197	46
For a few minutes	177	42
<i>Total</i>	426	

Table A.4. Example descriptions provided by respondents sorted under the main strategies (some of the descriptions will be hybrid and thus fit under more than one strategy and have in Table 4 been sorted and counted accordingly).

Strategy	Sample descriptions
a) Recovery by the use of materials, tools and technology	<p>‘Looked at the surroundings to find landmarks, zoomed in on the digital map, then verified the landmarks on the digital map.’</p> <p>‘I was on a mountain top, fog came. Had Strava on my phone, therefore followed Strava when we went back down since we didn’t see anything.’ [Our translation.]</p> <p>‘By using my google maps to guide me to a known point.’</p> <p>‘Put away the map app on the phone and found an analogue compass and paper map.’ [Our translation.]</p> <p>‘Find a path that is clearly marked on the map. Find signs that indicate the direction and distance to a known place.’ [Our translation.]</p> <p>‘Used Google maps on the phone to orient myself again’ [Our translation.]</p> <p>‘There were more of us and we had several digital maps, i.e. mobile maps in addition to Garmin GPS.’ [Our translation.]</p> <p>‘The fog lifted and there was better visibility again, I ran into others astray with a compass, I had a map.’ [Our translation.]</p> <p>‘Picked up the phone, and then pointed the phone in the direction I was going on the map.’ [Our translation.]</p> <p>‘[I] had to use a phone to find out where I was and use a digital compass to find my way back to a trail.’ [Our translation.]</p> <p>‘Found a map/GPS on skisporet.no’ [Our translation.]</p> <p>‘We set a compass course.’ [Our translation.]</p> <p>‘Picked up the phone and saw that I was on the wrong path. Went wrong because the connection was broken, so the marker showing ‘me’ on the map didn’t move.’ [Our translation.]</p> <p>‘[In a] snowstorm, had to use the GPS.’ [Our translation.]</p> <p>‘Used paper maps along with an analogue compass and GPS on the phone.’ [Our translation.]</p>
b) Recovery by reading and interpreting the surroundings	<p>‘I was out hunting, unknowingly I passed a post, I then used the valley to find my way.’</p> <p>‘Walked towards a stream and followed it.’</p> <p>‘Looked at what I recognised and went for what I remembered.’</p> <p>‘I stopped to look at my surroundings and found myself (my position) on the map.’</p> <p>‘I recognised the formation of the terrain.’</p>

Continued.

Table A.4. Continued.

Strategy	Sample descriptions
c) Recovery by movement	'In a white-out while skiing: we oriented by the incline of the terrain to move from the mountains and down into the woods.' [Our translation.]
	'Made sure that the waves hit the boat at a constant angle until I reached the shore.' [Our translation.]
	'Found a marked trail (T)'
	'Mistook some random boulders for some well-known boulders along the trail. Realised after walking 30 min through the bush. Found my bearings by walking for an hour to a hilltop for a better view of my surroundings.'
	'Found a familiar landmark and recognised my surroundings.' [Our translation.]
	'Power lines.' [Our translation.]
	'Use of mobile. Study the surroundings/known formations. Proceed carefully to what I think is the right direction, possibly correct if wrong. Finding the way in the end!!' [Our translation.]
	'Looked for the sun in relation to time of day.' [Our translation.]
	'Often lost track of location due to fog/whiteout/poor visibility. Don't always trust the digital maps where you are if there is poor coverage on the mountain. Then found the way when the weather let up and we moved on.' [Our translation.]
	'Went off the trail to take some photos and couldn't find my way back to the trail. Listened for the waterfall. Found the way down to the river and then I could orient myself again' [Our translation.]
	'Followed the stars.' [Our translation.]
	'Got away from the path in thick fog. Went downwards in the direction where we thought there was a stream. Reorientated from the stream and went in the direction where we thought we would have to cross the path. Found it and followed it down the terrain. The fog eased a little and I could see the light from a mining tower. Then knew where the car park was in relation to the tower and found the way.' [Our translation.]
	'Was out hunting. Was surprised by the darkness. And the headlamp ran out of battery. Then I followed the light on the sky. Arrived at the nearest settlement. And found the way home.' [Our translation.]
'I think we walked in one direction until we stumbled on a walking path and followed that.'	
'Keep moving forward. Eventually you'll end up in a circle and find your way back.'	
'Just continued to walk until I found something I recognised.' [Our translation.]	
'Continued to move in assumed correct direction. It proved to be correct even though I had moved away from the original path.' [Our translation.]	
'Followed [a] hiking trail which was not obvious. So it was a bit of luck that I caught up with others.'	

d) Recovery by using existing knowledge and memory (individual or shared)

‘Mistook some random boulders for some well-known boulders along the trail. Realised after walking 30 min through the bush. Found my bearings by walking for an hour to a hilltop for a better view of my surroundings.’

