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Developing excellence in outdoor provision: Enhancing training pathways for outdoor qualifications

Hardy, William

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**Developing excellence in outdoor provision:
Enhancing training pathways for outdoor
qualifications**

Thesis submitted to Bangor University in fulfilment of the requirements
for the Degree of Doctor of Philosophy at the School of Sport, Health,
and Exercise Sciences, Bangor University.

Will A. S. Hardy

2021-03-12

Declaration and Consent

Yr wyf drwy hyn yn datgan mai canlyniad fy ymchwil fy hun yw'r thesis hwn, ac eithrio lle nodir yn wahanol. Caiff ffynonellau eraill eu cydnabod gan droednodiadau yn rhoi cyfeiriadau eglur. Nid yw sylwedd y gwaith hwn wedi cael ei dderbyn o'r blaen ar gyfer unrhyw radd, ac nid yw'n cael ei gyflwyno ar yr un pryd mewn ymgeisiaeth am unrhyw radd oni bai ei fod, fel y cytunwyd gan y Brifysgol, am gymwysterau deuol cymeradwy.

I hereby declare that this thesis is the results of my own investigations, except where otherwise stated. All other sources are acknowledged by bibliographic references. This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree unless, as agreed by the University, for approved dual awards.

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Mae'r Ysgoloriaeth Sgiliau Economi Gwybodaeth (KESS 2) yn fentersgiliau lefel uwch Cymru gyfana arweinir gan Brifysgol Bangor ar ran y sector AU yng Nghymru. Fe'i cyllidir yn rhannol gan raglen cydgyfeirio Cronfa Gymdeithasol Ewropeaidd (ESF) ar gyfer Gorllewin Cymru a'r Cymoedd.

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Thesis Abstract

This thesis reports the findings of the first empirical investigations into the completion rates of the Mountain Leader qualification. In addition, the research reported in this thesis relied on the development of a novel methodology that provides researchers with a new tool for investigating complex real-world phenomena, where complex interactions are likely to be important. Further, the findings of the research in this thesis support those of recent investigations into the development of expertise and advances understanding of self-efficacy theory. This thesis comprises six chapters that answer the research question and five appendices that provide supplementary information that is not central to the findings of the research but was foundational in the development of the research and researcher.

Chapter 1 outlines the nature of the problem investigated in the research presented in this thesis—the low completion rates of Mountain Training qualifications and notably the Mountain Leader qualification. Chapter 1 also introduces several prominent (and relevant) areas of social and sports psychology literature, along with explanations of their proposed relevance to the completion rates of the Mountain Leader. Further, the chapter briefly outlines some theoretical and methodological limitations of previous research that has tried to investigate similarly complex problems.

Chapter 2 presents Study 1, the first empirical investigation into the completion rate of the Mountain Leader qualification. Study 1 was a large qualitative study that used in-depth interviews to identify the factors that organisational managers felt were important influences on the completion rate of the Mountain Leader qualification. The findings suggested that completion involved at least two distinct stages: (a) getting to an assessment and (b) passing an assessment. Participants felt that different factors were relevant to each of these steps. For getting to assessment, participants felt that confidence, motivation, barriers to gaining experience, and social support were

important factors influencing the likelihood of candidates getting to an assessment. To pass an assessment, participants felt that it was essential that candidates were resilient and had enough experience that was good quality and suitably varied.

The research in Chapter 3 built on Study 1 by collecting quantitative data from candidates and Mountain Training's database and using non-linear pattern recognition analyses to identify the most important discriminatory factors for three classification problems: (a) discriminating male candidates who are assessed within 18 months of their training course from those who are not, (b) discriminating female candidates who are assessed within 18 months of their training course from those who are not, and (c) discriminating candidates who pass their first assessment from those who do not. Whilst relatively few themes were included in the findings of Study 1, up to 168 individual factors were identified as potentially important to the completion rate of the Mountain Leader qualification. Therefore, we put significant effort into creating a survey tool for collecting quantitative data for these variables from candidates reliably. This work is reported in Appendix B.

Chapter 3 presents a study for each of the classification problems listed above. Study 2 identified 16 features that classified male candidates as having been assessed within 18 months or not with up to 92.73% accuracy. These features can be considered in three groups: the context of the Mountain Leader within a candidate's life, self-efficacy and resilience, and social support. Study 3 identified 22 features that correctly classified female candidates as having been assessed within 18 months or not with up to 96.64% accuracy. These features can be considered in three groups: the context of the Mountain Leader within a candidate's life, motivation, and consolidation of experience. Study 4 identified 14 features that correctly classified candidates as having passed their first assessment or not with up to 82.61% accuracy. These features can be considered in two groups: the experience of training and preparation for assessment. The findings of Studies 2-4 broadly supported those of Study 1. This congruence allowed us to place greater confidence in the importance of the factors identified as important influences on the completion rate of the Mountain Leader qualification.

Based on the findings of Studies 1-3, Chapter 4 addresses a question that arose about the nature of the relationship between experience and self-efficacy for female and male candidates. To do so, Chapter 4 presents two studies that examined the

relationship between experience and gender differences on Mountain Leader related self-efficacy from an interactive perspective. The first of which, Study 5, developed the Mountain Leader Self-Efficacy Scale (MLSS). The MLSS had a good fit to the data, and measurement invariance analyses suggested that the MLSS factors were the same for female and male candidates. Study 6 confirmed the factor structure of the MLSS and, using moderated hierarchical regression analyses, provided evidence for an interactive effect of gender and experience on routine skill self-efficacy, where the relationship between experience and self-efficacy was stronger for female than male candidates.

Chapter 5 contains a general discussion of the methodological, theoretical, and applied implications of the research reported in this thesis. Finally, Chapter 6 discusses some of the work that has been carried out to disseminate the findings of this research throughout the Mountain Training network.

Chapter 1

General Introduction

1.1 Mountain Training

Mountain Training is responsible for training walking, climbing, and mountaineering instructors in the United Kingdom and Ireland. Mountain Training is not one single entity; it is the outward-facing name for a group of organisations in the United Kingdom and Ireland. Mountain Training England, Cymru, Scotland, and the Mountain Training Board of Ireland are responsible for administering the Mountain Leader qualification in their respective countries. Whereas, Mountain Training United Kingdom and Ireland are responsible for the generic training pathway for all qualifications. However, as this project has stakeholders within each Mountain Training organisation, we simply refer to Mountain Training as a single entity throughout the thesis.

Mountain Training's qualifications all follow a similar pathway to qualification, which was created in 1964 for the Mountain Leadership Certificate (what is now the Mountain Leader qualification) and has not changed significantly since then. Candidates must first gain some *prerequisite experience and register for the qualification*, and then they *complete a training course*. Following the training course, candidates gain *further experience to consolidate skills*, and finally, they then need to *complete an assessment course*. Candidates are awarded the relevant qualification on successful completion of the assessment course.

In 2018 there were 3,228 qualifications awarded to candidates, which suggests that this pathway is successful to some degree, as each year many candidates progress from registration to qualification. However, for all qualifications, the number of

candidates at each stage of the pathway is lower than the number at the previous stage (i.e., registration to training, training to assessment, and passing an assessment). Figure 1.1 shows this drop-off for six of the Mountain Training qualifications.

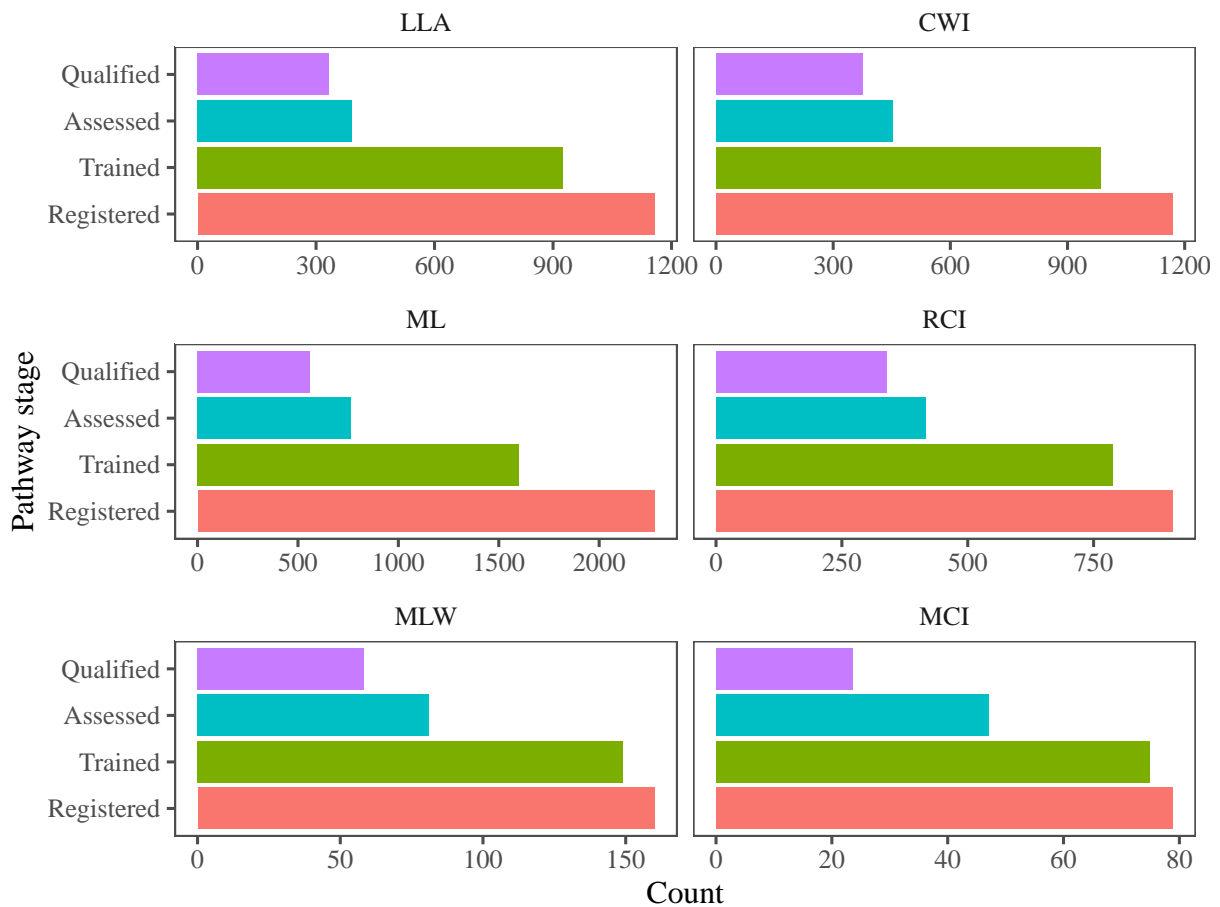


Figure 1.1: Average number of candidates at each pathway stage 2009-2018. LLA = Lowland Leader Award, CWI = Climbing Wall Instructor, ML = Mountain Leader - Summer, RCI = Rock Climbing Instructor, MLW = Mountain Leader - Winter, MCI = Mountaineering and Climbing Instructor.

Mountain Training estimates that its qualification holders impact over 1.5 million people each year (Mountain Training England, 2019a). This number is likely to increase in the coming years as the “The overall growth in numbers [of active adults] continue [*sic*] to be driven by strong upward trends in walking and adventure sports (a category which includes hill and mountain walking, climbing and orienteering)” (Sport England, 2020, p 14). Therefore, it is vital to Mountain Training that they understand why people do and do not complete their qualifications.

This thesis focuses on the Mountain Leader qualification to understand the factors influencing the completion of Mountain Training qualifications, so that they can

identify improvements that can be made to their training pathway. There are four main reasons for focusing on the Mountain Leader qualification: (a) it is the largest qualification as measured by the number of candidates; (b) it has the largest drop-off in candidates progressing from training to assessment, the drop-off at this point is of particular interest as candidates have engaged with the Mountain Training delivery system; (c) it is the highest entry-level qualification; and (d) it is the oldest qualification and has had few major changes made to it recently.

1.2 The Mountain Leader Qualification

The Mountain Leader qualification is for “people who want to lead groups in the mountains, hills and moorlands of the UK and Ireland” (Mountain Training UK, 2015a, p 5). Whilst the Mountain Leader qualification is UK based and aimed at those who wish to lead others in the UK, training programmes in other countries are based on the success of the Mountain Leader qualification (Union Internationale des Associations d’Alpinisme, 2015). To qualify as a Mountain Leader, candidates must: (a) *register for the qualification* and gain a minimum of 20 Quality Mountain Days (QMDs),¹ (b) complete a six-day *training course*, (c) gain a minimum of 20 additional QMDs as *further experience to consolidate skills (to give a minimum of 40 QMDs in total)*, and (d) successfully complete a five-day *assessment course*. Therefore, to become a Mountain Leader, a candidate must spend a minimum of 51 days in the mountains. Most successful candidates will have more experience than this, whether that is additional QMDs, other experience of mountain walking that does not meet the QMD criteria or other mountaineering experience. Therefore, becoming a Mountain Leader requires candidates to commit a significant amount of time and money.

Between 2009 and 2018 an average of 2,278 candidates registered for the Mountain Leader qualification each year, but only 559 qualified a year. When looking more closely at the numbers of candidates who did qualify, it becomes clear that there are two main components to qualifying: (a) getting to an assessment and (b) passing an assessment. Interestingly, most candidates did not get to an assessment (Figure 1.2), but most candidates who got to an assessment passed their first assessment (Figure 1.3).

¹There is not a simple definition for a QMD; however, QMDs should “make a positive contribution towards a person’s development and maturity as an all round mountaineer” (Mountain Training, 2019).

It is also noteworthy that, as shown in Figure 1.2, becoming a Mountain Leader is not a quick process (period between training and assessment, $M = 1.57$ years, $SD = 1.45$).

To examine the difference in the number of candidates being trained and assessed for the Mountain Leader qualification in more detail we carried out a *survival analysis* (cf. Harrell, 2015). With this survival analysis, rather than looking at summary statistics averaged over several years, we look at the probability of an individual candidate having been assessed over time following their training course. As can be seen in Figure 1.2, at any given point in time, fewer female candidates get to an assessment than male candidates. The percentage likelihood of a candidate having been assessed five years following their training course is $\sim 32\%$ and $\sim 40\%$ respectively for female and male candidates. After this point the rate of candidates being assessed decreases for both genders. Over half of candidates who did reach assessment did that within 18 months of their training courses, but it was not unusual to take longer, and some candidates were assessed more than five years after their training course.

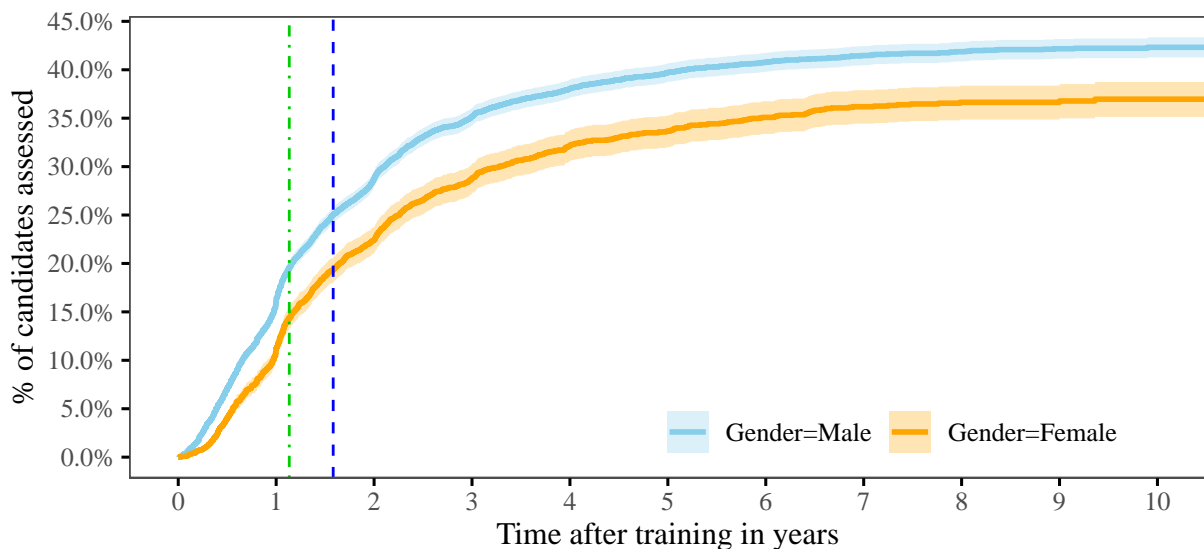


Figure 1.2: Survival rates for female and male candidates post-training. Candidates trained 2009-2019 ($N = 15,635$). The green dotted and dashed line represents the median time to assessment, and the blue dashed line represents the mean time to assessment.

We also examined the pass rates for the Mountain Leader qualification. The pass rate increased over time, and there were changes in pass rates over the last 10 years for female and male candidates (Figure 1.3). When looking at pass rates for the last 10 years, female candidates are less likely to pass their first assessment, but the pass rate increased faster for them than it did for male candidates. However, when looking at

data from the last five years, neither the effect of gender on the pass rate or rate of change of the pass rate is statistically significant.

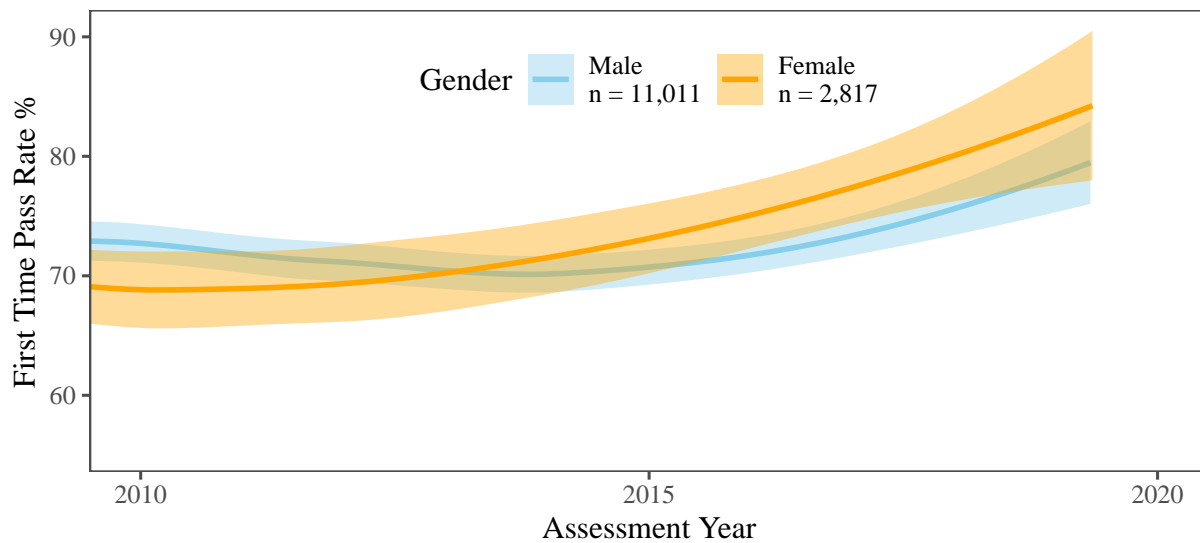


Figure 1.3: Pass rates for female and male candidates assessed since 2000 ($N = 13,828$).

1.3 Thesis Rationale

Mountain Training wanted to understand why more people do not complete the Mountain Leader qualification and identify if there are any changes that they could make to the pathway that would better support their candidates. It is unlikely that there is a single factor that would be a “silver bullet” to improve completion rates. Instead, there is likely a myriad of factors which influence completion at various stages of the pathway. Some of these factors will be generic to all candidates, whilst some may be specific to individual and/or groups of candidates.

The work reported in this thesis is the first empirical investigation of the factors that influence the completion rate for the Mountain Leader qualification. Therefore, this thesis is an essential first step for Mountain Training towards making evidence-based changes to their training pathway to improve the completion rates of their qualifications.

1.4 Terminology

It is important that I provide a note on the terminology used in this thesis. Historically, and somewhat incorrectly, the terms *sex* and *gender* have been used somewhat interchangeably in the scientific literature. Current guidelines from the American Psychological Association (2020) define gender as, “the attitudes, feelings, and behaviors that a given culture associates with a person’s biological sex” (American Psychological Association, 2012, p 12); sex as, “biological sex assignment;” and *gender identity* as “a component of gender that describes a person’s psychological sense of their gender” (American Psychological Association, 2020, Section 5.5).

Based on the definitions of sex and gender presented above, it would be more appropriate to use terms such as “man” and “woman” than “female” and “male” when discussing gender differences. However, in the studies reported in this thesis, I retrieved data concerning participants’ gender from Mountain Training’s Candidate Management System (CMS), which stores it as female, gender-neutral, and male. To avoid making presumptions about participants gender identities, we have used the terms female and male throughout this thesis. No data were collected from gender-neutral candidates in any of the studies presented in this thesis. This may be unsurprising, given that 0.03% of all Mountain Training candidates report being gender-neutral (Mountain Training UK, 2019). Further, following the same principle, when discussing previous research, we have used terminology consistent with that used by the original authors.

1.5 Pathways to Expertise

The development of expertise and the pathways to achieving it are of interest in a variety of domains. Historically, most studies have examined the impact of specific factors on the completion of a training pathway (e.g., delays in completing PhDs; van de Schoot et al., 2013b). However, these single-variable approaches fail to acknowledge that there may be vast differences between individuals in their pathways to expertise.

Developing expertise is the result of complex interactions between a variety of developmental factors (e.g., practice and training, personality traits, motivation, social support to name but a few; Baker & Cobley, 2013; Gagné, 2004; Johnston et al., 2018). Further, different factors will be more salient at different points of development

pathways (Rees et al., 2016). As such, a growing number of researchers now recommend that multidisciplinary approaches should be adopted for identifying the complex interactions that influence talent/expertise development (e.g., Abernethy, 2013; Güllich et al., 2019; Johnston et al., 2018; Pearson et al., 2006; Rees et al., 2016; Schorer & Elferink-Gemser, 2013). Based on these principles, several projects in the elite sport domain have recently used multidisciplinary studies to explore the most important combinations of factors in the development of athletes in elite pathways (e.g., Güllich et al., 2019; Hardy et al., 2017a; Jones et al., 2019; Jones, 2019; Jones et al., 2020; Rees et al., 2016). These projects have used a mixed-methods approach, collecting both rich qualitative data from athletes and making use of state-of-the-art machine learning techniques to identify sets of variables, whose main-effects and interactive-effects are able to discriminate between athletes at different performance levels.

In line with the studies mentioned above, in this thesis, I took a holistic approach in understanding the factors that influence the completion rate of the Mountain Leader qualification, where we explored many factors using a variety of analytical methods. The work in the present thesis considers a wide range of factors. Providing a detailed literature review of factor each is beyond the scope of the present thesis, given the number of constructs included. However, in the following section, I aim to provide a brief overview of relevant theory and explain its relevance to the Mountain Leader qualification. Empirical chapters include additional detail where relevant. Further, these theories provide useful frameworks for discussing the results of the empirical chapters. These theories are useful for understanding the relationships between various factors, but this thesis is not a test of any specific theory.

1.6 Personality and Individual Differences

It is widely accepted that people are different from one another and that the characteristics that make them individuals influence thoughts, feelings, and behaviours (cf. Roberts & Woodman, 2015). The Big Five model of personality (McCrae & Costa, 1987) is well established in the psychology literature and has been widely used when considering individual differences in a wide range of outcomes (e.g., behaviour-change, performance, motivation; cf. Allen et al., 2013; Ryan & Deci, 2019). Given the

pervasive influence of personality, and specifically the Big Five, on human functioning, it seems reasonable to expect that some aspects of the Big Five might have relevance for the Mountain Leader qualification. For example, more conscientious individuals will be more hardworking and ambitious than those who are less conscientious (McCrae & Costa, 1987) and will persevere through difficulty. Consequently, conscientious individuals may be more likely to complete the Mountain Leader qualification than those who are less conscientious. As another relevant example, extraversion has been positively associated with effective leadership and decision making (Hardy et al., 1996; Judge et al., 2002). Personality constructs beyond the Big Five are also likely to be relevant. For example, higher levels of resilience are associated with a range of positive outcomes, including overcoming adversity (cf. Smith et al., 2008). Becoming a Mountain Leader is a long process and requires candidates to operate in challenging environmental conditions (e.g., wind and rain), in addition, they are likely to encounter other obstacles in life. Therefore, the more resilient a candidate is, the more likely they are to overcome such adversity and obstacles.

1.7 Motivation

Candidates engage with the Mountain Leader qualification for different reasons. Therefore, in trying to understand why some candidates complete the Mountain Leader qualification and others do not, it is important to consider these reasons and the associated motivation. Further, it is widely accepted that a raft of factors will influence motivation (Deci & Ryan, 2000; Weinberg & Gould, 2014), these factors include both individual characteristics (e.g., personality, individual goals) and situational factors (e.g., interaction with others, the context of the behaviour); understanding candidates' individual characteristics and situations is, therefore, important when trying to understand the effects of motivation on candidates likelihood of completing the Mountain Leader qualification.

In this thesis I use self-determination theory (Deci & Ryan, 1985a, 2000; Ryan & Deci, 2017) to consider motivation its relationship with both candidates' individual characteristics and situational factors. Self-determination theory is a theory of human behaviour that is widely used when studying motivation (cf. Ryan & Deci, 2019) and

grew from studies of *intrinsic motivation* (e.g., Deci, 1975; Deci & Ryan, 1980b).

Intrinsically motivated behaviours are “behaviours that are motivated by the underlying need for competence and self-determination ... that are performed in the absence of any apparent external contingency” (Deci & Ryan, 1980b, p 42).

Self-determination theory contains six mini-theories: *cognitive evaluation theory* (Deci, 1975; Deci & Ryan, 1980a), *organismic integration theory* (Deci & Ryan, 1985a; Ryan & Connell, 1989), *causality orientations theory* (Deci & Ryan, 1985b), *basic psychological needs theory* (Ryan & Deci, 2000b), *goal contents theory* (Kasser & Ryan, 1996; Niemiec et al., 2009), and *relationship motivation theory* (Deci & Ryan, 2014; Ryan & Deci, 2017). Basic psychological needs theory and organismic integration theory are particularly relevant to the present study and are described below.

1.7.1 Basic Psychological Needs Theory.

Basic psychological needs theory is central to self-determination theory and each mini-theory (Ryan & Deci, 2002). Basic psychological needs theory posits three basic psychological needs: *autonomy*, feelings of volition, choice, and internal control; *competence*, the feeling of mastery and effectiveness; and *relatedness*, feeling connected and involved with others. Considerable evidence supports self-determination theorists’ suggestion that need satisfaction is essential for optimal-functioning, good mental health, and well-being (e.g., Chen et al., 2015; Deci & Ryan, 2000). Further, self-determination theorists suggest that the satisfaction of these three needs supports well-being and “high-quality” motivation, as the satisfaction of these needs will lead people to invest more in the activities or goals they are actively pursuing, whereas the frustration of these needs will lead people to invest less in their activities or goals (Ryan & Deci, 2019). Accordingly, it seems reasonable to suggest that candidates whose basic psychological needs are satisfied rather than frustrated in the pursuit of becoming a Mountain Leader will invest more effort and will therefore be more likely to complete the qualification.

1.7.2 Organismic Integration Theory.

Organismic integration theory is concerned with extrinsic motivation and activities where the outcome is separable from the behaviour (Ryan et al., 1985).

Self-determination theory has traditionally suggested that every behaviour can be placed on a continuum, the relative autonomy continuum, with autonomous or self-determined motives on one side and controlled or non-self-determined motives on the other, and that people will therefore vary in both levels of and quality of motivation (Deci & Ryan, 1985a; Sheldon & Prentice, 2019).²

Organismic integration theory suggests that there are four types of extrinsic motivation—despite suggesting that they form a continuum. Two of these are considered controlled forms of extrinsic motive and the other two are considered autonomous forms of extrinsic motive. The most controlled form of extrinsic motivation that is proposed is *external regulation*, where an individual is motivated by external pressures or reward. Whilst external regulation can be a powerful form of motivation, it is not typically thought of as having a long-lasting influence on behaviour (Ryan & Deci, 2000a). The next form of extrinsic motivation is *introjected regulation*, where behaviour is motivated by internally controlling pressures (e.g., ego-involvement, contingent self-worth). This form of motivation may also be powerful but may be weakened in the face of setbacks and behaviours that result from introjected regulation are unlikely to be stable (Deci & Ryan, 1995; Ryan & Deci, 2019).

Considering the more autonomous forms of extrinsic motivation, *identified regulation* is when an individual consciously values their engagement in the activity and accepts the behaviour as personally important. Finally, the most autonomous form of extrinsic motivation proposed is *integrated regulation*, when the behaviour is congruent with personally endorsed values. Integrated regulation shares some features with intrinsic motivation; however, it is considered an extrinsic form of motivation as the outcome is separable from the behaviour (Ryan & Deci, 2002).

Self-determination theory suggests that autonomous forms of motivation are more sustainable and better predictors of performance and goal persistence than controlled forms of motivation are (Hagger & Chatzisarantis, 2015; Pelletier et al., 2001; Ryan & Deci, 2019). Various studies have found evidence that individuals who engage in behaviours for autonomous reasons will experience more positive affect, feel more satisfied, persist for longer, and feel more competent (cf. Frederick-Recascino, 2002).

²There is some evidence that the various types of motivation should not be placed on a continuum but may be better considered as contiguous (Chemolli & Gagné, 2014). That notwithstanding, it is still considered that the different types of motivation may engender different outcomes.

Therefore, it is likely that candidates with more autonomous forms of motivation will be more likely to become Mountain Leaders than those with more controlled forms of motivation, especially as time goes on.

1.7.3 Hierarchical Models of Motivation.

Researchers have suggested that motivation is a complex construct and operates in a hierarchical fashion on at least three different levels (e.g., Ingledew et al., 2009; Vallerand, 1997; Vallerand & Ratelle, 2002). These levels are the global/dispositional, (why an individual generally engages in activities), contextual/participatory (the contents of motives within a particular domain or what an individual is trying to achieve or avoid), and situational/regulatory motives (the perceived locus of causality of the behavioural goals—where the motive sits on the relative autonomy continuum; Deci & Ryan, 2000; Ingledew et al., 2009; Vallerand, 1997; Vallerand & Ratelle, 2002). At the global level, motivation is considered as an individual difference, and therefore results in general consequences. Whereas, at the participatory level, the context will influence motivation and motivation may be manipulated more easily (Vallerand & Ratelle, 2002). Research has shown that these different levels of motivation have a top-down influence; for example, participatory motives influencing regulatory motives (Ingledew et al., 2009). Given the evidence for, and the effects of, these different levels of motivation, it may be important to consider the multiple levels of motivation for becoming a Mountain Leader in the present project.

1.8 Self-Efficacy Theory

Self-efficacy refers to an individual's confidence in their ability to carry out a specific task at a given time. Self-efficacy theory suggests that if an individual possesses the necessary skills and is sufficiently motivated, then their level of self-efficacy will be the primary determinant of their performance, how much effort they will put in, and how long they will persist—particularly in the face of adversity (Bandura, 1977, 1982, 1997). Bandura (1982) suggested that four main sources of information determine an individual's perception of self-efficacy.³ In decreasing order of influence on efficacy

³Other researchers (e.g., Maddux, 1995) have added additional sources; however, most research considers the four sources proposed by Bandura.

beliefs, they are *previous performance accomplishments*, *vicarious experience/modelling*, *social/verbal persuasion*, and *physiological/emotional states* (cf. Bandura, 1982; Samson & Solmon, 2011).

Results of meta-analyses offer evidence supporting the relationships suggested by Bandura between self-efficacy and performance and persistence across several domains, for example in sports (Moritz et al., 2000), in work contexts (Stajkovic & Luthans, 1998), and academic environments (Multon et al., 1991). Several experimental lab studies that manipulated participants' level of self-efficacy found that higher levels of self-efficacy are related to increased task persistence (Hutchinson et al., 2008; Tenenbaum et al., 2001; Weinberg et al., 1979, 1980, 1981). Self-efficacy theory, and the evidence supporting it, suggests that candidates who have higher levels of self-efficacy are more likely to become Mountain Leaders.

1.9 Theory of Planned Behaviour

The theory of planned behaviour (Ajzen, 1991; Ajzen & Madden, 1986) is a model for predicting behaviour and builds on the theory of reasoned action (Ajzen & Fishbein, 1980) and that intentions are the best predictor of future behaviour. The theory suggests that an individual's intentions are the result of their attitudes towards the behaviours and the *subjective norm* surrounding that behaviour. Subjective norms are formed based on an individual's belief about other's views and the motivation of the individual to comply with those views.

The theory of planned behaviour extends the theory of reasoned action by including *perceived behavioural control* as an influence on both the intention and the behaviour. An individual's perceived behavioural control reflects the extent to which they feel that they have the resources and opportunities to control the behaviour (n.b., Ajzen, 1991, suggested that perceived behavioural control is similar to the construct of self-efficacy). Meta-analytic studies provide evidence that the constructs that comprise the theory of planned behaviour can predict future behaviour (Armitage & Conner, 2001; Hagger et al., 2002).

It should be noted that the theory of planned behaviour is not without its critics, some of whom suggest that the theory is too limited in the constructs that it includes

(cf. Sniehotta et al., 2014). However, the present project considers more constructs than just those related to the theory of planned behaviour, thus allaying such concerns. The theory of planned behaviour suggests that candidates who feel that it is normal to complete things in general, or more specifically the Mountain Leader pathway, and intend to complete the pathway will be more likely to complete than those who do not. Further candidates with higher rather than lower levels of perceived behavioural control will be more likely to become Mountain Leaders because they feel that they have the resources and opportunities to control the behaviour.

1.10 Support

The literature introduced above relates primarily to candidates. However, it is clear that candidates will be influenced by other people during the journey through the Mountain Leader qualification pathway. Importantly to Mountain Training, the course staff will influence candidates; indeed, course staff could be thought of as coaches to candidates. In the sections that follow, I make the distinction between coaching and social support, where coaching relates to specific behaviours that the course staff may or may not engage in (Wagstaff et al., 2018) and social support is the support that candidates may or may not receive in a broader context (Cutrona & Russell, 1990).

1.10.1 Coaching.

Coaching usually aims to improve an individual's knowledge, skills, and competencies (Wagstaff et al., 2018). Leaders may engage in coaching behaviours, and some models of leadership (e.g., transformational leadership theory; Bass, 1985) include elements of coaching behaviours. Mountain Leader course staff will engage in coaching behaviours to a greater or lesser extent, and their facilitation of candidate's development will vary accordingly. Wagstaff et al. (2018) describe five coaching behaviours, based on sport and business coaching models: (a) observing and performance analysis, (b) asking effective questions, (c) facilitating goal setting, (d) providing developmental feedback, and (e) providing motivational feedback.

In addition, coaches' actions may support candidates' basic psychological needs to a greater or lesser extent by tailoring the course delivery to individual candidates on the

course (Arthur et al., 2019; Markland & Tobin, 2010). Supporting basic psychological needs is relevant to the present project as organismic integration theory suggests that social factors that support the basic psychological needs foster the development of more autonomous forms of extrinsic motivation (Deci & Ryan, 1991; Ryan, 1995; Ryan & Deci, 2002). Autonomy support, the provision of structure, and involvement are need supportive behaviours, which support the development of autonomous regulation (Ryan et al., 2016; Markland & Tobin, 2010; Silva et al., 2010). Therefore, it seems reasonable to expect that candidates who felt their course staff engaged in more coaching behaviours and did so in a *need supportive* manner are more likely to become Mountain Leaders than candidates who did not feel that their course staff did.

1.10.2 Social Support.

Social and sports psychology widely consider four types of social support: *esteem support*, bolstering a person's sense of competence or self-esteem (e.g., giving individuals positive feedback on their skills and abilities, expressing a belief that the person is capable of coping with a stressful event); *emotional support*, the ability to turn to others for comfort and security during times of stress, leading the person to feel that he or she is cared for by others; *informational support*, providing the individual with advice or guidance; and *tangible support*, concrete assistance, providing someone with the necessary resources (e.g., financial assistance, physical help with tasks) to cope with something (e.g., Cutrona & Russell, 1990; Cutrona, 1990; Freeman & Rees, 2010; Freeman et al., 2014; Rees et al., 2007; Rees & Freeman, 2007).

Social support has been associated with increased levels of self-confidence, has “stress-buffering effects,” and can be used to influence self-efficacy (Rees & Freeman, 2007; Freeman et al., 2014; Samson & Solmon, 2011). However, the effects of perceived support (i.e., the support an individual feel they would have available to them should they need it) are not the same as the effects of received support (the frequency with which support that has been provided to an individual; cf. Rees & Freeman, 2007; Freeman et al., 2014). Therefore, it is likely that candidates who feel they have more social support available to them *and* those who receive more social support are more likely to become Mountain Leaders than those who feel that their needs are not met. Distinguishing between the effects of perceived and received support will be important

for understanding the implications of any social support related findings.

1.11 Thesis Structure

A substantial body of work is reported in appendices, and the empirical chapters have been written in a way that aids their preparation for publication. The reasons for this are twofold. Firstly, it was necessary to develop the data collection tool needed for the work reported in Chapter 3. This work was foundational in the PhD process, in both developing the researcher and enabling the completion of five of the six main studies. However, including it in the main body of the thesis may distract the reader and likely detract from the “story” presented in the thesis. Therefore, this development work is reported in Appendix B so that the reader can engage with it having read the main body of the thesis, which reports on the work answering the research question/s. Secondly, this thesis aims to satisfy the dual objective of writing a thesis and preparing the research for publication.

A consequence of writing this thesis with publication in mind is the self-referential terminology used in the empirical chapters. Accordingly, empirical chapters are written in the first-person plural, consistent with conventions in reporting co-authored research, and the remaining chapters are written in the first-person singular. The format of the thesis is in line with the policy of the School of Sport, Health and Exercise Sciences.

There are three empirical chapters following this chapter, which report the results of six studies. Chapter 2 presents a qualitative inquiry that aimed to explore organisational managers’ understanding of factors that influence the completion of the Mountain Leader qualification (Study 1). Chapter 3 comprises three studies, each of which uses state of the art pattern recognition techniques to identify key discriminatory features that provide insight into the factors influencing different stages of the qualification pathway (Studies 2-4). Chapter 4 explores the main and interactive effects of gender and experience on self-efficacy; in this chapter, I present two studies (Studies 5 and 6). Study 5 presents the development and validation of a measure for Mountain Leader related self-efficacy. Study 6 presents the findings of a study examining relationships between gender and experience on self-efficacy. Chapter 5 is a discussion of the three empirical chapters, identifying consistent themes and their implications as well

as identifying potential future directions for research. Chapter 6 then describes the dissemination of this research to the Mountain Training network. Finally, the appendices provide supplementary information, development work, additional analyses, and a summary of other work carried out during the PhD that has been relevant to my development as a researcher.

