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Examining the perceived value of professional judgment and decision making in mountain leaders in the UK: A mixed-methods investigation

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4 **Examining the Perceived Value of Professional Judgment and**
5 **Decision Making in Mountain Leaders in the UK: A Mixed-Methods**
6 **Investigation**

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25 **Abstract**

26 This paper utilised a two-part mixed-methodology to examine the value placed on
27 judgement and decision making by a sample of qualified mountain leaders in the UK.
28 Qualified leaders ($N = 331$) completed a web-based survey and a smaller sample ($N =$
29 8) were then interviewed. Survey data showed that mountain leaders place greater
30 value on their judgements and decision making when compared to the technical skills
31 of mountain navigation and rope work; however, the process for developing these
32 judgment skills was unclear. Interview data identified that judgment skills appear
33 transferrable from other domains experienced by the leaders (e.g., emergency
34 services, military) but are then recontextualised and modified for effective use within
35 mountain leadership. The leaders facilitated this via a nested reflective process that
36 combines in-action, on-action and on-action/in-context aspects that rely on
37 metacognition. This combination of reflection and metacognition allows for rapid
38 development of judgment making skills in-context. Implications for mountain
39 leadership training are discussed.

40

41 **Keywords:** coach education; expertise; metacognition; reflective practice;
42 survey

43

44 **Introduction**

45 As adventure sports continue to grow in popularity, creating what has been termed
46 ‘hard adventure’ tourism (Beedie, 2003; Beedie & Hudson, 2003), UK government
47 policy has focused on the use of the outdoors as a medium to promote health and
48 wellbeing (Sport England, 2015). It has been reported that 48% of the UK population
49 participate in adventure sport at least once a year (Cousquer & Beames, 2013; Taylor
50 & Garratt, 2010). Among these activities and sports, and thus forming the focus of
51 this paper, is mountaineering. Crucially, in response to this increased participation
52 level, the demand for qualified leaders and instructors is clear. As such, this paper
53 addresses the professional characteristics of mountain leaders.

54 At an organisational level within the UK, Mountain Training UK (hereafter
55 referred to as MTUK) are the governing body that oversees the training of mountain
56 leaders. As part of their role, MTUK administer and certify three different mountain
57 leadership awards (summer, winter and international; see Table 1) to accommodate
58 the mountaineering skills required across various conditions¹. Notably, each award
59 domain can be characterised as an open, dynamic and, at times, hyper-dynamic
60 environment whereby the task demands are often highly fluid and variable. In
61 summary, award certification requires the trainee leader to have pre-requisite personal
62 and leadership experience within the relevant conditions, attend formal training
63 courses, complete a first aid qualification and to consolidate their personal and
64 leadership skills between training and assessment via ongoing logged evidence of
65 ‘quality mountain days’ (QMDs) for each award (see Table 1). Overall, training to
66 become a certified mountain leader takes several years of experience and training.

¹ IFMG Guides Carnet operates under a standalone scheme and are internationally qualified to operate on glaciated terrain and ski mountaineering.

67 Regardless of the award being undertaken, assessments are conducted across several
68 days and nights. Indeed, there are distinct advantages to this length of assessment.
69 Firstly, it affords the assessor a better understanding of candidates' expertise over
70 representative timescales (e.g., while on an expedition, in poor conditions). Secondly,
71 it almost inevitably tests candidates' abilities to lead, and adapt, within a dynamic
72 environment that so typically characterises the eventual role.

73

74 ***Insert Table 1 near here***

75

76 At present, the formalised training programme has an explicit technical focus
77 on the skills associated with mountain leadership, such as; rope work, navigation and
78 camp craft. Application of these declarative technical skills emerges in the
79 experience requirements of the QMDs; that is, by increased 'doing' in practice. It is
80 less clear, however, how the judgment, decision making and leadership skills that are
81 required to be adaptable are actually developed and learnt. An equally essential
82 aspect would also be the assessment of those hyper-dynamic interactions between
83 judgement, decision making and leadership skill that are derived from those
84 experiences (L. Collins, Carson & Collins, 2016; L. Collins & Collins, 2015, 2016a).
85 In short, the development towards *adaptive expertise*.

86 Certainly, judgment and decision making has long been acknowledged as a
87 critical component for successful mountaineering and its leadership. For example,
88 Cousquer and Beames (2013) highlight judgment as a crucial aspect in the
89 professional practice of International Federation of Mountain Guides (IFMG) and
90 International Mountain Leaders (IML). Specifically, from the participant(s)
91 perspective, it is identified that the led participants are *passengers* in the adventure,

92 experiencing a *perception* of risk without the skills to manage the *real* risk
93 independently presented by a hazard (Loynes, 1996, Brown, 2000). Fundamentally,
94 the *passenger* engages a leader to make judgments and decisions about the activity on
95 their behalf. Therefore, it is important that the leader can adequately respond to a
96 changing environment while catering for the adventurous expectations, abilities and
97 safety of the group and individuals within it. Consequently, judgement and decision
98 making skills appear critical for the outdoor leader.

99 In contrast to the adventure sports *coaches* identified by L. Collins, Collins
100 and Grecic (2015), and expanding further on the notion of an *independent*
101 performance, leaders in this context do not seek to develop independent performances
102 in the participant(s). In fact, leaders may actively discourage an independent
103 performance in their clients as part of safety management (ensuring the client behaves
104 in a particular manner in a given situation) or because of a commercial interest (i.e.,
105 maintaining return clientele). Accordingly, mountain leaders contribute to the
106 ‘experience economy’ (Pine & Gillmore, 1998), delivering the sensations, thrills and
107 experiences sought, but in a manner that can be managed, made safe for and
108 ‘collected’ (e.g., ‘Munroe-bagging’ in Scotland) by the participant. Leaders therefore
109 operate to satisfy the requirements and ambitions of their client(s). Because of such
110 activity *commodification* (Loynes, 1996), the traditional approach of ‘apprenticeship’
111 development has been replaced by formalised training, pre-requisite experience and
112 assessments, eventually leading to certification as a mountain leader. In short, the
113 training of leaders may have also become, or at least be perceived as also being,
114 ‘commodified’.