‘I got lost in a dense forest and ran out of power on my mobile phone. I had to climb a peak to get my bearings.’ [Our translation.]

‘Just went in one direction and saw where I ended up’ [Our translation.]

‘I had made a wrong choice of way, the map no longer matched the surroundings, but only by following this new way further could I orientate myself.’ [Our translation.]

‘I returned to where I came from and ended the trip.’ [Our translation.]

‘Go back to the last known location and reorient myself from there.’ [Our translation.]

‘I went back up the mountain above the tree line and got my bearings.’ [Our translation.]

‘Moved consistently in one direction until I found a clear landmark that I could recognise on the map.’ [Our translation.]

‘Was . . . on a manoeuvre in the army, was under attack and had to run. We walked for 36 h before we knew exactly where we were, we knew the whole time that we were going in the right direction but could not place ourselves on the map until we found a dirt road.’ [Our translation.]

‘Went back to where I had control over where I were last.’ [Our translation.]

‘I went in a direction and took a chance on that I would hit a river and a hill, and I listened to find the river, and then walked along the river in the right direction until I found a bridge that showed me where I was on the map.’ [Our translation.]

‘I called out to other hikers and moved on with them.’ [Our translation.]

‘I’ve never travelled too far alone so perhaps not the most relevant to answer. I’m terrified of getting lost so stick to paths and surroundings I know well, or travel with someone who knows the area well.’

‘Coming back to a place I remember.’

‘With the help of digital maps on the mobile phone and by asking people I passed by’

‘(I) met someone who knew the way.’ [Our translation.]

‘Found the nearest cabin to ask for directions.’ [Our translation.]

‘I was in an area with relatively many other people, so I asked other hikers for directions.’ [Our translation.]

‘Sought help from other hikers.’ [Our translation.]

‘I had to call someone for help.’ [Our translation.]

‘I let my dog lead the way 😊 then I recognised a crossing forest road as she led me across it.’ [Our translation.]

‘I asked other hikers, and tried to recognise other (known) mountain peaks.’ [Our translation.]

‘[Took] a short break and a look around the surroundings, then my head connected where I was.’ [Our translation.]

Continued.

Table A.4. Continued.

Strategy	Sample descriptions
	‘Met someone who guided me in the right direction. Asked for help.’ [Our translation.]
	‘There were several of us on the trip and we found out the route ahead through discussion.’ [Our translation.]
	‘Called someone who had done the walk before and described the area, was on the right path but it was poorly marked.’ [Our translation.]

List 1: The sub-categories of tactics and moves from [Table 1](#) ordered after rate of occurrence from top to bottom (number of responses and percentages of total ($n = 283$) in parentheses):

- Recovery by using digital maps (64/22 · 6%)
- Recovery by using terrestrial landmarks (58/20 · 5%)
- Recovery by general movement (43/15 · 2%)
- Recovery by using maps (42/14 · 8%)
- Recovery by reading the terrain (33/11 · 7%)
- Recovery by following a trail (31/11%)
- Recovery by social navigation (30/10 · 6%)
- Recovery by backtracking (24/8 · 5%)
- Recovery by ascending to higher ground for view enhancement (15/5 · 3%)
- Recovery by following marks or signs (15/5 · 3%)
- Recovery by reading cardinal directions from the sun (13/4 · 6%)
- Recovery by using a compass (12/4 · 2%)
- Recovery by using memory (6/2 · 1%)
- Recovery by using other technologies (4/1 · 4%)
- Recovery by reading weather phenomena (4/1 · 4%)
- Recovery by using sound (3/1 · 1%)
- Recovery by following their dog (3/1 · 1%)
- Recovery by moving in circles (2/0 · 8%)
- Recovery by using stars (1/0 · 4%)
- Accidental recovery (1/0 · 4%)