Chapter 2

Study 1: Factors Influencing the Completion of the Mountain Leader Qualification: A Qualitative Inquiry

2.1 Introduction

There has been no research into the factors influencing the completion rate of the Mountain Leader qualification, or indeed any other element of Mountain Training qualifications. As discussed in Chapter 1, the development of expertise is the result of complex interactions between a multitude of variables from a variety of areas. Consistent with contemporary recommendations for conducting expertise development research (e.g., Güllich et al., 2019; Jones et al., 2019; Rees et al., 2016), this study considered a wide range of variables, which could influence the completion rate of the Mountain Leader qualification. However, given the lack of previous research that considers the Mountain Leader qualification, we took a largely “bottom-up” (inductive) approach as we felt this would provide insights that a deductive approach may not fully explore.

The present study aimed to develop an understanding of the multidimensional influences on the completion rate of the Mountain Leader qualification and identify the particularly important factors. Consequently, we drew from several different elements of psychology literature when trying to identify factors that may influence the completion rate of the Mountain Leader qualification and identified 52 potentially relevant factors (see Table 2.1). It is not practical to provide a comprehensive review of all these factors

in this thesis; however, many of them are introduced in Chapter 1. Following the approach by Hardy et al. (2017a), we detail the research questions and explain how we refined them for the reader to gain an understanding of the factors involved. Further, additional detail about these factors is included in the findings section of this study when relevant. Presenting the results within a “findings” section reflects common practice in qualitative research where it is common to present results within a broader context (American Psychological Association, 2020).

2.1.1 Refinement of the Research Questions

The aim of this study was to understand the factors that were an important influence on the overall completion rate of the Mountain Leader qualification. Therefore, we felt that in-depth qualitative interviews with *organisational managers* (i.e., the Mountain Training staff responsible for the qualification), who had an overview of the Mountain Leader qualification across the UK, would be the preferred method. It was clear that the organisational managers would have a much better insight into some factors (e.g., the influence of candidates’ age) than others (e.g., the influence of candidates’ family values) and we felt that it was impractical to include all 52 factors in the interviews. Therefore, we engaged in an expectancy x utility analysis to identify the factors we felt would be most important to include in the interviews. WH rated the factors initially, with the ease of collecting meaningful data rated on a three-point scale, from *difficult* (1) to *easy* (3), and the likely utility of each factor for understanding the completion rate, also rated on a three-point scale, from *low* (1) to *high* (3). WH discussed the initial ratings with RR; in particular, we explored disagreements until we found a consensus.

We then calculated the product of the ease of collection and utility ratings to create a single score for the expected likelihood of collecting useful data for each factor (see Table 2.1). We then ranked factors using this score, and removed factors scoring less than six. It is important to note that we considered utility rather than perceived importance in this exercise. For instance, mental toughness, which was defined by Bell et al. (2013) as “the ability to achieve personal goals in the face of pressure from a wide range of different stressors” was not included in the interview guide as we felt that it would be somewhat tautological to ask a question along the lines of “are people who are good at completing things good at completing things?”

The 44 factors with a score greater than six were split into five sections and then used to develop a guide for the interviews: (a) candidate background, (b) candidate career history and social influence, (c) candidate personal characteristics, (d) candidate experience and ability, and (e) candidate support. We introduce relevant literature at the beginning of each theme and give examples of the broad research questions considered within each section of the interview below, to render this chapter more readable. In addition, the full interview guide is presented in Appendix A.

2.1.1.1 Candidate Background.

Does a candidate's socioeconomic background influence their progression through the Mountain Leader qualification? How does a candidates' age influence their progression? Are there any professions that help or hinder candidates' progression?

2.1.1.2 Candidate Career History and Social Influence.

Why do people want to become Mountain Leaders? Do these reasons influence their progression? How long do candidates think it will take to become Mountain Leaders? Do candidates see becoming a Mountain Leader as a standalone profession, or do they intend to use it alongside another job? How do candidates who want to continue to higher-level qualifications differ to those who only want to be Mountain Leaders? Do candidates have role models? What influence do role models have on candidates?

2.1.1.3 Candidate Personal Characteristics.

What attitudes do candidates have towards the Mountain Leader qualification? How confident are candidates that they can become Mountain Leaders? What increases/decreases this confidence? Do candidates want to be as good as they can be or just good enough? What sort of disconfirmatory experiences do candidates have? How do these experiences affect different candidates? How do candidates cope with setbacks?

2.1.1.4 Candidate Experience and Ability.

How does prior experience influence performance at an assessment? What types of experience help/hinder candidates becoming Mountain Leaders? What causes candidates with lots of experience to perform poorly at an assessment? What causes

Table 2.1: Expectancy value exercise.

Factor	Ease of collection	Expected utility	Expectancy value
Candidate background			
Age at registration/life history	3	3	9
Location	3	3	9
Age	3	2	6
Sex	3	2	6
Social media profile	2	3	6
Level of education	2	2	4
Socioeconomic status	1	2	2
Candidate career history and social influence			
Intention/goal expectations	3	3	9
Opportunities for relevant work	3	3	9
Subjective norms/social influence	3	3	9
Relevant sports media influence	3	3	9
Role model	3	3	9
Engagement with “mainstream sports”	3	2	6
Other qualifications	3	2	6
Profession	2	3	6
Critical developmental experiences	2	3	6
Opportunities to participate	2	2	4
Enjoys exercise	2	2	4
Number of career changes	2	2	4
Attraction to everyday life vs. outdoor life	2	1	2
Mid-career turning point - injury	2	1	2
Candidate personal characteristics			
Achievement orientation	3	2	6
Conscientiousness	3	2	6
Grit	2	3	6
Resilience	2	3	6
Attitudes and outcome expectations	2	3	6
Perfectionism	2	3	6
Optimism	2	3	6
Motivation	2	3	6
Need to succeed	2	2	4
Obsessiveness	2	2	4
Mental toughness	3	1	3
Locus of control	1	3	3
Selfishness	2	1	2
Family values	1	2	2
Ruthlessness	1	1	1
Candidate experience and ability			
Training staff/centre	3	3	9
Personal experience	3	3	9
Personal competency	2	3	6
Perceived competence	2	3	6
Self-efficacy	2	3	6
Disconfirmatory experiences	2	3	6
Family activity	3	1	3
Candidate support			
Mentoring	3	3	9
Association membership	3	2	6
Instructor support	2	3	6
Family/significant other support	2	3	6
Peer-support	2	3	6
Emotional support	2	3	6
Esteem support	2	3	6
Informational support	2	3	6
Tangible support	2	3	6

candidates with little experience to perform well at an assessment? How do candidates view gaining experience? How does a candidate's level of experience affect them on a training course?

2.1.1.5 Candidate Support.

What do the course staff think about the Mountain Leader qualification? How does a course debrief influence candidates? Do course staff help candidates plan their progression? What are course staff coaching and leadership behaviours like? How prevalent is mentoring? What is good/bad about mentoring? Which types of support help/hinder candidates' progression? Where do candidates get support from? Are candidates supported well enough? Which candidates need more/less support?

2.2 Methods

2.2.1 Philosophical Orientation

We adopted a critical realist ontology and epistemology for this study. Critical realism posits that reality is out there, but is independent of our thoughts and impressions (Bhaskar, 1998). A central tenet of critical realism is that ontology cannot be reduced to epistemology and that knowledge is only a part of reality (Bhaskar, 1998; Fletcher, 2017). Therefore, we must accept that knowledge will be theory-laden and mediated by language, culture, and experience (Clarke et al., 2015; Houston, 2001; Philips, 1987; Ussher, 1999).

Throughout the remainder of the methods section, we present evidence of the credibility of this research. In addition, the findings section includes rich and detailed quotes from participants. In doing so, we provide the reader the opportunity to evaluate the rigour of the study for themselves (Sparkes & Smith, 2009).

Given that there has been no previous research into the factors influencing the completion rate of the Mountain Leader qualification, but there is a great deal of relevant research in sport, social, and organisational psychology, we used a directed approach (i.e., primarily deductive but flexible) in the present research (cf. Fletcher, 2017; Hsieh & Shannon, 2005), this approach is also known as abductive or a concurrent inductive and deductive (Biddle et al., 2001; Patton, 2002; Webster et al.,

2017). This approach allows the inclusion of existing theory, but acknowledges that new knowledge may be created from the data, therefore sits well with critical realism (Fletcher, 2017).

2.2.2 Participants

After gaining ethical approval from Bangor University's School of Sport, Health, and Exercise Sciences ethics committee, and individual informed consent, seven individuals participated in this study. We used a purposive sampling strategy in this study (Patton, 2002; Sparkes & Smith, 2014). The individuals who participated in the study were recruited based on their knowledge and experience of the Mountain Leader qualification from an organisational perspective, rather than their personal experience of becoming a Mountain Leader. We completed initial interviews with four members of staff from Mountain Training including staff from Mountain Training Cymru, England, and Scotland, the three main national training boards and Mountain Training United Kingdom and Ireland (three men and one woman; age, $M = 47.19$ years, $SD = 6.60$; number of Mountain Leader courses worked, $M = 41.60$ courses, $SD = 29.86$, $range = 13-78$).

It became clear, having completed these interviews, that it would be important to interview course staff who had a greater knowledge of candidates and their experiences than the Mountain Training staff had. Therefore, we interviewed two high volume course providers and a course director who had worked for eleven different providers over 14 years (two men and one woman; age, $M = 55.30$ years, $SD = 5.18$; number of Mountain Leader courses worked, $M = 284.00$ courses, $SD = 214.68$, $range = 66-576$).

2.2.3 Semi-Structured Interviews

It is important to match the research method to the question being asked (Smith & Sparkes, 2016). For this study, we chose to use semi-structured interviews as they can provide a rich, yet broad, understanding of a given phenomenon (Lincoln & Guba, 1985). To facilitate discussion and ensure that we asked all participants broadly similar questions, covering the same topics, we developed an interview guide which included questions that covered the 44 factors deemed as the most important following the expectancy-value ranking process. The interview guide contained five sections: (a)

candidate background, (b) candidate career history and social influence, (c) candidate personal characteristics, (d) candidate experience and ability, and (e) candidate support.

Each section began with questions designed to help participants focus their attention on the topic of interest (e.g., “Could you start by describing a typical group of six candidates on a Mountain Leader training course to me?”). Participants were then asked more specific questions, which related to the factors identified in the expectancy-value exercise (e.g., “Are there any professions that significantly influence, positively or negatively, completion of the Mountain Leader award?”). These questions were followed up with elaboration probes (e.g., “What do you think it is about these professions that makes a difference here?”) to improve the clarity and detail of the data (Patton, 2002).

Each section ended with two final questions. Firstly, we asked participants if there was anything else that they thought was relevant to the completion of the Mountain Leader qualification but had not been discussed (e.g., “Is there anything about candidates’ backgrounds that you think is important but we haven’t spoken about”). Secondly, we asked participants if they felt that any of the topics discussed in that section were more salient than the others (e.g., “We have spoken about a number of different factors relating to candidate background. Do you think that there are any factors relating to candidate background that are generally more important with regards to completion of the Mountain Leader award?”).

We completed eight pilot interviews with Mountain Leader course staff and a Mountain Training Officer to familiarise the interviewer with the interview guide, to identify any factors not included in the interview guide that may be important, and to ensure that participants were able to provide sufficiently detailed answers to the questions. We made minor changes to the final interview guide following each pilot interview (e.g., rewording questions to make them clearer for participants). The final interview guide can be found in Appendix A.

RR and LH instructed WH in qualitative research methods, and additional knowledge was gleaned from recent literature on qualitative research methods (e.g., Smith & McGannon, 2018). The research team all had mountaineering experience and an understanding of the Mountain Leader qualification at the time the interviews were conducted. This experience allowed us to be more sensitive to the specific experiences

and language of the participants, reducing the likelihood of introducing bias through insinuation and assumption (Denzin & Lincoln, 2005).

WH, who had 10 years of outdoor experience across the world, conducted all the interviews. Most of this experience was gained in a recreational context rather than a professional one. The nature of this experience is seen as a strength because the analysis was less likely to be influenced by his personal experiences of Mountain Training qualifications, ensuring that it is the participants' experiences that are presented. In addition to this, RR is a senior lecturer in sports psychology with over 20 years of outdoor experience; and LH is a professor in sports psychology, has over 50 years of outdoor experience, and is an IFMGA Mountain Guide. The experiences of the research team meant that a good rapport could be established with participants and that the subtleties of the phenomena of interest could be fully understood.

2.2.4 Procedure

All interviews were carried out face-to-face in a location chosen by the participants (e.g., home, office space or a café). Given the exploratory nature of the interviews and range of factors included in the interview schedule, we completed the interviews out over two to five sessions to avoid fatiguing the participants and interviewer (duration, $M = 316.25$ min, $SD = 54.85$). The interviewer made notes during the interview and digitally recorded the interviews. The recordings were transcribed clean verbatim by UK Transcription yielding 314,927 words, or 1,329 transcript pages. Before beginning the analysis, WH listened to the recordings whilst checking the transcripts for errors.

2.2.5 Data Analysis

The transcripts were analysed using a codebook thematic analysis (cf. Braun et al., 2019) in the directed approach described above. Analysing the data using a deductive approach allowed us to consider the data in relation to existing theory, but also to create new themes from the data. The flexibility of this analytical approach was important to this study as we were trying to identify potentially important factors, some of which we may not have considered a priori. Acknowledging the existence of relevant literature and relating the data to it whilst also considering new themes of interest allowed us to make the best use of the rich data that were collected without sacrificing its complexity and

nuance (cf. Feilzer, 2010).

The analysis of the transcripts involved a series of separate steps. First, WH read each transcript to familiarise himself with the data. Following this, he coded the transcripts using NVivo 11 Pro (QSR, 2017) into the five *a priori* deductive codes and a sixth code—“Other.” He then inductively analysed this sixth code to identify any themes not encompassed by the deductive codes. This approach is based on that of Hardy et al. (2017a) who also sought to identify important variables from a large number of variables that had been identified as potentially important to the development of expertise.

Once all first-order themes had been identified, sub-themes were identified within each theme. WH presented a summary of each theme, including raw quotes from the interviews, to RR and LH who acted as *critical friends* (cf. Sparkes & Smith, 2014; Smith & McGannon, 2018). Acting as critical friends, RR and LH offered critical feedback, the aim of which was not to reach a consensus but to encourage reflexivity (Smith & McGannon, 2018). This resulted in minor changes in the structure of some themes to better reflect extant literature.

2.3 Findings

When conducting the interviews, it quickly became apparent that becoming a Mountain Leader has at least two distinct steps: firstly, a candidate must *get to an assessment* and secondly, they must *pass an assessment*. If they fail to pass their first assessment, then they can return for a *reassessment*, which they may or may not pass. Consequently, we present the findings under three main headings: (a) getting to assessment, (b) passing, and (c) reassessment. This is done to aid readability and because there are differences in the factors that participants felt were important at each step.

2.3.1 Getting to Assessment

Factors that influenced the likelihood of a candidate being assessed can be considered under four main themes: confidence, motivation, barriers to gaining experience, and social support. There were two additional themes that participants felt influenced whether candidates reached assessment (albeit to a lesser degree): re-engaging later in life and redirection to lower qualifications.

2.3.1.1 Confidence.

Self-efficacy theory suggests that assuming an individual is sufficiently skilled and motivated, their level of self-efficacy will be the main influence on effort and task persistence (Bandura, 1977, 1982, 1997). There is considerable evidence from experimental research that levels of self-efficacy are positively related to task persistence (e.g., Hutchinson et al., 2008; Tenenbaum et al., 2001; Weinberg et al., 1979, 1980, 1981).

The results in this section show that candidates must be confident in their ability to pass a five-day Mountain Leader assessment before they attend one and the threshold (i.e., minimum) level of confidence required to attend assessment varies considerably across individuals. Several factors influence both the level of confidence and the individualised thresholds that candidates must surpass.

2.3.1.1.1 Level of Confidence. All seven participants said that candidates needed to feel confident before they would attend an assessment. Officer 1 said:

[Candidates] have to put themselves on a little pedestal and go, “This is me, and this is how I’m trying to go through the scheme” That takes someone who’s got a reasonable amount of confidence in themselves to do that. I can imagine some candidates not feeling comfortable in putting themselves in that position ... and I think that they will be the ones less likely to complete.

Officer 2 supported this when describing candidates on assessment courses by saying, “In their heads, they’re prepared for it.” suggesting that only well-prepared, and therefore confident, candidates attended assessment courses. Talking about candidates who did not attend assessments, Provider 1 said, “They convince themselves they’re not ready, and then they won’t book on.” However, Officer 1 suggested that more than simply having experience was needed for candidates to feel confident when he talked about a candidate who, “Doesn’t have the confidence to do the assessment” despite them being a “Super keen hillwalker ... who has done the training.”

This evidence shows that the candidates who have reached assessment were confident in their abilities and that some of those who have not reached assessment did not feel confident. The findings also suggest that candidate’s confidence was not always dependant on their abilities.

2.3.1.1.1.1 Individual Differences in Thresholds of Confidence. This section presents evidence that candidates have their own thresholds for confidence that they must surpass before they will attend an assessment, together with factors that influence that threshold (thus moderating the relationship between the level of confidence and the likelihood of booking an assessment).

Five participants suggested that younger candidates have lower thresholds for confidence and that older candidates were less likely to feel confident enough to attend an assessment. Officer 4 said, “younger folk can be less constrained by lack of confidence.” Provider 2 supported this, suggesting that if older candidates did not feel confident they are more likely to refrain from booking an assessment, “Some of the older guys and girls have come in already with 40 days but they still might not come back for a year or two because they’re sometimes not as confident.” Officer 1 and Officer 2 did not comment on how age may or may not relate to confidence and getting to assessment.

Five participants discussed the effect of gender on confidence and all said that females needed to be more confident than males to attend an assessment. When asked if there were many candidates who were ready for their assessment but did not feel ready, and so did not attend an assessment, Provider 1 said:

I think a lot of girls fall into that category. That they actually could do it, but it feels like such a big thing. They want every “i” dotted and every “t” crossed, and they want to be absolutely doubly sure that they can do it, and really, they could have done it earlier.

Five participants suggested that some candidates may not have attended an assessment because their perfectionistic traits led to them having a higher threshold for confidence, thus not feeling confident enough to attend an assessment. Perfectionism is a multidimensional construct that can be thought of as two separate factors:

perfectionistic strivings, self-orientated striving for perfection and setting extremely high standards for performance; and *concerns**, which includes concern over making mistakes, doubts about actions, and harsh personal criticism following failure (cf. Stoeber et al., 2006; Stoeber & Gaudreau, 2017).

Provider 2 gave an example where high-levels of perfectionistic strivings may have led to candidates not feeling ready for an assessment despite being ready, “For

some reason or another, they've really held back ... it could be that they're an absolute perfectionist and they just didn't want to turn up until they were totally happy."

Officer 3 suggested that female candidates had higher levels of perfectionistic concerns, thus were more likely to feel that they were "below the standard" incorrectly, "A female might actually be overly cautious about exposing themselves, and potentially failing ... through believing they're actually below the standard. Whereas they're probably higher than that." Officer 1 and Provider 3 did not discuss how perfectionism may or may not influence the candidates' confidence threshold.

2.3.1.1.1.2 Understanding the Standard. Throughout the interviews all participants referenced "the standard" (i.e., the standard required to pass) and commented that it is often hard for candidates, and sometimes staff, to understand what the standard is. The five participants that discussed "the standard" and how it related to getting to assessment all suggested that a candidate's confidence level may not surpass the threshold needed to attend an assessment because they did not understand "the standard," thus making it hard to be confident. Provider 3 explained that this holds some candidates back from being assessed:

They need that reassurance that ... they're consolidating correctly, and actually they're performing at the standard ... because they're not going to come forward unless they feel like that I think that's really hard [for candidates] to know where they're at in relation to the bar. We think it's clear ... but candidates always ask, "How close do I have to be? You know, like, ten metres, a hundred metres. One contour line, two contour lines."

Three other participants made similar comments, and Officer 2 did not refer to understanding the standard.

2.3.1.1.1.3 Raising Candidates' Confidence Levels. Six participants discussed how support helped close the gap between candidates' confidence levels and their confidence thresholds by raising confidence levels rather than lowering confidence thresholds. When talking about candidates who lacked confidence, Provider 3 said:

They often need a lot more support, and with a bit of support they often shine as well: as soon as they realise that, "Actually, I am good enough

and I can do it”, then they’re up and running, although it can be fragile, and it doesn’t take much to knock it.

Talking about isolated candidates, Officer 4 said, “I suppose the ones without a network ... and those at the lower end of the confidence spectrum ... are going to need help with upskilling or believing that they’ve got the skills in the first place.”

2.3.1.1.2 Gender Differences in Robustness of Confidence. In addition to the gender differences in confidence thresholds discussed above, three participants spoke about gender differences in the robustness of candidates’ confidence (i.e., the extent to which confidence is maintained in the face of disconfirming experiences). When talking about the different influences of negative events on candidates, Officer 3 said, “Who can take it in their stride? Blokes, I suppose. Not because they perform well afterwards, they will probably be weaker. They are more *bolshie*, I suppose.” Officer 2 supported this:

For some candidates, particularly men, those effects of that bit of negative feedback or that bad day they had on the hill, they try and brush off and just carry on ... and get it right next time What you might find with many females is that’s thrown a spanner in the works. It’s made them doubt what they need to do, and now they need to readjust their consolidation plan.

2.3.1.2 Motivation.

Many motivation researchers have proposed that motivation operates at different levels (e.g., Vallerand, 1997; Vallerand & Blssonnette, 1992). In particular, self-determination theorists have proposed three levels of motivation: dispositional motives (i.e., goals for life in general), participatory motives (i.e., what someone hopes to achieve or avoid by participating in a behaviour), and regulatory motives (i.e., the perceived loci of causality of behavioural goals; e.g., Deci & Ryan, 2000; Ingledew et al., 2009). All seven participants gave examples of candidates with different participatory motives who also had different regulatory motives within those participatory motives. They suggested that both levels of motive influence candidates’ likelihood of attending an assessment.

2.3.1.2.1 Participatory Motives. All participants said that candidates with extrinsic (i.e., to achieve an external goal), participatory motives particularly relating to them being able to work in the outdoors following completion,, are more likely to complete than those with intrinsic participatory motives (i.e., doing something for its own sake). Provider 1 said “The ones where there’s a driver, are more likely to [complete] ... If they’re not doing it for work and they’re using it in an informal thing, they are probably less likely to [complete].” Provider 1 went on to say, “People who want to use it for their work: formally or informally, directed or volunteer ... they’re pretty motivated to do it, and so I would say I think that the success rates are pretty good.” Similarly, Officer 3 said:

If there’s an expectation that somebody’s going to have their ML to be able to do their job ... I should imagine they get on with it. But if there’s no real drive ... [they] kick it down the road and, “I’ll get around to it, maybe, or maybe not. It’s not a big deal.” sort of thing.

Five participants said that some candidates had registered for the Mountain Leader qualification to develop their personal skills and that for some of these candidates passing an assessment was not important. Officer 4 said, “The ones doing it for their own skill improvement, it’s not part of a definite plan ... they’re not so concerned if they complete or when they complete the award.” However, Officer 3 did not believe that candidates attend a training course without any intention of going onto assessment but did think that some will decide not to continue:

I don’t transpire [sic] to this “doing the mountain leader training course for a skills course”, to up-skill for an individual I can see how people would do it to start with, thinking they were going to progress to assessment, work out what were the demands upon them of attending an assessment, decide that we’re going to call it a day there.

Provider 2 did not talk about candidates who only registered for the Mountain Leader qualification to develop their personal skills.

2.3.1.2.2 Regulatory Motives. Regulatory motives can be placed on a continuum from autonomous to controlled. Intrinsic motives are considered the most autonomous.

Integrated and identified regulatory motives are examples of autonomous extrinsic regulatory motives, where behaviour is self-determined as the value of it is (somewhat) internalised. In contrast, controlled regulation includes introjected and external regulation, where behaviour is [non-self-determined](#) and the value of it may only be slightly internalised or not at all (Deci & Ryan, 2000). In these data, participants gave examples of candidates who had different regulatory motives and the influence that these had on candidates' likelihood of attending an assessment.

2.3.1.2.2.1 Autonomous Extrinsic Regulatory Motives. All seven participants said that those candidates who wanted to be outdoor instructors got to assessment. Officer 1 said, “[If] they’re wanting to work in the outdoor sector they will naturally get [to assessment].” Provider 3 suggested that those with autonomous regulatory motives were more likely to get to assessment, “If you’ve got people that are thinking about a full-time career in the outdoors ... they are going to be more inclined to follow the process through.”

Another example of candidates having different types of participatory- and regulatory motives was seen in candidates who aspired to hold higher Mountain Training qualifications, of which the Mountain Leader qualification is a prerequisite for. Officer 2 said, “they’ll tell you, ‘I am doing this because I want to do my MIA.’” Participants suggested that these candidates were extrinsically motivated but had autonomous behavioural motives. Officer 3 supported this when describing his own experience of becoming a Mountain Leader, “I didn’t even want to do my ML, I just wanted to go and be an MIA. I was only interested in that ... I was pretty flipping motivated to get through this thing as fast as I could.”

Officer 4 suggested that candidates who aspired to hold higher Mountain Training qualifications wanted to complete the Mountain Leader qualification quickly to progress, “Folk that have got a definite plan for using their ML, like they want to become an IML [International Mountain Leader] or whatever either will pursue it in a shorter time frame.”

Officer 4 suggested that course staff can influence candidates' motivation (e.g., facilitate the internalisation of the motive) as well as their confidence (described above):

It’s a combination, isn’t it? Of helping them believe they can do it and

helping them want to do it, to see value in completing, because a lot of folk come on training courses not being sure they need to do the assessment.

2.3.1.2.2.2 Controlled Regulatory Motives. All seven participants talked about candidates who had controlled regulatory motives and suggested that these candidates were less likely to be assessed than those with more autonomous regulatory motives. When talking about which candidates attended assessments, Officer 1 said, “If the school has sent them there because they’re going to run a Duke of Edinburgh, then no. They won’t do it.” Provider 3 supported this and said that is because these candidates had not gained the necessary experience:

We see a lot of people coming through with Duke of Edinburgh and Scouts who I’d say are pushed into it ... they don’t have the experience – the mountain experience as opposed to, sort of, hill and moorland experience – and it can be a shock. And then actually progressing through to assessment: they sort of realise, “Hang on.” Yes, “I can’t do this,” or, “This isn’t for me.”

2.3.1.2.2.3 Intrinsic Regulatory Motives. Candidates with intrinsic regulatory motives also had intrinsic participatory motives, at least to attend training. Those who did not feel that they wanted to be assessed were intrinsically motivated to attend a training course but amotivated to complete the qualification. Provider 1 suggested that if candidates registered for the Mountain Leader qualification to develop their personal skills and found their training course inspiring, then they were more likely to want to be assessed:

If you run a good course, you enthuse them so much that there’s no requirement on them to come back and do the assessment, but they actually want to do the assessment because they feel that it’s a good challenge for their hobby.

This was supported by Provider 3:

Quite a few who come on training courses and say, “Oh, I’m just doing this for a personal thing,” actually really enjoy it, and then they go, “Oh,

I'm going to carry on now and do the assessment, and actually this seems like a really cool thing.”

2.3.1.2.3 Negative Disconfirmatory Experience. All participants talked about disconfirmatory experiences that reduced candidates' motivation to attend assessments. However, three of the participants also provided evidence that not all candidates who had these experiences were affected. Officer 2 proposed that all candidates will have at least one such experience, “I would be really surprised if they have never had a disconfirmatory experience.” Officer 1 and Officer 3 went further and suggested that some candidates may become more motivated following a negative disconfirmatory experience. Officer 1 summarised the possible effects of negative events on getting to assessment by saying that, “[candidates] either do a U-turn and don't bother or they up their game.”

Five participants gave examples where candidates were partway through the Mountain Leader qualification process and realised that it was not something that they either needed to or could do. Officer 1 gave the following example:

Someone who ... saw a Mountain Leader working, thought, “That's the thing for me,” ... and then once they started the process realised [that] actually there's a lot more to it than they were hoping and then become disinterested with how much experience they needed to gain from then on it, and then dropped off.

2.3.1.2.3.1 Negative Experiences at Training. Six participants suggested that, in some instances, a Mountain Leader Training Course itself could be a negative experience. When asked for an example of a disconfirmatory experience, Officer 3 said, “[a disconfirmatory experience] might be just feeling they are well off the mark during a training course ... that can be quite depressing ... just not really nailing it on the training and then getting disillusioned.”

When talking about candidates who felt less willing to attend an assessment, Provider 2 said, “People say, ‘It really put me off. The training course really put me off,’ and that's a shame when you hear that because they say, ‘It was just awful.’” Provider 2 repeated examples that candidates had previously given to them of reasons they had become less willing to attend an assessment:

A lot of comments come, “Our training was worse than the assessment” ... “We never had any feedback. We were assessed basically” These people went on their training course and felt like they were beasted and battered and scrutinised like as if they were being assessed.

Six participants spoke about candidates who had not understood the purpose of the qualification when they had registered for the Mountain Leader qualification and once the candidates better understood the purpose of the qualification, they realised/decided that they could/would not complete it. Provider 3 explained that the training course had sometimes been the stimulus for candidates making that choice, “We definitely get [candidates] that are coming forward and then they do the training course and they realise it is just not for them, they are not going to be able to put the time and effort in.”

Some of the candidates who decided that they could/would not complete the qualification following their training course may have done so based on incorrect information. Officer 1 said:

We have had cases where someone has asked about experience [needed prior to assessment] and a provider has gone, “Well, in my view everyone needs to go to Scotland and go to the Highlands to gain experience” Suddenly people are going, “Oh, my God. I live in the South East If I have to go to Scotland that’s a whole different ballgame.”

Officer 1 went on to explain that the quality of the information provided by training staff determined if it had a positive or negative influence on candidates, “The wrong kind of responses [from training staff] can have an impact. Whereas the right answers might mean that people get the correct information and can then plan accordingly.”

Officer 3 provided an example where candidates’ perception of the course staff as role models might discourage them from completing, “I am sure there is nothing more disengaging than seeing somebody out of shape, out of currency doing a crap job on the hill. It is hard to engage with that.”

2.3.1.2.4 Competing Influences. Five participants spoke about candidates who wanted to complete the Mountain Leader qualification but were not motivated enough

to find the time to prepare for and then attend an assessment. There was some evidence that those who take longer to complete the Mountain Leader qualification will need more enduring motivation. Officer 3 said, "Sometimes I think momentum is everything." Officer 1 supported this:

I think those who see it as the end goal take longer, and the more time that you put in between that training and assessment there are more variables of life that can get in the way that would then push that to the back burner.

When asked about candidates who were ready for assessment yet did not attend one, Officer 3 said that the Mountain Leader qualification is, "an easy can to kick on down the street if you're busy with other parts of your life." Officer 2 supported this idea of candidates having put their assessment off because they were busy with other things:

Maybe they haven't turned up to assessment at that point because they haven't got the days, and said, "You know what, I haven't managed to get the days in, I'll leave it this year, I'll do it next year." That's fairly common There are just other things, life's got busy in other ways.

Officer 1 explained that following a training course some candidates realised that they would need longer than previously expected to complete the Mountain Leader qualification. For some of those candidates, their motivation to complete the Mountain Leader qualification did not last:

Where candidates lose focus is if they've found that the training course has brought lots of new skills to them that they haven't seen before, they start pushing back when their assessment time's going to be. I think once that goes beyond 12 months, they kind of come off the boil with their consolidation time because it feels like there's no urgency I think once they do that they're less committed, so making good use of their free time to consolidate and gain further experience becomes less of a priority, so the further that goal is the less a priority it becomes in their everyday life. Then that opens up lots of opportunity for life events to get in the way.

2.3.1.3 Barriers to Gaining Experience.

One prerequisite for a candidate to attend an assessment is having a minimum experience of 40 Quality Mountain Days (QMDs). Accruing 40 QMDs requires the investment of both time and money. All seven participants discussed reasons that candidates had not met this prerequisite and thus did not attend assessments. All seven participants spoke about aspects of candidates' lives that prevented them from gaining sufficient experience to get to assessment. Officer 1 said, "If people can't get the experience they can't proceed." Provider 3 supported this by saying, "Location and time, I would say are the biggest two handicaps for people. So, if you don't live in the mountains and you've got a fulltime job and a family, really hard." When asked how different motives for doing the Mountain Leader qualification influenced a candidates' chances of completion, Provider 1 said:

Well, really, it boils back to, "Are they in a position to gain that experience to go forward to assessment?" That's the actual crucial thing, I think, more so than any one group where you go, "Yes, they're much more likely to do it."

Officer 3 supported this saying, "I think timing is critical, you have got to have the time to gain experience. You have got to have enough money in the bank to get through the process."

2.3.1.3.1 Lack of Time. Participants gave three main reasons that candidates felt they lacked time to prepare for their Mountain Leader assessment: profession, family, and doing other multiple qualifications at the same time. These other domains of candidates' lives became barriers to completion for them as they were more important to those candidates than becoming Mountain Leaders.

2.3.1.3.1.1 Profession. All seven participants suggested that candidates whose profession allowed them time to prepare were more likely to be assessed than those whose profession did not. How a candidate's job is set up appears to be more important than what that job is.

An example of candidates in the same profession having different amounts of time to prepare is clearly illustrated amongst trainee instructors; five participants spoke

about how different trainee instructor schemes influenced how much time candidates felt they had to prepare. When asked how being a trainee might affect a candidate's chances of completion Provider 3 said, "[Outdoor Centre A] and people like that with, some of their staff are very good at giving them time off, or sometimes even paid time to go and do a bit of personal development." And when talking about candidates from outdoor-activity centres, Provider 2 said:

If you're just given week after week of programmes that demand your time, working at low level, and the organisation is not giving time to develop their own skills ... It's down to the company you're working for and it's down to the organisation. They're the ones who will decide what they need and how much time they've got available to release.

The influence that employers have over the time candidates feel they have available to prepare was also evident in the five interviews where participants spoke about how being a teacher influenced a candidate's likelihood of attending an assessment. Provider 1 explained that teachers who felt that they only had their holidays to prepare for the Mountain Leader might have felt that they could not "fit it in" and that teachers' available time is dependent on their school's view of the Mountain Leader qualification:

I mean, schools can be helpful or not so helpful If the head teacher gets outdoor ed. and all the good things that spin out of it, then they can be very supportive. If the head teacher doesn't, then the teacher's kind of fighting them as well with all the other pressures: family, money and whatever.

2.3.1.3.1.2 Family. All participants said that candidates having family commitments would make them feel that they had less time to prepare, so were less likely to get to assessment. For some candidates, this potential constraint was moderated by support from their family, allowing candidates to prepare for the Mountain Leader assessment instead of fulfilling their family commitments. When asked for examples of reasons people have given for not completing the Mountain Leader qualification, Officer 2 said:

Family. Family and work. Kids, or family circumstances, maybe elderly parents. That seems to be the main thing, or work commitments Sometimes they come back ... they have resurfaced on the other side to say, "I am picking this back up again."

Officer 1 gave an example of a candidate whose family situation, and thus priorities, changed between training and assessment, which meant that they had not and were unlikely to complete the Mountain Leader qualification:

Three years ago, I talked to her about doing the ML. She cracks on with doing that. She's done the training. She hasn't done the assessment. She's now had a kid, and it's almost totally irrelevant to talk to her about ML these days.

Officer 2 explained that candidates from different backgrounds will have different levels of family responsibility when talking about candidates from minority groups, "Sometimes when folk in other communities get involved in the outdoors there are religious, cultural and social pressures Family commitments come first, and it has a big impact on free time ... suddenly your free time isn't free."

2.3.1.3.1.3 Multiple Qualifications. Some candidates also work towards other qualifications at the same time as the Mountain Leader qualification. Five participants suggested that working towards multiple qualifications at the same time negatively impacts the time available to candidates and thus their likelihood of attending an assessment. Officer 2 explained that working towards multiple qualifications at the same time made it harder to do one well:

[Candidates] who tried to then spread with paddle sports and that really suffered You have to have a bit of a focus You have to decide which one it is you are going to do. Unless you are one of these really rare people who's brilliant at everything.

Provider 3 suggested that working towards multiple qualifications at the same time may be detrimental to a candidate's chances of attending an assessment because of changes in their regulatory motives:

Sometimes they're trying to do quite a lot of tickets all at the same time and it can become a chore for them, and it's almost like a hoop that they feel they need to jump through as opposed to actually enjoying the process ... I think a lot of them find it really hard to put the time in.

Officer 4 also recognised that working towards multiple qualifications at the same time may limit the amount of time that candidates can gain experience in but suggested that there might be some advantages to this as well:

[Trainees] might be preparing for other things at the time. But equally, they're in a particular phase of their life and mindset, which is award focused. So, therefore, they will be quite good at preparing for assessments and more likely to have access to other people that have got MLs that can help them.

2.3.1.3.2 Location. Six participants discussed how the place where a candidate lives influences how easily they can accrue QMDs. It is harder for candidates who live further from the mountains to accrue QMDs as they must both travel for longer and often feel that they need to take a block of time off to get to the mountains. Officer 2 explained that candidates living in Scotland could gain QMDs "in a day rather than two days" because they did not "have a day's travelling to get there and back." This was supported by Provider 1 who said, "People for whom the mountains are a long way away: by definition, it's going to be harder because they've got to have the time and the money to get themselves there." Provider 1 went on to say, "They're going to do it more as bunches of days, so they're quite likely to do multi-day expeditions Whereas, the people who live closer can do it weekend and weekend, once a month on a Sunday."

Further, candidates living further from the mountains will face a higher financial cost. For some candidates, this can seem beyond their means, Officer 1 said:

The financial cost of gaining the experience is a massive challenge. When you're talking to someone from the South East, telling them they need to get up into Snowdonia and The Lakes, or The Highlands, on 40 occasions, they start going, "Bloody hell. I can't afford that."