115 In doing so, however, this overlooks a growing realisation that the decision
116 making load on leaders and coaches is high. In part, this is because the participant

117 has abdicated the complex decisions that are associated with independent
118 participation in favour of a commodified adventure (Loynes, 1996) or collectable
119 experiences and, in another, because of the inherent need to negotiate the
120 nonlinear/complex environment–performer interaction. Within the context of
121 adventure sport coaching, at least, L. Collins and Collins (2015) and D. Collins,
122 Collins and Carson (2016) found preliminary evidence for a nesting of
123 conscious/deliberate (i.e., logical thinking) and intuitive (i.e., gut feeling) decision
124 making processes in order to manage such cognitive loads depending on the
125 situational context and experience.

126 Therefore, the aim of this paper is to understand the relative value placed by
127 UK mountain leaders on judgement and decision making, by considering the nature of
128 those judgements and the manner in which they are developed. In doing so, the paper
129 is presented in two progressive parts; a large-scale web-based survey (Part 1) and
130 semi-structured interviews (Part 2).

131 **Part 1**

132 Firstly, we sought to assess the level of consensus regarding the value, development
133 and deployment of judgement and decision making in a large sample of qualified
134 mountain leaders via a quantitative online survey.

135 **Method**

136 *Participants*

137 Participants were 331 qualified mountain leaders (male = 287, female = 44). All were
138 at least 18 years of age ($M_{age} = 47.1$ years, $SD = 11$), as required for mountain
139 leadership accreditation. Ethical approval was provided by the University of Central
140 Lancashire’s ethics committee prior to data collection and each participant provided
141 informed consent prior to taking the survey.

142 ***Procedure***

143 A draft survey was constructed using the guidelines outlined by Carson, Collins and
144 MacNamara (2013). This survey consisted of multiple choice ranking and rating
145 questions, as informed by the professional judgement and decision making literature
146 (e.g., Abraham & Collins, 2011; L. Collins & Collins, 2016a; Martindale & Collins,
147 2007). These were then presented to an expert panel for evaluation of effectiveness
148 against the study's aims. These experts, three qualified mountain instructors and an
149 experienced academic within the field of adventure sport, provided feedback and
150 revisions were made to the survey. These revisions were resubmitted for approval to
151 that group before a series of cognitive interviews were conducted (Willis, DeMatio &
152 Harris-Kojetin, 1999) with a sample of eight representative participants; this step was
153 included to remove any misunderstandings, inconsistencies, inappropriate response
154 options and to expand the process performed by the expert panel. Final revisions
155 were returned to the pilot participants for confirmation and an update provided to the
156 expert panel for their consideration. The survey questions are available online
157 (Supplementary File 1).

158 With the assistance of MTUK acting as a 'gatekeeper', the survey, provided
159 via the online tool Survey Monkey (www.surveymonkey.com), was distributed by e-
160 mail to approximately 4,000 qualified mountain leaders. An explanation of the study
161 aims, purpose and an electronic link to the survey were provided within the e-mail.
162 Progress through the survey was dependent on consent being provided at the start of
163 the survey. Participants that completed the survey were offered the opportunity to
164 enter into a prize draw to win one of three £50 vouchers as an incentive. All data
165 were anonymised and the termination point for this survey set when stable levels
166 were reached (achieved after ~65% of completed responses). The survey was

167 available for completion across a period of 2 months and did not take more than 10
168 minutes to complete.

169 *Data Analysis*

170 Data were analysed automatically by the website www.surveymonekey.com and
171 presented descriptively in tabulated or graphical form (Figures 1 and 2).

172 **Part 1 Results**

173 Participants were asked to rank several skills, including decision making, in terms of
174 their importance toward mountain leadership. As shown in Figure 1, decision making
175 was ranked as the highest, closely followed by navigation and the ability to interpret
176 conditions. Contrary to the large emphasis on technical skills within current
177 accreditation courses, mountain leaders rated technical skills (e.g., rope work) as
178 being least important.

179

180 ***Insert Figure 1 here***

181

182 At a more specific level (see Table 2), participants expressed *strong*
183 *agreement* for the notion that to be effective the mountain leader must exercise good
184 judgment and, that learning from experience is a characteristic of effective mountain
185 leadership. There was overall *agreement* that developing judgment skill is complex;
186 with a number of participants *strongly agreeing*. There was greater spread of
187 responses across the options when rating whether errors in judgment are inevitable
188 and that good judgment is a product of poor judgment, therefore challenging the
189 adage that good judgment is learnt from previous experiences of poor judgment.
190 Results suggest that mountain leaders *neither agree nor disagree* on these statements;

191 in short, how judgment is developed is unclear to the participating mountain leaders
192 in the study.