2.3.1.4 Social Support.

There are four types of social support widely considered in the social sports psychology literature: esteem support, emotional support, informational support, and tangible support (Cutrona & Russell, 1990; Cutrona, 1990; Freeman & Rees, 2010; Freeman et al., 2014; Rees et al., 2007; Rees & Freeman, 2007). Cutrona & Russell (1990) suggested that when an event is perceived as controllable (e.g., threat or challenge rather than harm or loss), that problem-focused social support (informational and tangible support) will be required more than emotion-focused support (emotional and esteem support). We consider becoming a Mountain Leader as relatively controllable as there are actions that candidates can take to influence the process (e.g., gain experience), therefore problem-focused rather than emotion-focused social support would be more relevant.

Seven participants spoke about elements of informational support received by candidates and six discussed tangible support received by participants. Research suggests that the distinction between received and perceived support is important as the effects of each are different (cf. Rees & Freeman, 2007). However, due to the nature of the relationships between participants and candidates (i.e., relatively distant), it is far more likely that participants would have an insight into the support that candidates receive than the support that they feel they have available to them. Therefore, whilst not discussed by participants, other elements of social support may also be important influences on candidates' progression.

2.3.1.4.1 Informational Support. All seven participants said that it was important for candidates to leave their assessment with an understanding of what they needed to do to prepare for an assessment (i.e., have a development plan). When asked what the most important part of support was for candidates, Provider 2 said:

Once they've got onto the training a really good training course, which makes it clear to the candidates what it's all about, and then directs them the right way. You need to individually debrief people and get to know what their personal needs are ... A generic debrief really sometimes doesn't cover it thoroughly enough for individuals.

When asked what influence they thought the post-training debrief has on

candidates, Provider 3 suggested that it could have a profound impact on candidates' expectations:

It's a really important chat ... it's really common on a debrief when you sit down with somebody and say, "That was an awesome performance. All you need to do is pad this logbook a bit, and you could come forward for assessment really quickly." They sit there and go, "But I was thinking about doing it in four years' time." and you're like, "What? You could do it next spring, no problems at all" You can have a big impact.

However, Officer 3 explained that providing individualised feedback can be at odds with preventing training courses feeling like an assessment, an issue highlighted above (see Section 2.3.1.2.3.1), "I don't believe that candidates should feel they're under any sort of assessment process while on the training course. Once you have a formalised one-to-one debrief it can feel like an assessment." Provider 1 suggests that it is possible to provide individualised feedback without making candidates feel that they have been assessed:

My debrief is actually getting them to tell me what they think they need to do rather than me telling them what they need to do, because I would've had to assess them somehow to do that I'm asking them to self-assess and tell me what they think they need to do to get to the assessment.

2.3.1.4.2 Tangible Support. Participants spoke about two main types of tangible support; the first of these was financial support. Six participants spoke about candidates who had received financial support. In some instances, this was essential to candidates' progression to assessment. Provider 2 said that "A lot of people wouldn't be able to do ML if they didn't get financial assistance" and went on to say, "However, participants also suggested that financial support will only benefit candidates if they are also sufficiently motivated to complete the ML." Officer 3 said:

In my experience, those [whose] pathway has been paid for or financially supported, they don't really seem to engage with the actual role of taking responsibility for a group in the mountains Heavily subsidised or full

payment I tend to find they don't get a good solid engagement and on occasions people just don't turn up because there's no engagement at all.

When talking about candidates who want to use the Mountain Leader qualification for work, Provider 1 supported this interaction between motivation and with financial support, saying, "they're pretty motivated to do it, and so I would say I think that the success rates are pretty good for that, particularly if they've paid for it."

Secondly, participants spoke about candidates being provided with assistance that gave them more time to prepare for a Mountain Leader assessment. As shown above (see Sections 2.3.1.3.1.1 and 2.3.1.3.1.2) some candidates felt that they did not have enough time to prepare for a Mountain Leader assessment. However, different candidates with the same demands on their time can feel differently about the amount of available time they have. One reason for this is that some candidates are supported by their employers and families. When asked what sort of support candidates might look for Officer 2 said,

Having the support of their family is going to be absolutely paramount ... Having support from family to free up time and then actually having the time both from family and work that coincides with the others ... It is an acknowledgement within the family that the Mountain Leader qualification is important to the person. The ones who have succeeded against the odds have had that support. That's been really obvious.

Employers are another source of time support for some candidates. When talking about support candidates received with practical matters, Provider 1 said, "Some of them are in organisations and centres where the management are on the ball enough to allow them development time."

2.3.1.5 Re-engaging Later in Life.

Five participants discussed candidates who had disengaged with the Mountain Leader qualification but re-engaged with it later in life. Provider 2 gave an example where candidates had an enduring motivation to become Mountain Leaders but had not completed the qualification because they were busy with other aspects of their lives:

They start the process when they were young, free and single. They meet somebody, get married, have kids, they don't do it for years and years and years. Then they come back to it. It's something they've always wanted to do.

Provider 1 also suggested that changes in family circumstances can be the reason that candidates re-engaged with the Mountain Leader qualification:

The Scouts, the Guides and the D of E are often the kick-start to get people back into it again because they've suddenly found that their kids are actually at that stage Then, they want some formal training on top of that.

Provider 3 suggested that retirement might also provide candidates with an opportunity to re-engage, “[Candidates] who did their training a long, long time ago and then their career is coming to an end They'll re-engage as well.”

2.3.1.6 Redirection to Lower Qualifications.

Five participants suggested that after Mountain Leader training, some candidates decided to pursue a lower qualification instead of the Mountain Leader. Officer 1 said, “They can't put the Mountain Leader qualification as the priority in their life, so they may drop back to the Hill and Moorland Leader or the Lowland Leader course as a more achievable objective.” This was supported by Officer 2 above (see Section 2.3.1.3.1.2) and when talking about candidates who have struggled with the Mountain Leader training course, “We get a reasonable number that then convert to Hill and Moorland Leader They decide that they are going to do that, because that is a shorter assessment and less intensive.”

It is unclear from the interviews how redirecting to a lower qualification will ultimately influence getting to a Mountain Leader assessment. For some candidates, this lower qualification will suit their needs; therefore, they will not continue with the Mountain Leader, qualification but for others completing the lower qualification becomes another step in the process of becoming a Mountain Leader. When talking about training debriefs, Provider 2 said, “Sometimes, we would advise somebody to go and do

the Hill and Moorland assessment They worked really hard to get the Hill and Moorland ... then eventually, after a couple of years, they've done the ML assessment.”

2.3.2 Passing

Factors that influenced the likelihood of a candidate passing an assessment could be considered under two broad headings, experience and resilience. Whilst these are presented as two separate themes, participants suggested that they are linked, as discussed below.

2.3.2.1 Resilience.

Within the scientific literature, resilience is a widely used term. However, various definitions have been used (cf. Fletcher & Sarkar, 2013). Based on a systematic review of resilience research in sport and work domains, Bryan et al. (2019) offered the following definition, “A dynamic process encompassing the capacity to maintain regular functioning through diverse challenges or to rebound through the use of facilitative resources.” Further, Bryan et al. (2019) found that the five psychological resources most commonly associated with resilience were: (a) support, (b) self-efficacy, (c) optimism, (d) coping skills, and (e) motivation; three of which have been identified above as important factors for getting to assessment.

All seven participants spoke about the need for candidates to be able to recover from setbacks to pass an assessment (i.e., be resilient). Indeed, mountaineering and leading others in the mountains can often be a stressful experience. When talking about the perception that Mountain Leader assessments are stressful Officer 2 said:

I've been in really shit situations with clients, and there are no assessments as stressful as when things aren't going well when you've got real people there. So therefore, if you haven't got the mechanisms and strategies to deal with assessment nerves and stress, then actually you're not really going to cope well when things go horribly wrong with a group.

Five participants felt that at some point during a Mountain Leader assessment it was inevitable that candidates would make a mistake, even the most competent, and how candidates deal with those mistakes is important, Provider 2 said:

I always say to people, “It’s very, very unlikely that you will not make a mistake because making mistakes is part of it. We all make mistakes so if you make mistakes, learn from them and move on. Be positive with it.” It’s very difficult to be assessed or watched for five days without making an error of some kind, and I said, “When you make mistakes you will blow those mistakes right out of proportion because you’ll be hard on yourself. You’ll have your moment where you’ve got to get through that. It’ll happen to everybody probably. It’s really unlikely to get through this week without making mistakes so you mustn’t let these mistakes get you down. You’ve got to keep coming back. When you rectify mistakes, it tells us [assessors] a lot about you. It’s no good you getting disoriented a bit and throwing the towel in because what we want to see you do is get disoriented and sort it out because we’ve got to think if you were with a group in that situation, what would you do? Throw the towel in or would you sit down, concentrate, re-orientate, think about it and sort it out?”

Five participants spoke specifically about experience building resilience as candidates with more experience are more likely to have dealt with setbacks as part of that experience. Provider 1 said, “we want people to be able to bounce back, that’s perhaps a product of experience, and greater experience means that they’re more likely to have to do that because if you’re in the mountains long enough things go wrong.” Officer 2 explained how Mountain Training has incorporated this phenomenon into the concept of a QMD:

One of the reasons for creating the concept of Quality Mountain Days, I try and explain to people, it’s not just any old day, it’s challenging days. And the idea really ... is to develop resilience. So, you go into situations where you’re challenged on a wide variety of levels, both technically, and physically, and mentally. And if you have loads of quality [mountain] days, where all of these elements are taxed and challenged. Then you come through it, or sometimes you don’t but you learn from it, you’ll develop resilience. And you’re used to dealing with adversity. And that’s what a Mountain Leader, I guess, at the end of the day, when push comes to shove, that’s what they’ve got to deal with. But I think folk

short-circuit the quality mountain day experience. So, any day is a quality mountain day, and therefore that resilience isn't necessarily as great.

Officer 3 explained that candidates' experience outside of the mountains may also help them to cope with adversity:

Candidates' experience and abilities that is important... I guess we touched on yesterday, it's that ability, the resilience and robustness of the candidate. That might be born partly from their mountaineering experience, it could also be lessons they've learned in other aspects of their lives that they can very easily transfer to coping with adversity in that mountain context.

2.3.2.2 Experience.

It is widely recognised that the experience is important for the development of skills or expertise (cf., Baker & Cobley, 2013; Baker & Young, 2014; Ericsson et al., 1993; Jones et al., 2020). Traditionally, the moderating effects of the type and structure of experience on the quantity of experience needed to develop expertise has not been considered. However, a recent study found that more random and variable practice increased the rate of expertise development in a sample of cricketers, with the suggestion that this was a consequence of optimised challenge (Jones et al., 2020).

All seven participants discussed the importance of candidates' experience in relation to passing a Mountain Leader assessment. Above, experience has been related to increased levels of confidence (Section 2.3.1.1) and resilience (Section 2.3.2.1). In addition, influences on candidates' ability to gain experience have been discussed concerning candidates getting to an assessment (Section 2.3.1.3). Participants discussed three facets of experience that were important when considering the outcome of an assessment: quantity, quality, and variety. The relationship between each of these facets and candidates' performance at an assessment are discussed below.

2.3.2.2.1 Quantity. All seven participants spoke about how the quantity of experience a candidate had influenced the outcome of their assessment and suggested that, in general, candidates with more experience would be more competent and therefore more likely to pass. When asked about the performance of candidates at an

assessment, Provider 1 said that, “A lot of it is about experience, that you build up ... by being in the mountains and having done all that stuff.” Provider 2 supported this, saying, “People’s performance is more down to the level of experience and the amount of preparation they’ve done for that week.”

Having 40 QMDs is a prerequisite for passing a Mountain Leader assessment and all seven participants emphasised the fact that 40 QMDs is the minimum, explaining that having the minimum experience is not always enough for candidates to demonstrate competence. Officer 1 said:

If we have a candidate that reads the assessment criteria and does the minimum, is aiming for the minimum, so that is visiting three areas, getting 40 quality mountain days, then typically you find that they’re struggling to make the right decisions and adapt to different scenarios and different places.

However, four participants suggested that for a minority of candidates, 40 QMDs were more than enough. Officer 3 said:

It’s a bit of an issue for course directors sometimes, where during the practical assessment, the candidates show evidence satisfying all the competencies, as such. Therefore, they want to pass the person. But when they look back in their DLOG, they find that, actually, they’ve got less than 40 Quality Mountain Days, so it’s a logbook deferral. Which seems a bit weird to me, that, if they’ve shown evidence that they can do the job on the hill. Almost, the logbook becomes less relevant. But it’s what we do. I guess they’re few and far between, those. Regularly, poor performance goes hand in hand with a weak logbook.

Three participants spoke about the relationship between the quantity of experience that a candidate has and their level of confidence. All three suggested that experience develops confidence and confident candidates usually perform well. Provider 2 explained that:

Loads of people turn up really confident because they’re really good and they’ve got really strong logbooks and they are confident in their skills.

That is from the word go. They have done so much preparation, so much, they are so used to what we're going to do now this week, so they just cruise it At the end of the day, we're going mountain walking and if they do a lot of mountain walking and they're comfortable with that then they're just good aren't they and they're confident.

Four participants described reasons that candidates had not been able to gain as much experience as they would have liked to before being assessed. Section 2.3.1.3 discussed barriers to candidates gaining enough experience to get to an assessment; for some candidates, these barriers did not stop them getting to an assessment, but they did prevent them gaining the experience that the candidates would like to have before being assessed. Officer 1 gave an example of this and the effect it had on the candidate:

They made the decision to book [an assessment]. Then a life event got in the way, didn't allow them to consolidate as much as they wanted to, but they still went through with it, to try and give it a go. Then I think when they arrive, having not done the preparation that they knew they needed to do, day one you do introductions around the room, and then they've got other people in the room who appear very well prepared, that then knocks them back.

However, having a large quantity of experience on its own is not enough. Candidates also need to have sufficient quality and variety of experience. Provider 1 suggested that, "If they've got a huge mountain experience, yes, it will serve them better. It can't help but not, really, and the wider that experience almost the better."

2.3.2.2.2 Quality. All seven participants spoke about the importance of candidates having suitable quality experience, as it is possible for candidates to gain 40 QMDs, but not develop their skills as the experiences would not have been challenging enough.

2.3.2.2.2.1 Weather All seven participants spoke about the importance of candidates having experience in bad weather. Officer 1 said, "There's less value in lots of good weather days in terms of gaining experience." Provider 1 explained that a lack of experience in bad weather before an assessment could leave candidates unprepared,

“In the past, [candidates] have come adrift on assessments because they’ve not been out in bad weather.” Officer 2 supported this, and explained how they thought having experience of bad weather developed candidates’ resilience:

We could tell the ones who’d been out [in] really crap weather, really stormy, horrific weather; natural propensity was not to go out in it. Well actually, some did. And when they all came to do the assessment, you knew the ones who’d been out in it, because they could deal with it. And the ones who couldn’t just went to pieces. And that was resilience. And you knew that they’d paid their dues, and it had been probably really tough. And hats off to them, they’d put themselves into quite unpleasant, and probably quite dangerous situations, potentially, and they’ve come through it. And then they’ve paid their dues when they came on the assessment, and they were facing similar conditions. “Well, this is... I’ve done this before.” Whereas the ones who avoided that, because it was unpleasant, didn’t. So I think, in a way, we rely on that resilience to be developed, just by doing experience.

2.3.2.2.2 Off the Beaten Track All seven participants spoke about the importance of candidates gaining experience “off the beaten track.” Candidates must be able to navigate in a variety of mountainous terrain to pass a Mountain Leader assessment. However, it is easy for one to spend time in the mountains, but never venture from an established path; Provider 1 said, “Let’s face it. Most mountains you walk up you walk up the path When do you ever go up a mountain that you don’t walk up the path? You would have to deliberately not walk up the path.” Provider 2 explained that candidates may have lots of experience, but not in appropriate terrain, which results in their skills not being at the standard required at an assessment:

They might have done 100 mountains but every mountain they’ve done is on a major footpath, for example, and they’ve never really ever gone into any steep, complex territory so they’re struggling as soon as they’re in that territory and you’ve got to test people in that territory just in case they go there or they end up being there or they choose to be there for any particular reason and that is the standard isn’t it? Sometimes people

struggle off the beaten track, they can't get their head around that side of things and you look at their logbook and they've done a lot of footpaths. But then again, why shouldn't they? If you go up Scafell, you're going to go up a footpath aren't you? If you go up Snowdon and you've never been here before you're going to go up the footpath. It's logical so it's pretty normal I think.

2.3.2.2.3 Variety. All seven participants discussed various ways in which candidates' experiences varied and the effect these differences had on their performance at an assessment. In general, the more varied *relevant* experience a candidate had, the better their performance was; however, any experience that was not relevant was not related to performance. Participants spoke about four different aspects of variety of experience: variety of QMDs, experience of other assessments, climbing and mountaineering experience, and international trekking experience.

2.3.2.2.3.1 Variety of QMDs Five participants discussed the variety of QMDs that a candidate may have, and all five participants suggested that the more variety in QMDs that a candidate had the better. Indeed, Officer 4 suggested that the variety of QMDs a candidate has is more important than the quantity:

I guess the type of experience they've been getting is more important than the absolute volume. A lot of folk do quite repetitive stuff, feeling they're gaining good experience, where actually, if it was condensed into fewer but more varied; they would be learning a lot more.

More specifically, Provider 1 suggested that one benefit of gaining experience in different geographic locations was that it has exposed candidates to a wider variety of terrain:

If somebody had 40 days only in Snowdonia, compared to 40 days where that was spread across Snowdonia, the Lakes, the odd days in the Peaks, and the West and East in Scotland, would the second one be better? Yes, of course they would, because they've just got a greater experience of different types of terrain.

Officer 3 supported this and also suggested that it was important that QMDs were gained in areas unfamiliar to the candidates, “I think if somebody just goes out and does loads of varied days in the mountains in all sorts of weathers in places they don’t know, then I think they will get through.”

2.3.2.2.3.2 Experience of Other Assessments Five participants spoke about the benefits of candidates having previously attended assessments, especially if the assessments were similar in nature to a Mountain Leader assessment (e.g., practical, continuous in nature). When asked for examples of the types of candidates who are confident that they will pass when arriving for their assessment, Provider 3 said:

Anybody that’s been through a similar process already, so maybe they’ve done their paddling qualifications, so a similar outdoor qualification, will have a better idea of what to expect. Military personnel who have already been through a military process have a better expectation of that. And, maybe people who are further along in professional careers that require some sort of continual assessment, you know, so they’re just used to being looked at and being assessed and having to revalidate with qualifications and things like that, they tend to be a little bit happier in that environment as well.

In contrast, it was suggested that candidates who were less familiar with assessments were more anxious. Indeed, Provider 2 said, “when I did my first training and assessment, I would say that I was probably a bag of nerves and I wasn’t sleeping properly the night before it started.” Officer 2 suggested that candidates who were less familiar with assessments sometimes behaved in ways that were unusual for them:

You also get people that might be a little bit older who haven’t been assessed for a very long time When you review it with them, they go, “I don’t know why I did that. I wouldn’t normally do that. I thought that might be what you wanted to see” Whereas an outdoor instructor who’s going through multiple qualifications is getting very used to peer review, receiving feedback, being trained, being assessed, and they’re enjoying the process. That is going to make a difference to how people then do things throughout their assessment week.

2.3.2.2.3.3 Climbing/Mountaineering Experience Five participants discussed the influence of climbing and mountaineering experience on candidates' performance at an assessment; however, their views were somewhat nuanced. All five participants felt that climbing and mountaineering experience could benefit a candidate's performance, as they were more likely to be confident and proficient in their mountaineering skills. Officer 2 said:

Candidates with a much more broader mountaineering experience, they're generally more relaxed because they've been to lots of different environments, they've made a lot more decisions, they've had different circumstances and that makes it more adaptable. So their approaches to the technical skills it's more common sense approach I guess rather than a clinical, "This is how I need to navigate to get out of here." Yes, broader experiences is something that I think would really help someone towards getting through an assessment successfully.

Whilst the potential benefits were recognised, four participants (including all three providers) described candidates with climbing experience being overconfident or not appreciating the difference in climbing and mountain walking. Provider 3 said:

There can be a negative side of things: People that are on climbing quals – you know, SPAs and things like that – can be overconfident in what they think is suitable terrain to jig people around on; I see that quite a lot. And yes, that's not nice when you see that. And I warn them. (Laughter) I do give them a heads-up that this is their Summer ML and not their SPA and they need to be behaving appropriately. So unfortunately yes, I've seen some quite poor performances because of overconfidence because they think they're a climbing instructor and there's a lack of appreciation of the difference between the two.

Interestingly, Officer 4 linked this inability to differentiate the context to experience, with those who were less experienced being less able to make appropriate judgements, "If your experience is quite limited, it's quite hard to know, to sort of sift through that difference to ML rope work, climbing rope work and the two can get a bit confused."

2.3.2.2.3.4 International Trekking Four participants discussed the influence of international trekking experience on candidates' performance at an assessment. Whilst this experience would prove somewhat useful, it was something that could compliment QMDs, not replace them, as some skills that are required for the Mountain Leader are unique to the UK, an example of this is navigating away from paths, the importance of which is discussed in Section 2.3.2.2.2.2. Officer 3 said:

The reality is, unless they've actually hung out in the British mountains a bit, they don't perform very well. Irrespective of how compatible they think the [non-UK] environment is to the UK, it's very unique. So experience in the UK mountains is the most important thing, and developing a personal skillset.

2.3.3 Reassessment

Candidates who do not pass their initial assessment may or may not return to be reassessed. Whilst the interview was not designed to answer questions about what factors influence if candidates return to be reassessed, the semi-structured nature of them meant that some data emerged that provides some insight into this. However, these results are not as clear as those in previous sections.

2.3.3.1 Understanding the Original Result.

All seven participants spoke about candidates either understanding and accepting their original assessment result or not. Participants suggested that candidates who understand and accept their result are in a better position to decide if they want to continue with the Mountain Leader qualification and if they do, understand what they need to do to pass a reassessment.

2.3.3.1.1 Preparing for Reassessment. Four participants spoke about candidates who realised that they were below the standard and then went away to prepare for reassessment, Provider 3 said:

You'll get lots of candidates who get deferred on their navigation, and are like, "Urgh," then they go away, sort themselves out, come back for

reassessment, and at the reassessment process they go, “I definitely wasn’t good enough, and I’ve gone away and done all this stuff, I now realise I’m a much better navigator than I was before.”

2.3.3.1.2 Disagree With/Do Not Understand Result. Three participants spoke about candidates who did not either agree with or understand their original assessment result. Officer 4 gives an example of why candidates might not agree with their result:

I guess there’s a danger that [candidates] don’t fully understand, the reasons for having been deferred. If they’re pinning it on isolated, you know, isolated mistakes that they’ve made or errors. Maybe they haven’t grasped that it’s a pattern that’s emerged.

2.3.3.1.3 Consequences of Not Understanding/Accepting the Result.

Officer 1 explained that candidates who felt that their result was unfair would do one of two things:

They would literally finish that assessment. Get the result they didn’t want to hear. Then they will either do one of two things, complain, or just get annoyed, and try and book onto the next earliest assessment they can. They don’t believe they need to retrain. They believe they need to just be assessed again. Then they go to that next assessment and, hey presto, the same result ... Because nothing has changed. Unless it is about the assessor/candidate relationship ... If it’s about the system, rather than about the assessor, then if they go on to the next assessment they will just get the same result again.

2.3.3.1.4 Reasons for Not Understanding/Agreeing. Provider 2 suggested that clashes between candidates and staff are not uncommon:

You always have people complain about something or somebody, sometimes, about situations they’re in. You get a lot of info when people are being reassessed because they’d been deferred so you run a reassessment and because they’re being deferred, they start telling you

why they think they shouldn't have been deferred and then they start slagging off providers and organisation.

Provider 2 goes on to explain that in some instances these clashes can be highly charged, "I have heard stories of people saying, 'I nearly punched him. I nearly hit him. In fact, we all did. We all felt like turning round and hitting him.' That's not good, is it?"

2.3.3.2 Nerves.

Three participants said that candidates who present for reassessment are nervous, Provider 2 said, "Everybody who turns up for a reassessment is full of nerves. They're very nervous when they start". Two of these three participants suggest that for some, this nervousness can be so extreme that it manifests itself with physical symptoms. Provider 1 gave an example:

Some people are literally sick with worry on ML assessments. I mean, I remember doing a reassessment for this one guy and he confessed afterwards that, just before we'd met up, he was throwing up because he was that nervous about doing this.

Provider 1 supports this, suggesting that it is not a one-off occurrence:

They are really nervous and when you meet them you've got to really make sure you calm them down and you've got to try to create a really relaxed atmosphere before you set off because they're shaking some of them. They're nearly sick.

This nervousness may be in part due to their experience on their original assessment. Provider 2 provided the following insight in candidates' original experience of assessment, "[Candidates] felt like [assessors] were quite harsh and quite lacking in any form of feedback or lacking in any form of empathy, which made them feel very uncomfortable, which made their performance even worse."

2.3.3.3 Redirected Towards a Lower Qualification.

Some candidates will not return for a reassessment following their initial assessment because the assessment staff have redirected them towards a lower level qualification, as

the assessment staff feel that it would be more appropriate for them. Whilst only Provider 2 spoke about candidates being directed towards a lower level qualification rather than reassessment this redirection is also spoken about in Section 2.3.1 Getting to Assessment. Provider 2 said, “When you get people like that, we advise them to do Hill and Moorland You will get that candidate who will be better off, definitely, doing Hill and Moorland.”

2.4 General Discussion

The present chapter reports the findings of a *large qualitative* study that is the first investigation into the factors influencing the completion rate of the Mountain Leader qualification. To do so, we conducted in-depth interviews with Mountain Training staff and experiences course staff, which covered candidates’: background, career history and social influence, personal characteristics, ability and experience, and support. The flexible nature of the concurrent inductive and deductive analytical approach allowed us to combine extant literature and the expert knowledge of the study’s participants. The findings of the present study suggest that a multitude of factors influence the completion rate of the Mountain Leader qualification, with different factors being important at each stage of the pathway. This position supports the conclusions of other recent works that have used a multidisciplinary approach to study expertise development (e.g., Hardy et al., 2017a; Güllich et al., 2019; Jones et al., 2020).

The findings of the present study suggest that there were four main themes identified as influences on candidates’ likelihood of getting to assessment: confidence, motivation, barriers to gaining experience, and social support. Candidates who get to assessment were more likely to be confident in their ability to pass an assessment. Further, candidates differed on the threshold level of confidence required to attend an assessment, and this threshold was influenced by several psychosocial factors. In terms of candidate motivation, interestingly, it was seen as important that candidates had an extrinsic participatory motive that was autonomously regulated for them to get to an assessment. Candidates with either intrinsic participatory motives or controlled regulatory motives were less likely to get to assessment. Regarding experience, participants suggested that it was important that candidates were able to gain

experience before they would attend an assessment, with several barriers to gaining experience identified. These barriers mainly related to a lack of time and the influence of where candidates live on how easily they can accrue QMDs. Finally, in terms of social support, it appeared that received social support could help candidates understand what they needed to do to prepare for an assessment and free up their time to prepare for an assessment.

There were two additional themes identified as important influences on the likelihood of candidates passing an assessment: experience and resilience. The findings of the present study suggested that the quantity, quality, and variety of experience were all important. More specifically, candidates needed to have at least 40 QMDs, so that they met the prerequisites for passing; however, once this prerequisite was met, the quality and variety of experience was more important. Without experience that is varied and good quality, participants suggested that there would be gaps in candidates' skills, leading to poor performance at assessment. Participants also suggested that candidates must be resilient to pass an assessment, as it is highly likely that they will make at least one mistake whilst being assessed. The findings suggested that experience, especially of challenging situations, will increase candidates' resilience.

Finally, three themes were identified as important influences on the likelihood of candidates returning for reassessment: their understanding of the original result, nerves, and redirection to a lower qualification. Candidates who failed needed to understand and agree with the original assessment result, as doing so would allow them to prepare effectively for reassessment. Participants also suggested that candidates who attend reassessments are often very nervous; one inference of this was that there are candidates who are too nervous to attend a reassessment. Candidates being redirected towards lower-level qualifications was also considered potentially important; if candidates' needs were met by a lower qualification, it was unlikely they would be reassessed for the Mountain Leader qualification.

2.4.1 Potential Links

The factors identified in the present study as important influences on the likelihood of candidates getting to and passing a Mountain Leader assessment qualification can be organised in a logical sequence based on the relevant theory that has been introduced in

Chapter 1 (Figure 2.1). The relationships depicted in Figure 2.1 are described in the relevant sections above. It is important to note, that whilst not explicitly stated thus far, factors that influence candidates getting to assessment will indirectly influence the likelihood of them passing an assessment. In addition, note that these links are suggested tentatively, as it is difficult to evidence such links from a study such as the present one.

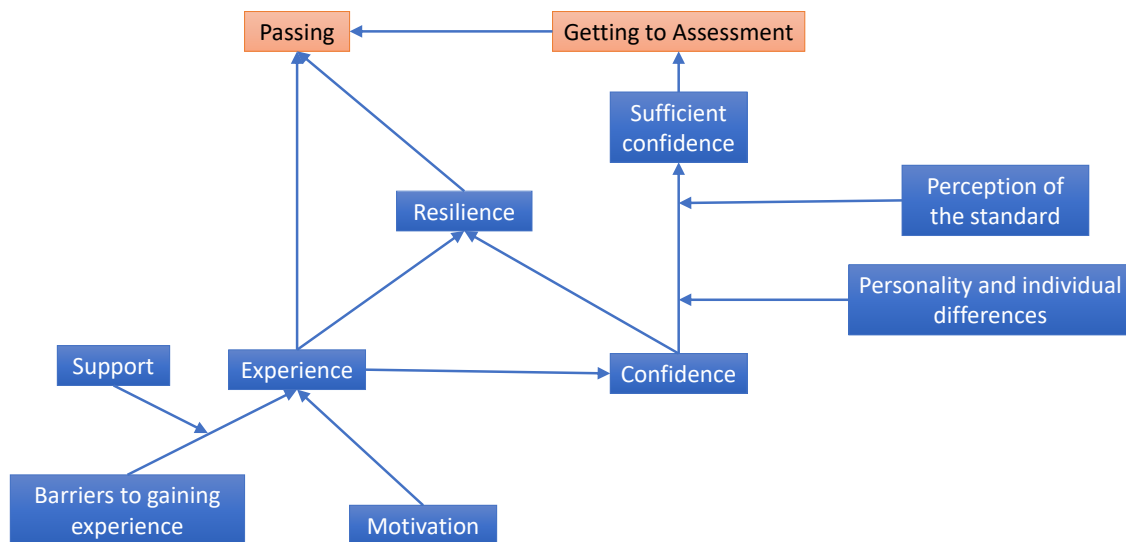


Figure 2.1: Potential links between themes identified as important influences for candidates getting to and passing an assessment.

2.4.2 Future Research Directions

The findings presented in this study represent the views of organisational managers and course staff and given the relativist epistemology adopted for this study, it is important that the findings are validated in a study with participants “from the other side” (i.e., candidates). Indeed, not investigating what is clearly a complex phenomenon could be seen as reductionist, ignoring candidates’ realities (Smith et al., 2008). Therefore, an important extension of the research would be to assess the relevance of the factors identified in this study to the likelihood of candidates becoming Mountain Leaders from their perspectives. A logical extension to this research would be studies that used multidisciplinary approaches capable of including complex interactions that aimed to successfully discriminate candidates who: (a) get to assessment from those who do not

get to assessment and (b) pass an assessment from those who do not. Such studies may also include factors that we felt it was too difficult to collect meaningful data for in the present study and should consider individual difference variables.

The gender differences in confidence related variables discussed above should also be investigated further. Section 2.3.1.1.1.1 suggested that female candidates need to be more confident than male candidates do to get to an assessment and Section 2.3.1.1.2 suggested that female candidates' confidence is less robust than male candidates' confidence is. Given that experience is identified as an important influence on confidence, both above and in the literature both theoretically (e.g., Bandura, 1982) and empirically (e.g., McAuley et al., 2006), research should investigate the nature of the relationship between experience and confidence for females and males.

Chapters 3 and 4 build on the present study in a series of studies in which we analysed data collected from candidates. Chapter 3 presents studies in which I used pattern recognition analyses to identify sets of variables that can successfully discriminate candidates who (a) get to assessment from those who do not (for female and male candidates separately) and (b) candidates who pass their first assessment from those who do not. Chapter 4 comprises two studies, in the first we developed a Mountain Leader specific measure of self-efficacy. In the second, we used this measure to examine gender differences in the relationship between experience and self-efficacy using moderated hierarchal regression. Therefore, applied implications are discussed at the end of those chapters, considering the findings of the present study and the findings of the studies within each of those chapters. This combination of approaches allows us to be more confident in the important factors and the relationships between them. Consequently, we can be more confident in the applied implications.

2.5 Concluding Remarks

This study is the first to examine the factors influencing the competition rate of the Mountain Leader qualification and has laid a clear foundation for future research in this area. A multitude of factors were identified as important influences on the completion rate of the Mountain Leader qualification and different factors are important at different stages of the Mountain Leader pathway. Further, there are differences in the relative

importance of the factors for different individuals.

Chapter 3

Key Discriminatory Factors

3.1 Introduction

From the results of Study 1, it was clear that there was no single factor that determined whether or not a candidate would complete the Mountain Leader qualification. Instead, the results suggested that both the main effects of and interactions between a myriad of factors were important. Study 1 collected data from those who were involved with the organisation and delivery of Mountain Leader training and assessment courses. To our knowledge, Study 1 represents the most in-depth investigation of factors influencing the completion of the Mountain Leader thus far. However, it does not include any data from candidates themselves, nor does it test whether these factors do influence completion. Therefore, to develop a broader view of the factors influencing the completion of the Mountain Leader qualification, this chapter reports the findings of three studies that collected data for these factors from candidates who had registered and attended a training course for the Mountain Leader qualification.

3.1.1 Chapter Structure

We identified 168 factors from the results of Study 1 and a workshop with Mountain Training,¹ that we deemed potentially important to the completion of the Mountain

¹This workshop involved a presentation of the results of Study 1 to the Mountain Training council, followed by a series of break-out focus groups. There are 25 members of the council, each of whom represents a different stakeholder. We asked questions in the break-out focus groups to help us understand two things. Firstly, if the results of Study 1 resonated with the council and secondly, if the council members felt there was anything that may be relevant, but had not already been identified through the literature review and interviews.

Leader qualification. We operationalised these factors as up to 529 individual variables. The findings in Study 1 also made it apparent that completion may be better considered as two separate components with different factors being most relevant to each: getting to an assessment having attended a training course and passing that assessment. Mountain Training does not set a maximum duration between a Mountain Leader training and assessment courses.

Figure 1.2 shows that the median duration between training and assessment for all candidates trained between 2009 and 2018 was 1.13 years and the mean duration was 1.58. Based on these statistics and the time constraints of this project, we operationalised getting to an assessment having attended a training course as getting to an assessment within 18 months of training. Furthermore, female candidates are less likely to be assessed than male candidates ($\chi^2(1, n = 15433) = 47.33, p < .001$), therefore we decided to examine separately the factors influencing female and male candidates getting to assessment within 18 months of their training course.

There are four possible results for candidates who get to an assessment: pass, deferral (candidates will need to be reassessed on part(s) of the syllabus before qualifying), fail (candidates will need to complete a full reassessment), and withdrawn (candidates who do not complete the five-day assessment course will need to attend a full reassessment). In this study, we were primarily concerned with candidates passing or not passing their first assessment; therefore, we grouped the three non-pass results into one, rather than considering the non-pass results separately. The analyses in Chapter 1 did not indicate differences in the pass rates for female and male candidates. Therefore, we included both sexes as a single group with sex as an additional factor in the analysis for passing first time.

The present chapter aimed to identify variables influencing completion of the Mountain Leader qualification. In Study 1, we identified potentially important variables, from which we created a survey tool of reasonable length (we estimated that it would take approximately 20 minutes to complete) to collect data for these variables (see Appendix B). In the present chapter, we used the survey tool to collect data from candidates to identify important discriminatory variables for each of the following classification problems:

1. Male candidates who are assessed within 18 months of their training course from

those who are not.

2. Female candidates who are assessed within 18 months of their training course from those who are not.
3. Candidates who pass their first assessment from those who do not.

The remainder of this chapter is structured as follows. First, there is a brief overview of relevant constructs; then there is a general methods section that describes the data collection and analytical method for the three studies. This is followed by three studies, one for each of the classification problems listed above. Each of these studies draws participants from the aforementioned data collection based on their sex and progress through the pathway—any deviation from the general method is described. Finally, there is a general discussion of the overarching themes of the three studies.

3.1.2 Relevant Constructs

Given the number of constructs, it is beyond the scope of this chapter to provide a detailed literature review of each construct. However, to aid the readers understanding of the relevance of the constructs, we have grouped the relevant constructs into several domains and provide an overview of the domains and the rationale for their inclusion in this project in Table 3.1.

Table 3.1: Overview of the theoretical domains included in the survey tool and the rationale for their relevance.

Construct	Rationale
Big Five	The Big Five model of personality (McCrae & Costa, 1987) is widely used when considering individual differences (Allen et al., 2013). For example, individuals who are more conscientious will persevere and be more hardworking and ambitious, therefore may be more likely to complete the Mountain Leader qualification than those who are less conscientious. As another relevant example, extraversion has been associated with effective leadership (Judge et al., 2002) and decision making (Hardy et al., 1996).
Resilience	Higher levels of resilience are associated with positive outcomes, including overcoming adversity (Smith et al., 2008). Further, the results of Chapter 2 suggested that it was important that candidates could deal with setbacks to become a Mountain Leader.
Intention of being assessed	The theory of planned behaviour suggests that intentions are the best predictor of behaviour (cf. Ajzen, 1991; Ajzen & Madden, 1986). Several studies have found evidence that intentions have been shown to predict behaviour (e.g., Armitage & Conner, 2001; Hagger et al., 2002).
Expected time to assessment	The results of Chapter 2 suggested that candidates who intended to be assessed sooner after their training course were more likely to be assessed.
Personal projects	There is evidence that goal importance influences goal progress and that it also moderates the relationship between self-efficacy and goal progress (cf. Beattie et al., 2015). Further, it was suggested that those who had multiple goals were less likely to be assessed as they would be committing resources to attain other goals.

Table 3.1: Overview of the theoretical domains included in the survey tool and the rationale for their relevance. (*continued*)

Construct	Rationale
Understanding of the qualification	The results of Chapter 2 suggested that it was important candidates understood the purpose of and the standard of the qualification. It was suggested that candidates who were less certain of the purpose of the qualification might attend a training course to find out more about the qualification and then discover it was not what they needed to do, and those who were less certain of the standard would find it more difficult to be confident.
Socio-demographics	The results of Chapter 2 suggested that there were socio-demographic variables were important to consider when understanding why candidates do or do not complete the Mountain Leader qualification.
Available time	The importance of candidates having enough time available to become a Mountain Leader was highlighted in Chapter 2, as those who did not have available time would be unable to prepare for an assessment.
Access to the mountains	The results of Chapter 2 suggested that candidates who have better access to the mountains are more likely to be able to gain experience and that living further from the mountains may be a barrier to completion.
Participatory motives	The results of Chapter 2 suggested that candidates with extrinsic participatory motives were more likely to be assessed than those with intrinsic participatory motives.
Regulatory motives	Self-determination theory suggests that autonomous forms of motivation are better for prolonged engagement and more robust in the face of adversity (Deci & Ryan, 1985a; Ryan & Deci, 2017, 2019). This was supported by the results of Chapter 2.

Table 3.1: Overview of the theoretical domains included in the survey tool and the rationale for their relevance. (*continued*)

Construct	Rationale
Self-efficacy	Self-efficacy theory suggests that, if sufficiently motivated, self-efficacy will be the primary determinant of their performance, how much effort they will put in, and how long they will persist—particularly in the face of adversity (Bandura, 1977, 1982, 1997). Higher levels of self-efficacy have been associated with higher levels of goal progress (Sheldon & Kasser, 1998), task engagement (Caraway et al., 2003; Walker et al., 2006), goal commitment for self-set goals (Locke et al., 1984; Locke & Latham, 1990), and on-task effort (Bandura & Cervone, 1983). The results of Chapter 2 suggested that candidates would need to feel confident in their skills before they would go to an assessment.
Self-guides	The results of Chapter 2 suggested that candidates would have a “threshold” of confidence that they would need to surpass before they were assessed. It was also suggested that this threshold would vary with age, gender, and personality.
Self-efficacy discrepancy	Self-discrepancy theory (cf. Higgins, 1987) suggests that greater discrepancies between the actual self and self-guides would lead to greater motivation as one would try to reduce the discrepancy.
Training staff coaching behaviour	Coaching literature describes various benefits on a variety of outcomes, for example, performance/skills, well-being, coping, work attitudes, and goal-directed self-regulation (e.g., Theeboom et al., 2014; Weinberg & Gould, 2014). The results of Chapter 2 also suggested that the behaviours of the training course staff were influenced candidates in several ways, including having the potential to foster more autonomous forms of extrinsic motivation.

Table 3.1: Overview of the theoretical domains included in the survey tool and the rationale for their relevance. (*continued*)

Construct	Rationale
Life changes	There is evidence that goal importance influences goal progress and that it also moderates the relationship between self-efficacy and goal progress (cf. Beattie et al., 2015). Further, the results of Chapter 2 suggested that candidates who had multiple goals were less likely to get to assessment if pursuing the other goals was more important.
Negative experiences	Negative events were identified as important in Chapter 2; it was suggested that experiencing these events would reduce a candidate's motivation to be assessed. In addition, self-efficacy theory suggests that disconfirmatory events would reduce an individual's level of self-efficacy (Bandura, 1977, 1982).
Additional training	The results of Chapter 2 suggested that candidates who received additional training after their training course would be more likely to pass their first assessment.
Preparation for assessment	Preparing for an assessment will provide candidates with opportunities to have mastery experiences, which could increase their levels of self-efficacy (Bandura, 1977, 1982). In addition, candidates are required to have a minimum amount of experience before attending their assessment course; most candidates will need to gain additional experience after attending a training course. The importance of the quantity, quality, and variety of this preparation are highlighted in the results of Chapter 2.

Table 3.1: Overview of the theoretical domains included in the survey tool and the rationale for their relevance. (*continued*)

Construct	Rationale
Social support	Social support has been shown to have a number of benefits, including helping individuals deal with pressure (Freeman et al., 2011, 2014), which would likely be beneficial to candidates preparing for an assessment. In addition to this, the provision of tangible support was discussed in Chapter 2 as it could help them find the time to prepare for an assessment.

3.2 General Method

3.2.1 Participants

We contacted all candidates who had attended their first Mountain Leader training course in 2017 or 2018, inviting them to participate in the study ($N = 2,867$). One thousand and thirty candidates started the survey, and 440 completed the survey (15.35% of all candidates trained in 2017 or 2018).² Table 3.2 provides a summary of the demographic variables for this sample. Sixty-three different providers had trained these candidates, and 47 different providers assessed those who had been assessed.

Table 3.2: Participant descriptive statistics.

Sex	n	M _{age}	SD _{age}	White ^a	Assessed ^b	Assessed within 18 months ^c	Passed First Time ^d
Female	155	36.10	10.94	140 (90.32%)	50 (32.3%)	45 (29.03%)	42 (84%)
Male	285	40.77	12.33	263 (92.28%)	119 (41.8%)	108 (37.89%)	103 (86.55%)

^a Percentage of candidates who are white.

^b Percentage of candidates who were assessed.

^c Percentage of candidates who were assessed within 18 months of their training course.

^d Percentage of candidates who were assessed who passed first time.

When responding to the survey, candidates were at different stages of the pathway. Some candidates had been assessed, whereas others had not. In addition, some candidates had completed their training course at least 18 months before responding to the survey, and the remainder responded to the survey less than 18 months after their training course. Therefore, candidates could have completed the survey either prospectively or retrospectively with regards to *both* the event (the assessment itself) and the criterion variable (getting to [an](#) assessment within 18 months of training) *separately*. As such, we were able to create four groups within each sex (see Table 3.3 for descriptive data).

²We made an interesting observation when conducting the pilot work, that was when sending the survey out, response rates appeared to be higher when candidates received the study invitation on a rainy day. As a result, for both this study and the data collection for an ongoing study into the factors influencing the completion rate of the MCI, we sent the invitations on bad weather days. This observation may be useful to others who are designing survey-based research; however, it is the principle, not the detail, that is important. For example, kayakers are more likely to participate in their sport on rainy days, as there will be more water in the rivers, therefore if one were to conduct a survey to understand the completion rates of British Canoeing qualifications, it might be more prudent to send the survey in the middle of a heatwave than on the first rainy day in a month.

Table 3.3: Candidates pathway progress when completing the survey.

Assessment	18 months post-training	n
<i>Female</i>		
Post-	Greater than or equal to	12
	Less than	22
Pre-	Greater than or equal to	19
	Less than	102
<i>Male</i>		
Post-	Greater than or equal to	36
	Less than	55
Pre-	Greater than or equal to	35
	Less than	159

Each of the three studies had different inclusion criteria and subsequently, used a different subset of candidates. Details of the candidates included in each data set are presented in the sections below and a visual representation of groups that candidates were included in is presented in Figure 3.1.

3.2.2 Measures

We collected data from candidates for this study through two mechanisms. Firstly, we retrieved data from Mountain Training’s Candidate Management System (CMS). The CMS data include information on candidate demographics, training course attendance, and experience data in the form of a digital logbook (DLOG). Secondly, we developed a self-report survey tool to collect quantitative data from Mountain Leader candidates that were not already held by Mountain Training. Given the large number of factors identified as important in Study 1, the first challenge was to create a survey tool that was of reasonable length and would therefore be completed by candidates.

It was necessary to carry out extensive pilot work because of the large number of potentially important variables. This work involved two separate studies: one study to identify suitable short-form measures of constructs (i.e., one or two items per construct) and a second, to reduce the number of constructs included in a survey tool so that we could administer it to candidates without being unduly onerous for them to complete. The resultant survey tool included constructs within each of the domains listed in Table

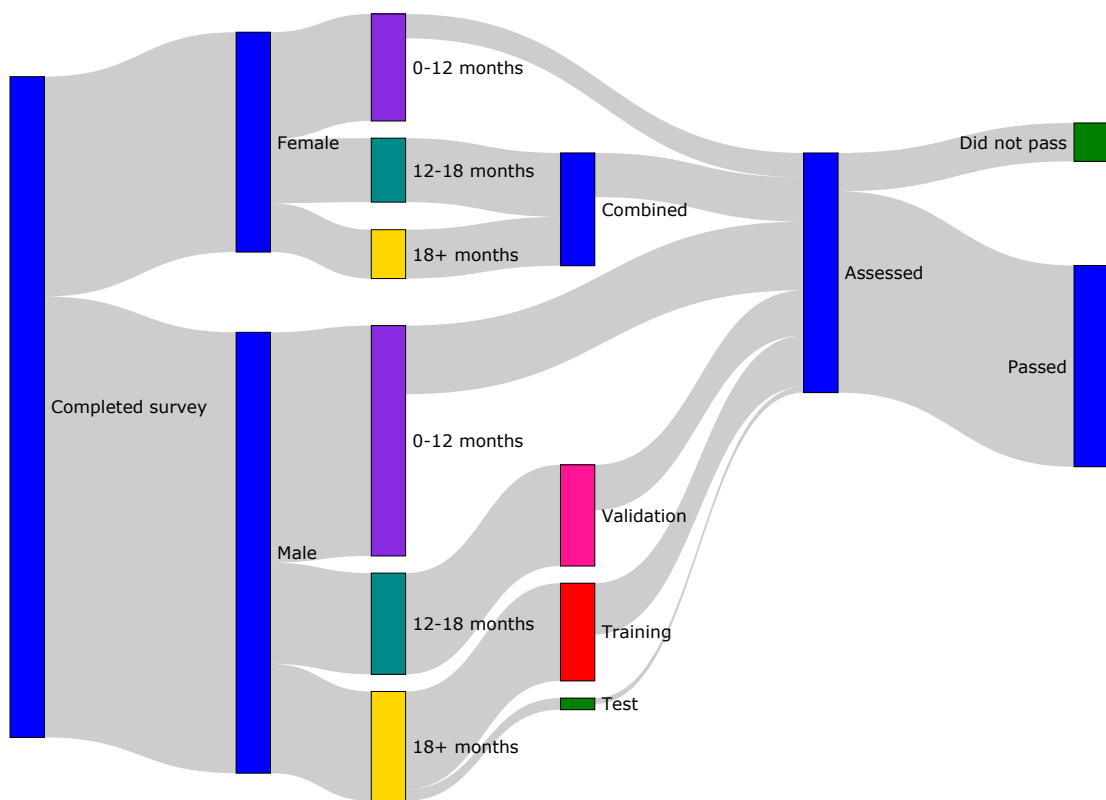


Figure 3.1: Study 4 participants. For simplicity, candidates who have not been assessed have not been added to this figure as a final group; therefore it can be assumed that candidates not progressing from one node to another have not been assessed.

3.1. We believe that it is important for the reader to understand the work that underpins the survey tool, although, including that detail here would distract from the purpose of this chapter—which is to understand the factors that best discriminate candidates who are assessed from those who are not. Therefore, the development of this survey tool and a full list of measures included is described in detail in Appendix B. We encourage the reader to engage with this material having read this chapter, to understand the rigour of the pilot work and the techniques employed to reduce the number of items required to measure the constructs of interest. This method may prove useful in other domains.

3.2.3 Procedure

After the project received institutional ethical approval, we invited Mountain Training candidates who had attended a Mountain Leader training course in 2017 and 2018 to complete the survey tool through the Qualtrics online survey platform (Qualtrics, 2019). Before completing the survey, participants provided informed consent. Following this, they were asked to indicate if they had attended a Mountain Leader assessment course or not, so that they were shown the appropriate questions. We then instructed participants to think about *how they felt before their first assessment* for consolidation and assessment-related questions if they had been assessed but to think *how they felt now* when answering these questions if they had not been assessed when completing the survey.

3.2.4 Analytical Method

We used pattern recognition analyses to identify the most important discriminatory variables within each group. By identifying the most important, we were able to infer which variables were less important discriminatory variables. Pattern recognition analyses, originally developed in bioinformatics (Duda et al., 2000), use machine learning algorithms to identify a set of discriminatory features (variables), which can be used to identify the class (group) of objects (candidates). Pattern recognition analysis is more appropriate for these data than “traditional” methods (e.g., discriminant function analyses) as pattern recognition employs both linear and non-linear functions and therefore reflects multiple and complex interactions and not just “main-effects.”

More specifically, we used a pattern recognition procedure that has been

developed for analysing *short and wide* data sets (i.e., data sets that contain more variables than cases) as the present data set are. This pattern recognition procedure has been used in several recent studies to examine differences between athletes of different performance levels (e.g., Güllich et al., 2019; Jones et al., 2019; Jones, 2019; Jones et al., 2020).

This procedure is a three-part process. First, we aimed to identify a set of features which correlated well with the class but had a low correlation with one another (*feature selection*). Second, we tested the ability of this feature subset to correctly classify the candidates according to the criterion variable for that analysis (*classification*). Finally, we refined the feature subset to identify the simplest solution that best explained the data (*recursive feature elimination*). We completed all analyses using WEKA 3-9-3 open source software issued under the GNU General Public License version 3 (Bouckaert et al., 2018; Frank et al., 2016). WEKA is a machine learning workbench with a collection of algorithms widely used for data mining, machine learning, and pattern recognition.

3.2.4.1 Preprocessing.

Using the same data to train and test a model leads to the risk of over-fitting and classification rates being artificially inflated as all the data have been “seen” during the feature selection stage. This phenomenon is known as “peeking” (Kuncheva & Rodríguez, 2018; Reunanen, 2003; Smialowski et al., 2010) and can be avoided by holding some data out of the feature selection stage as outlined below. For a given classification problem, the ideal way to perform the analyses would be as follows:

1. Given N cases, randomly select x cases, where

$$\frac{N}{3} > x > \frac{N}{10}$$

for each class of the criterion variable to be held out as a test data set D_{test} and the remaining candidates become the training data D_{train} .

2. Prepare both the D_{train} and D_{test} data sets separately (e.g., standardising the data).

3. Perform the feature selection process using D_{train} .
4. Carry out the classification process using D_{train} using k-fold cross-validation to select the best model.
5. Carry out the classification process on the previously unseen data (D_{test}) using D_{train} to train the classification model chosen in step 4.

We could only use this full procedure for the data collected from male candidates as there were not enough data available from female candidates or candidates who had not passed their first assessment to split the data and have a large enough sample in D_{train} . Therefore, for female candidates and the first-time pass analysis, we included all cases in D_{train} .

3.2.4.2 Feature Selection.

Feature selection aims to remove irrelevant and redundant variables from the analysis to improve the predictive performance of models (Guyon & Elisseeff, 2003). In this study, we used three techniques designed to improve the performance of feature selection when applied to short and wide data: the use of multiple feature selection algorithms, carrying out feature selection in a *vertically distributed* fashion, and using *leave-one-out cross-validation*.

When using multiple feature selection algorithms, the greater the number of algorithms that select a feature, the more confident one can be that the feature is important as it is less likely that the feature has been chosen by chance (Visa et al., 2011). In this study, we used four feature selection algorithms: Fast Based Correlation Filter (FCBF; Yu & Liu, 2003), Correlation Attribute Evaluator (CAE; Bouckaert et al., 2018), Relief-f (Kira & Rendell, 1992), and Support Vector Machine - Recursive Feature Elimination (SVM-RFE; Guyon et al., 2002).

CAE, Relief-f, and SVM-RFE rank all features in order of merit (magnitude of relationship), whereas FCBF selects a subset of features that are highly correlated with the class but not with one another. As only FCBF provides a subset of features, we selected the top 20 features from the rankings provided by the other three algorithms (if the attribute merit was greater than zero).³ All four algorithms are well-established

³If there were fewer than 20 features in the subset that feature selection was being applied to, we selected the top 10 features. There were more than 10 features in all subsets.

feature selection methods, and the most important point to note about these four algorithms is that each works in a very different way (see Bolón-Canedo et al., 2015b).

When applied to a data set, using multiple feature selection algorithms yields several feature subsets for each classification problem based on the agreement between the algorithms about the importance of each feature. We discarded features that were not selected or were only selected by one feature selection algorithm. We created the following feature subsets from the remaining features: features selected by at least two feature selection algorithms (2s) and features selected by at least three feature selection algorithms (3s). In the studies reported in the present chapter, we only retained feature subsets which contained at least five features. In this chapter, the feature subsets of features selected by all four feature selection algorithms contained a maximum of four features; therefore, they were not retained.

We ran each algorithm using a leave-one-out cross-validation (LOO-CV) protocol. LOO-CV is a special case of K -fold cross-validation, where $K = N$, as it reduces the impact of each object on the feature selection process by increasing the generalisability of the model (Hastie et al., 2009; de Rooij & Weeda, 2020). Each data set was split into K parts or *folds*, with each fold having an approximately equal number of cases. The K th fold is then removed from the data, and the feature selection algorithm is then applied to the remaining data, with each feature being assigned a merit score (or being selected/not for CFS), once this has been repeated K times the merit score for each attribute is averaged across the K iterations.

Feature selection was carried out separately in a both a vertically distributed and *centralised* fashion. Centralised feature selection includes all features at once. In contrast, vertically distributed feature selection applies the algorithm to several distinct subsets of features, before merging the features selected in each vertical partition, to form a previously unseen feature subset, and applying the algorithm to the newly merged feature subset (see Bolón-Canedo et al., 2015b). There is evidence that this process can improve classification rates as it results in “a more balanced feature/sample ratio” reducing the likelihood of overfitting problems (Bolón-Canedo et al., 2015a, p 137). For the getting to assessment analyses the survey data were split into three sections: psychosocial, training, consolidation; and the DLOG data were split into four sections based on time post-training: DLOG experience at training (DLOG_t), DLOG

experience six months post-training (DLOG_t6), DLOG experience 12 months post-training (DLOG_t12), DLOG experience 18 months post-training (DLOG_t18). For the passing first time analyses, the survey data were split into the same three sections as for the getting to assessment analyses and the DLOG data were split into three sections: previous course experience, DLOG experience at training (DLOG_t), and DLOG experience at assessment (DLOG_a).

In this study, the combination of multiple feature selection algorithms and vertically distributed meant that we created 2s and 3s for each feature subset. We then merged the vertical partitions based on the level of agreement between the feature selection algorithms before reapplying the four feature selection algorithms to the newly merged feature subsets. For example, we combined all of the 2s across the feature subsets to form a newly merged subset and reapplied the feature selection process to this new feature subset, potentially resulting in a further two feature subsets for each classification problem (i.e., merged 2s and merged 3s).

The merging process was carried out for all feature subsets as well as for the survey-based feature subsets and DLOG based feature subsets separately. This process resulted in several candidate feature subsets to be carried forward to the classification stage of the analysis. For each classification problem, there were subsets of features selected by at least two feature selection algorithms (2s) and features selected by at least two feature selection algorithms (3s) for the following candidate feature subsets: centralised, each vertical partition of the data, merged, merged survey, merged DLOG.

3.2.4.3 Classification.

To evaluate the predictive performance of each candidate feature subset, we performed *initial classification* experiments using WEKA's Experiment Environment (Bouckaert et al., 2018; Frank et al., 2016). As in the feature selection step, classification experiments used four classification algorithms and LOO-CV given the nature of the data. We used the following classification algorithms with their default settings: Naïve Bayes (NB; John & Langley, 1995), Sequential Minimal Optimization (SMO; Platt, 1998), Instance Based Learning (IBk; Aha et al., 1991), J48 Decision Tree (J48; Quinlan, 1993). As with feature selection, the more consistent the results from each algorithm (classification accuracy) for a feature subset, the more confidence we can place

in the predictive validity of that subset. This process returned a classification rate for each feature subset and classifier.⁴ As with the approach taken by Güllich et al. (2019), we then rated each model as *excellent*, *very good*, *good*, *modest*, and *poor* based on our interpretation of the quality of discrimination based on the different percentage accuracies.

Having conducted the initial classification experiments, we sought to identify more parsimonious models, potentially with higher classification accuracies using the Recursive Feature Elimination (RFE) method (Guyon et al., 2002). This process is known as *final classification*. To complete final classification, we took each feature subset with more than five features in, examined the normalised SMO weight provided by the SMO classifier and removed the feature with the lowest weight before re-running the four classifiers on the, now smaller, feature subset. This process continued iteratively until all features with an SMO weight $< .4$ had been removed. We retained the iteration with the best classification rate as a new feature subset.

3.2.4.4 Model Selection.

The feature selection process yielded 33 getting to assessment models for both male and female candidates and 26 first time pass models. For each of the classification problems listed above, we selected the “best” models. It is necessary to recognise that these best models are not the only useful ones; however, they were the models that best classified the training data. It is also important to note that we considered the classification profile for each model, rather than just the mean score. It is not uncommon for one classifier—often J48—to perform much worse than the others. Therefore if a model performed well with three classifiers and poorly with another, that model was preferred to one that performed better on average (i.e., had a greater mean classification accuracy). For example, consider the classification profiles of the following models, Model A: NB = 85, SMO = 90, IBk = 85, J48 = 50 (mean = 77.5) and Model B: NB = 80, SMO = 80, IBk = 80, J48 = 80 (mean = 80). In this example, we would prefer Model A to Model B.

⁴It is important to note that as all of the data have been “seen” during the feature selection stage, the classification rates may be slightly higher than they would be for previously unseen data (Kuncheva & Rodríguez, 2018; Smialowski et al., 2010).

3.3 Study 2: Male Candidates Getting to Assessment

In Study 2, we sought to identify variables that could discriminate male candidates who were assessed within 18 months of their training course from male candidates who were not assessed within 18 months of their training course.

3.3.1 Method

3.3.1.1 Participants.

There were 71 responses from male candidates who completed the survey more than 18 months after their training course (i.e., retrospectively), 33 of whom had been assessed within 18 months of their training course and 32 who not been assessed at the time of completing the survey. We excluded six participants who were assessed more than 18 months post-training because the wording of the questions they answered meant that their responses were not comparable to those who had been assessed within 18 months and those who had not been assessed. Therefore, from the 65 eligible candidates, we were able to create a set of *training data* ($n = 55$), which we could use to select variables and a set of *test data* ($n = 10$), with five candidates who had been assessed 18 months after their training course and five who had not been assessed 18 months after their training course.

3.3.1.2 Analytical Method.

3.3.1.2.1 Model Testing and Validation. A further 60 male candidates completed the survey less than 18 months after their training but as of 9th June 2020, were at least 18 months post-training. These candidates formed the *validation data* set. We used the test and validation data sets to test the generalisability of models retained from the model selection step of the analysis. To do so, we used the same four classifiers as in the model selection step (i.e., NB, SMO, IBk, and J48) and rather than using LOO-CV, we used the training data to train the classifiers to predict the class of each object in the test and validation data sets. We assessed the performance of these predictions using percentage classification accuracy (as in the model selection stage of the analysis).

3.3.2 Results

3.3.2.1 Model Selection.

Using the feature selection method outlined above in Section 3.2.4.2, as noted we created 33 different feature subsets using the training data for classifying male candidates as assessed or not assessed within 18 months of their training course. To evaluate the performance of each feature subset, we carried out initial classification on all 33 feature subsets. There were 13 feature subsets that were *very good* at classifying the data. One of these was from an original feature subset, two were from the centralised feature selection, and the remainder were merged feature subsets from the decentralised feature selection. The performance of each feature subset can be seen in Appendix C Table C.1. We retained the best two of these feature subsets: the “Merged survey 2s 2s” and the “Centralised 3s” feature subsets to carry forward to the final classification step of the analysis. There were 18 unique features between the two feature subsets; six features were common to both feature subsets, and twelve features were contained in only one of the feature subsets.

For the final classification step, we carried out the recursive feature elimination process on the two feature subsets separately; Table 3.4 shows the results of this process. In the Merged survey 2s 2s feature subset only one feature was removed; IBk and J48 saw improvements in classification rates, SMO decreased in performance, and NB remained the same. We retained the RFE feature subset as it had fewer features and had a better classification profile—both in terms of average and consistency. In the Centralised 3s feature subset, again only one feature was removed, improving the performance of NB and SMO, but substantially reducing the performance of IBk, and the performance of J48 remained the same. This time, we retained the original feature subset as it had a better classification profile than the RFE feature subset. Given that neither the Centralised 3s nor Merged survey 2s 2s RFE feature subsets performed better than the other, we retained both as predictive models for the model testing and validation steps.

Table 3.4: Male candidates getting to assessment within 18 months of training, classification rates for feature subsets included in the final classification step.

Feature subset	n_{features}	Classification rate (%)			
		NB	SMO	IBk	J48
Initial classification					
Merged survey 2s 2s	17	90.91	92.73	80.00	89.09
Centralised 3s	7	85.45	89.09	90.91	89.09
Final classification					
Merged survey 2s 2s RFE	16	90.91	90.91	89.09	90.91
Centralised 3s RFE	6	89.09	90.91	81.82	89.09

Note: NB = Naïve Bayes, SMO = Sequential Minimal Optimization, IBk = Instance Based Classified, J48 = J48 Decision Tree.

3.3.2.2 Model Testing and Validation.

We tested both models selected above on the test data. Across all four classification algorithms, each model classified the test data with 90% accuracy, except for IBk in the Merged survey 2s 2s RFE model, which had a classification rate of 80%.

NB, SMO, and IBk misclassified Case 8; J48 misclassified Case 3 in both models. Case 7 was also misclassified in the Merged survey 2s 2s RFE model by IBk. The performance of these models on the test data is evidence that the models are not over-fitted to the training data as they are similar to the classification rates from the training data, thus increasing our confidence that the variables selected are important discriminatory variables.

When applied to the validation data (i.e., candidates who completed the survey 12-18 months post-training), the performance of the models was *good*, consistent across both the classifiers and models. However, it was lower than in the test data (see Table 3.5). It is important to note that validation data set included candidates who were assessed more than 18 months-post training, which neither the training nor test data sets did. Therefore, this reduction in classification accuracy may not be surprising.

Table 3.5: Male candidates getting to assessment within 18 months of training, test and validation data model performance.

Feature subset	Classification rate (%)			
	NB	SMO	IB6	J48
Test data (n = 10)				
Merged survey 2s 2s RFE	90.00	90.00	80.00	90.00
Centralised 3s	90.00	90.00	90.00	90.00
Validation data (n = 60)				
Merged survey 2s 2s RFE	71.67	76.67	75.00	70.00
Centralised 3s	73.33	76.67	76.67	66.67

Note: n = number of candidates, NB = Naïve Bayes, SMO = Sequential Minimal Optimization, IBk = Instance Based Classified, J48 = J48 Decision Tree.

To better understand the prediction errors in the validation data set, we assigned a *voted predicted class* for each candidate based on the average predicted class across the classifier ensemble⁵ for both the Merged survey 2s 2s RFE and Centralised 3s models. We then split the candidates into groups based on three factors: when the candidates completed the survey, prospectively (i.e., before an assessment) or retrospectively (i.e., after an assessment); if they had been assessed within 18 months of their training course; and if they had ever been assessed. We then calculated the percentage accuracy of the voted predicted class within the resultant groups. We used this to assess the performance of the model, rather than the classification rates of the individual classifiers. Table 3.6 shows the mean classification rates for each group by model combination.

This analysis shows that, again, both models perform approximately equally well. Both models were extremely good at classifying candidates who had been assessed within 18 months of their training course and responded to the survey after their assessment. Both models were also very good at classifying candidates who were not assessed within 18 months of their training nor had they been at the time of writing ($M_{interval} = 2.65$, $SD_{interval} = 0.1$ years; over 80% of male candidates who are ever assessed are assessed within this period (see Figure 1.2)). These groups are the same as the two groups of candidates who were included in the training and test data sets.

However, the models were less good at classifying candidates who completed the survey prospectively and were subsequently assessed. The models were moderately good

⁵We added a fifth classifier, the Multilayer Perceptron (MLP; Bishop (2006)), for these classification analyses to ensure that there were no ties amongst the predicted classes for a given object.

Table 3.6: Male candidates getting to assessment within 18 months of training, sub-group prediction model performance.

Survey completion	Assessed within 18 months	Assessed	n	Classification rate (%)	
				Merged survey 2s 2s RFE	Centralised 3s
Prospective	FALSE	FALSE	23	82.61	82.61
		TRUE	10	20.00	30.00
Retrospective	TRUE	TRUE	27	92.59	88.89

at classifying those who complete the survey prospectively and were assessed within 18 months of their training course and were extremely poor at classifying candidates who completed the survey prospectively and were assessed more than 18 months after their training course. It is important to reiterate that we excluded candidates who were assessed more than 18 months post-training from the training and test data as the wording of the questions shown to them was not comparable to those who had been assessed within 18 months, which was important for questions asking the candidate to consider the “six months before assessment.” Further, given the broader context of these analyses—trying to understand the factors that differentiate those who complete the Mountain Leader from those who do not—this poor classification accuracy may not be so important as many of the candidates that are being misclassified are those who are assessed, but more than 18 months post-training.

When candidates who were assessed more than 18 months post-training were excluded from the analysis, the classification rates for both models were 84.89%, which is much closer to the classification rates in the training and test data. These findings provide further evidence that the models are not over-fitted to the training data and are good at classifying candidates who are assessed within 18 months of their training course.

The results from this data set do allow us to place more confidence in the models selected and many of the classification errors may not be important to Mountain Training as some of the candidates who are being misclassified are still going on to be assessed (most within 24 months of their training).

3.3.2.3 Key Discriminatory Features.

Given that no single model performed better than all others, we retained two classification models for male candidates: a 16 feature model (the Merged survey 2s 2s RFE feature subset) and a seven feature model (the Centralised 3s RFE feature subset). Figure 3.2 shows the normalised group means for the training data of the 16 unique features included in the Merged 2s 2s model and Figure 3.3 shows the normalised group means for the training data of the seven unique features included in the Centralised 3s RFE model. Table 3.7 shows the unstandardised descriptive statistics for the 17 unique variables in the two models for each of the two classes separately. Both representations of the data can be considered as *stereotypical profiles* for the two classes. The features within the models must be considered holistically, as it is their combination that can correctly classify candidates, not any single feature.

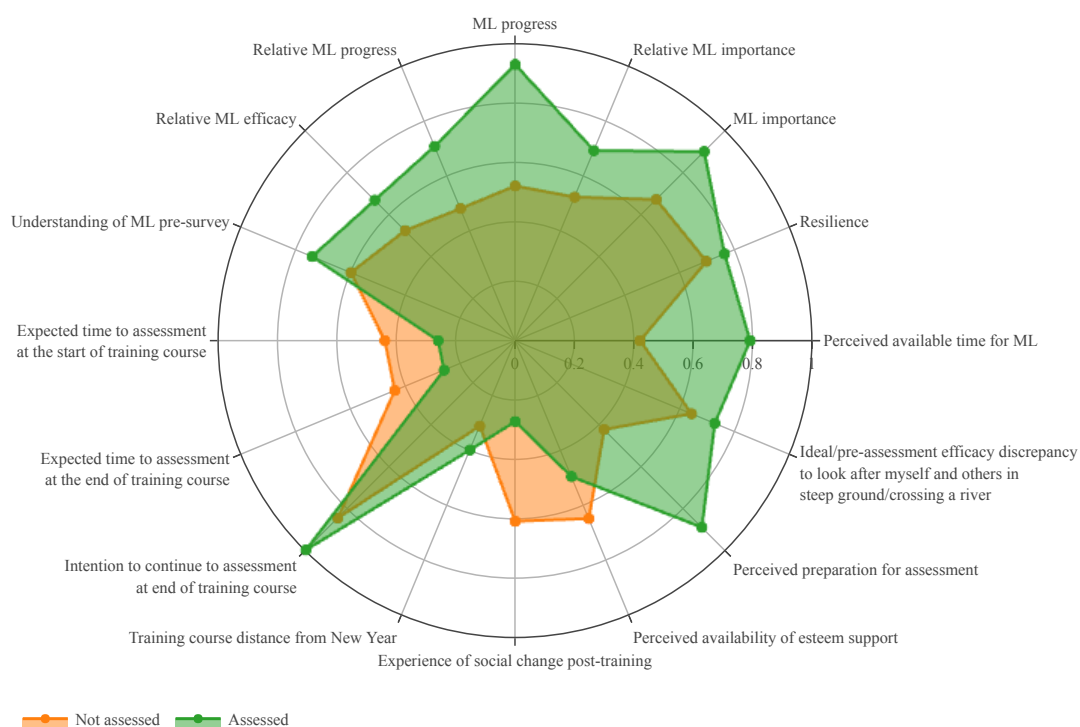


Figure 3.2: Merged survey 2s 2s RFE: Normalised training group means for male candidates getting to assessment within 18 months of their training course.

The analyses for this classification problem identified two predictive models with equal performance; the features included in one of which were a subset of the features included in the other. The models were excellent at classifying both the training and

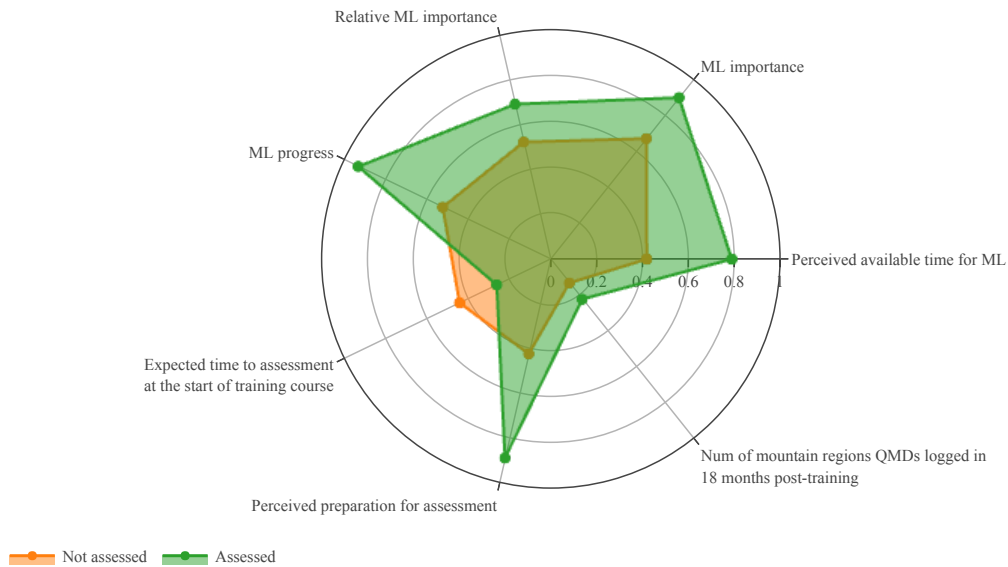


Figure 3.3: Centralised 3s: Normalised training group means for male candidates getting to assessment within 18 months of their training course.

test data, which suggests that the model developed using the training data can be generalised to previously unseen data. The models suggest that male candidates who are assessed within 18 months of their training course are more likely than male candidates who are not assessed within 18 months of their training course to

- feel that they have enough time to become a Mountain Leader
- feel more resilient
- feel that becoming a Mountain Leader is important
- feel that becoming a Mountain Leader is more important than achieving other life goals
- feel that they have made progress towards becoming a Mountain Leader.
- feel that they have made more progress towards becoming a Mountain Leader than other life goals
- have more confidence in their ability to become a Mountain Leader than to achieve other life goals
- have felt that they had a better understanding of the Mountain Leader qualification before they attended their training course
- have felt that it would take a shorter period of time to get from training to assessment, both at the start of and end of their training course

- have a greater intention to be assessed by the end of their training course
- be trained in the summer
- experience less social change post-training
- feel that they have less esteem support available
- feel that they had done more to prepare effectively for an assessment in the last six months
- feel closer to their ideal level of self-efficacy to look after themselves and others in steep-ground/crossing a river
- have QMDs logged in a greater number of mountainous regions 18 months post-training

Table 3.7: Unstandardised group descriptive statistics of the features that discriminate male candidates who are assessed within 18 months of their training course from those who are not.

Variable	Not assessed					Assessed				
	mean	median	sd	min	max	mean	median	sd	min	max
Perceived available time to become an ML ^{ab}	42.07	45.00	27.35	0.0	100.00	79.11	85.00	22.51	13.00	100.00
Resilience ^a	5.33	5.50	1.58	1.5	7.00	5.70	6.00	0.84	3.00	6.50
Importance of becoming an ML ^{ab}	68.19	69.00	25.57	1.0	101.00	91.00	94.50	11.19	66.00	101.00
Relative importance of becoming an ML ^{ab}	-21.80	-20.00	25.30	-100.0	17.00	3.54	1.00	14.99	-31.00	49.50
Progress towards becoming an ML ^{ab}	53.07	59.00	29.69	1.0	90.00	93.96	101.00	13.14	53.00	101.00
Relative progress towards becoming an ML ^a	-13.65	-12.00	33.23	-75.0	44.00	15.30	11.25	17.81	-23.00	52.50
Relative efficacy of becoming an ML ^a	-7.44	0.00	25.61	-74.0	36.00	10.95	5.50	20.79	-27.50	53.00
Recalled understanding of the qualification pre-training ^a	67.52	75.00	23.12	19.0	100.00	78.93	80.00	13.86	41.00	100.00
Expected time to assessment at start of training ^{ab}	16.93	12.00	9.48	2.0	36.00	10.82	12.00	4.40	3.00	24.00
Expected time to assessment at the end of the training course ^a	16.93	12.00	9.48	2.0	36.00	10.82	12.00	4.40	3.00	24.00
Intention to complete at the end of training ^a	87.89	100.00	22.74	22.0	100.00	99.75	100.00	1.00	95.00	100.00
Training course distance from New Year ^a	-0.38	-0.35	0.44	-1.0	0.37	-0.21	-0.14	0.59	-0.99	0.99
Experience of social change post-training ^a	60.81	70.00	33.86	0.0	100.00	27.25	7.50	33.75	0.00	94.00
Perceived availability of esteem support ^a	3.59	4.00	1.05	1.5	5.00	2.98	3.00	1.12	1.00	5.00
Perceived preparation in the last six months/six-months before assessment ^{ab}	42.33	32.00	33.69	0.0	100.00	88.89	91.00	13.22	48.00	100.00
Difference between ideal and pre-assessment efficacy to look after myself and others in steep ground/crossing a river ^a	-13.30	-9.00	17.97	-57.0	11.00	-7.54	-5.50	8.20	-25.00	0.00
Number of mountain regions QMDs logged in 18 months post-training ^b	13.44	14.00	12.26	0.0	49.00	22.54	17.00	20.60	0.00	101.00

^a Included in the merged survey 2s 2s RFE model

^b Included in the centralised 3s model

3.3.3 Discussion

We identified two predictive models that were both very good at correctly classifying the training data (up to 90.91% accuracy) and test data (up to 90% accuracy) for male candidates getting to assessment within 18 months of training. These models were also able to predict if male candidates who completed the survey more than 12 months, but less than 18 months post-training would be assessed within 18 months of their training with good accuracy (up to 76.67%). Below we discuss the variables selected and then the performance of the models on the test and validation data sets. We have grouped the variables selected as important discriminatory variables for male candidates getting to assessment within 18 months of their training course into three categories to facilitate discussion of the results: *context*, how becoming a Mountain Leader fits into a candidate's life; *self-efficacy and resilience*, how confident a candidate is that they can become a Mountain Leader and perform assessment-related tasks and how well they bounce back from setbacks; and other.