193

194 ***Insert Table 2 here***

195

196 It is clear from Figure 2 that participants consider good mountain leadership to
197 more often than not rely on logical thinking rather than the use of gut feeling
198 responses (Figure 2A), and that this generally reflects *their* professional practice
199 (Figure 2B). Whereas, in scenarios outside of the mountain leadership context,
200 participants reported a lower extent of logical thinking in their decision making
201 process; responses shifted slightly to a more balanced use of gut feeling and logical
202 thinking (Figure 2C). There was little difference between participants' views on their
203 learning contexts, only 11 more participants thought that their learning was carried
204 out informally versus formally with the remainder expressing an even 50/50 split
205 (Figure 2D). This challenges views regarding the value placed on formalised training
206 for coaches and leaders and may be a consequence of the pre-requisite requirement
207 prior to training. Data in Figure 2E suggests that mountain leadership requires a
208 blend of decisions to be made in practice and planned for in advance. Less than 10%
209 of participants reported a split equal to or higher than 90/10 (or 10/90). Perhaps
210 reflecting the dynamic nature of these leaders' role, there were slightly more
211 responses suggesting that decisions were made more often in practice. Finally, an
212 overwhelming majority of participants categorised their pre-planned decisions as
213 underpinned by logical thinking (Figure 2F).

214

215 ***Insert Figure 2 here***

216

217 Brief Discussion

218 Data provide support for the notion that decision making is highly valued by
219 mountain leaders. At the very least, this indicates a possible need for greater
220 emphasis on decision training during training and assessment and, that such a
221 modification is likely to be well received/supported by mountain leaders themselves.
222 Although it is apparent that the development of decision making skill is an active,
223 often logically thought through, process that is reliant upon experience, the overall
224 lack of agreement on *how* it was best developed warrants further investigation. In this
225 regard, data support previous findings (D. Collins et al., 2016) showing that decision
226 making in adventure sport requires a blending of logical thinking and gut feel
227 responses, which may provide a suitable start point for future development. As such,
228 considering the similarly dynamic environment in which mountain leadership
229 operates, it would be surprising if the cognitive demands were not similarly complex.
230 Research to understand the possible mechanisms involved would therefore be a
231 logical extension of this work.

232 Part 2

233 Having determined that judgment and decision making are highly valued by mountain
234 leaders, we present a qualitative study to provide a richer and in-depth exploration of
235 the development and utilisation of such judgement and decision making skills.

236 Method**237 Participants**

238 A sample of accredited UK Mountain Leaders ($N = 8$, 6 males, 2 females; M_{age}
239 = 48.1 years, $SD = 10.85$) were purposively selected based on, a) a willingness to
240 participate as expressed at the end of the survey presented in Part 1, b) current

241 accreditation as a Mountain Leader (Table 3) and, c) over 5 years of experience post
242 qualification at Summer level. As such, participants also completed the survey prior
243 to interview. Ethical approval was provided by the University of Central Lancashire's
244 [university name removed for blind peer-review purposes] ethics committee prior to
245 data collection and each participant provided signed informed consent.

246

247 ***Insert Table 3 here***

248

249 *Procedure*

250 Following analysis of survey responses from Part 1, a semi-structured interview guide
251 was constructed with the additional inclusion of questions/probes based on literature-
252 derived themes. The questions drew on critical incident technique (Flanagan, 1954)
253 as a "knowledge elicitation strategy" (Flin, O'Connor & Crichton, 2008, p. 222).

254 This approach was adopted to uncover any complexities when applying knowledge
255 within the mountain environment. Critical incident technique has been utilised in the
256 past with experienced decision makers, targeting key judgments during nonroutine
257 activities (Crandall, Klein & Hoffman, 2006; Flin et al., 2008; Hoffman, Crandall &
258 Shadbolt, 1998). The semi-structured nature of interviews allowed the interviewer to
259 elicit key information and for experiences to be explored in greater depth.

260 Specifically, the process involves a partnership between interviewer and interviewee
261 who select a key incident that can be clearly defined and then examined at a deeper
262 level. The key element is an exploration with the interviewee of what information
263 was influential when changing an assessment of the situation, or when selecting a
264 particular course of action (Flin et al., 2008).

265 This interview guide was piloted with six representative participants and
266 feedback was sought regarding the content, structure and procedure. Amendments to
267 the guide were made and then returned to the representative group for confirmation.
268 The interview guide can be found in Supplementary File 2. Interviews were
269 conducted at a convenient time for each participant and in a private location to ensure
270 anonymity. The mean interview duration was 31 minutes and interviews were
271 recorded on an electronic Dictaphone device that stored data in mp3 file format.

272 *Data Analysis*

273 Following the guidance provided by Braun and Clarke (2006), data were analysed
274 using a thematic analysis. Accordingly, interviews were first transcribed verbatim
275 and read several times to fully apprehend the essential features (Sandelowski, 1995).
276 General impressions of these data were written in note form and shared between the
277 researchers conducting the analysis (first and third authors). Secondly, driven by an
278 interest in the decision making processes and its epistemological underpinnings, an
279 initial deductive coding of response data was applied to each transcript; thus formally
280 identifying relevant extracts. Thirdly, data codes were collated into lower-order
281 themes based on common features, which were then grouped together under higher-
282 order themes representing the highest level of abstraction. Within a fourth phase of
283 analysis, these themes were subjected to review and further refinement by the
284 researchers. The primary aim was to check for a shared understanding and
285 interpretation of data and, therefore, the emerging themes as a whole data set. This
286 process involved revisiting the original transcripts, interviewer notes and digital
287 recordings, enabling themes to be reconsidered, combined, broken down and the
288 generation of new themes. Importantly, the development of themes at any point
289 during the analysis did not depend on the prevalence of a code, but rather, on what the

290 theme revealed about the decision making process and its philosophical
291 underpinnings.

292 In addition to the steps outlined above to, the issue of trustworthiness was
293 addressed through use of an additional researcher, who was not involved in the
294 interviewing or coding process, independently coding a random sample of the
295 transcripts (25%) to ensure inter-coder agreement. Data were coded against the
296 developed themes and assessed for the level of agreement. Three disagreements
297 regarding these differences in codes were discussed until a consensus was reached.