3.3.3.1 Features selected.

3.3.3.1.1 Context. Several variables relating to how becoming a Mountain Leader is situated in the broader context of male candidates' lives were important for discriminating male candidates who had been assessed 18 months post-training from male candidates who had not been. The attitudes of a candidate towards being assessed will likely be informed by the importance of becoming a Mountain Leader, their understanding of the qualification, and the time they expect it will take them to get from their training course to an assessment. Put another way, how a candidate feels that becoming a Mountain Leader will fit into, or even enable, their life may influence their attitude towards being assessed. In addition, the amount of time that candidates feel they have available to become a Mountain Leader in and their perceived efficacy to become a Mountain Leader will likely influence their perceived behavioural control. The *theory of planned behaviour* (Ajzen, 1991; Ajzen & Madden, 1986) provides a useful framework for discussing many of these variables. According to the theory of planned behaviour, the attitudes and perceived behaviour control formed by these variables would form a candidate's intention to be assessed. In addition to this, there is evidence in the personal goal literature that goal importance influences how committed to a goal

an individual will be (Gollwitzer, 1993) and that individuals will engage in task-relevant behaviours when they feel that the task is important (e.g., Ingledew et al., 2005; Yukl et al., 1999, 1996).

Candidates reported their intention to be assessed at various stages of the pathway (at registration, at the start of their training course, and at the end of their training course), but only their intention to be assessed at the end of their training course was selected as an important discriminatory variable. Not all candidates have a good understanding of the Mountain Leader qualification and therefore may be attending a training course to find out more about the qualification (see also Section 2.3.1.1.1.2). This understanding may influence candidates' attitudes towards being assessed, and it is also likely to influence their intention to be assessed. Therefore, we would suggest that the strength of a candidate's intention to be assessed at the end of the training course is more important than their intention at the start of the training course because it is based on a more accurate and complete understanding of the qualification.

Candidates who had not been assessed when they responded to the survey were also asked to report their intention to be assessed at that point in time ($n = 334$). Analysis of these data (reported in Appendix D) suggests that candidates with a greater intention to be assessed were more likely to be assessed six months after answering the survey than those who reported a lesser intention to be assessed. These results support the hypothesis, from the theory of planned behaviour, that intentions cause behaviours rather than this feature having been selected due to attribution bias.

Whilst the observation that candidates who expect it to take them longer to get from training to assessment were less likely to be assessed within a given period may seem elementary, it is important to note that, of the 27 candidates not assessed within 18 months of their training in the training data, only 10 expected it to take them more than 18 months. One reason for candidates expecting it to take them longer to get from training to assessment may be that they feel they have less available time to become a Mountain Leader than those who expect it to take less time. We were unable to test the direction of this hypothesis with the data from the present study, but it would seem more likely that the less time a candidate feels they have available to become a Mountain Leader, the longer they would expect it to take them to get to an assessment,

rather than thinking that they do not have time available to become a Mountain Leader because they expect it to take them longer to get to assessment.

In addition, there is a substantial body of evidence that suggests that goals that are proximal in time are more likely to be adhered to (see Hardy et al., 1996; Weinberg & Gould, 2014), therefore we would expect candidates who expect to be assessed sooner to be more likely to get to assessment than those who expect it to take a longer time. Further, experiencing social change after a training course may mean that candidates have more or less available time and/or change their importance in becoming a Mountain Leader. The question used in the survey did not ask if candidates had more or less of a given resource (e.g., available time) because of this change; however, given that more social change a candidate experienced, the less likely they were to be assessed within 18 months, it would be reasonable to assume that these social changes are more likely to leave candidates with less, rather than more, resources to become Mountain Leaders. If candidates who expect to take longer do take longer, then there will be more opportunities for barriers to prevent them pursuing and/or attaining that goal. Indeed, experiencing social change may be one reason for the observed difference between expected and actual times to assessment from training.

3.3.3.1.2 Self-Efficacy and Resilience. Self-efficacy theory (Bandura, 1977, 1982) may also be useful in understanding the relationships between some of the variables selected as important discriminatory variables (n.b., Ajzen, 1991, suggested that perceived behavioural control is similar to the construct of self-efficacy). The data presented in Table 3.7 show that, on average, male candidates who were assessed within 18 months of their training course felt more confident in their ability to become a Mountain Leader than they did to achieve other personal life goals, whilst those who were not assessed felt less or equally confident, in their ability to become a Mountain Leader in comparison to other personal life goals. As outlined in Table 3.1, higher levels of self-efficacy have been associated with higher levels of goal progress, task engagement, goal commitment for self-set goals, and on-task effort.

Goals that are too difficult or unrealistic may not be accepted (Kyllo & Landers, 1995). Further, goals that are too difficult may be perceived as threatening; therefore, strong self-efficacy to meet goals is important for sustained motivation (Bueno et al., 2008). The importance of strong self-efficacy when goals are difficult may suggest that if

candidates had lower levels of self-efficacy, they could have felt the goal of becoming a Mountain Leader was too difficult or unrealistic. Consequently, it would be less likely that they had sustained motivations and is one explanation for candidates with higher rather than lower scores on self-efficacy constructs getting to assessment within 18 months of their training course.

In addition, there is evidence in the literature that self-efficacy and goal importance interact in such a way that when goal importance is low, self-efficacy has a weaker effect on goal progress, including in situations where multiple goals are considered (e.g., Beattie et al., 2015; Kernan & Lord, 1990; Orbell et al., 2001; Schmidt & DeShon, 2007; Schmidt et al., 2009; Schmidt & Dolis, 2009). Beattie et al. (2015) showed that self-efficacy predicted goal progress when goal importance was high and had no effect when goal progress was low. Considering this finding in relation to the present data, we suggest that the more important a candidate feels it is that they become a Mountain Leader, (a) the more committed they will be to achieving it, (b) the more they will engage in task-relevant behaviours (e.g., preparing for an assessment), and (c) that goal progress would be greatest amongst candidates who felt it was both important that they became a Mountain Leader and also felt that they were able to.

This explanation is congruent with the results discussed above (Section 3.3.3.1.1), where candidates who feel that becoming a Mountain Leader fits into their life are more likely to have been able to commit resources towards preparing for a Mountain Leader assessment. It seems reasonable to suggest that the more resources that a candidate has put towards becoming a Mountain Leader, the higher their levels of self-efficacy will be because they have done more to prepare for an assessment. Therefore, how becoming a Mountain Leader fits into a candidate's life may have an indirect effect on their self-efficacy through the preparation they have or have not done for a Mountain Leader assessment.

Preparation for an assessment will likely include the deliberate practice of the skills required for candidates to look after themselves and others in steep-ground and when crossing rivers. For some candidates, these skills will be the most specialist mountaineering skills they possess, and they will have little reason, beyond passing a Mountain Leader assessment, to practice them. Unless these candidates have spent time deliberately preparing for an assessment, they will likely feel less confident than their

ideal-self would at assessment that they can successfully demonstrate these skills. Therefore, these candidates may feel that they are not ready to pass an assessment and therefore not attend one, a phenomenon described by the participants in Study 1.

Self-efficacy theory suggests that previous performance accomplishments, followed by vicarious experiences, verbal persuasion, and emotional arousal have the greatest effect on self-efficacy and negative experiences of a given magnitude will have a greater effect than an equivalent positive experience (Bandura, 1977, 1982). Candidates who have visited different mountainous regions are more likely to have encountered a range of different terrain and situations that require them to practice their skills—not limited to the specialist mountaineering skills previously mentioned. In doing so, they may have had mastery experiences in a range of settings that increased their levels of self-efficacy to become a Mountain Leader and to carry out tasks related to the assessment.

In our analyses, we used the time of year that courses took place as a proxy measurement of weather and daylight hours. We would expect that courses nearer to the New Year would have worse weather and less daylight than those nearer to the middle of the year (i.e., June/July). Given that candidates who were trained closer to the middle of the year were more likely to have been assessed 18 months post-training, we would suggest that better weather and more daylight on the training course provides candidates with a more positive experience and possibly a better learning environment. Such environments may be more conducive to mastery experiences, which would build candidates' self-efficacy. Weather data (held on CMS) and daylight hours data should be included in future studies to investigate this further.

There is a broad literature reporting the benefits of resilience (e.g., Seery & Quinton, 2016; Smith et al., 2008). Becoming a Mountain Leader is a difficult process which requires the investment of time, energy, and money and most candidates will have to deal with setbacks during this process. More resilient candidates will be better able to overcome adversity (Smith et al., 2008). For example, bad weather on a training course or changes in life circumstances that become barriers to becoming a Mountain Leader. It is also a central tenet of self-efficacy theory that people with firmly rather than weakly established self-efficacy beliefs are more resilient as the stronger self-efficacy beliefs are, the easier they are to maintain following disconfirming events (Bandura, 1997).

3.3.3.1.3 Social support. Social support is typically seen as beneficial to performance and self-confidence (Rees & Freeman, 2007). It may therefore be surprising that candidates' who were not assessed felt that they had more esteem support available to them than the candidates who had been assessed did. One explanation for this is that candidates who do not feel that they need esteem support answer this question in a different way to those who do (i.e. they do not perceive it as available). Therefore candidates who feel they need social support, score more highly and with less variation in their responses. Another explanation is that esteem support may be reinforcing beliefs around unpreparedness for male candidates, with greater levels of esteem support acting to simply reminding candidates that they are not ready for an assessment. Without further investigation, both explanations remain somewhat speculative. However, it is worth noting that findings consistent with the latter explanation, where psychological skills and strategies have paradoxical effects on performance, have been reported elsewhere in the literature (Roberts et al., 2013). Regardless, the results highlight that some support strategies might need to be used with caution. Future research could investigate the potential adverse effects of social support to understand when support strategies are appropriate better.

3.3.3.2 Model Testing and Validation.

The results from the test data set demonstrate that the three-step feature selection process applied to the training data resulted in a model that was not over-fitted to the data and can therefore be generalised beyond the training data. Interestingly, we did not observe the reduction in classification rate one may expect due to the peeking effect (Kuncheva & Rodríguez, 2018; Reunanen, 2003) in these data. We recognise that the absence of evidence is not evidence of absence, this is one of few studies that we are aware of which have used this three-step process and then tested the predictive models identified on previously unseen data (see Jones, 2019; Jones et al., 2020). However, when classifying models are unseen test-data with models developed using this approach, none of these studies has seen a reduction in the classification rates. This observation allows us to place more confidence in the three-step method when applied to similar classification problems (i.e., classification problems using multifaceted, short and wide data sets).

There are three main reasons the classification rates for the models when applied to the validation data may be lower than in the training and test data. Firstly, in the training and test data candidates who had been assessed more than 18 months post-training were excluded from the analyses. Secondly, we collected the validation data from candidates who had completed their training less than 18 months before training; these candidates were not at the same point in the pathway when they answered the survey, like those included in the training and test data were. Therefore, their answers may have been different from those they would have given six-months later, which would be particularly important for variables that asked candidates about the last six months. For example, a candidate may not have felt that they had made much progress towards becoming a Mountain Leader 6-12 months post-training and then may make progress in the 12-18 month period. Finally, it is possible that candidates are creating narratives in their minds based on whether they have been assessed and that had they answered the survey before being assessed, then their answers may have been different.

The performance of the two models on the training, test, and validation data sets allows us to place confidence in the importance of the features included in the models for discriminating male candidates who are assessed within 18 months of their training course from those who are not.

3.4 Study 3: Female Candidates Getting to Assessment

3.4.1 Method

3.4.1.1 Participants.

We collected the data for this analysis from 27 candidates who had been assessed 18-months after their training and 27 who had not. We received fewer responses from female candidates and were, therefore, unable to have separate test or validation data sets. In each group, 10 candidates completed the survey retrospectively (i.e., more than 18 months post-training) and 17 who completed the survey prospectively but had completed their training at least 12 months before (i.e., 12-18 months post-training).

3.4.2 Results

Using the same feature selection method as for male candidates, we created 37 feature subsets using the training data, which we then used to perform the initial classification procedure. As in the male candidates' data, there was no single standout feature subset, in this instance, two feature subsets (Merged survey 3s 2s and Merged 3s 3s) classified the training data approximately equally well. These two feature subsets were “very good” at classifying the training data and contained 31 unique features; five features were included in two of the feature subsets. Table C.2 shows the classification rates for all feature subsets included in the initial classification step.

Both feature subsets were carried forward to the final classification step of the analysis. We removed seven features from the Merged survey 3s 3s feature subset, improving the classification rate of all four classifiers, and we removed three features from the Merged 3s 3s feature subset. However, this process did not improve the performance of any classifier; rather, it reduced the performance of two of them (see Table 3.8). We retained the Merged survey 3s 2s RFE model (Figure 3.4) and the Merged 3s 3s (Figure 3.5) feature subsets as predictive models. Table 3.9 shows the unstandardised descriptive statistics for the 22 unique variables in the two models, for each of the two classes separately.

Table 3.8: Female candidates getting to assessment within 18 months of training, classification rates for feature subsets included in final classification.

Feature subset	n_{features}	Classification rate (%)			
		NB	SMO	IBk	J48
Initial classification					
Merged survey 3s 2s	23	87.50	92.86	85.71	78.57
Merged 3s 3s	14	92.86	92.86	92.86	94.64
Final classification					
Merged survey 3s 2s RFE	14	94.64	94.64	85.71	80.36
Merged 3s 3s RFE	11	91.07	92.86	91.07	94.64

Note: NB = Naïve Bayes, SMO = Sequential Minimal Optimization, IBk = Instance Based Classified, J48 = J48 Decision Tree.

The two models retained include 22 features; both of the models included six of the 22 features, and 16 features are unique to a single model (nine of which were DLOG variables, therefore could only be included in one model). This level of overlap between the models allows us to place more confidence in the importance of the features included

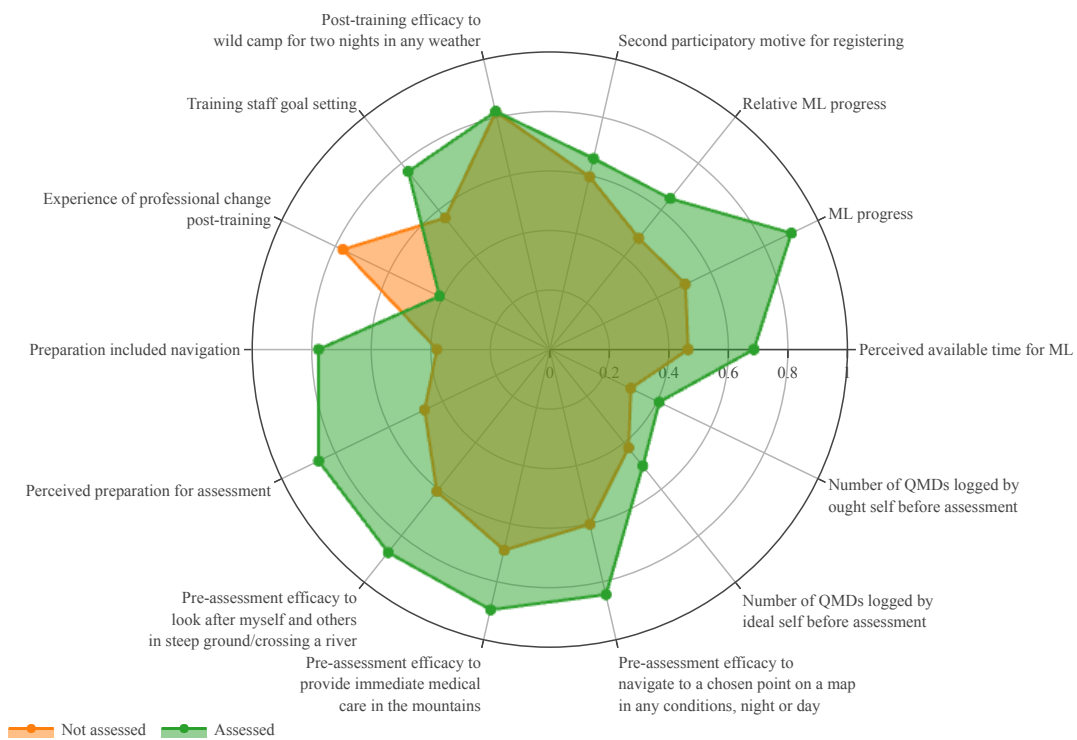


Figure 3.4: Merged survey 3s 2s: Normalised training group means for female candidates getting to assessment within 18 months of their training course.

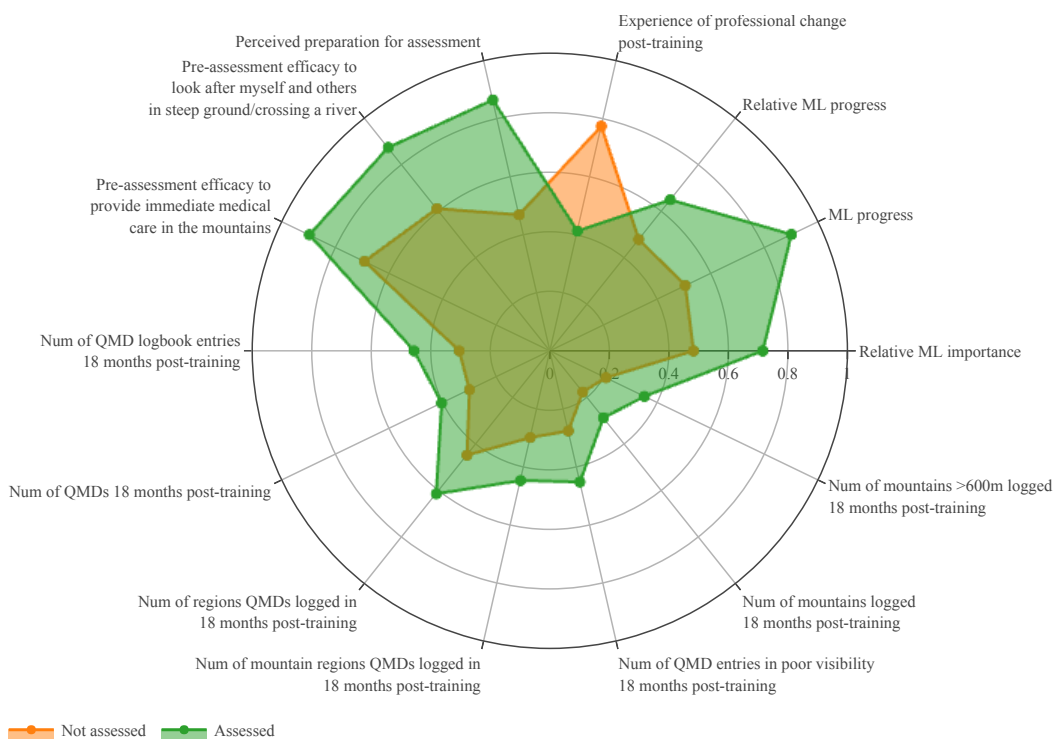


Figure 3.5: Merged 3s 3s: Normalised training group means for female candidates getting to assessment within 18 months of their training course.

in them. The features contained in the two models retained suggest that female candidates who are assessed within 18 months of their training course are more likely than female candidates who are not assessed within 18 months of their training course to

- feel that they have enough time to become a Mountain Leader
- feel that becoming a Mountain Leader is important
- feel that becoming a Mountain Leader is more important than achieving other life goals
- feel that they have made progress towards becoming a Mountain Leader
- feel that they have made more progress towards becoming a Mountain Leader than other life goals
- feel that their training course staff helped them to set goals
- feel more confident at the end of training that they could wild camp for two nights in any weather
- experience professional change post-training
- have an extrinsic second participatory motive for registering
- feel that they have done more to prepare for an assessment in the last six months
- have practised their navigation skills
- feel more confident pre-assessment in their skills to
 - look after themselves and others in steep-ground
 - provide immediate medical care in the mountains
 - respond appropriately to an emergency
 - navigate to a chosen point on a map in any conditions, night or day
- feel that both their ideal and ought selves would have logged a greater number of QMDs pre-assessment
- eighteen months post-training:
 - have a greater number of QMD entries
 - have a greater number of QMDs⁶
 - have visited more mountainous regions to log their QMDs
 - more QMDs in poor visibility
 - summited more mountains

⁶QMD entries can span more than one day.

- summited more mountains at least 600m high

Table 3.9: Female candidates getting to assessment within 18 months of training, unstandardised group descriptive statistics

Variable	Not assessed			Assessed		
	mean	median	sd	mean	median	sd
Perceived available time to become an ML ^a	44.37	50.0	29.32	68.44	74	22.03
Progress towards becoming an ML ^{ab}	49.04	58.0	22.74	90.96	101	15.09
Relative progress towards becoming an ML ^{ab}	-15.52	-15.5	29.46	17.96	8	26.46
Relative importance of becoming an ML ^b	-29.96	-27.5	29.62	3.43	0	15.39
Second participatory motive for registering ^a	3.04	2.0	1.26	3.63	4	1.28
Post-training efficacy to wild camp for two nights in any weather ^a	90.85	98.0	13.16	85.41	100	20.66
Perception of training course staffs' "goal setting" skills ^a	6.26	6.0	2.54	8.11	9	2.52
Experience of professional change post-training ^{ab}	83.89	94.0	26.27	41.22	29	35.14
Preparation included navigation ^a	0.41	0.0	0.50	0.78	1	0.42
Perceived preparation in the last six months/six-months before assessment ^{ab}	43.19	50.0	31.84	86.30	91	17.36
Pre-assessment efficacy to...						
look after myself and others in steep ground/crossing a river ^{ab}	66.19	70.0	24.54	88.37	91	11.01
provide immediate medical care in the mountains ^{ab}	73.63	78.0	25.04	90.52	91	8.03
navigate to a chosen point on a map in any conditions, night or day ^a	63.70	67.0	25.62	85.85	90	14.87
Number of...						
QMDs logged by ideal self before assessment ^a	50.56	50.0	13.03	60.00	60	14.14
QMDs logged by ought self before assessment ^a	42.41	40.0	8.70	52.59	50	16.49
QMD logbook entries 18 months post-training ^b	13.07	13.0	7.63	21.48	21	7.89
QMDs 18 months post-training ^b	16.04	16.0	11.25	22.63	21	8.18
regions QMDs logged in 18 months post-training ^b	6.52	7.0	3.45	9.81	10	3.69
mountain regions QMDs logged in 18 months post-training ^b	12.56	13.0	7.44	20.07	20	8.82
QMD entries in poor visibility 18 months post-training ^b	4.19	3.0	3.73	7.67	7	4.39
mountains logged 18 months post-training ^b	30.93	26.0	20.15	51.11	47	32.79
mountains >600m logged 18 months post-training ^b	27.56	24.0	18.72	48.04	42	30.89

^a Included in Merged survey 3s 2s RFE

^b Included in Merged 3s 3s

3.4.3 Discussion

There were two predictive models retained that could correctly classify female candidates as having been assessed or not within 18 months of their training course with very good accuracy (up to 94.64%). There were 22 unique variables between the models, six of which were also selected in the final models for classifying male candidates.

Some of the variables discussed under the context heading for male candidates were also selected as important variables for discriminating female candidates who are assessed within 18 months of their training course from those who were not. The relationships discussed above for male candidates between perceived available time to become a Mountain Leader, perceived progress towards becoming a Mountain Leader (both absolute and relative to other life goals), the importance of becoming a Mountain Leader (both absolute and relative to other life goals), and progress towards becoming a Mountain leader relative to other life goals and getting to assessment within 18 months of training are likely to be the same for female candidates. However, there are other variables, from various stages of the pathway, that are also important for discriminating female candidates who are assessed 18 months post-training from those who are not. These additional variables can be considered under two headings: motivation and consolidation of experience (i.e., what a candidate does after their training course to consolidate what they have learnt on their training course and prepare for an assessment).

3.4.3.1 Motivation.

In this study, we asked candidates to state two reasons that they had registered for the Mountain Leader qualification (i.e., two participatory motives). For their first reason, there was little variation, and most candidates said that they had registered to become a Mountain Leader (n.b., this is an extrinsic participatory motive). Female candidates who gave an extrinsic participatory motive for their second motive (e.g., “Pass assessment.”) rather than a more intrinsic one (e.g., “To spend more time in the mountains.”) were more likely to have been assessed 18 months after their training course. This finding suggests that having more than one extrinsic participatory motive is important for candidates getting to assessment.

This finding does not fit comfortably with the traditional view that

predominantly intrinsic motives are better predictors of performance and goal persistence than predominantly extrinsic motives. However, there is evidence from the sporting domain that self-determined forms of motivation are not always the best predictors of desired outcomes (e.g., Chantal et al., 1996; Fortier et al., 1995; Güllich et al., 2019; Hardy et al., 2017a). Indeed, the pursuit of an Olympic gold medal is somewhat like the attainment of a qualification. Ultimately attaining either goal is contingent on an external reward, and one may argue that it is therefore not possible to be genuinely intrinsically motivated to attain such goals.

3.4.3.2 Consolidation of Experience.

Goal setting facilitated by course staff was also selected as an important discriminatory variable for female candidates. Goal setting has been shown to improve outcomes in several domains (see Weinberg & Gould, 2014, p 356). One way that goal setting facilitated by training course staff may have helped candidates is by enabling them to maximise the benefits of the time that they spent consolidating their skills and preparing for a Mountain Leader assessment after the training course. In addition to this, goal setting may have made it more likely that candidates would prepare for an assessment. The more specific these goals are, the more they will have focused candidates' attention and efforts towards being at the right level to pass an assessment. Further, goal setting will have helped facilitate mastery experiences; thus, this goal setting will have helped female candidates develop their confidence, which, as discussed below, is critical for female candidates getting to assessment.

Female candidates who experienced professional change post-training were less likely to be assessed 18 months post-training than those who did not. For male candidates, we suggested that experiencing social change post-training may reduce the time that they have available to become a Mountain Leader and the same point may also be true for female candidates who experience professional change. An additional consideration for those who experience professional change is that if they were pursuing the Mountain Leader qualification for work, they may no longer need to become a Mountain Leader because of work changes. Whilst this hypothesis is somewhat speculative given the lack of data to test it with, this explanation seems plausible when considered with the apparent importance of having extrinsic participatory

motivation—often for work—and would be characterised by reduced levels of extrinsic motivation and increased levels of amotivation.

Female candidates who were assessed 18 months post-training felt that they had done more to prepare for an assessment in the six months prior to their assessment than those who had not been assessed felt that they had done in the six months prior to completing the survey. In addition, they were more likely to have included specific navigation practice in their preparation. Self-efficacy theory suggests that those who have done more to prepare would be more confident in their skills. Whilst the relationship between confidence and experience may vary between individuals (Weinberg & Gould, 2014), mastery experiences will enhance one's confidence (Bandura, 1977) and, in general, the more experience one has, the more confident and competent they will be. Indeed, variables related to three different sets of skills were identified as important for discriminating female candidates who did and did not pass their first assessment: navigation, security in steep-ground, and emergency procedures. Candidates need to be competent in all three of these areas to pass an assessment.

In the Merged survey 3s 2s model (that did not include DLOG variables), the number of QMDs that a candidate felt their ideal- and ought-selves (i.e., their self-guides) would have logged before assessment were both included as important discriminatory variables. The greater the number of QMDs logged by a self-guide at assessment, the greater the discrepancy post-training. According to self-discrepancy theory, those with greater discrepancies would be more motivated than those with smaller discrepancies (Higgins, 1987) and they may therefore be more likely to prepare for an assessment. It is also possible that the more challenging goals (as represented by the self-guides) of the candidates who were assessed within 18 months of their training course were a result of them having higher levels of self-efficacy (cf. Bandura, 1986).

Due to the cross-sectional design of this study, it is not possible to empirically test the direction of causality between motives, confidence, and experience. However, we asked candidates to think about themselves at different points in time (i.e., at registration, training, and pre-assessment) whilst completing the survey and to answer the questions in relation to how they remember feeling at those time points. Assuming that candidates followed these instructions and that attribution bias did not overly influence their answers, we would suggest that their goals (as represented by their

self-guides) influenced their motivation to gain experience, as candidates who set themselves higher goals would have greater levels of motivation to reduce the discrepancy between their actual-self and their self-guides. If this greater motivation resulted in candidates gaining more experience as they prepared for an assessment, they would likely have more mastery experiences, resulting in higher levels of self-efficacy.

We conducted an additional exploratory analysis (described below) to investigate the relationship between self-guides and getting to assessment within 18 months of training. This analysis revealed that only female candidates who were not assessed within 18 months of their training course felt that their ideal- or ought-self would have logged fewer than 40 QMDs pre-assessment—the prerequisite number of QMDs that a candidate must have before passing an assessment (Mountain Training UK, 2015a)—and that all female candidates who were assessed within 18 months felt that their self-guides would have at least 40 QMDs before being assessed. In addition, female candidates who felt both of their self-guides would have logged more than 40 QMDs pre-assessment were more likely to have been assessed 18 months post-training than those who did not feel that both of their self-guides would have more than 40 QMDs at assessment. The thresholds of 40 QMDs were identified by applying a J48 classifier (with LOO-CV) to the ideal- and ought-self number of QMDs pre-assessment, which had a classification rate of 72.22% and a balanced confusion matrix. When assessed using a χ^2 -test, those who exceed these thresholds are significantly more likely to have been assessed 18 months post-training than those who do not, $\chi^2(1, n = 54) = 12.54, p < .001$.

In the model developed from the full set of features (i.e., including survey and DLOG variables), neither of the self-guide features nor the discrepancy scores between the self-guides and the number of QMDs logged 18 months post-training were selected as important discriminatory variables. However, several DLOG variables were selected; this difference in model structure suggests that actual experience is more important than goals for discriminating female candidates who have been assessed 18 months post-training from those who have not. The DLOG variables selected were all related to QMDs and no other types of experience. Candidates who had been assessed 18 months post-training had more logged experience (as represented by the number of QMDs and QMD entries), had gained that experience in a greater range of locations (the number of areas and the number of mountain regions), had logged more experience in poor

visibility, and had summited a greater number of mountains (in total and mountains higher than 600m above sea level). This set of features suggest that it is not only important that female candidates gain experience during their preparation for an assessment, but this experience should be varied and include experiences where their skills will be challenged (e.g., for example having to navigate due to poor visibility), which will provide mastery experiences that will increase their self-efficacy. Whilst the exact nature of the relationship between the features relating to candidates' navigation skills/experience and the outcome is unclear when considering self-efficacy theory and the results from Study 1, this deliberate practice likely increases female candidates' efficacy to become Mountain Leaders.

3.5 Study 4: Passing First Time

3.5.1 Method

3.5.1.1 Participants.

We collected the data used for this study from 46 candidates, 34 of whom had been assessed prior to completing the survey, and 12 of whom had not been assessed before completing the survey. [This sample comprised 12 female candidates and 34 male candidates](#). As with the data in female candidates getting to assessment, we combined the retrospective and prospective data to increase the sample size.⁷ Of the 23 candidates who did not pass, two withdrew from their first assessment, none failed, and the remainder were deferred. Seven of those who were deferred only needed to log additional days.

3.5.2 Results

The feature selection process yielded 26 feature subsets that were all carried forward to the initial classification step. Again, there was no single feature subset that out-performed the others. The two best feature subsets (Merged survey 2s 3s and Centralised 2s) were “good” at classifying the data. These two feature subsets contained

⁷This means that no variables about candidates' experience of assessment were included in the analyses. We have run the analyses on just the retrospective data, which allowed us to include some variables about candidates' experiences of assessment. However, none of these variables were selected in the best discriminatory subsets, nor were the classification rates significantly higher.

20 unique variables; six of these features are included in both feature subsets. Table C.3 shows the classification rates for all feature subsets included in the initial classification step.

These two feature subsets were carried forward to the final classification step. Two features were removed from the Merged survey 2s 3s feature subset and six features were removed from the Centralised 2s model. In both instances, this process resulted in the classification rates for two classifiers improving and one decreasing; these changes made the classification profile more consistent (see Table 3.10). On this basis, the Merged survey 2s 3s RFE model (Figure 3.6) and the Centralised 2s (Figure 3.7) were retained as predictive models. Table 3.11 shows the unstandardised descriptive statistics for each feature, retained in the two models, within the two classes.

Table 3.10: Passing first time, classification rates for feature subsets included in final classification.

Feature subset	n _{features}	Classification rate (%)			
		NB	SMO	IBk	J48
Initial classification					
Merged survey 2s 3s	8	73.91	67.39	82.61	60.87
Centralised 2s	18	76.09	69.57	82.61	60.87
Final classification					
Merged survey 2s 3s RFE	6	73.91	69.57	71.74	63.04
Centralised 2s RFE	12	82.61	78.26	73.91	60.87

Note: NB = Naïve Bayes, SMO = Sequential Minimal Optimization, IBk = Instance Based Classified, J48 = J48 Decision Tree.

The two models retained include 14 features; four features are included in both models, and ten features are unique to a single model (eight of which were DLOG features, therefore could only be included in one of the models). The features in the two classification models suggest that candidates who pass their first assessment are more likely than those who do not to

- live closer to the mountains
- feel that the training course staff were involved in their development
- experience less inter-personal conflict on their training course
- feel that their course staff used observation and effective questioning skills more often

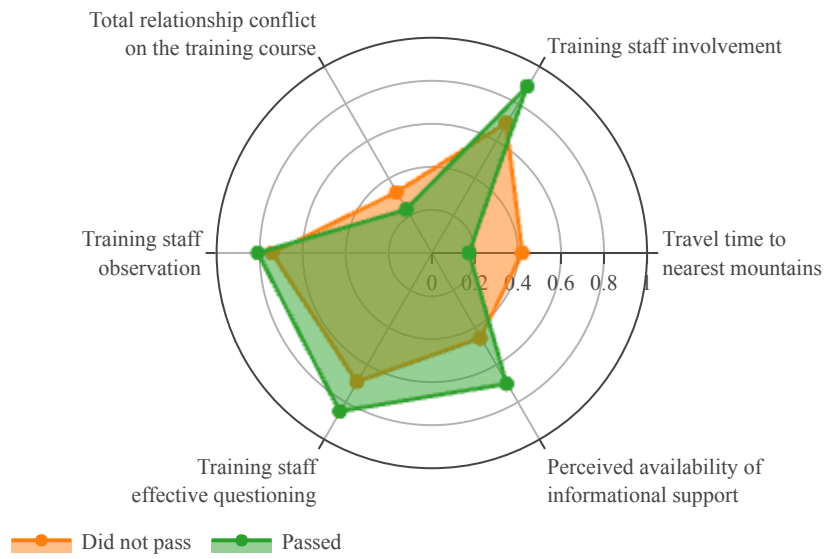


Figure 3.6: Merged survey 2s 3s: Normalised training group means for candidates passing their first assessment.

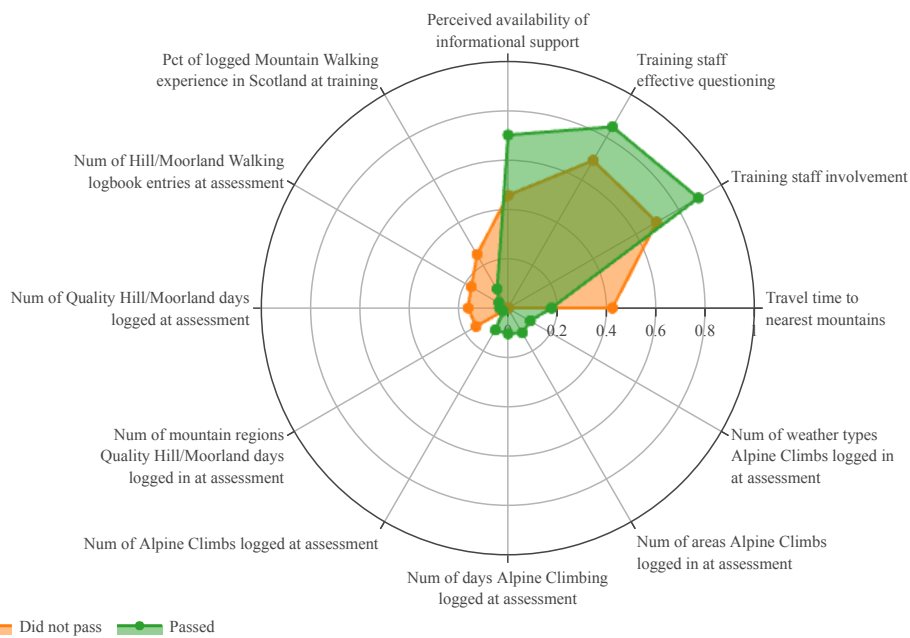


Figure 3.7: Centralised 2s RFE: Normalised training group means for candidates passing their first assessment - survey variables.

- feel that they have more informational support available to them
- log less experience below the standard for the Mountain Leader (Hill/Moorland walking) prior to assessment
- log more experience above the standard of the Mountain Leader (Alpine Climbing) prior to assessment

Table 3.11: Candidates passing first time, unstandardised group descriptive statistics

Variable	Not passed			Passed		
	mean	median	sd	mean	median	sd
Perceived travel time to the nearest mountainous region at registration ^{ab}	7.35	6	4.23	3.65	3	2.29
Perceived involvement of training staff ^{ab}	4.17	5	2.23	5.35	6	1.03
Total relationship conflict on the training course ^a	58.30	56	44.27	41.74	23	48.01
Perception of training course staffs' "observation" skills ^a	8.43	9	1.95	8.83	8	1.11
Perception of training course staffs' "effective questioning" skills ^{ab}	7.52	8	2.35	8.78	9	1.51
Perceived availability of informational support ^{ab}	2.83	3	1.15	3.80	4	1.44
Percentage of logged Mountain Walking experience in Scotland at training ^b	25.09	0	39.31	8.91	0	20.29
At assessment, number of...						
Hill/Moorland Walking logbook entries ^b	4.48	1	7.32	1.13	0	1.94
Quality Hill/Moorland days logged ^b	7.61	3	12.00	1.65	0	3.21
mountain regions Quality Hill/Moorland days logged in ^b	1.35	0	2.27	0.22	0	0.52
Alpine Climbs logged ^b	0.00	0	0.00	1.13	0	2.82
days Alpine Climbs logged on ^b	0.00	0	0.00	1.57	0	3.93
areas Alpine Climbs logged in ^b	0.00	0	0.00	0.35	0	0.88
weather types Alpine Climbs logged in ^b	0.00	0	0.00	0.52	0	1.27

^a Included in Merged survey 2s 3s RFE

^b Included in Centralised 2s RFE

3.5.3 Discussion

We retained two predictive models that could classify candidates as having passed their first assessment or not with good accuracy (up to 82.61%). None of the features selected as important discriminatory variables were included in the predictive models retained for the getting to assessment classification problems. There were 14 unique variables between the models, none of which were included in either the female or male getting to assessment models. The features included in the final models can be considered under two broad headings, candidates experience of training and their preparation for assessment.

3.5.3.1 Experience of Training.

Candidates who felt that course staff were more involved with their development, observed them more closely, and helped them to set goals and identify targets for attaining their goals were more likely to pass their first assessment than those who felt the course staff engaged in these behaviours to a lesser degree. Coaching usually aims to improve an individual's knowledge, skills, and competencies (Wagstaff et al., 2018). Course staff will engage in coaching behaviours to a greater or lesser extent, and their facilitation of candidate's development will vary accordingly. Two coaching behaviours were selected as important discriminatory variables: effective questioning and goal setting. It is important to note that candidates who did not pass their first assessment reported that their course staff did engage in these behaviours, just not to the same extent as those who did pass.

Clear and specific goals are more effective than broad/vague goals for influencing behaviour change (Gould, 2005) and by closely observing a candidate's skills, the course staff will have more information with which to help the candidate set goals. This close observation of candidates' skills would likely make them feel that their course staff were genuinely interested in their development. In addition, the use of effective questioning may encourage candidates to think and reflect on their actions, thus encouraging self-directed learning, thus supporting candidates' autonomy (Wagstaff et al., 2018).

We measured relationship conflict between candidates, and between candidates and staff on the training course and it was the total of these four items that discriminated between candidates who did and did not pass, suggesting that any conflict

experienced on a training course has a negative impact on the assessment outcome. Relationship conflict has generally been found to have negative relationships between both distal- and proximal-group outcomes (see de Wit et al., 2012). Whilst candidates on a Mountain Leader training course may only be a group for the five days of the course; they will share goals and be required to work together to complete tasks. It has been suggested that relationship conflict can distract groups from task accomplishment (Evan, 1965; Jehn, 1995). In the context of the Mountain Leader training course, this conflict may manifest as less time being spent on course content and the training staff coaching the candidates.

Candidates who felt they had more informational support available to them were more likely to have felt that they would have someone to give them advice about becoming a Mountain Leader and about performing at assessment if they needed it. In the sporting domain, perceived available support has been associated with positive effects on self-confidence and stress-buffering (Rees & Freeman, 2007), performance (Freeman & Rees, 2009), and the processes underpinning performance (Rees et al., 1999). More specifically, perceived informational support has been correlated with greater situational control, increased challenge appraisal, decreased threat appraisal, and better performance (Freeman & Rees, 2009). When considering the findings of Study 1, it would be reasonable to expect that informational support may also help candidates to understand the (sometimes fuzzy) concept of “the standard” required for assessment. Understanding this would then help candidates better plan their preparation for assessment.

3.5.3.2 Preparation for Assessment.

Interestingly, no QMD variables were selected in the final models. However, Hill/Moorland Walking, Mountain Walking, and Alpine Climbing variables were selected. Hill/Moorland Walking and Mountain Walking are types of mountaineering experience that do not meet the standard for a QMD because of the terrain that they cover, or because there has not been sufficient challenge to develop candidates Mountain Leader skills and therefore do not qualify as a QMDs. In contrast, Alpine Climbing is considered beyond the scope of the Mountain Leader qualification but does include terrain that will develop skills relevant to the Mountain Leader assessment (e.g., moving

safely in steep-ground). One explanation for no QMD variables being included in the final models is that candidates with little experience may include all of their experience, whilst those who have a plethora of experience may only include enough in their logbook to meet the course prerequisite, leaving the majority of their experience unlogged. Thus, making it impossible to differentiate the highly experienced from those with little experience using QMD data alone; however, we would suggest that by using other DLOG variables, it is possible to do just that.

The results presented above suggest that candidates who include Hill/Moorland Walking and Mountain Walking in their DLOG are less likely to pass their first assessment. Whilst it is unlikely that this type of experience is detrimental to candidates' performance at an assessment, its inclusion in their logbooks may indicate that these candidates have less experience and feel their logbook is weak. Therefore, they want to include as much experience as they can to “pad” their logbook out. In contrast, Alpine Climbing experience may be considered as an indicator of a candidate with more mountaineering experience—which may or may not be logged. These candidates may have logged this experience as it is important for higher-level qualifications. These findings support the results of Study 1, which suggested that the quantity, quality, and variety of experience candidates had when they were assessed were all important for discriminating those who did pass from those who did not. Further, the findings suggest that having the right quality of experience is vital and that lower-quality experience is not a suitable substitute and that experience of mountaineering at a level higher than the Mountain Leader qualification may be beneficial to candidates.

Seven of the 23 candidates who did not pass their first assessment were only deferred because they had too few QMDs in their logbook at assessment.⁸ It is important to highlight that the features presented here discriminate between candidates who do and do not pass their assessment, not between candidates who are and are not good enough to pass a Mountain Leader assessment, in terms of their skills and decision making. If we removed these particular candidates from the sample, we would have too few cases to perform the analysis. Therefore, it is difficult at this juncture to answer the question “Is having more than the minimum experience beneficial for passing a Mountain Leader assessment?” If anything, the fact these candidates were able to

⁸Candidates who are deferred must be reassessed; however, when they are deferred for not having enough experience at assessment, their reassessment is simply presenting an assessor with an updated logbook.

perform at the standard required at assessment is evidence that one can pass the practical element a Mountain Leader assessment with fewer than 40 QMDs. Further, these candidates not passing only because of their logbooks is likely to be a contributory factor to the lower classification rates in the passing first-time analyses than the getting to assessment analyses.

Candidates who live further from the mountains were less likely to pass; of the 12 candidates who lived more than 16 hours from the nearest mountains, only one passed their first assessment (8.33%), whereas, of the 34 candidates who lived within six hours of the nearest mountains, 22 passed their first assessment (64.71%). Living further from the mountains may mean candidates are not able to travel to the mountains as frequently and may not be able to spend as long there when they do travel. This potential barrier may result in candidates logging more experience that is not as relevant (e.g., Hill/Moorland Walking) or not of the requisite quality (e.g., Mountain Walking) during their preparation for an assessment.

3.6 General Discussion

3.6.1 Overview

In this chapter, we aimed to identify important factors that discriminated candidates who (a) having been trained, went on to be assessed within 18 months of training from those who did not (for female and male candidates separately); and (b) having got to their first assessment, pass first time from those who do not. To achieve these aims, we considered a wide range of potentially relevant variables (informed by the results of Study 1) and used pattern recognition analyses to analyse data collected from candidates. The use of the pattern recognition analyses allowed us to account for the multifaceted nature of becoming a Mountain Leader by considering variables from several domains: personality, socio-demographics, intentions and expectations, motivation, the experience of training, experiences post-training, social support, self-efficacy, and experience of assessment if relevant.

We were able to identify appropriate predictive models for all three classification problems. The results presented above suggest that there is no one single factor that is important for discriminating candidates, but there are combinations of factors that are

important. Whilst there is some overlap between the factors selected in the classification problems, there are factors unique to each problem. It is important to reiterate that the variables included in these models are the best discriminatory variables. Therefore, there may be other variables that are not included in the models but are very important for candidates getting to an assessment/passing their first assessment. For example, none of the variables included as important discriminatory variables are included in either of the first time pass models, but it is likely that to pass their first assessment, candidates must possess both the characteristics identified as important in the first time pass analyses *and* the characteristics identified as important for getting to assessment.

It is important that becoming a Mountain Leader fits into the broader context of a candidate's life for them to get to an assessment. This will allow them the time to prepare effectively for an assessment, likely resulting in them having higher levels of self-efficacy that they can become a Mountain Leader and perform tasks that will be required of them at assessment. Preparation for assessment seems particularly important for female candidates and training course staff may be able to help candidates maximise the benefits of their preparation by helping candidates to set personalised goals, which may be tailored to the candidate's life context. Further, it appears that it is important that this experience is varied and not all gained in the same area, but also that it is relevant to the Mountain Leader qualification. Experiencing changes in life may "derail" candidates' progress towards becoming a Mountain Leader and therefore could be considered as career turning points, especially if this change precipitates an alteration in the relative importance of becoming a Mountain Leader. It was important for candidates who did get to an assessment to have had a positive experience of their training course, that would help them to understand what they needed to do to prepare for an assessment, and then to have done so, (i.e., to have prepared effectively by gaining suitable and sufficient experience) to pass the assessment.

3.6.2 Applied Implications

If candidates leave their training course wanting to be assessed (i.e., they are motivated) and they can prepare effectively for an assessment, they are more likely to be assessed. Any plan for getting to assessment that a candidate creates should consider how becoming a Mountain Leader fits into the rest of their life as this is clearly very

important. Such a process needs to include consideration of other life goals, how much time candidates feel they have available to prepare for an assessment, and how easy it is for them to access the mountains. These considerations must be made as if a plan is unrealistic, it is unlikely to be followed, and failure to attain goals will have a negative impact on candidates' motivation and confidence. Similarly, it is important that candidates who experience changes in their life reconsider their plan, as the changes they have experienced may then make the plan unrealistic.

Candidates' plans for consolidation should include goals that provide them with the opportunity for mastery experiences. When set in conjunction with course staff who can provide structure, these goals will offer candidates the opportunity to experience success as a result of good performance, which should increase their level of confidence to perform tasks related to passing a Mountain Leader assessment. Course staff may benefit from additional training, aimed at enhancing their coaching skills and helping them to provide a need supportive environment for their candidates.

3.6.3 Methodological Considerations

The strengths of this study include the broad range of variables considered, the rigorous development of a survey tool to measure these variables, and advanced statistical analyses. However, we recognise that several limitations can be identified in this project. Firstly, most of the data used were collected retrospectively. Retrospective data will be less accurate as time increases between the event and when participants are sampled (Hopwood, 2013), and people may create their own narrative retrospectively, which may or may not reflect reality. An example of this could be a candidate who did not pass their first assessment attributing their failure to the coaching (or lack thereof) they received on their training course. Some questions in the survey tool were quite complex and related to specific time points. Therefore, where possible, we used decomposition techniques like those found in The World Health Organization Health and Work Performance Questionnaire (HPQ; Kessler et al., 2003) to improve response accuracy and reduce the potential impact of recall bias.

Secondly, there is some evidence of sampling bias in the data used to identify the important discriminatory factors for both getting to assessment and passing. The proportion of female and male candidates who did get to assessment within 18 months

of their training course is not the same in the retrospective data (females = 23.21% and males = 41.35%) as it is in the population of candidates trained in the same period (females = 19.02% and males = 30.22%). In addition to this, the proportion of males who did not pass their first assessment is not the same in the retrospective data (13.50%) as it is in the prospective data (19.60%) or in the population⁹ (19.80%); there is no evidence of the same problem in the data collected from female candidates. The simplest explanation for this is that candidates who are not assessed and male candidates who do not pass their first assessment are less likely to respond to the survey *retrospectively*. Whilst there may be a subset of candidates who are not represented in the data collected as part of this project, we believe that the findings presented in this chapter can be used to make a positive impact on the completion rate of the Mountain Leader qualification. This belief is based not only on the analyses of retrospective and prospective data presented here but their congruence with the results from Study 1 and existing literature.

3.6.4 Future Directions

The nature of the data and classification problems mean that as time passes, further analysis of the data is possible, as more candidates are further in time from their training course. For example, in the future, it will be possible to analyse the data to understand which factors are important for discriminating candidates who have been assessed five years post-training from those who have not been. We would also suggest that further analysis of these data in the future should go some way to mitigating the sampling bias mentioned above, as the response rate in the prospective data is similar to that in the population and reduce the impact of recall bias. However, a truly prospective study that collected data from candidates at registration, training, and during their consolidation would likely overcome the limitations described above.

The results presented in this chapter suggest that both experience and self-efficacy are important for both female and male candidates at various stages of the pathway. However, based on the number of relevant variables selected, both experience and self-efficacy appear to be more important variables for discriminating female candidates, rather than male candidates, who are assessed within 18 months of their

⁹Candidates who were first trained after 2016.

training course from those who are not. It would be useful for future studies to consider the nature of the relationship between experience and self-efficacy and potential gender-differences, this would not only be useful for developing the Mountain Leader qualification but may also be useful for better understanding the relative magnitude of the effects of positive and negative experiences on self-efficacy.

3.7 Conclusion

From up to 529 features, we were able to identify predictive models of no more than 16 variables, that could correctly classify candidates with up to 94.64% accuracy, based on three different outcome variables with good to excellent accuracy. The discriminatory variables included in these models covered several different temporal aspects of the training pathway and related to both candidates and course staff. This study supports the view of previous research that the development of expertise is multifaceted and complex.

In order to become a Mountain Leader, these findings suggest that it is important that candidates feel that becoming a Mountain Leader is an important goal, can prepare effectively for an assessment including gaining relevant experience, feel confident that they can perform Mountain Leader related tasks at an assessment, and have a positive experience of the training course. These findings leave Mountain Training with several areas to focus their efforts if they wish to improve the completion rates of the Mountain Leader qualification (e.g., training course staff to improve their coaching behaviours; helping candidates to set appropriate and realistic goals, thereby increasing the number of opportunities for mastery experiences and thus, their progress towards becoming a Mountain Leader).

Chapter 4

Self-Efficacy and Quality Mountain Days

4.1 Introduction

An individual's level of self-efficacy reflects their level of confidence that they can perform a specific task successfully at a given moment in time (Bandura, 1977).

According to self-efficacy theory, if one possesses the necessary skills and is sufficiently motivated, their level of self-efficacy will be the primary determinant of performance, effort, and persistence—especially in the face of adversity (Bandura, 1977, 1982, 1997).

Self-efficacy theory posits that there are four main sources of efficacy information, in order of decreasing influence on efficacy-beliefs: (a) previous performance accomplishments, (b) vicarious experience/modelling, (c) social/verbal persuasion, and (d) physiological/emotional states (Bandura, 1982). Evidence supports the influence of performance accomplishments on efficacy, with, a recent meta-analysis, Sitzmann & Yeo (2013) showing previous performance to have a moderate to strong effect on efficacy-beliefs ($\rho = .18 - .52$). As self-efficacy theory has been introduced previously (see 1.8 General Introduction), we will not repeat details here.

The findings of Chapter 2 suggested that it was important that both female and male candidates were confident in their skills for them to become Mountain Leaders. Moreover, the findings suggested that female candidates needed to be more confident than male candidates did before being assessed. Further, the results of Chapter 3 suggested that candidates' self-efficacy to perform specific skills relating to the

Mountain Leader qualification were important variables for discriminating both female and male candidates who did and did not get to an assessment within 18 months of their training course. However, more self-efficacy variables were important for discriminating female candidates than were important for discriminating male candidates. In addition, the findings from Chapter 3 also highlight the importance of experience. Mountain Training require candidates to have a prerequisite level of specific experience before being assessed (40 Quality Mountain Days [QMDs]), and in Chapter 3, some experience related variables (e.g., QMDs 18 months post-training) were important for discriminating candidates who were assessed 18 months post-training from those who were not. As with the self-efficacy variables, more experience related variables were important for discriminating female candidates who were assessed from those who were not than they were for male candidates.

Whilst there are no previous studies on gender differences in self-efficacy within the Mountain Leader community, research in education has examined the effects of gender on self-efficacy for over 30 years and has reported that females have lower levels of self-efficacy than males (e.g., Murphy et al., 1989; Klassen & Chiu, 2010). The field of computer education, in particular, has considered the relationship between experience, gender, and self-efficacy. For example, several studies have examined the effects of gender and training on self-efficacy (e.g., Cassidy & Eachus (2002), Murphy et al. (1989), Torkzadeh & Koufteros (1994)). Torkzadeh & Koufteros (1994) considered the effects of gender and training on four factors of computer self-efficacy: beginning skills, mainframe skills, advanced skills, and file management. Torkzadeh & Koufteros (1994) found evidence for gender differences pre-training for one factor of self-efficacy; females reported lower self-efficacy scores on the file management factor pre-training. Both female and male participants reported increased levels of self-efficacy post-training for all four factors and there was no longer a significant difference in their scores for any factor.

Interestingly, the difference in file management self-efficacy between female and male participants was no longer significant post-training, suggesting that there may be an interaction between gender and training time point on file management self-efficacy, where the effect of training was more positive for female participants (although the authors did not test for the presence of interactions directly). In addition, results reported by Cassidy & Eachus (2002) suggest that male rather than female participants

have higher levels of self-efficacy pre- and post-training, but do not appear to control for previous experience in their analyses, despite reporting that male candidates “were more experienced” than their female counterparts. However, when examining these articles, it would appear that an important variable—experience—has potentially been overlooked when considering gender differences in self-efficacy.

When considering the results of the previous two chapters through the lens of self-efficacy theory, it is apparent that the relationship between confidence and experience is likely to influence the likelihood of a candidate becoming a Mountain Leader. Further, this relationship is likely more important for female than male candidates. Based on the results of the previous chapters and the computer education studies presented above, it seems reasonable to hypothesise that (a) candidate experience will positively predict their level of self-efficacy because experience increases the opportunity for performance accomplishments, and (b) that this relationship will be influenced by gender. More specifically, this positive relationship should be stronger for female candidates than males.

Therefore, with this interaction perspective in mind, the aim of the present chapter was to investigate the relationship between experience and gender differences on Mountain Leader related self-efficacy. To do so, we used the data collected for the work reported in Chapter 3 and Appendix B. The remainder of this chapter is structured as follows. Firstly, we present Study 5, which reports on the development and initial validation of a measure of self-efficacy for skills related to becoming a Mountain Leader using participants from Appendix B. Following that, in Study 6, we used the measure created in Study 5 to examine the relationship between self-efficacy, experience, and gender using participants from Chapter 3. Participants in Appendix B completed their first Mountain Leader training course between 2008 and 2016, whereas participants in Chapter 3 completed their first Mountain Leader training course in either 2017 or 2018. The availability of digital logbook (DLOG) data is greater the more recently a candidate was trained. Therefore, we used the data from participants in Appendix B for Study 5 and data from participants in Chapter 3 for Study 6. Finally, we discuss these two studies and consider future directions for this research.

4.2 Study 5: The Mountain Leader Self-Efficacy Scale

Self-efficacy is domain-specific. Therefore, it is important that any measure of self-efficacy is also domain-specific (Bandura, 2006). There is no existing measure of Mountain Leader self-efficacy, however, in Chapter 3 we developed 11 self-efficacy items for skills that candidates would be required to perform at an assessment based on the Mountain Leader candidate handbook and syllabus (Mountain Training UK, 2015a), and a separate skills checklist (Mountain Training UK, 2015b). Therefore, the aim of Study 5 was to develop self-efficacy measure using these 11 items and provide initial evidence for its validity.

4.2.1 Methods

4.2.1.1 Participants.

Participants for Study 5 were 526 candidates who had attended a Mountain Leader training course between 2008 and 2016 and completed the survey used for the Chapter 3 pilot work (21.67% female, M_{age} 39.14 years, $SD = 11.98$, 72.24% had been assessed when completing the survey).

4.2.1.2 Measures.

The initial Mountain Leader Self-efficacy Scale (MLSS) comprised 11 items developed by WH using an inductive content analysis (Cho & Lee, 2014) of the candidate handbook and syllabus (Mountain Training UK, 2015a) and skills checklist (Mountain Training UK, 2015a). WH then checked these items with the RR and LH, with any disagreements being discussed until a consensus was reached. Finally, Mountain Training viewed the items and agreed that they provided good coverage of the skills that would be covered on an assessment and were worded in a way which would be understood by their candidates. The final scale was made up of 11 items (e.g., “lead a group effectively in the mountains”) rated on a scale of *could not do at all* (0) to *highly certain could do* (100) with a mid-point anchor (*moderately could do*; 50). For those candidates who had been assessed, we asked them to think about how confident they

were when they arrived for assessment. We asked candidates who had not been assessed how confident they were when completing the survey.

4.2.1.3 Analyses.

We used an exploratory approach to confirmatory factor analysis with a robust maximum-likelihood estimator using the R package `lavaan` (Rosseel et al., 2020). A model was considered a good fit to the data if the Yuan-Bentler (Y-B; Yuan & Bentler, 1997) χ^2 test was not-significant. However, given that this is a test of exact fit, many researchers suggest that it is overly conservative and is often significant when performing CFAs on large samples. Thus, Jöreskog (1989) recommends inspecting the χ^2/df ratio to assess model fit, with values < 2 indicating good model fit. In addition to the χ^2/df ratio, we also evaluated several approximate fit indices and considered the model an approximately good fit if it satisfied the following criteria: the comparative fit index (CFI; Bentler, 1990) was greater than or equal to .95, the root-mean-square-residual (RMSEA; Steiger, 1990) was less than or equal to .06, and the standardised root-mean-square-residual (SRMR) was less than or equal to .08 (Hu & Bentler, 1999). We assessed internal consistency using composite reliability (ω), values $> .70$ are considered acceptable (Fornell & Larcker, 1981).

In addition to examining the factor structure, we sought to test the factor solution for measurement invariance between female and male candidates. Testing for measurement invariance allows one to examine whether scores of a construct have the same meaning in different conditions (Meade & Lautenschlager, 2004). In this chapter, we tested if the MLSS scores had the same meaning for female and male candidates. More specifically, we sought to test for *configural invariance* (is the factor structure the same across groups?), *weak invariance* (are the factor loadings the same across groups?), and *strong invariance* (are the item intercepts the same across groups?). To do so, we specified three models with additional constraints in each model, which increases the model degrees of freedom.

To test for configural invariance, the same CFA model is tested in each group; if this model is inconsistent with the data, then the measure is considered non-invariant at all levels. The hypothesis of weak invariance in this chapter is that the MLSS unstandardised factor loadings are the same for female and male candidates and the

hypothesis of strong invariance is that the MLSS unstandardised factor loadings and item intercepts are the same for female and male candidates (cf. Kline, 2016). These three models are considered to be *nested models* as they have the same model structure but test increasingly strict hypotheses (Kline, 2016). Therefore, changes in fit can be attributed to the constraints associated with each level of invariance. Current guidelines suggest that researchers should use multiple fit statistics to assess model fit (Kline, 2016) and that χ^2 and at least two other fit indices should be reported when assessing the fit of invariance models (Putnick & Bornstein, 2016). In this study, we used CFI, RMSEA, and SRMR. Simulation results from Chen (2007) suggest that $\Delta_{CFI} > .005$ and $\Delta_{RMSEA} > .010$ between more and less constrained models are adequate for detecting non-invariance. Therefore, when testing each measurement invariance hypothesis, we considered models with increases in CFI and RMSEA greater than these values to be non-invariant at the relevant level of invariance.

4.2.2 Results

Results of a single factor CFA revealed a poor fit, ($Y-B\chi^2 = (44) 310.87, p < 0.01, CFI = 0.82, RMSEA [90\% CI] = 0.18 [0.20,0.17], SRMR = 0.07$). We subsequently made modifications to the model in an iterative fashion based on examination of standardised loadings, modification indices and theoretical considerations (cf. Biddle et al., 2001). The first modification made to the model was creating two separate factors. We created two factors as the modification indices suggested that there was covariance between two of the items which were not adequately explained by the model. These two items were about *emergency skills* (i.e., those only required in the event of an emergency), whilst the remainder of the items reflected *routine skills* (i.e., those required on a routine basis). Given the difference in theoretical focus across these two factors, we deemed this distinction appropriate, and hence created a new two-item factor with the aim of better modelling this covariance.¹

The remaining modifications involved the removal of items based on their modification indices ($n = 5$), which suggested that there was covariance unaccounted for in the model, but there was no clear theoretical justification for creating any further

¹Whist a single factor CFA model must have at least three indicators for the model to be identified, when the number of factors is greater than one, each factor must have at least two indicators when there are no correlated error terms (Kline, 2016).

factors; hence the items were removed. This process led to the retention of a six-item, two-factor model, which was a good fit to the data and displayed good internal consistency (see Table 4.1). We performed a Satorra & Bentler (2001) scaled difference χ^2 test (S-B χ^2_{diff}) on the two-factor model and a respecified one-factor model to test the discriminant validity of the two factors. The results of this test supported the discriminant validity of the two-factor model (S-B χ^2_{diff} (1) = 356.42, $p < .001$).

Because we wished to create a measure that could be used to assess self-efficacy of female and male candidates, to make any comparisons between these two groups it was important that at least the hypotheses of configural and weak invariance were satisfied. The results of the measurement invariance analyses carried out on the six-item two-factor model supported the hypotheses of configural, weak invariance, and strong invariance (see Table 4.2). These findings suggest that the scores for the two MLSS factors have the same meaning for female and male candidates.

Table 4.1: Factor loadings and model fit indices for the two-factor MLSS in Study 5 and 6.

	Study 5	Study 6
Routine skills		
Wild camp for two nights in any weather.	.62	.62
Look after myself and others in steep ground/crossing a river.	.80	.77
Navigate to a chosen point on a map in any conditions, night or day.	.79	.81
Plan a mountain day that is appropriate for the group.	.80	.83
Emergency skills		
Provide immediate medical care in the mountains.	.91	.90
Respond appropriately to an emergency (e.g., broken leg).	.96	.98
Composite reliability (ω)		
Routine	.84	.85
Emergency	.93	.94
Inter-factor correlation		
Routine-Emergency	.71	.70
Two-factor model fit indices		
Y-B χ^2	7.35	7.35
df	8	8
p	0.50	0.13
CFI	1.00	1.00
RMSEA [90% CI]	0.00 [0.00,0.08]	0.05 [0.00,0.10]
SRMR	0.02	0.02

Note:

Y-B = Yuan-Bentler. CFI = comparative fit index. RMSEA = root-mean-square error of approximation. SRMR = standardised root-mean-square residual.

Table 4.2: MLSS measurement invariance results for Study 5 and 6.

Model	Y-B χ^2	df	p	$\Delta\chi^2$	Δ df	p	CFI	Δ CFI	RMSEA [90% CI]	Δ RMSEA	SRMR	Δ SRMR
Study 5												
Configural	21.05	16	.18	NA	-	NA	.994	NA	.050 [.000,.103]	NA	.025	NA
Weak	26.01	20	.17	4.93	4	.29	.993	-.001	.049 [.000,.096]	-.002	.037	.012
Strong	30.30	24	.18	3.56	4	.47	.994	.000	.044 [.000,.086]	-.005	.038	.001
Study 6												
Configural	24.08	16	.09	NA	-	NA	.991	NA	.062 [NA,.109]	NA	.030	NA
Weak	26.80	20	.14	2.86	4	.58	.993	.001	.051 [.000,.096]	-.011	.036	.007
Strong	36.71	24	.05	11.96	4	.02	.987	-.006	.062 [.008,.100]	.011	.042	.005

Note:

All fit indices estimated using robust SEs.

The $\Delta\chi^2$ is a robust difference test that is a function of two standard (not robust) statistics.

4.2.3 Discussion

The aim of Study 5 was to develop a measure of self-efficacy for skills related to becoming a Mountain Leader—the MLSS—using the data previously collected as part of Chapter 3. Fit indices and standardised factor loadings suggested that the six-item two-factor model fit the data well. In addition, the hypotheses of configural, weak, and strong invariance were supported, which suggests that the MLSS factor factors are not different for female and male candidates. Having established a factor structure of the MLSS using an exploratory approach to CFA, in Study 6, we sought to test the proposed factor structure using a strictly confirmatory approach to CFA.

4.3 Study 6

The aim of Study 6 was twofold: (a) to confirm the factor structure of the MLSS and (b) to test the hypotheses presented in the introduction to this chapter.

4.3.1 Methods

4.3.1.1 Participants.

Participants for Study 6 were a new sample of 431 candidates who had attended a Mountain Leader training course in 2017 or 2018 and completed the survey used for Chapter 3 (35.27% female, M_{age} 39.14 years, $SD = 11.93$, 29.93% had been assessed when completing the survey).

4.3.1.2 Measures.

We used the six-item MLSS from Study 5 to measure *routine skills self-efficacy* and *emergency skills self-efficacy*. In addition, we operationalised experience as either the sum of the number of QMDs that a candidate had when answering the survey, for candidates who had not been assessed when completing the survey or the number of QMDs at assessment for those who had been assessed. We chose the number of QMDs as the measure of experience as that is the type of experience Mountain Training requires candidates to accrue to become a Mountain Leader.

4.3.1.3 Analyses.

To test the fit and invariance of the two-factor model retained from Study 5, we carried out a CFA and measurement invariance analyses as specified for Study 5. Following this, we used moderated hierarchical regression analyses to test the interactive effects of gender and experience on self-efficacy. We examined each factor of self-efficacy separately. To obtain scores for the two self-efficacy variables, we retained the factor scores from the two-factor CFA; factor scores are a better estimate of the true value of the latent construct than a sum-scores, as factor scores account for measurement error (cf. Grice, 2001).

For each factor, using the factor scores as the dependent variable, we fitted three regression models to the data. The first model (Step 1) had gender as the sole predictor of the dependent variable. In the second model (Step 2), we included the main effects of both gender and experience as predictors of the dependent variable. Finally, for the third model (Step 3), we included both the main effects and interactive effect of gender and experience as predictor variables. Alpha was set at .05 and we standardised all continuous variables before entering them into the regression models to provide a common metric, thus aiding the interpretation of the interaction term (Aiken & West, 1991).

4.3.2 Results

4.3.2.1 MLSS Model Fit and Invariance.

The two-factor model was an approximately good fit to the data (see Table 4.1) and the results of a S-B χ^2_{diff} test supported the discriminant validity of the two-factor model when compared to a single factor model (S-B $\chi^2_{diff}(1) = 355.38, p < .001$). The results of the measurement invariance analysis provided good support for the hypotheses of configural and weak invariance. However, there was evidence to reject the hypothesis of strong invariance. The $\Delta\chi^2$, ΔCFI , and $\Delta RMSEA$ were all just outside the criteria specified above for detecting invariance. Rejecting the hypothesis of strong invariance suggests that there is a *differential additive response style* (i.e., female and male candidates do not use the response scale in the same way) and that differences in group means should be interpreted with caution as there may be a systematic cause for the

difference in scores that is not explained by the MLSS factors (Kline, 2016). Whilst this may influence gender differences in self-efficacy, this should not change our interpretation of the main effect of experience on self-efficacy, nor the interactive effect of gender and experience on self-efficacy.

4.3.2.2 Self-efficacy, Experience, and Gender.

Before interpreting the results of the regression analyses, we used the variance inflation factor (VIF) to assess the multicollinearity of the predictor variables. Values close to 1 are preferred and values less than 5 are acceptable (Tabachnick & Fidell, 2007); the maximum VIF in these data was 1.35. Descriptive statistics for study variables are presented in Table 4.3.

Table 4.3: Descriptive statistics and correlations between study variables (N = 433.)

Variable	M	SD	1	2	3
1. Gender ^a	0.35	0.48			
2. Experience	34.06	25.97	-.12*		
3. Routine self-efficacy	0.33	8.92	-.31**	.27**	
4. Emergency self-efficacy	0.70	18.37	-.14**	.20**	.75**

Note:

* indicated $p < .05$. ** indicates $p < .01$.

^a Males coded as 0 and females coded as 1.

4.3.2.2.1 Routine Skills. Gender predicted self-efficacy at Step 1 ($b = -5.75$, 95% CI $[-7.43, -4.07]$, $t(431) = -6.72$, $p < .001$), with female candidates having lower levels of self-efficacy to perform routine skills than males. Experience predicted self-efficacy at Step 2 over and above gender ($b = 2.11$, 95% CI $[1.33, 2.90]$, $t(430) = 5.30$, $p < .001$, $\Delta R^2 = .06$), with greater experience being associated with greater levels of efficacy. Of more interest, the interaction was significant ($b = 2.31$, 95% CI $[0.49, 4.12]$, $t(429) = 2.50$, $p = .013$, $\Delta R^2 = .01$). In line with our hypotheses, simple slope analyses suggested that the positive relationship between experience and self-efficacy was stronger for female candidates ($b = 3.86$, $p = 0.01$) than for male

candidate ($b = 1.55$, $p < 0.01$). Figure 4.1 shows the nature of the interaction.

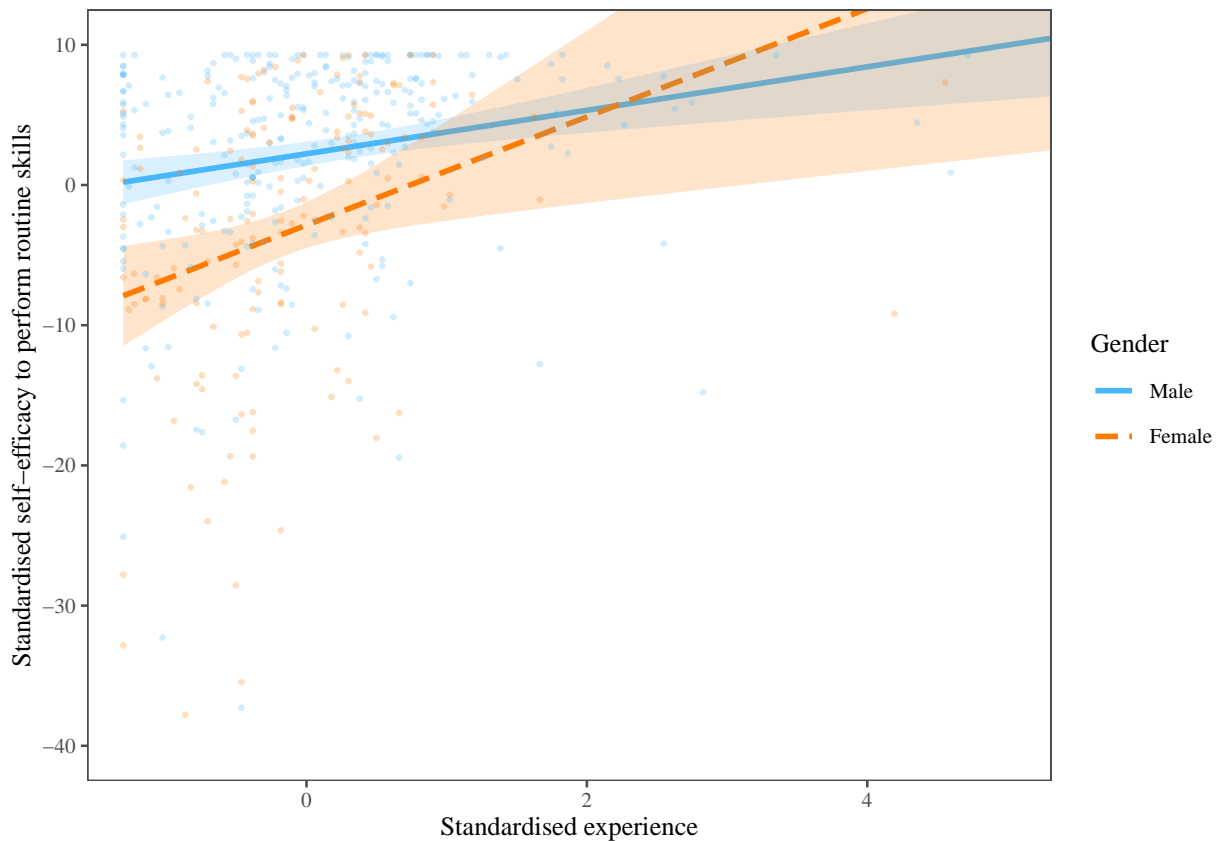


Figure 4.1: Interactive effects of gender and experience on self-efficacy to perform routine Mountain Leader skills $N = 433$. Ribbons represent the 95% CI.

4.3.2.2.2 Emergency Skills. Gender predicted self-efficacy at Step 1 ($b = -5.23$, 95% CI $[-8.84, -1.63]$, $t(431) = -2.85$, $p = .005$), with female candidates again having lower levels of self-efficacy to perform emergency skills than males. As with the previous analysis, experience predicted self-efficacy at Step 2 over and above gender ($b = 3.54$, 95% CI $[1.84, 5.24]$, $t(430) = 4.09$, $p < .001$, $\Delta R^2 = .04$). However, the interaction term was not significant in Step 3 ($b = 2.99$, 95% CI $[-0.97, 6.95]$, $t(429) = 1.48$, $p = .139$, $\Delta R^2 = .00$).

Table 4.4: Regression analyses examining interactions between gender and experience on self-efficacy to perform routine and emergency Mountain Leader skills.

Predictor	b	b 95% CI	sr2	sr2 95% CI	Fit	Difference
Routine						
<i>Step 1</i>						
(Intercept)	2.35**	[1.35, 3.34]			R ² = .095**	
Gender:Female	-5.75**	[-7.43, -4.07]	.09	[.05, .15]	95% CI[.05,.15]	
<i>Step 2</i>						
(Intercept)	2.18**	[1.22, 3.15]			R ² = .150**	Δ R ² = .055**
Gender:Female	-5.29**	[-6.93, -3.65]	.08	[.03, .13]	95% CI[.09,.21]	95% CI[.02, .10]
Experience	2.11**	[1.33, 2.90]	.06	[.02, .10]		
<i>Step 3</i>						
(Intercept)	2.23**	[1.26, 3.19]			R ² = .163**	Δ R ² = .012*
Gender:Female	-5.09**	[-6.72, -3.45]	.07	[.03, .12]	95% CI[.10,.22]	95% CI[-.01, .03]
Experience	1.55**	[0.65, 2.45]	.02	[-.00, .05]		
Gender:Female X Experience	2.31*	[0.49, 4.12]	.01	[-.01, .03]		
Emergency						
<i>Step 1</i>						
(Intercept)	2.53*	[0.40, 4.67]			R ² = .019**	
Gender:Female	-5.23**	[-8.84, -1.63]	.02	[.00, .05]	95% CI[.00,.05]	
<i>Step 2</i>						
(Intercept)	2.26*	[0.16, 4.36]			R ² = .055**	Δ R ² = .037**
Gender:Female	-4.46*	[-8.02, -0.90]	.01	[-.01, .03]	95% CI[.02,.10]	95% CI[.00, .07]
Experience	3.54**	[1.84, 5.24]	.04	[.00, .07]		
<i>Step 3</i>						
(Intercept)	2.32*	[0.22, 4.42]			R ² = .060**	Δ R ² = .005
Gender:Female	-4.19*	[-7.77, -0.62]	.01	[-.01, .03]	95% CI[.02,.10]	95% CI[-.01, .02]
Experience	2.82**	[0.86, 4.77]	.02	[-.01, .04]		
Gender:Female X Experience	2.99	[-0.97, 6.95]	.00	[-.01, .02]		

Note:

A significant b-weight indicates the semi-partial correlation is also significant.

b represents unstandardised regression weights.

sr2 represents the semi-partial correlation squared.