298 **Results**

299 Initial analysis identified 247 coded units. These were subsequently grouped into 70
300 lower-order, 15 mid-order and 5 higher-order themes (see Table 4). Higher-order
301 themes were then discussed in the context of the second set of research questions;
302 What value do UK mountain leaders place on judgement and decision making and,
303 what are the characteristics of judgment skills in mountain leaders? Higher-order
304 themes emerged during the analysis and formed the structured discussion outlined
305 below. A variety of different length quotes from all the participants have been used to
306 illustrate the points made throughout the discussion.

307

308 ***Insert Table 4 here***

309

310 **Brief Discussion**

311 *Metacognition*

312 Metacognition (L. Collins et al., 2016) emerged as an overarching higher-order theme
313 that links the four other higher-order themes. Data support recent proposals that
314 metacognition forms an important aspect of the decision making process (L. Collins et

315 al., 2016). It is suggested that metacognition assists the naturalistic ‘gut feel’ decision
316 making (NDM) processes whilst in-action. Furthermore, metacognition underpins the
317 reflective process associated with maximising the learning from experience. In this
318 respect, the blending of NDM processes and metacognitive attributes enables the leader
319 to manage high cognitive loads associated with the in-action decision (L. Collins &
320 Collins, 2015). Evidently two aspects emerged from the interviews; firstly, an ability
321 to reflect on the process of the decision and the decision outcome. ML7 highlights a
322 metacognitive capacity as follows, “So I purposefully stopped the group and tell them
323 that I need to make a couple of decisions”. As part of this decision to stop, the nature
324 of the decision was reviewed and reflected on, and the consequences of the action and
325 impact on the group was considered as part of the contextual framework for the
326 decision.

327 Secondly, the capacity to anticipate changes in a situation and to accommodate
328 those possible ‘new’ variables into the leadership decisions as an ongoing auditing
329 process was apparent. Referring specifically to managing risks and illustrating the
330 cognitive load, ML4 explained:

331 Identifying and managing [anticipating] all the risks that are coming up. Even
332 if they’re only very slightly apparent. So the changes of weather, changes in
333 the physical state of your group are things you need to make an effort to keep
334 tabs on.

335 It seems likely that those anticipated changes are analogous in nature and draw
336 on previous experiences of similar situations. However those changes may be
337 metaphoric in nature when learning from experiences to inform novel situations or
338 new context.

339 *Diverse mental models*

340 During planning processes, the mountain leader utilises predominantly a classical
341 ‘logical thinking’ decision making (CDM) style (cf. L. Collins & Collins, 2016b, in
342 adventure sport). Following sufficient volume of experience, the leader is able to
343 anticipate, prioritise and plan for potential courses of action within specific contexts
344 (i.e., the likelihood of implementing alternative plans). Moreover, these actions
345 appear to be stored as a procedural chunk and highly associated with recognisable
346 contextual demands (e.g., the clearly delineated Danger, Response, Airways,
347 Breathing, Circulation [DRABC] procedure in First Aid situations). For example,
348 ML1 described: “So I gave them [the lost walkers] my spare clothes to warm them up
349 a bit. I always bring spare clothing” that are carried as a requirement by the mountain
350 leader. ML3 highlights the valuable impact of such procedures within a more
351 complex context that served to reduce the cognitive load:

352 So I suppose using my first aid knowledge and the procedures that you learn
353 in basic first aid going through your ABCs etc. [the delineated procedural
354 chunk], actually asking the right questions I could see that [was] more than
355 indigestion and to be honest with you, that was a fairly easy decision.

356

357 In addition, options may also be derived in an episodic manner, drawing from
358 the knowledge within the leader’s community of practice, as exemplified by ML8 in
359 the following: “on slopes of this aspect after these conditions I anticipate ‘X’
360 conditions”. Without experience of that *actual* slope, but by drawing on experience
361 of similar slopes (aspect, shape, gradient etc.) in similar conditions, leaders often
362 combine this knowledge with the advice of another leader who has direct experience
363 of the slope in question.

364 An interesting aspect of the community of practice is the value placed on the
365 provided information as being equal to the leader's own; in other words, there is a
366 high degree of trust between mountain leaders. With this information, the leader
367 generates a range of mental models/options that relate to a particular sequence of
368 events, pivotal occurrences or combination of factors. This aspect of judgment and
369 decision making is broadly classical in nature and allows the leader to rationalise,
370 prioritise and reduce the range of options considered in-action, essentially narrowing
371 the range of options considered and reducing cognitive demands on the NDM process.
372 ML 8's statement that "But feels like relatively smaller decisions, really. But the big
373 decisions you've made a long time ago" highlights the "big decision as part of the
374 planned process". In this respect, the metacognition facilitates the nesting of CDM
375 and NDM in the judgement and decision making process. This metacognitive
376 capacity appears critical within the professional judgement and decision making
377 (PJDM) approach advocated by Abraham and Collins (2011) and L. Collins et al.
378 (2016) and, as we have demonstrated, is highly valued by these mountain leaders.
379 Like their coaching colleagues, mountain leaders experience high cognitive loads and
380 a strong metacognitive capacity would seem well developed to assist in managing this
381 demand.

382 ***Judgment and decision making***

383 As stated earlier, anticipation of particular events, pivotal occurrences or specific
384 combinations of factors *prime* the leader in 'selecting' from a predetermined set of
385 options. Metacognition allows the generation of heuristics that facilitate a quicker
386 route to an option derived from CDM. This illustrates the nested synergy of NDM
387 and CDM that may operate in the PJDM model. ML 8 describes the classical, logical-
388 thinking part of the process at a crucial moment in a walking tour: "... you want to be

389 there when it's stable [the snow]" and also illustrates the result of actually arriving at
390 that snow slope "... I was listening to my body then, when I realised that, kind of
391 shaking knees means that you should really not be there."