Square brackets are used to enclose the lower and upper limits of a confidence interval.

* indicates $p < .05$. ** indicates $p < .01$.

4.3.3 Discussion

Study 6 had two aims, firstly, to confirm the factor structure of the MLSS and secondly, to test the two hypotheses presented in the introduction to this chapter. Study 6 confirmed the factor structure of the MLSS and its weak invariance for female and male candidates. In addition, findings provided evidence that: female candidates are less confident than their male counterparts; increased levels of experience predict increased levels of self-efficacy, supporting hypothesis one; and that the relationship between experience and self-efficacy to perform routine skills is more positive for female candidates than it is for male candidates, providing partial support for hypothesis two.

Experience may have a greater positive effect on efficacy to perform routine skills for female candidates than male candidates due to female candidates with less experience having lower levels of self-efficacy than their male counterparts. Indeed, the results of Study 1 suggest that, in some instances, female candidates felt that in order to feel confident enough to be assessed they needed to do more to prepare for an assessment (see Section 2.3.1.1.1.1). When considering the results of Study 6, specifically female candidates with little experience being less confident in their routine skills than male candidates of equal experience, one may interpret the findings of Study 1 differently. That is rather than female and male candidates having different thresholds of confidence that they must meet before being assessed, they have different initial levels of confidence and require experience to gain enough confidence to feel ready to be assessed.

The most parsimonious explanation for why there was no interactive effect evident for emergency skills is because of the few opportunities Mountain Leader candidates get to practice their emergency skills when gaining QMDs, at least in comparison to the opportunities to practice routine skills. Accidents in the mountains are relatively rare; between 2009 and 2016 it is estimated that approximately four million people visited Snowdon² yet only 1,081 people required assistance from mountain rescue (i.e., < 0.01% of visitors; Snowdonia National Park Authority, 2017). It is possible that the scarcity of experience in emergency situations means that any experience relating to emergencies is equally valuable for female and male candidates. Future studies of the effects of experience on self-efficacy may consider the scarcity of specific types of experience on their relative contributions to self-efficacy.

²Snowdon is the highest mountain in England and Wales and one of the busiest in the world.

Higher levels of experience predicted higher levels of self-efficacy; however the proportion of variance in the MLSS factors explained by experience (i.e., the number of QMDs accrued) was small. There are several explanations for the modest size of this relationship. One such explanation is that whilst QMDs are important, they are not the only source of self-efficacy. This suggestion is concordant with self-efficacy theory, which suggests previous experience is only one source of efficacy beliefs. In addition, other forms of experience are likely important in establishing efficacy beliefs (e.g., scrambling experience). Another factor that is likely to influence the variance explained is the variability in the accuracy of candidates' logbooks. As noted in Chapter 3, not all candidates will use their logbooks in the same way, thus adding noise to the data. In addition to the different use of logbooks, although the number of QMDs is an important real-world measure of experience, it does remain a somewhat crude measure of experience. More specifically, simply reporting the number of QMDs does not consider other factors that would, according to self-efficacy theory, be important in shaping efficacy-beliefs (e.g., was the experience perceived as a success or a failure? What were the candidates' attributions of the experience? Was the experience challenging or easy?).

Given that the number of QMDs in a candidate's logbook is quite a crude measure of their experience for the reasons listed above, one may consider the recovery of any effect from the noise resulting from the measures' crudeness to be surprising; especially when considering the difficulty of detecting significant moderator effects (Evans, 1985), especially in field rather than experimental studies (McClelland & Judd, 1993). Therefore, the fact that additional variance was explained by the interaction between gender and experience on routine self-efficacy is noteworthy. It is also important to consider that whilst the number of QMDs logged may be a crude measure of candidates' experience; it is the measure that Mountain Training use and it is, therefore, useful for them to understand the efficacy of that measure. To overcome the limitations identified in this study, a future prospective longitudinal study that measures self-efficacy using the MLSS and collects more accurate data about candidates' experiences would likely provide a better understanding of the relationships examined in Study 6. We hypothesise that in such a study, experiences that were: perceived as successful, attributed internally (e.g., having tried), and appropriately challenging would have the greatest positive influence on self-efficacy beliefs. In contrast, experiences that

were perceived as a failure would decrease self-efficacy beliefs, especially when coupled with an internal attribution.

At this juncture, we should note that these results should be interpreted with some caution as in Study 6 the hypothesis of strong invariance was rejected. We recognise that the changes in fit indices when testing the hypothesis of strong invariance are (marginally) greater than those specified above for detecting non-invariance. However, given that several researchers caution against the use of exact cut-off values or “golden rules” (e.g., Kline, 2016; Markland, 2007) and one hypothesis of this study was that there would be an external variable—experience—that had a different effect on self-efficacy for female and male candidates we suggest that this violation of the hypothesis of strong invariance may be due to a difference in the mean experience of female and male candidates ($\Delta M = 0.22$, 95% CI [0.04, 0.40], $t(380.44) = 2.35$, $p = .019$). In addition, strict measurement invariance (as examined in this study), could be considered overly restrictive (cf. Muthén & Asparouhov, 2012) and an *approximate measurement invariance* approach could be tested in the future to better understand the exact nature of the non-invariance of item intercepts. Approximate measurement invariance is carried out using Bayesian structural equation modelling and involves specifying small (i.e., *approximately zero*) prior variances for parameters that would be fixed to zero in normal structural equation models (including CFAs). This change, therefore, allows models to better deal with unimportant levels of model miss-fit (cf. Muthén & Asparouhov, 2012; van de Schoot et al., 2013a).

Another explanation for the hypothesis of strong invariance being met in Study 5 but not in Study 6 could be the difference in the proportion of candidates in each study that had been assessed when answering the surveys (72.24% and 29.93% respectively). In addition to the prerequisite of having 40 QMDs logged prior to assessment, candidates must also hold a valid first-aid certificate. Whilst not having data to support this hypothesis, we would suggest that more participants in Study 5 had received first aid training than in Study 6 and that first aid training is likely to influence an individual’s efficacy to perform the skills in the emergency skills factor (i.e., provide immediate medical care in the mountains and respond appropriately to an emergency [e.g., broken leg]).

4.4 Applied Implications

There are several implications of this work that are relevant to Mountain Training and Mountain Leader candidates. The MLSS comprises two distinct factors and items from both factors were selected as important discriminatory variables in Chapter 3.

Therefore, it is likely to be important that candidates consider both sets of skills when preparing for an assessment. The results of Study 6 suggest that experience predicts self-efficacy for both sets of skills; therefore, candidates should gain experience whilst preparing for an assessment. However, as a measure of experience, QMDs explain a relatively modest proportion of the variance in self-efficacy scores. It is likely that this is in part due to inaccuracies in DLOGs, but it is also likely that other forms of experience are important influences on candidates' self-efficacy. Therefore, Mountain Training may wish to expand the prerequisites for experience to include sources of efficacy that are likely to be important (e.g., a measure of experience in steep-ground).

Finally, when considered together, the results of Studies 3, 4, and 6 suggest that it is particularly important that female candidates seek opportunities for mastery experiences should they wish to become Mountain Leaders. Study 3 showed that it is important that female candidates are confident in a number of skills before being assessed. Study 6 showed that experience has a stronger relationship with self-efficacy for female candidates than it does for male candidates, and the findings of Study 4 indicate that it is important that candidates have sufficient relevant experience to pass their first assessment. Training course staff are in an ideal position to help candidates establish goals as they should understand candidates' abilities and which activities would provide an appropriate challenge for a given candidate's abilities. We suggest that the course staff helping candidates set clear and specific goals that are appropriate for them would help build their self-efficacy. In addition, supporting candidates to meet these goals during the consolidation phase would also be beneficial to candidates. Given the importance of these goals, it is likely that providing training to course staff to improve their goal setting skills would be beneficial.

4.5 Future Directions

To our knowledge, previous research has not considered the interactive effects of experience and gender on self-efficacy, but in some areas has suggested that differences in self-efficacy are a result of “perceived masculinity” (Cassidy & Eachus, 2002, p 135). The equivocal results in Study 6 of the interactive effects of experience and gender on self-efficacy suggest that there may be other important factors to consider (e.g., differential availability/scarcity of types of experience). Given these results and the “real world” cross-sectional nature of the data in this chapter, future research should further investigate the interactive effects of experience and gender on self-efficacy both in a prospective longitudinal fashion and in an experimental fashion. Such studies should also consider the other variables identified as relevant (e.g., attributions) and may also consider relevant personality variables (e.g., emotional stability).

The MLSS was a good fit to the data in both Study 5 and Study 6 and can be used as a relatively short measure of two types of self-efficacy related to becoming a Mountain Leader. However, there are some items that could be improved. For example, one routine skill item reads, “look after myself and others in steep-ground/crossing a river.” This item could be split into four separate items: one about candidates looking after themselves in steep-ground, one about candidates looking after themselves when crossing a river, one about candidates looking after others in steep-ground, and one about candidates looking after others when crossing a river. Whilst increasing the number of items, improving the items might create a better measure of self-efficacy related to becoming a Mountain Leader, which could prove useful if Mountain Training wanted to better understand the relationship between experience and self-efficacy to perform specific skills. In addition, carrying out approximate measurement invariance studies may shed light on differences in the use of the MLSS response scale by female and male candidates.

4.6 Summary and Concluding Discussion

In this chapter, we sought to create a measure of self-efficacy for skills related to becoming a Mountain Leader—the MLSS—and to examine the additive and interactive effects of experience and gender on self-efficacy as measured by the MLSS. The MLSS

developed in Study 5 and tested in Study 6 provided an appropriate fit to the data in both studies and the hypothesis of weak invariance between female and male candidates was supported, whilst the stricter hypothesis of strong invariance was only supported in Study 5. This issue notwithstanding, the model fit was good in both studies—which had different proportions of candidates who had been assessed—providing initial evidence for the validity of the measure for candidates who have and have not been assessed. The measurement invariance findings suggest that whilst the two self-efficacy factors have the same structure in both female and male candidates, their scores on the items are non-invariant. The moderated regression analyses in Study 6 provide evidence that: female candidates are less confident than their male counterparts, increased levels of experience predict increased levels of self-efficacy, and that the relationship between experience and self-efficacy to perform routine skills is more positive for female candidates than it is for male candidates.

In summary, candidates with more experience are more confident in their skills to perform tasks related to becoming a Mountain Leader and it is particularly important that female candidates gain relevant experience in order to be confident in their routine skills.

Chapter 5

General Discussion

This chapter provides a summary of the research in this thesis, followed by its theoretical and methodological implications, and applied implications for Mountain Training and its candidates. I identify future directions for research and discuss the strengths and limitations of the thesis. Finally, this chapter concludes with brief personal reflections.

5.1 Summary of Results

The research presented in this thesis aimed to identify factors that influence the completion rate of the Mountain Leader qualification. Across the project, I employed a multi-source, mixed-method, approach, collecting data from candidates at various stages in the pathway, and from staff who had an in-depth knowledge of the Mountain Leader process and its candidates. The remainder of this subsection is a summary of the six separate, but related studies in this thesis.

Chapter 2 reported the findings of seven in-depth interviews with Mountain Training Staff and experienced course staff (Study 1). The results of Study 1 suggest that different factors were important when considering the two main stages of becoming a Mountain Leader (i.e., getting to an assessment and passing). More specifically, the findings suggest that the candidates who were confident that they could become Mountain Leaders, who had extrinsic participatory motives that were autonomously regulated, who were able to gain experience, and who received appropriate support were the candidates most likely to be assessed.

The findings also indicate that the nature of candidates' experience would largely

determine their performance at assessment. Candidates who had varied experience, at or above the standard required, were more likely to pass than candidates who had little relevant experience, little variety in their experience, and low-quality experience. Candidates' experience not only helped them to be more competent through practice but also allowed them to be more confident and resilient.

In Chapter 3, I sought to build on the results of Study 1, by collecting data from candidates about the variables that the findings of Study 1 suggest are important. Following extensive pilot work to develop an appropriate survey tool (see Appendix B), the results of pattern recognition analyses in Chapter 3 provided evidence of important discriminatory variables for each of the following classification problems: (a) male candidates who were assessed within 18 months of their training course versus those who were not assessed within 18 months (Study 2), (b) female candidates who were assessed within 18 months of their training course versus those who were not assessed within 18 months (Study 3), and (c) candidates who passed their first assessment versus those who did not pass their first assessment (Study 4).

Results from Study 2 suggested that to get to an assessment within 18 months of training, it was important that male candidates: could fit becoming a Mountain Leader into their lives and prepare for an assessment, were confident in their ability to become Mountain Leaders and their skills, and were able to deal with setbacks they might encounter on the way to becoming a Mountain Leader.

Results from Study 3 suggested that to get to an assessment within 18 months of training, it was important that female candidates: could fit becoming a Mountain Leader into their lives and prepare for an assessment, were confident in their skills, had extrinsic participatory motives to become Mountain Leaders, consolidated their experience post-training, and prepared effectively for an assessment by accruing good quality and varied experience.

Results from Study 4 suggested that it was important that candidates (female and male) received good coaching from training course staff and prepared effectively for an assessment, by gaining experience of suitable quality.

Taken together, the findings from Studies 2-4 supported those of Study 1. The congruence of findings across methods and samples allows us to place more confidence in the variables identified as important influences on the completion rate of the Mountain

Leader qualification. Accordingly, I can be more confident when making recommendations to Mountain Training based on these findings.

In Chapter 2 and Chapter 3, it was apparent that candidate self-efficacy and experience were important factors in identifying who went onto become Mountain Leaders and who did not. Further, it was also clear that these two factors were linked and there was evidence to suggest that there were gender differences involved in the relationship between experience and self-efficacy. With this in mind, in Chapter 4, I examined how gender moderated the relationship between experience and self-efficacy. To do so, I used data collected for the work reported in Chapter 3 and Appendix B. In Study 5, I developed the MLSS to measure self-efficacy for skills related to becoming a Mountain Leader. Study 6 had two aims, firstly to confirm the factor structure of the MLSS in a new sample and secondly, to examine the additive and interactive effects of gender and experience on self-efficacy.

The MLSS measures two factors: self-efficacy to perform routine skills and self-efficacy to perform emergency skills. Measurement invariance analyses suggested that the MLSS measured the same factors in female and male candidates; however, there was evidence in Study 6 that female and male candidates had different scores on the factors, although the factor structure and item-factor loadings were no different between genders. In Study 6, the results of moderated hierarchical regression analyses suggested that female candidates were less confident than male candidates, candidates with more experience were more confident, and the relationship between experience and routine skill self-efficacy was stronger for female candidates than it was for male candidates.

5.2 Theoretical and Methodological Implications

One implication emanating from the work presented in this thesis is that factors influencing (Mountain Leader) candidate progression and development are multifaceted and complex. As such, there is no “silver bullet” that determines, or even influences, the likelihood of a candidate completing the Mountain Leader qualification. Accordingly, to positively impact completion rates of the Mountain Leader qualification would require a multifaceted set of changes.

Further, the findings also show that different factors are important at different

stages of the Mountain Leader pathway. Therefore, if individuals and/or organisations are trying to improve one step of a training pathway, any changes need to be considered in a holistic manner, so that changes in one area of the pathway enhance as opposed to exacerbating problems later in the pathway. Thus, I recommend that the term “holistic” is viewed as meaning both multidisciplinary and across the different stages of the pathway. The findings reported in this thesis, add to the body of research from elite sport that recommends researchers take a holistic approach when considering journeys through pathways (e.g., Jones et al., 2019; Güllich et al., 2019; Hardy et al., 2017a). There are three major theoretical and methodological implications resulting from the work in this thesis, namely a new methodology for researching development pathways, gender differences in the relationship between experience and self-efficacy, and the greater relative importance of good quality and varied experience than the quantity of experience for passing an assessment.

5.2.1 A Methodology for Researching Development Pathways

The broad methodology used in this thesis provides a framework for those wishing to use a survey approach to examine complex questions in real-world applied environments involving a large number of variables. Despite the plethora of evidence that factors from a range of domains influence training pathways, few researchers have adopted multidisciplinary approaches that are capable of accommodating complex interactions (cf. Rees et al., 2016; Güllich et al., 2019). Traditionally, due to the limitations of traditional quantitative analyses (e.g., regression-based techniques), adopting a multidisciplinary approach that considers a wide range of variables has relied on a qualitative methodology (e.g., Hardy et al., 2017a).

However, with machine learning techniques (e.g., pattern recognition analysis) becoming more readily available a small number of recent studies have used machine learning techniques to adopt a multidisciplinary approach that accommodates the effects of complex interactions (e.g., Güllich et al., 2019; Jones et al., 2019, 2020). These studies have relied on in-depth interviews to collect data, placing a considerable burden on participants. This qualitative data has then been coded by the researchers to facilitate quantitative analysis. One reason for using a qualitative approach may be that researchers have felt they were unable to collect valid quantitative data from participants

without asking so many questions that they would compromise the quality of their data.

By conducting extensive qualitative and quantitative pilot work (i.e., Chapter 2 and Appendix B), I was able to develop a survey tool that collected quantitative data from participants. Using this approach I was able to significantly extend the methodology used by other researchers who have used pattern recognition analyses to understand complex journeys through pathways (e.g., Jones et al., 2019, 2020; Güllich et al., 2019), where data collection has relied on interview-based methods to collect data. The methodology of this thesis does not necessarily reduce the overall burden on participants; however, it could be viewed as spreading the same total burden over a greater number of participants, through the extensive preliminary work, thereby reducing the burden on each participant. If it is important that the pilot work is carried out in exactly the same population, spreading the burden in this way is obviously only possible when there is a large population to collect data from, unlike the populations in the previously cited studies (i.e., Güllich et al., 2019; Jones et al., 2019, 2020). The thoughtful researcher will no doubt be able to overcome this limitation.

This preliminary work (reported in Chapter 2 and Appendix B) involves a qualitative enquiry coupled with a review of relevant literature to identify potentially relevant factors, finding suitable short-form measures for each factor, and finally ensuring that the resultant survey is of reasonable length,¹ using empirical methods to reduce the length if necessary. These methodologies supersede methodologies which aim to answer complex questions but can only consider a relatively small number of variables, essentially forcing the researcher to ask relatively simple questions. There will be some situations where interview-based methods are preferable to survey-based methods (e.g., when the population is small, when building a rapport with participants is important, when participants have the time to be interviewed). Therefore I suggest that this methodology provides researchers with another tool for collecting data when researching multidimensional questions (e.g., “Which factors are important in the development of expertise?”).

¹What is considered “reasonable” should be determined by the researcher, taking both the research question and population into account.

5.2.2 Gender differences in the Relationship Between Experience and Self-Efficacy

Self-efficacy theory has suggested that performance accomplishments are the strongest influence on efficacy beliefs (Bandura, 1982). Chapters 2, 3, and 4 all add to the body of evidence that support this (e.g., Chase et al., 2003; Samson, 2014; Shipherd, 2019). In Chapters 2 and 3 experience-related variables appeared to be more important for female than male candidates; therefore, I tentatively suggested that the relationship between self-efficacy and experience may not be the same for the two genders considered in this thesis. However, to the best of my knowledge, no published research directly examines *both* the additive and interactive effects of gender and experience on self-efficacy.

Therefore, the research reported in Chapter 4 examined the additive and interactive effects of gender and QMDs (experience) on two factors of Mountain Leader self-efficacy (routine and emergency skills). The results of Study 6 suggested that the relationship between experience and routine skill self-efficacy was stronger for female candidates than it was for male candidates. While the underlying mechanism for this interactive effect was not explored, the implication remains the same; female candidates need more experience than male candidates to feel confident. Whilst this mechanism was not explored directly, the results of the studies presented in Chapters 2 and 4 suggest that male candidates are confident even when they have little experience, whereas female candidates are only confident once they have experience.

Given the stronger relationship between experience and routine skill self-efficacy for female candidates, it seems important that they leave the Mountain Leader training course with a clear understanding of what they should do to gain more experience. Whereas for male candidates, their development plans may focus more on how to fit the preparation into their lives, as a greater number of factors relating to the context of the Mountain Leader qualification within candidates lives were important for discriminating male candidates who were assessed within 18 months of their training course than were important for female candidates.

5.2.3 Quality and Variety Over Quantity

Deliberate practice theory suggests that higher levels of deliberate practice will result in greater levels of performance (Ericsson et al., 1993). However, there is evidence that greater levels of experience do not always predict greater levels of performance (see Rees et al., 2016, Section 4.1 for a review). The results of Chapters 2 and 3 suggest that whilst it is important that candidates have enough experience to meet the prerequisites for passing the Mountain Leader assessment, it is also important that their experience is of sufficient quality and variety. Indeed, there is some evidence that suggests the variety and quality of experience is more important than the quantity of experience, as some candidates with high levels of experience do not pass, whilst some candidates with a lower level of experience do pass.

Skill acquisition literature suggests that improvements in performance are contingent on three factors: the level of challenge, availability of feedback, and the opportunity to detect and correct errors (Ericsson et al., 1993; Guadagnoll & Lee, 2004). Jones et al. (2020) found that super-elite cricket batsmen performed more random practice than their elite counterparts and suggested that this greater volume of random practice led to a greater level of challenge and contextual interference and therefore, higher levels of performance. Whilst I did not investigate the relationship between the perceived challenge of candidates' experiences and their performance, it seems likely that having more varied rather than repeated and higher rather than lower quality experience will lead to higher levels of challenge. It is likely that through increasing the level of challenge, higher quality and more varied experience will increase the performance of Mountain Leader candidates at an assessment. The findings reported in this thesis and those of Jones et al. (2020) suggest that the positive relationship between experience and performance will be stronger for those with more varied experience.

5.3 Applied Implications

The present section proposes some applied implications that may be useful for Mountain Training to consider in addition to those presented in Section 3.6.2 and Section 4.4. The implications below relate to the Mountain Leader qualification; however, Mountain Training may wish to consider them in relation to their other qualifications, and other

organisations may also consider them relevant to their training pathways. Given that the largest drop-off (in percentages terms) of candidates is in the period between training and assessment and that many of the factors identified as important in this thesis are about what candidates do in that period, the recommendations will focus primarily on this particular period. Some of these implications are relatively simple to act on, whereas others require more work to act upon. Therefore, I present *quick wins*, which represent what I believe to be relatively low-effort interventions and *long-term goals*, which are goals that I believe would take more effort to achieve but would ultimately prove worthwhile.

As mentioned above, both the factors influencing candidates getting to assessment and the factors influencing candidates' assessment performance should be considered together in any intervention designed to increase the completion rate if Mountain Training wishes to have the maximum positive impact on the completion rate of the Mountain Leader qualification. Suppose only factors influencing candidates getting to assessment are considered. In that case, it is possible that there will be an increase in the number of candidates who are not competent enough to pass a Mountain Leader assessment being assessed and thereby reducing the pass rate (e.g., if an intervention that helped candidates gain experience was successful, but did not ensure that experience was of suitable variety and quality).

5.3.1 Quick Wins

Below are examples of how providing additional information to candidates could provide quick wins for Mountain Training.

5.3.1.1 Information About the Mountain Leader Qualification.

Providing candidates with more information about the Mountain Leader qualification before or at the point of registration would help candidates understand both the purpose *and* standard of the Mountain Leader qualification. This information would help candidates to make a better-informed decision about the appropriateness of the qualification for their needs. In Study 1, the findings in Section 2.3.1.1.2 suggested it was important that candidates understood “the standard” of the qualification so that they understood how confident they needed to be in their skills. In addition, Section

2.3.1.6 suggested that having attended a Mountain Leader training course, staff recommend that some candidates pursue a lower level qualification (e.g., Hill and Moorland Leader) as that would be a more reasonable objective for them than the Mountain Leader qualification. In Study 2, results indicated that some male candidates might be attending a training course to understand more about the qualification (see Section 3.3.3.1.1) and presumably, having learnt more about the qualification, a proportion of these candidates decide not to continue to assessment. Therefore, I believe that providing this information would help candidates to choose the right course for them, reducing the number of candidates attending a Mountain Leader training course somewhat speculatively and potentially increasing the number of candidates registering for the lower level qualifications. In addition, this information would help candidates understand what they needed to do to become a Mountain Leader which would help them prepare effectively.

5.3.1.2 Information About the Importance of Experience.

Explaining the importance of relevant experience to candidates, but more importantly, how this experience benefits them, may help candidates to prepare effectively for an assessment. A better understanding of how experience benefits them will allow candidates to plan their consolidation in a way that maximises the benefits of experience. The present thesis provides evidence that gaining relevant experience increases candidates' self-efficacy (see Section 2.3.1.1 and Study 6) and can develop candidates' resilience (see Section 2.3.2.1). In addition, Section 2.3.2.2 describes the importance of this experience being varied and of suitable quality. Explaining the benefits of relevant experience to candidates and helping them to understand how experience provides these benefits should help candidates to make the most of their consolidation. For some candidates, this may result in them doing less, however, their preparation could be more focused, thus making it easier for them to fit preparing for a Mountain Leader assessment into their lives.

Traditionally Mountain Training has relied on the written word to convey information to candidates. However, the use of new technologies may offer novel ways of providing candidates with information about QMDs in what could be a more engaging format, which could also be useful in explaining the nuances of the QMD definition. The

advent of the quantified and shareable self through the use of global positioning system (GPS) technology, digital mapping, and digital media provides the opportunity to show candidates examples of QMDs overlaid on a digital topographical map² and at important junctures throughout the day, brief segments of video could be used to explain what about that juncture means that it counts as a QMD. Indeed, it would also be possible to discuss changes to the day that would have meant it was not a QMD (e.g., walking up an established path in good weather with peers versus walking up the same path, but in poor weather whilst looking after a group of novices).

5.3.2 Long Term Goals

Long term goals based on the findings from the thesis for Mountain Training could include: (a) developing a system for creating individualised consolidation plans for candidates who have been trained, (b) identifying candidates who lack confidence, either at the end of their training course or during their consolidation, and then offering individualised support to bolster their confidence, and (c) using CMS to connect candidates who may benefit from meeting other candidates (e.g., to prepare together). Each of these goals would aim to help candidates to make the most of their consolidation period. Therefore, meeting these three goals should help Mountain Training increase the proportion of candidates who have attended a Mountain Leader training course who subsequently become Mountain Leaders.

5.3.2.1 Development Plans.

In Study 1, participants explained that they felt it was important candidates left their training course with a good understanding of what they—as an individual—needed to do to prepare for an assessment and lack of time was identified as a barrier to gaining enough experience to be assessed. Furthermore, in Chapter 3 female and male candidates who were not assessed within 18 months of their training course were identified as more likely than candidates who were assessed within 18 months of their training course to report that becoming a Mountain Leader was less important than other life goals and they were also more likely to report that they did not have enough

²This link provides an example of a route being overlaid on a digital map, albeit a bike ride on the road <https://www.relive.cc/view/vJOKXWoyK56>

time to become a Mountain Leader. In Study 1, participants suggested that the variety and quality of a candidate's experience are more important than the quantity of their experience to the outcome of their assessment. This point was supported by the results of Study 4 (Section 3.5.2), which identified that candidates who included experience below, rather than at, the standard for the Mountain Leader qualification in their logbook were less likely to pass than candidates who did not. In addition, candidates who included experience above the standard for the Mountain Leader qualification in their logbook rather than those who did not were more likely to pass their first assessment.

Considering these findings in combination, it seems that time is a precious resource for Mountain Leader candidates and that helping them to make the most of the time they have available is extremely important. I suggest that ensuring candidates leave their training course with a written development plan for their consolidation that describes how, within the context of their life, they can best prepare for an assessment. This would help candidates prepare *effectively and efficiently* for an assessment, thus increasing the completion rate of the Mountain Leader qualification. Goal setting theory suggests that these plans should: include short- and long-term goals; include a combination of outcome, performance, and process goals; consider the individual situation and needs of the candidate; have the opportunity for feedback on goal progress; have review points scheduled (either by time or event); and importantly should have input from both the candidates and training course staff (cf. Gould, 2005; Weinberg & Gould, 2014).

5.3.2.2 Course Staff Training.

The staff on a Mountain Leader training course are in a position to significantly impact a candidate's journey through the pathway. Chapters 2 and 3 both discuss staff behaviours that can positively influence candidates (e.g., through goal setting and fostering autonomous motivation). Further, research suggests that by training those in leadership positions (e.g., course staff) it is possible to improve their leadership behaviours and subsequently their followers' self-confidence, resilience, satisfaction, and their likelihood of completing a training pathway (cf. Hardy et al., 2010). Therefore, it would seem prudent to provide training to Mountain Training course staff, informed by

this research, to develop their coaching skills to maximise the positive impact that they can have on candidates' journeys through the Mountain Leader pathway. Wagstaff et al. (2018) describe five coaching skills—observation, questioning, goal setting, developmental feedback, and motivational feedback—which provide a useful framework for such training as they are easily understood, and there is a degree of overlap with other pertinent frameworks (e.g., transformational leadership, basic psychological need support).

5.3.2.3 Reviewing Assessment Prerequisites.

The results presented in this thesis suggest that difficulty gaining experience is one of the main barriers to candidates becoming Mountain Leaders. The main prerequisite for assessment related to candidates' experience is the number of QMDs. More specifically, Mountain Training states, "You must have logged a minimum of 40 Quality Mountain Days in three different regions of the UK and Ireland" (Mountain Training UK, 2015a, p 6). However, results of Study 1 suggest that quality and variety seem to be more important than the quantity of QMDs and that some candidates were competent despite having fewer than 40 QMDs (Section 2.3.2.2). Further, in Study 4, I discussed the fact that the only reason that 30.43% of candidates in the analysis did not pass their first assessment was that they had too few QMDs (Section 3.5.3.2).

Based on these findings, Mountain Training may wish to review their prerequisites for attending an assessment course. It is possible that providing prerequisites that were more prescriptive about the quality and variety of experience would allow the quantity of QMDs required to be reduced, thereby making it a more attainable goal for some. Given the importance of candidates knowing what they need to do to prepare for a Mountain Leader assessment, more prescriptive prerequisites may also help candidates prepare effectively for an assessment. However, this suggestion should be taken as just that, a suggestion. Conducting the interviews and being embedded with Mountain Training for the best part of four years has given me an understanding of QMDs and the perception of them by the Mountain Training network (e.g., staff, providers). The breadth of the definition is somewhat deliberate, allowing it to be interpreted differently—by both candidates, course staff, and Mountain Training—to accommodate the wide ranges of experience that different candidates will

have. There is a perception amongst the Mountain Training network that candidates will appreciate this breadth once they have gone through the process of becoming a Mountain Leader. Whilst I appreciate this sentiment, the “when you know, you know” approach is not necessarily helpful to candidates who are trying to prepare for an assessment.

The current concept and definition of QMDs are extremely important to Mountain Training; however, candidates do not always understand the concept or definition of QMDs. In addition, many candidates struggle to accrue the prerequisite experience to attend an assessment course—40 QMDs—and therefore do not get to assessment. However, there is evidence that some candidates are capable of successfully completing the practical element of an assessment course with fewer than 40 QMDs. Further, it is clear that what a candidate does during their preparation for assessment is more important than the number of QMDs they have when considering assessment performance.

Given the importance of candidates understanding what they need to do to prepare effectively for an assessment and the overarching aim of this research project (i.e., to find ways in which Mountain Training can improve the completion rates of the Mountain Leader qualification) Mountain Training could consider, or even pilot, an alternate set of experience-based criteria for attending an assessment. Given the greater relative importance of variety and quality than volume of experience, an alternate set of criteria could reduce the quantity criterion, thus making it more attainable for those with limited time available to prepare for an assessment but provide more specific criteria for the quality and variety of this experience.

For example, candidates may need to gain additional experience after their training course that includes three graded scrambles, evidenced experience of navigating “off the beaten track,” and evidenced experience in bad weather. Further, candidates may be required to gain that experience in at least two of the main mountainous regions (i.e., Scottish Highlands, the Lake District, the Mourne Mountains, and Snowdonia). If this additional experience were to be set at 10 days in total, it would mean that a candidate who could spend five days a year gaining QMDs would be able to get from training to assessment in two years, rather than four. As shown in Figure 1.2, the likelihood of a candidate being assessed four years post-training is much lower than the

likelihood of them being assessed two years post-training.

It is important to note that this suggestion is meant to increase the proportion of candidates who become Mountain Leaders having attended a training course and is not meant to lower the standard of candidates who get to assessment. To borrow a phrase from a similar stream of research, this is meant to “train [candidates] in, not select out” (Hardy & Arthur, 2014).

Therefore, to test the efficacy of this suggestion, Mountain Training should pilot the alternate criteria alongside the current ones, thereby offering two routes to assessment. This approach would allow them to observe the proportion of candidates who get to an assessment via each route, which would show if the new criteria did make assessment more accessible. It would also allow Mountain Training to monitor the pass rate for candidates, as it may be important to ensure that the overall pass rate did not decrease and to ensure that candidates who got to assessment via the new criteria were suitably prepared and experienced for assessment.

5.3.2.4 Supporting Access to the Mountains.

A barrier to completion identified in 2.3.1.3 was living further away from the mountains (Section 2.3.1.3.2). Travel time to the mountains was an important feature for discriminating candidates who passed their first assessment from those who did not, and I suggested that living further from the mountains was a reason for some candidates logging experience below the standard of the Mountain Leader qualification. As previously discussed, experience below the standard is unlikely to prepare candidates for a Mountain Leader assessment effectively. Therefore, identifying and supporting candidates who have difficulty accessing the mountains may help them to gain enough experience of sufficient quality to become Mountain Leaders.

This support could be provided at two levels. Firstly, direct support could be offered to candidates who are registered for the Mountain Leader qualification if they are identified as having difficulty accessing the mountains. If these candidates are geographically dispersed, then travel bursaries may help them to join up public transport links with more expensive forms of transport (e.g., taxis). However, if these candidates are located near one another, it might be possible to try and develop a community transport system. Secondly, if there are candidates who have difficulty

accessing the mountains, it is likely that there are other people, including those who are not registered for the Mountain Leader qualification, who also find it difficult to access the mountains. Therefore, identifying the latent demand for access to the mountains and improving the travel provision to the mountains may have a greater positive impact than just helping candidates to become Mountain Leaders. It may also help the general population access the mountains more easily.

5.3.2.5 Changes to DLOG.

This implication is somewhat speculative, but given that the causal attributions made by a candidate about their experience are likely to influence the change in efficacy that results from the experience, trying to influence these causal attributions may reduce the negative impact that experiences perceived as failures have on self-efficacy and increase the positive influences of success (cf. Rees et al., 2005). Mountain Training's DLOG facility provides an interesting opportunity to do just this. Candidates could be required to provide information about their experience, additional to that already required, to encourage them to frame the experience in a positive manner. For example, Seligman et al. (2005) showed that an online intervention that required participants to write three good things about their day for a week along with their perceived causal attributions for each good thing increased happiness and decreased depressive symptoms for six months. Therefore, it is conceivable that asking candidates to write three good things about the experience they are logging, and their causal attributions could help candidates frame their experiences in a (more) positive manner.

5.4 Strengths and Limitations

5.4.1 Strengths

There are several strengths to this thesis. Firstly, it is the first investigation into the completion rates of the Mountain Leader qualification and was carried out in a holistic manner, making use of various existing bodies of research in conjunction with the domain-specific knowledge of Mountain Training and the research team. The methodology provided a rigorous investigation and this approach has resulted in robust findings. More specifically, the multi-source mixed-methods approach allowed us to

triangulate the findings between the studies reported in this thesis, as well as explore the nuances of the data. In addition, the state-of-the-art statistical techniques used in data-analysis have allowed this research to overcome the limitations of the traditional linear analytical approaches normally applied to similar research. Further, this thesis is based on a significant quantity of both qualitative and quantitative primary data. As mentioned above, the congruence of the qualitative and quantitative data supports the generalisation of this thesis' findings to the wider Mountain Leader population.

5.4.2 Limitations

The main limitation of this thesis is that most of the work relies on retrospective methods, thus making the designs weak with regard to causality. However, collecting data from multiple sources allowed us to triangulate the findings, additional confirmatory and prospective analyses in Chapter 3 supported the findings of the main analyses, and importantly, the interpretation of results has been theoretically driven. It should, however, be noted that these interpretations reflect my understanding of psychology and that there are likely other plausible explanations for the results reported. Box (1976) stated that “All models are wrong” and suggested that scientist should seek “simple but evocative models” and “be alert to what is importantly wrong.” I suggest that the models presented in this thesis are simple and evocative, in that they resonate with both the research team and Mountain Training, and I do not believe them to be “importantly wrong.” A related limitation is the lack of any intervention or experimental studies. Either an intervention or experimental study would have been beneficial for validating the findings reported in this thesis and would have been beneficial for developing a broad research experience. However, the development and use of the methodology in this thesis have allowed me to develop a wide range of skills, most notably the use of advanced and complex statistical analyses, survey design, and dissemination to non-academic audiences.

A final noteworthy limitation is the representativeness of candidates who provided data for this project. As discussed in Chapter 3, retrospective responses to the survey were not representative of the wider populations. Candidates who had not been assessed or who had not passed their first assessment were less likely to respond to the survey. The nature of most research is similar, in that it is not always possible to collect

data from everyone that one would like to. However, it is significant that the survey which collected data for Chapter 3 included data from 15.35% of the population who met the inclusion criteria. Even if this thesis were only relevant to 15.35% of the candidates, it would be noteworthy. Furthermore, the results of Chapter 2 support those of Chapters 3 and 4, therefore I believe that it is highly likely that the findings are generalisable beyond the 15.35%, despite the bias of the sample towards those who are assessed and do pass.