392 While the crux had been planned for and anticipated, the decision not to cross the
393 slope was based on a more naturalistic, gut feel, process arrived at in-context.

394 ML7 highlighted the on-action/in-context aspects of judgement and decision
395 making identified by L. Collins and Collins (2015), while also anticipating the
396 consequence in context. For instance, the group getting cold while the leader collects
397 information to utilise in an apparently CDM process: "So I purposely stopped the
398 group and tell them that I need to make a couple of decisions, stay here, put a layer
399 on".

400 The mountain leaders appeared to attribute the in-action process to intuition,
401 with ML1 suggesting that his intuition reflected him knowing he "had *The Force* with
402 me basically". The leader's ability to rationalise their intuitive decisions appears to
403 contradict such a belief, suggesting that this is not the case and that the term
404 'intuition' is misused in this context. We do not dispute that intuition forms part of
405 the decision making process (Lufityanto, Donkin & Pearson, 2016), but suggest that it
406 is overemphasised due to its perceived high value status among leaders and possibly
407 because decision making is articulated from a solely CDM perspective. In short,
408 aspects of decision making that are not classical in nature *must*, therefore, be intuitive
409 because no other known terms can be applied.

410 Options that were generated changed in priority as the activity progressed and
411 appear to be conceptualised as a set of loose parts that can be reconfigured to facilitate
412 multiple outcomes in contexts (i.e., "now priorities are XYZ, while at other points the
413 priorities will be ZXY"). This contributes to the high cognitive load attributed within

414 the decision making process and, once again, links the judgement and decision
415 making process to the overarching/integrating metacognitive theme. The cognitive
416 load is associated with the adaptation, flexibility and creativity of a blueprint plan that
417 utilises preselected components, rather than constructing completely novel procedures
418 in the field. Action plan components are selected based upon their capacity to be
419 integrated. As such, appreciation of the context, situational awareness and demands is
420 highly significant to the decision making process.

421 *Contextual framework*

422 Judgment and decision making skill facilitates the adaptability and flexibility required
423 when utilising the loose parts, mentioned earlier, in a range of different
424 configurations. This facilitating mechanism and associated metacognitive processes
425 operate within a contextual framework that acts as scaffolding for the decisions.
426 Consideration towards the environment, group, and their interaction is similar to the
427 *situational awareness* described by Endsley and Garland (2000) and Banbury and
428 Tremblay (2004). ML2 explains:

429 We were quite a way down, you know. Actually, if the weather had been
430 better, we'd have had different options...you know, to go high up in the
431 Cairngorms. So if the weather had changed then we would have had different
432 options.

433

434 Fixed parameters, such as group experience, size and nature, terrain, gradient
435 and a limited range of anticipated or planned possibilities (e.g., task, conditions) act as
436 scaffold supports for the judgements and decisions. This declarative knowledge
437 demonstrates a deep understanding of the contextual framework. The contextual
438 framework constrains the decision in practice. This extends the concept of situational

439 awareness (Flin et al., 2008) and Abraham and Collins' (2011) *situational demands* to
440 encompass a greater 'projection of future state' than either description implies,
441 however does require further research. Indeed, this 'anticipated state' is influenced
442 by the practicality of the leader's decision, with the decision itself having an impact
443 on the future state, as ML1 explains: "if I do X I need only consider Y and Z as
444 possible alternatives". ML5 also illustrates the point clearly:

445 and to be quite forthright, people saying 'right well if you don't reach this
446 point by this time that's it we're turning round because if you go on you will
447 then go over the time limit and you will be slower coming down'. The delay
448 by proceeding resulting in the need to cross a snow slope that will be exposed
449 to the sun and consequently more avalanche prone.

450 In not reaching a particular point on an ascent, the leader knows that the
451 original plan is unachievable. In knowing that the ascent from a given point (e.g., a
452 col) to the summit will take 2 hours, by not reaching that point with 2 hours to spare
453 the final summit ascent becomes impossible. This appears to be facilitated by the
454 predetermined options derived from the plan and supports identified earlier.

455 In addition to the standard operating procedures, specific mental models for
456 action are generated via the planning process. These models draw on the experience
457 and declarative, technical and nontechnical knowledge/skills of the mountain leader.
458 These constructed models are specific to the context of the proposed activity
459 (dependant on the contextual frame) and operate alongside the standardised, more
460 routine, procedures. In this respect, the number of options available to the leaders in a
461 given situation is reduced into a manageable load. Such preplanned options appear to
462 reduce the leader's cognitive load in a given situation, selecting from a predetermined

463 short-list of options or tools available and, therefore, enabling the leader to be flexible
464 and adaptive within the constructed contextual framework.

465 Declarative technical skills including rope-work and navigation are taught
466 during training. Additionally, a range of nontechnical skills such as judgement and
467 decision making that are associated with leadership, emerge from the reflective
468 processes of the leader's own experiences or from previous formalised training (e.g.,
469 military, emergency services, police, business). In reality, the development of these
470 nontechnical skills is frequently a combination of the two. ML2 described a
471 particular course of action towards the summit of a mountain walk, "we're commando
472 forces so it was.... Nobody gets left behind". ML6 draws on their experience within a
473 military, paramedic role and states:

474 I learnt a lot of decision making and being a leader through the
475 military....Leadership skills, teamwork skills was driven by that more than
476 when I did my Mountain Leadership training.

477

478 In addition, ML6 also states "there's lots talked about reflective practice
479 within my paramedic role". These nontechnical skills appear to be reconceptualised
480 from other sources or developed via reflective and metacognitive skills. Importantly,
481 both approaches to the development of judgement require the metacognitive capacity
482 highlighted earlier. The first as part of the reflective process associated with learning
483 from experience, the latter in the transfer of skills to new domains or contexts. It
484 seems most likely that the two are interrelated and operate in synergy. Further
485 examination of this complex process is worthy of further investigation.

486 **General discussion**

487 The aim of this paper was to understand the relative value placed by UK mountain
488 leaders on judgement and decision making, by considering the nature of those
489 judgements and the manner in which they are developed. In doing so, the paper
490 addressed two questions: What value do UK mountain leaders place on judgement
491 and decision making and, how are these judgment skills learnt, developed and
492 refined?

493 ***What value do UK mountain leaders place on judgement and decision making?***

494 Mountain leaders clearly value judgement and decision making skill, as evidenced by
495 its top ranking position (above procedural technical skills) in the survey and important
496 impact offered within the interviews. Indeed, results revealed an important
497 recognition for practical integration of technical, leadership and judgment skills in a
498 synergy for optimum effect. Despite its highly assigned value, however, decision
499 making appears not to be explicitly taught during the mountain leadership training in
500 the UK; at least not according to the in-depth interviews in Part 2. In our professional
501 experience this is, likewise, generally common amongst other, more traditional, sports
502 coaching qualifications. This deficit could be seen to represent misalignment between
503 training and practice. Such perspectives are, however, in line with the PJDM
504 approach that similarly places an emphasis on judgment and decision making *because*
505 of its acknowledgment that leadership is complex, thus requiring adaptability and
506 flexibility. Recent studies have recommended that training/assessment be more
507 aligned with practice, with the need for a mixed assessment of *both* declarative
508 technical skill and decision making (particularly in higher awards: L. Collins et al.,
509 2016). Looking to the future, important questions for mountaineering training bodies
510 are, therefore, what does it *mean* to be a mountain leader? *What are the essential*
511 skills required by mountain leaders?

512 ***How are these judgment skills learnt, developed and refined?***

513 There were two main mechanisms that leaders in this study suggested for how they
514 were able to improve their judgment and decision making skills in their own practice.
515 Expressly, transferred leadership and decision making skills from either other
516 formalised training (e.g., emergency services or military) or via a process of
517 experience and self-directed reflection were identified. The former required leaders
518 to recontextualise existing knowledge and skills, or the reconstruction of that
519 knowledge and skill, both however require quality practical experience as a mountain
520 leader, reflective and metacognitive capacity. The processes of experiential learning,
521 however, are not facilitated in the mountain leader training. As a result learning from
522 the QMDs is potentially ad-hoc in nature, relying on reflective skills that are, also,
523 learnt and transferred from other contexts. In practice, this reflection on experiences
524 is associated with an intention to act (Martindale & Collins, 2005) that relates to the
525 goal associated with that judgement and is constrained by the contextual framework.

526 With the QMDs already required by MTUK as part of the formalised training,
527 it would seem sensible to capitalise on leaders' ability to learn from such experiences.
528 Accordingly, integrating metacognitive training (e.g., cognitive apprenticeship or
529 decision training) alongside declarative technical and nontechnical skills, with a clear
530 contextual framework that includes prioritised mental models, is an obvious way
531 forward for future training. Indeed, this *might* require the leader to articulate their
532 decision making and explain how it was derived. Crucially, such a requirement must
533 be understood, bought into and valued by the trainee leaders and, finally, supported
534 and reinforced by the community of practice.

535 **Conclusion**

536 In conclusion, there is much potential for research and development in judgement and
537 decision making skills for mountain leadership. This study has identified that
538 mountain leaders highly value these skills but are unsupported in knowing how to best
539 develop them. We have explained that the existing training structure is advantageous
540 for several reasons, including the duration, scope and practical requirements.
541 However, we propose that, without formal support for developing good judgment and
542 decision making skills, potential leaders are at a disadvantage when presenting for
543 assessment. In short, greater efforts need to be directed towards *maximising* the QMD
544 experiences which, in turn, we suggest will upskill the leadership workforce to
545 support the UK's growing industry in the wake of recent health initiatives.
546

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617

Figure Captions

618 Figure 1. Ranking of skills (1 being the highest and 10 the lowest) in terms of their
619 importance to mountain leadership.

620 Figure 2. Bar charts showing the extent to which participants believed good mountain
621 leadership is dependent on gut feeling or logical thinking (A), their mountain
622 leadership is dependent on gut feeling or logical thinking (B), decisions outside of
623 mountain leadership scenarios are based on gut feeling or logical thinking (C), their
624 mountain leadership decisions are developed informally or formally (D), their
625 mountain leadership decisions are planned in advance or responsive in practice (E),
626 and their planning decisions (prior to the activity) are based on gut feeling or logical
627 thinking (F).

628 **Tables**

629 Table 1.

Qualification & Remit	Training Pre-requisites	Training content	Consolidation requirements	Assessment requirements
<p>Summer Mountain Leader</p> <p>The scheme is intended for those leading groups in mountainous or remote country in the UK. The term ‘summer’ is used to describe any conditions not covered by winter.</p>	<p>Minimum age of 18 years. Minimum experience of 1 year in hill walking. Registration onto the scheme. Recorded a minimum of 20 QMDs.</p>	<p>Duration = 6 days.</p> <p>Group management Navigation Access and the environment Hazards (including steep ground and rivers) and emergency procedures Equipment Expedition skills Weather Background knowledge</p>	<p>The period between training and assessment varies in length for each person and is an opportunity for candidates to develop skills, paying particular attention to any weaknesses identified during the training course.</p>	<p>Duration = 5 days (including a two night expedition).</p> <p>Attend a Mountain Leader training course. Be familiar with the syllabus. Minimum of 40 logged QMDs. Hold a current first aid certificate, minimum 16 hours. Logged at least eight nights camping, including at least four nights of wild camping.</p>
<p>Winter Mountain Leader</p> <p>Winter can be defined as the time when snow and ice prevail or are forecast</p>	<p>Hold the Summer Mountain Leader award. Current experience of hillwalking and mountaineering in winter conditions in at least three</p>	<p>Duration = 6 days.</p> <p>Leadership and journey skills Navigation Snow and avalanches</p>	<p>The period between training and assessment varies for each person. The exact nature depends on the weaknesses</p>	<p>Duration = 5 days (including a two night expedition).</p> <p>Attended a Winter Mountain Leader training</p>

and is not to be defined by a portion of the year.	different UK mountain locations. Be well practised in the personal use of ice axe and crampons. Recorded a minimum of 20 Winter QMDs.	Ice axe and crampon skills Security on steep ground Emergency snow shelters and holes Cold weather injuries Winter weather	identified during the training course. 10 Grade I climbs, or equivalent mountaineering routes.	course (or have been granted exemption). Be familiar with the syllabus. Minimum of 40 logged Winter QMDs. Hold a current first aid certificate.
International Mountain Leader	Completed the Mountain Leader award. Recorded a minimum of 20 International summer QMDs and 20 winter QMDs (UK or overseas). Referee to endorse their experience.	Duration = two 5 day training courses (summer and winter). The mountain environment International legal and economic situation Group management and leaders responsibilities Teaching Anatomy and physiology Physical ability Navigation Weather Security Emergency procedures Bivouac and survival skills	The period between training and assessment varies depending on the weaknesses identified during the training courses. Mountain Training UK encourage candidates to develop experience post training.	Duration = 9 days (4 summer and 5 winter) Summer Assessment: Attend an IML Summer training course. Be familiar with the syllabus. Pass the Speed Navigation Test. Hold a current first aid certificate. Experience since completing the IML Summer training. Winter Assessment:

Expeditions
Snow-covered terrain

Pass the IML Summer
assessment
Complete IML Winter
training
Be familiar with the
syllabus
Hold a current first aid
certificate, minimum 16
hours.
Minimum of 60 logged
QMDs.

630

631 Table 2. *Ratings about Professional Judgment in Mountain Leadership.*

	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree	Average Rating
Effective mountain leadership relies on good judgement skills	276	51	1	2	1	1.19 (Strongly Agree)
An effective mountain leader has the ability to learn from experience	272	52	4	3	0	1.21 (Strongly Agree)
Good judgement is a product of poor judgement	6	75	112	106	32	3.25 (Neither Agree nor Disagree)
Errors in judgement are inevitable	27	173	67	51	13	2.55

							(Neither Agree nor Disagree)
	Developing judgement skill is a complex process	123	148	37	22	1	1.88 (Agree)

632

633 Table 3. *Participant Qualifications*

Participant No.	Qualification(s)
1	Summer Mountain Leader
2	Summer Mountain Leader
3	Summer Mountain Leader Winter Mountain Leader International Mountain Leader
4	Summer Mountain Leader
5	Summer Mountain Leader International Mountain Leader
6	Summer Mountain Leader
7	Summer Mountain Leader Winter Mountain Leader
8	Summer Mountain Leader Winter Mountain Leader

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634

635 Table 4. *Organisation of Data Codes from the Thematic Analysis.*

Higher-order Themes	Mid-order Themes	Lower-order Themes
Metacognition	Anticipation of change	Conditions (e.g., terrain, weather) Environment Group Goal (link to plan B)
	Cognitive load	High Changing (i.e., across a day) Varied (i.e., reflecting the nature of the decision)
	Knowledge generation	Knowledge sharing Community of practice
Diverse Mental Models	'What if?' (anticipation)	Recognising situational cues Pivotal moments in group behaviour/skills Accumulation of minor occurrences that then become significant (i.e., pattern recognition) Prioritisation of alternative possibilities

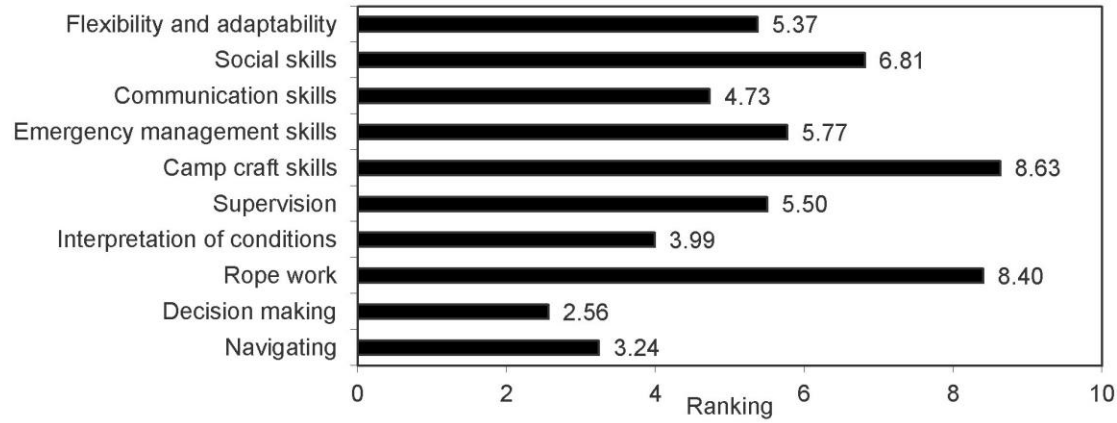
	Attending to realistic options (e.g., disregarding winter condition hazards in the summer)
Evolution of planning in accordance with anticipated situations	Creativity Adaptability Flexibility Pre-action planning
Engagement in the decision making process	Classical decision making Naturalistic decision making Recognition of emotional impact Synergy of classical and naturalistic decision making Misuse of intuition Metacognition
Contextual impact on DM 'span of control' management	Process (i.e., flexible application from own experience and knowledge) Protocols (i.e., derived from best-practice) Procedures (i.e., options to select from) Standing orders (i.e., external regulation)

		Routines (i.e., inflexible application of constructed knowledge)
Judgement and decision making	Reflection	In-action On-action On-action/in-context Reflective feedback Intention to act
	Feedback	Expectation to learn Explicit (i.e., requested from leaders) Implicit (e.g., body language, response from group) Emotional intelligence
	Community of practice	Value Use Access
Contextual Framework	Situational awareness	Group characteristics (e.g., size, make up etc.) Task (outcome, process) Environment (physical, social) Knowledge of conditions
	Interaction awareness	Contextual knowledge

	Contextual impact on group
	Contextual impact on task
	Anticipated changes
	Learning context
	Rapport with the group
Technical skills	Navigation
	Rope work
	Snow craft
	Emergency skill
	Tactics
	Supervisory skills
	Safety skills
Nontechnical skills	Adaptability
	Delegation
	Response/capacity to change
	Leadership styles
	Communication
	Empathy
	Emotional intelligence
Transferability	Military
	Emergency services
	Business
	Other life experiences

637 **Figures**

638 *Figure 1.*



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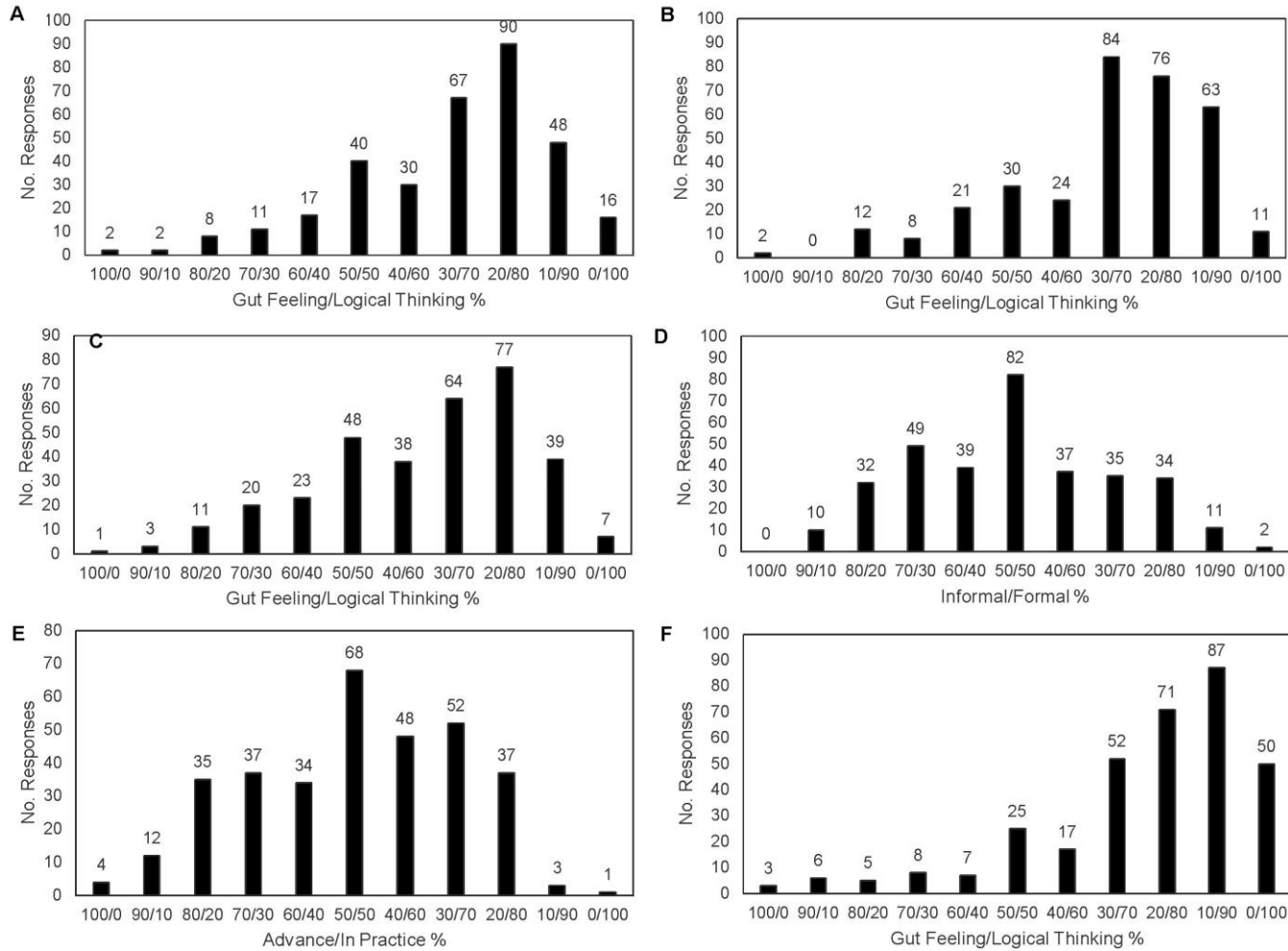
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647 *Figure 2.*



648