5.4.3 Future Research Directions

Two main directions for future research are discussed in Section 3.6.4 and Section 4.5. For the sake of completeness, they are briefly highlighted again here. Following that, I briefly suggest two additional future directions for research that are based on the findings of the thesis, rather than a single chapter.

Firstly, further analysis of the data collected in Chapter 3 would mitigate the effects of sampling and attribution bias, as there would be a greater number of responses from candidates who responded to the survey prospectively. The benefit of this would be the increased confidence that I could place in the findings as a result of the prospective nature of the analysis.

Secondly, a more detailed investigation into the effects of experience on self-efficacy for females and males should be completed. This investigation should include other relevant variables (e.g., perception of the experience, attributions, personality) and should be conducted with both a longitudinal and experimental design (ideally, but not necessarily in the same study). This would benefit Mountain Training as they could then provide gender-specific advice to candidates about increasing efficacy. Indeed, such a study would be of great interest to the applied psychology community as it would be the first study of its kind, providing new knowledge to the scientific community and developing self-efficacy theory.

In addition to these directions for further research, it would seem prudent for Mountain Training to consider what factors are important for the completion of other Mountain Training qualifications, given that candidate drop-off is similar for all qualifications (see Figure 1.1). Understanding which factors are similar for other qualifications says something about the generic training pathway, and which factors are

different would tell us something about developing different levels of expertise/performance and would therefore be of interest to both Mountain Training and the wider community of researchers and practitioners.

Finally, it would be prudent to investigate the efficacy of any intervention based on the implications listed above. If such interventions were shown to be effective, it would lend support to the explanations provided in this thesis. Results that did not support the explanations presented in this thesis would also prove interesting, as they would challenge well-established psychology literature (e.g., self-efficacy theory).

5.5 Conclusion

The conclusions of this research can be presented in a relatively simple manner; Mountain Training's Mountain Leader qualification pathway is effective and candidates who want to become Mountain Leaders and can fit the preparation into their life will achieve their goal, whilst those who do not or cannot, will not achieve theirs. However, this thesis highlights the importance of the consolidation period for candidates and provides some evidence-based recommendations for ways that Mountain Training could provide additional support to candidates, to increase the completion rate without reducing the standard of Mountain Leaders.

5.6 Personal Reflections

My life has changed immensely whilst navigating this PhD. I attribute this change to the product of a combination of factors, namely new knowledge, my relationships with others, and several significant life events. I understand far more about people than I previously did, especially myself. This new knowledge has helped me to build stronger relationships with others and, importantly, understand the impact of various life events.

My journey through this PhD could have gone in many different directions. Indeed, I am a long way from where I had planned to be; however, I have relocated and have a good idea of where I want to go next and importantly, how to get there.

Chapter 6

PhD Impact and Dissemination

This PhD programme was part-funded by Mountain Training with the aim of better understanding the factors influencing the completion rate of the Mountain Leader qualification. This work represents the first step towards evidenced based change within Mountain Training and their qualifications. Therefore, it was important that the results were disseminated to the organisation in an accessible format and when we were confident in our interpretation of the findings, rather than just presenting Mountain Training with a copy of this thesis at the end of the PhD.

Dissemination of this projects findings has been ongoing and has occurred at various levels. For much of the last four years I have been considered as part of the Mountain Training team, this has allowed for regular discussion of the project with various members of staff, which has been the least formal method of dissemination. These conversations were extremely important to the project, however, were limited in scope (i.e., they were primarily with Mountain Training staff, not the wider network). Two important types of output from this project were, a report and various presentations to different parts of the Mountain Training network (e.g., course staff, board members, external stakeholders).

The report is largely a lay summary of Chapter 3 with additional information from the remainder of the thesis and the presentations presented progress reports along with key findings so that Mountain Training could begin to consider the implications of the work. We felt that it was important to “bring everyone along” as we conducted the research so that they would have a better understanding of the rationale for the recommendations we made to Mountain Training. The sections below include a copy of

the report submitted to Mountain Training and examples of presentations given at the end of the project. One presentation is simply about this project and the Mountain Leader qualification, and the second is a presentation that was given to the providers of various Mountain Training qualifications, primarily their coaching qualifications, and it was important to try and relate the finding from this project to different Mountain Training qualifications. Following these presentations, Mountain Training Scotland wanted to understand more about candidates they were responsible for. This was a two part process, reported below.

6.1 Mountain Training Report

Physical copies of this report were distributed to all Mountain Training board members ($n = 106$) and Mountain Leader course providers ($n = 109$).



— THE AWARDDING BODY NETWORK



Developing excellence in outdoor provision:

Enhancing training pathways for outdoor qualifications

— THE MOUNTAIN LEADER QUALIFICATION



Will Hardy
Dr Ross Roberts
Prof Lew Hardy
2019-09-25



This project was part funded by Mountain Training United Kingdom and Ireland.

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Foreword

This is an unprecedented piece of research for Mountain Training United Kingdom and Ireland and I am delighted to introduce this report. The level of detail and length of this project is unique within our organisations and we are very pleased with the results.

Much of our focus in recent years has been to ensure that each of our qualifications matches the needs of our stakeholders and the many environments in which we work, whereas with this research we have been able to focus on the long standing process of training and assessment; the delivery system. Bangor University were given a fairly open brief to review our delivery system and it has been encouraging to learn that while it's not broken, there is more that we can do to support many of these people to gain our qualifications.

We are extremely grateful to all three researchers and hope that we will be in a position to conduct further research in the future. This report has provided us with much to think about and develop in the coming months and years, which we will do alongside stakeholders and providers to enable more people to become Mountain Leaders. We will also endeavour to use our learning to help other groups of candidates make the very most of their experiences in the mountains, crags and walls of the UK and Ireland.

John Cousins

Mountain Training United Kingdom
and Ireland Chief Executive Officer

Preface

This report is the product of a larger collaborative project between Mountain Training United Kingdom and Ireland and Bangor University. The primary objective of the project was to examine Mountain Training's qualification pathway (which has remained broadly unchanged since its creation in 1964) and identify possible enhancements to it in order that Mountain Training can help more of their candidates to progress from registering for a qualification to successfully completing it.

In 2018 there were 3,228 qualifications awarded to candidates, which suggests that this pathway is successful to some degree, as each year a large number of candidates are making it from registration to qualification. However, there is a drop-off in the number of candidates at each step in the pathway for all qualifications (i.e. registration to training, training to assessment, and passing an assessment; see Figure 1).

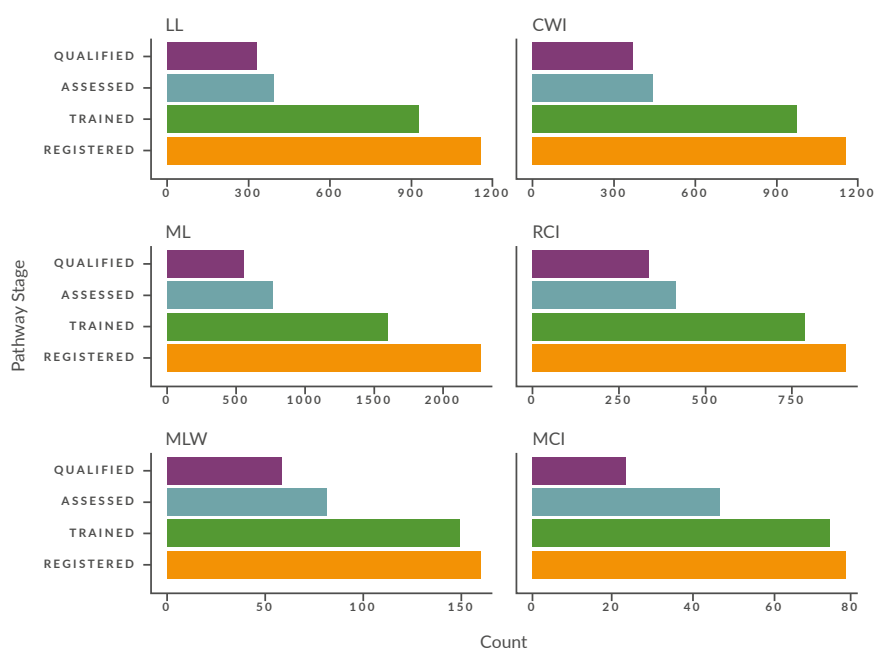


Figure 1: Average number of candidates at each pathway stage 2009-2018. LL = Lowland Leader, CWI = Climbing Wall Instructor, ML = Mountain Leader - Summer, RCI = Rock Climbing Instructor, MLW = Mountain Leader - Winter, MCI = Mountaineering and Climbing Instructor.

It is unlikely that there is a single factor that would be a "silver bullet" in answering the question, "why do candidates not complete Mountain Training qualifications?" Instead there are likely a myriad of factors which influence completion at various stages of the Mountain Training qualification pathway. Some of these factors will be generic to all qualifications, whilst some may be specific to individual qualifications/groups of candidates.

This report focuses on the Mountain Leader qualification for four main reasons: (a) it is the largest qualification as measured by number of candidates; (b) it has one of the largest drop-offs in candidates progressing from training to assessment, the drop-off at this point is of particular interest as candidates have engaged with the Mountain Training delivery system; (c) it is the highest entry level qualification; and (d) it is the oldest qualification and has had few major changes to it recently.

This report is structured in such a way that it can be read on a number of levels. At the first level, an executive summary is provided that presents a short summary of the report, including a distilled set of results. In addition to this, at the start of each section of results and discussion, we present "key messages" from the research that we feel are important for every reader to understand. The full report will provide readers with a deeper understanding of the findings as well as the methods used to reach them.

Executive Summary

— INTRODUCTION

The pathway to assessment is similar for all Mountain Training qualifications and has remained broadly unchanged since its inception. There are greater numbers of candidates being trained than are qualifying, for some candidates this is because they are trained but are not assessed and for others this is because they are assessed but do not pass.

This part of the project aims to better understand the factors that influence the completion or non-completion of Mountain Training's largest qualification, the Mountain Leader. The findings presented in this report are from a three-year, multi-method, multi-study collaborative project between Mountain Training United Kingdom and Ireland and Bangor University.

There are differences in the proportion of female and male candidates who have been assessed at a given point in time after their training course, in both cases, 50% of those who will ever go on to be assessed, have been within 18 months of their training course. There is no statistically significant difference in the pass rates for female and male candidates between 2013-2018.

In a preliminary study, a total of 37 hours of qualitative interviews were conducted with four Mountain Training Officers and three experienced Mountain Leader course directors. The results of this interview study informed the development of a survey tool which was used to collect quantitative data from 1,536 candidates who had attended their first Mountain Leader training course between 2008 and 2018. These quantitative data were then analysed using both standard statistical procedures and state of the art pattern recognition procedures to identify **the most important variables for discriminating: (a) candidates who were assessed within 18 months of their training course from those who were not and (b) candidates who passed their first assessment from those who did not.**

— MAIN RESULTS

We were able to discriminate candidates who were assessed within 18 months of their training course from those who were not with up to 96% accuracy (i.e. if we took 100 candidates, we successfully classified 96 of them as having been assessed or not within 18 months of their training course and four of them would be misclassified) and those who passed their first assessment from those who did not with up to 86% accuracy. Where additional data were available, we found support for these results, thus strengthening our confidence in them.

Five key findings emanated from the pattern recognition analyses:

1. For both female and male candidates, how they felt becoming a Mountain Leader would fit into the rest of their life was important in discriminating those who were assessed within 18 months of their training course from those who were not.
2. Coaching behaviours of training course staff, *especially in relation to using goal setting to set clear and specific goals for preparing effectively for an assessment*, are important for candidates both getting to *and* passing an assessment.
3. For both female and male candidates, it is important that they are confident in their abilities to perform a series of tasks related to passing a Mountain Leader assessment and that gaining relevant experience will increase their levels of confidence to do so.
4. Candidates must have *sufficient relevant experience* in order to pass an assessment.
5. Taking the previous points together, it becomes clear that **what candidates do after their training course is extremely important in determining if they will successfully complete the Mountain Leader qualification or not. It is not just about gaining more experience relative to the Mountain Leader qualification in general, but it is about gaining experience specific to preparing for an assessment.**

These results should be heartening and helpful to Mountain Training as they point to a specific area of the pathway where Mountain Training can focus its efforts.

— LIMITATIONS

A number of limitations can be identified with this study, most importantly sampling bias and issues relating to recall accuracy in the quantitative data collected from candidates. However, the results of the retrospective analyses have been supported by the qualitative results, and in some instances prospective analyses of quantitative data collected from candidates. Thus, readers can be confident in the accuracy of the findings presented here.

— RECOMMENDATIONS

The findings presented in this report highlight the importance of the candidates making good use of their consolidation period post-training. The most impactful implications of this work will be realised through the discussion of the findings by key stakeholders. Therefore, it is recommended that Mountain Training establishes a working group to identify potential additions to the pathway which would help candidates make the most of their consolidation period.

We would also recommend that some of the data collected for this project are analysed further (in a prospective fashion) and that data are collected at future time points which would reduce the impact of sampling bias and validate the findings presented.

1 - General introduction

Mountain Training is responsible for training instructors for walking, climbing, and mountaineering in the UK and Ireland. Its qualifications all follow a similar pathway to qualification, which was originally created in 1964 for the Mountain Leadership Certificate (what is now the Mountain Leader qualification) and has not changed much since then. Candidates must first gain some *prerequisite experience and register for the qualification*, then they *complete a training course*, following that they are required to gain *further experience to consolidate skills*, and finally they need to *successfully complete an assessment course*, following which they will be awarded the relevant qualification.

As seen in Figure 1 there is a large difference in the number of candidates who are trained and assessed each year. To examine this difference for the Mountain Leader qualification in more detail we carried out a *survival analysis*, where rather than looking at summary statistics averaged over a number of years, we look at the probability of an individual candidate having been assessed over time following their training course. As can be seen in Figure 2 at any given point in time, **fewer female candidates get to an assessment than male candidates**. The percentage likelihood of a candidate having been assessed five years following their training course is ~32% and ~40% respectively for female and male candidates, after this point the rate of candidates being assessed decreases for both sexes. Half of candidates who did reach assessment did that within 18 months of their training courses, but it is not unusual to take longer, and some candidates do go on to be assessed over five years after their training course.

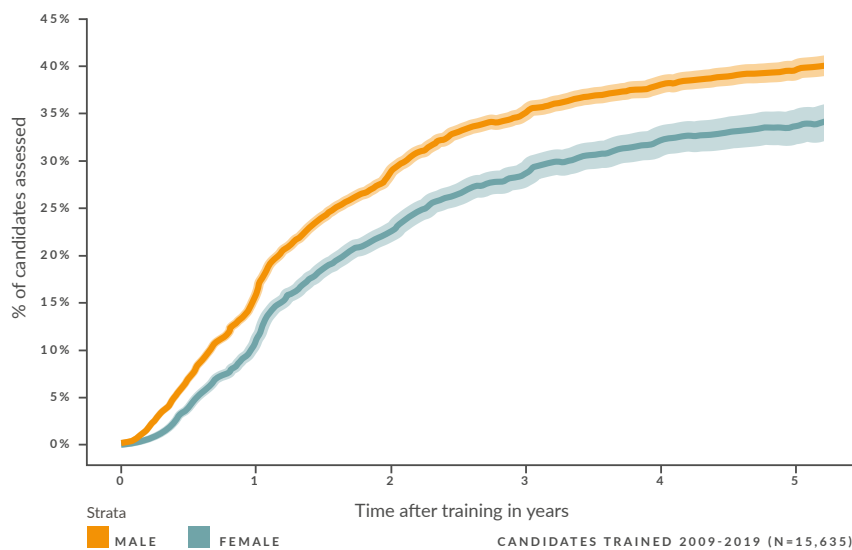


Figure 2: Survival rates for female and male candidates post-training.

We also examined the pass rates for the Mountain Leader qualification. **The pass rate is increasing over time and there have been changes to sex differences in the pass rates over the last 10 years** (Figure 3). When looking at pass rates for the last 10 years, women were less likely to pass their first assessment, but the pass rate was increasing faster for them than it was for men. However, when looking at data from the last five years, neither the effect of sex on the pass rate or rate of change of the pass rate are statistically significant.

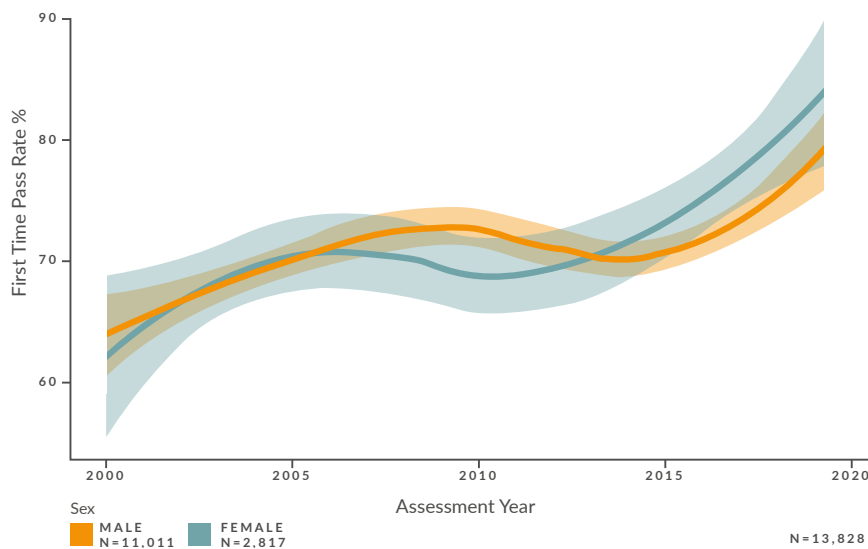


Figure 3: Pass rates for female and male candidates assessed since 2000.

There is a wealth of knowledge dispersed throughout the Mountain Training network, relevant to understanding why some candidates do not complete qualifications and others do. Whilst there is some quantitative data available on Mountain Training's Candidate Management System (CMS) these data are mostly limited to demographics and candidates' training and digital logbook (DLOG) records. Furthermore, much of the qualitative knowledge is somewhat compartmentalised and anecdotal, making it hard to use in a meaningful way.

By synthesising the qualitative information and then collecting relevant quantitative data this project aims to:

1. Identify a set of important variables for discriminating each of the following:
 - (a) Female candidates who are assessed 18 months after their training from those who are not.
 - (b) Male candidates who are assessed 18 months after their training from those who are not.
 - (c) Candidates who pass their first assessment from those who do not.
2. Allow Mountain Training to make *evidence-based change*, if they wish to do so.

To improve the readability of the report, in each section of the results and discussion, we present the key messages first in the form of bullet points, before providing the evidence to support these key messages. A glossary of terms can also be found in *Appendix A*; this will be used to explain some of the more technical language used in the report, specifically that relating to the variables included in the analyses. Each term that appears in this glossary will be italicised in its first usage in the body of the report (not in a table or figure).

2 - Methods and preliminary studies

— 2.1 PRELIMINARY STUDIES

— 2.1.1 *What do we think is important? - Study 1*

— 2.1.1.1 *Introduction*

To identify potentially important factors for the completion of the Mountain Leader qualification, we reviewed relevant literature and conducted a qualitative study with Mountain Training Officers and experienced course staff ($n = 7$) who had worked on a total of 1,060 Mountain Leader courses between them.

— 2.1.1.2 *Methods*

We carried out in-depth qualitative interviews with four Mountain Training Officers and three experienced course directors (two females and five males). On average, these participants had worked on approximately 60 Mountain Leader training courses over 19 years and approximately 92 Mountain Leader assessment courses over 17 years.

The interviews were semi-structured, using an interview guide to ensure that we covered topics of interest with each participant, but allowing the interview to cover other areas of interest as and when they arose. The interview guide was organised into the following sections: (a) candidate background, (b) candidate career history, (c) personal characteristics of candidates, (d) candidate experience and experience of training, and (e) support that candidates may or may not receive.

The interviews lasted approximately five and a half hours and were conducted in two to four sessions with each participant. This process yielded transcripts of almost 45,000 words per participant, which were coded thematically using an abductive approach. The research team all have over 10 years of relevant outdoor experience, which meant that good rapport could be established with interview participants and that the subtleties of the phenomena of interest could be fully understood.

— 2.1.1.3 *Results*

A brief summary of results for this study can be seen in Table 1. It is beyond the scope of this report to discuss these results in detail; however, it is important to note that different factors were reported as important by interviewees for either getting to assessment or passing an assessment. We also developed a list of hypotheses and potentially important factors for which we needed to collect quantitative data from candidates to evaluate.

Getting to assessment	Passing
- Self-efficacy	- Ability
- Participatory and regulatory motives	- Performing under pressure
- Understanding of the qualification	- Staff behaviour
- Ability to gain experience	- Quality, quantity, and variety of experience

— 2.1.2 Survey tool development - Study 2

— 2.1.2.1 Introduction

The aim of Study 2 was to develop a survey tool, which could be used to collect quantitative data from candidates for over 50 variables (identified as potentially important for the completion of the Mountain Leader qualification in *Study 1*) that data were not available for on the CMS. These variables covered four main areas: personality, motivation, confidence, and experience of training.

In October 2018 the research team presented the findings of *Study 1* to the Mountain Training UK council and ran a workshop, with 30 participants, to check that there was nothing important missing from the list of variables and to garner feedback about the face validity of some items. Following completion of the survey development, the data were collected (see below). We then used state of the art pattern recognition techniques to identify the variables that consistently discriminated candidates who (a) did and did not get to assessment within 18 months of their training course and (b) did and did not pass their first assessment.

— 2.1.2.2 Methods

The first step in creating the survey tool was to identify variables of interest and then to identify or create a suitable short measure for each of them. We employed a variety of techniques to ensure maximum validity for each of the measures, including using Bayesian Structural Equation Modelling (Muthén & Asparouhov, 2012) and reference to secondary data where possible. Once this process was complete, we were left with a pool of 194 items. If we had created a single survey with all of these items in it would have taken over 40 minutes to complete, which would have increased drop-out from the survey and those that did complete the survey in full would be less representative of the population than those who would complete a shorter survey. Instead, we created four surveys, each with approximately 120 items where each possible pair of variables was included in at least one of the four surveys and each variable was included in at least two of the four surveys.

— 2.1.2.2.1 Participants

We invited 3,794 candidates who had attended a Mountain Leader training course between 2008 and 2016 to participate in the study, and each candidate was randomly allocated to one of the four surveys. We received 1,056 usable responses (27.83% response rate)¹ from 256 female candidates (*Mean* = 41.46 ±11.32 years) and 800 male candidates (*Mean* = 45.16 ±12 years). These candidates had been trained by 112 different providers and assessed by 85 different providers.

— 2.1.2.2.2 Analytical procedure

To analyse the data we employed state of the art pattern recognition analyses, originally used in bioinformatics to classify objects according to features that they possess (Duda, Hart, & Stork, 2000). The aim of these analyses was to identify, from a potentially large number of features, a subset of features that best discriminate objects of one class from another. In this project, features are the variables we have collected data on, objects are the candidates that these data have been collected from, and the classes are the categories of the outcome variable (e.g. being assessed within 18 months of training or not). The interested reader will find more detail on the analytical procedure in *Appendix B*.

¹Similar surveys might normally expect ~10-20% response rates.

— 2.1.2.3 Results

The results of the pattern recognition analyses produced eight feature subsets, which had classification rates from 50 to 87%. At this stage we did not interpret the remaining features, but we retained them to create the final survey tool. *It is important to note that just because a feature was not included in a final feature subset does not mean that it was not important for either getting to assessment or passing, as some variables will be important commonalities between the groups that we are trying to discriminate.* This reductive process eliminated approximately 80 items from the full set (e.g. education level, income level, sources of support).

— 2.2 PARTICIPANTS AND DATA COLLECTION

We contacted all candidates who attended their first Mountain Leader training course in 2017 or 2018, inviting them to participate in the study. One thousand and thirty candidates started the survey and 480 completed the survey (16.74% response rate). Useable responses were from 166 female candidates ($Mage = 37.06 \pm 10.95$ years) and 314 male candidates ($Mage = 41.9 \pm 12.28$ years). These candidates had been trained by 70 different providers and assessed by 52 different providers.

Candidates completed a survey that contained questions about the variables selected in the *preliminary work*. At this point, it is important to explain the term *pre-assessment*. When starting the survey, candidates were asked, "Have you attended a Mountain Leader assessment course?" If they answered "yes", then the wording for these pre-assessment variables asked them to think about how they felt or what they experienced **immediately prior to their first assessment course**. If they answered "no," the questions asked them how they felt **now, or what they had experienced recently**.

Each of the main analyses used a different subset of candidates who had responded to the survey. Details of the candidates included in each analysis are presented below.

— 2.2.1 Getting to assessment within 18 months of training - Male candidates

There were 65 responses from male candidates who completed the survey more than 18 months after their training course (i.e. retrospectively), 33 of whom had been assessed within 18 months of their training course and 32 who not been assessed at the time of completing the survey². Therefore, we were able to create a set of *learning data* ($n = 55$), which we could use to select variables and a set of *test data* ($n = 10$, with an equal split of candidates who had and had not been assessed). In addition to this, 59 male candidates completed the survey more than 12 months after their training but less than 18 months after their training (i.e. prospectively). Using the model developed with the learning data, we made predictions for each of these candidates which we have been able to test as all of them are now more than 18 months post training.

²Candidates who had not been assessed within 18 months of their training course but had been assessed prior to completing the survey were excluded from the analysis as the wording of the questions shown to them meant they would not be comparable to the other candidates.

— 2.2.2 Getting to assessment within 18 months of training - Female candidates

The data used for this analysis were collected from 27 candidates who had been assessed 18 months after their training ($Mage = 35.98 \pm 10.93$ years) and 27 who had not ($Mage = 34.29 \pm 10.31$ years). We received fewer responses from female candidates, therefore we combined the retrospective and prospective data as neither group would have been large enough on its own. In each group there were 10 candidates who completed the survey retrospectively (i.e. more than 18 months post-training) and 17 who completed the survey prospectively (i.e. 12-18 months post-training).

— 2.2.3 Passing first time

The data used for this analysis were collected from 46 candidates, 35 of whom had been assessed prior to completing the survey and 11 of whom had not been assessed before completing the survey. As with the data in *female candidates getting to assessment*, we combined the retrospective and prospective data to increase the sample size³. Twenty three of the 46 candidates passed their assessment first time. Of the 23 who did not pass, 6 completed the survey prospectively. Two of the 23 candidates who did not pass withdrew from their first assessment, none failed, and the remainder were deferred. Seven of those who were deferred only needed to log additional days.

— 2.3 ANALYTICAL PROCEDURE

We used the same pattern recognition procedure as in the pilot work, to identify two feature subsets. The first was to discriminate candidates who were assessed within 18 months of their training from those who were trained over 18 months ago **and** had not been assessed when completing the survey. This was done to ensure the pre-assessment variables were comparable but does mean that candidates who were assessed more than 18 months after their training course were excluded from the analyses. Eighteen months was chosen as: a) half of all candidates who are assessed, have been within 18 months, b) it reduced the likelihood of recall issues, and c) it also fitted the timescale of this project. The second feature subset we aimed to identify was that which best discriminated candidates who did pass their first assessment from those who did not (irrespective of how long it took them to get to assessment).

³We have run the analyses on just the retrospective data, which allowed us to include some variables about candidates' experiences of assessment, but none of these variables were selected in the best discriminatory subsets, nor were the classification rates significantly higher.

3 - Results

3.1 GETTING TO ASSESSMENT WITHIN 18 MONTHS OF TRAINING - STUDY 3

3.1.1 Key messages

- For both female and male candidates, we were able to discriminate candidates who are assessed within 18 months of their training from those who are not with *good* accuracy.
- Whilst some of the discriminatory variables are specific to female or male candidates, others are common to both:
 - Progress towards becoming a Mountain Leader, both absolutely and relative to other life goals.
 - The relative importance of becoming a Mountain Leader compared to other life goals
 - Perceived progress in effectively preparing for a Mountain Leader assessment.
- It is important for candidates getting to assessment within 18 months of their training course and passing an assessment, that course staff display good coaching behaviours, particularly goal setting, thus facilitating candidates' effective preparation for assessment following training.
- Relevant experience (i.e. QMDs) is important, particularly for female candidates, to develop candidates' confidence to perform Mountain Leader related tasks (e.g. looking after themselves and others in steep ground and crossing rivers)

3.1.2 Overview

We present two feature subsets, one for female candidates (Figure 5) and one for male candidates (Figure 4), which discriminate candidates who have been assessed 18 months after their training course from those who have not. Both of these models discriminate candidates with *very good* accuracy on the learning data (87.04-96.30% and 89.09-92.73% respectively). Neither of the models included in this section of the report contain DLOG data⁴.

For all of the feature subsets presented in this document, it is important to note that it is the *combination* of features that discriminates the groups with the particular level of accuracy and not any single feature. Any visualisation is only a crude representation of the relationship between these variables and reflects an attempt to aid interpretation of the findings for the reader. Within the results there may be a series of complex interactions between the discriminating variables, which are impossible to represent graphically in two (or even three) dimensions.

3.1.3 Male candidates

3.1.3.1 Key messages

- It is important that becoming a Mountain Leader fits into male candidates' lives as it:
 - Allows them to make progress and prepare effectively for an assessment.
 - Reduces the expected time to assessment both pre- and post-training.
- Greater understanding of the qualification pre-training and a stronger intention to be assessed post-training are both important for getting to assessment.

The following sections will first present the model developed using the retrospective data and then the results of predictions made for candidates who completed the survey more than 12 months but less than 18 months after their training course.

⁴We have performed various analyses on subsets of the data; none of the subsets that included DLOG data classified candidates with a significantly higher percentage accuracy than the subsets presented in this report. These particular findings suggest that any variance explained by the DLOG data is shared by other variables that are included in the models presented here. On its own the DLOG data discriminated both female and male candidates across the four classifiers with modest accuracy (54.81-75.93% and 49.09-76.36% respectively).

— 3.1.3.2 Results

This analysis is based on a learning data set collected from 28 candidates who had been assessed 18 months after their training course (Mage = 41.61 ± 12.79 years) and 27 who had not been (Mage = 37.93 ± 12.22 years).

A subset of 16 features was selected as the best combination of discriminatory features. This subset classified the male candidates having been assessed within 18 months of their training course or not having passed their first assessment with *very good* accuracy (NB = 90.91%, SMO = 92.72%, IBk = 90.91%, J48 = 89.09%). We were also able to test this feature subset on 10 previously “unseen” candidates, again, we were able to discriminate candidates with *very good* accuracy (NB = 90%, SMO = 80%, IBk = 80%, J48 = 90%). This “test” increases our confidence in the discriminant function of this feature subset as these candidates were not included in identifying the most important discriminatory variables. Stereotypical profiles from male candidates who have and have not been assessed are visualised in Figure 4 and described in Table 2.

Table 2: Discriminatory features for male candidates getting to assessment within 18 months of their training course.

Male candidates who had been assessed within 18 months of their training were more likely than those who had not been to:
Have felt more resilient.
Have been more confident in their understanding of the qualification before their training course.
Have had a stronger intention to be assessed by the end of their training course.
Have expected that it would take less time to get to assessment from their training both at the start and the end of their training course.
Have been trained closer to the middle of the calendar year (i.e. the summer).
Have felt that in the last six months of their consolidation: <ul style="list-style-type: none"> - They had made progress towards becoming a Mountain Leader. - That becoming a Mountain Leader was important to them. - They had made more progress towards becoming a Mountain Leader than they had towards two other stated goals they were pursuing in their life. - That becoming a Mountain Leader was more important than attaining those other two goals. - They had more resources and skills available to them to successfully become a Mountain Leader than they did to attain the other two goals. - They had done more to prepare effectively for a Mountain Leader assessment course - That they had less esteem support available to them.
Have experienced less social change since their training course (e.g. children moving out from home, gaining or losing an immediate family member (adoption, birth, death), marriage/divorce, moving to a new home, becoming a carer for a relative/friend).
Have felt that they had enough available time to become a Mountain Leader.
Have had a less negative discrepancy between their pre-assessment self-efficacy and ideal self-efficacy to “look after myself and others in steep ground/crossing a river” (i.e. they were closer to reaching or surpassing the level of confidence that they would have in an ideal world).

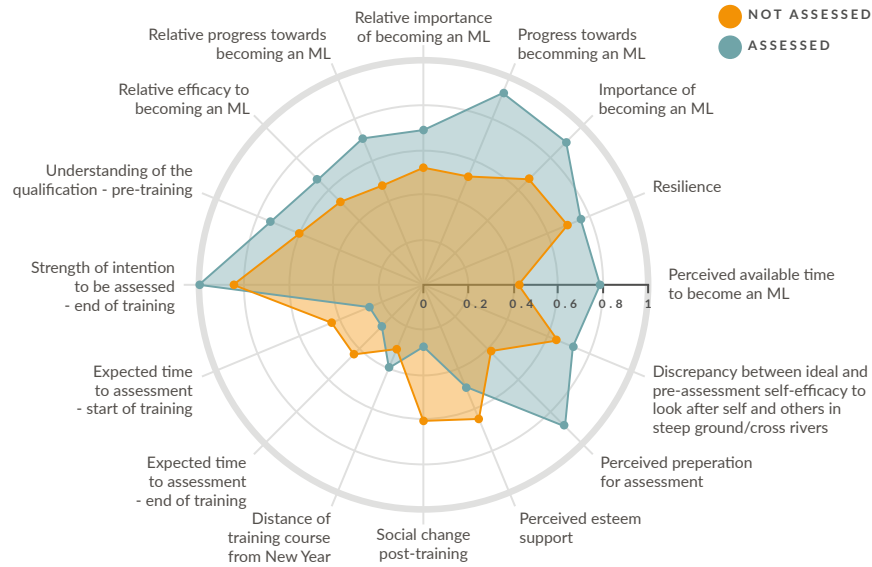


Figure 4: The 16 discriminatory features between male candidates who had and had not been assessed 18 months post-training. Note: Data points reflect the normalised mean values for each group (i.e. 0 represents the lowest value in the group and 1 represents the highest value; this transformation allows all variables to be displayed on the same scale).

3.1.3.3 Predictions

The predictions we made using the prospective data were *modest* in accuracy (NB = 72.88%, SMO = 74.58%, IBk = 72.88%, J48 = 71.19%). This is lower than the accuracy of both the training and test models, however these models *excluded candidates who had been assessed more than 18 months after their training course*. If we exclude candidates who had been assessed more than 18 months after their training course from the evaluation of the predictions, we would class the accuracy of these predictions as *good* (NB = 83.33%, SMO = 86.05%, IBk = 83.72%, J48 = 80.49%). As such, these data indicate the feature subsets have good predictive validity, yet candidates who are assessed more than 18 months after their training course may be misclassified. However, given that the aim of this project is to identify the factors that influence completion these errors should not be too concerning.

3.1.4 Female candidates

3.1.4.1 Key messages

- In addition to the key messages above, specifically for female candidates to get to an assessment within 18 months of their training course, it is important that they:
 - Are able to prepare effectively for a Mountain Leader assessment, which will be most likely to occur when it is directed by goal setting facilitated by training course staff.
 - Feel confident in their abilities to successfully perform tasks related to hazards and emergency procedures on a Mountain Leader assessment.

3.1.4.2 Results

A subset of 11 features was selected as the best combination of discriminatory features. This subset classified the female candidates having been assessed within 18 months of their training course or not having passed their first assessment with *very good* accuracy (NB = 87.04%, SMO = 96.30%, IBk = 92.59%, J48 = 87.04%). Stereotypical profiles from female candidates who have and have not been assessed are visualised in Figure 5 and described in Table 3.

Table 3: Discriminatory features for female candidates getting to assessment within 18 months of their training course.

Female candidates who had been assessed within 18 months of their training were more likely than those who had not been to:
Have felt that their training staff helped them with goal setting on their training course.
Have felt more confident in their ability to perform the following tasks pre-assessment: <ul style="list-style-type: none"> - Look after themselves and others in steep ground/crossing a river. - Provide immediate medical care in the mountains. - Respond appropriately to an emergency (e.g. a broken leg).
Have felt that in the last six months of their consolidation: <ul style="list-style-type: none"> - They had made progress towards becoming a Mountain Leader. - They had done more to prepare effectively for a Mountain Leader assessment course. - They had made more progress towards becoming a Mountain Leader than they had towards two other stated goals they were pursuing in their life. - That becoming a Mountain Leader was more important than attaining those other two goals.
Have experienced less professional change since their training course (e.g. changing job, increased/decreased income, retirement, change in working hours but not changes to family).
Have felt that in an ideal world they would have a higher number of QMDs before being assessed.
Have had an extrinsic motive as their second goal for registering for the Mountain Leader qualification.

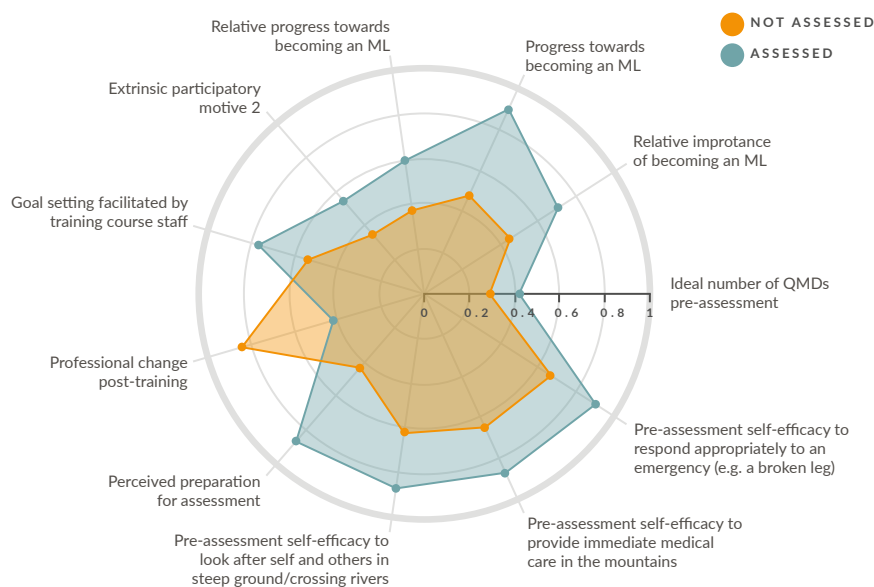


Figure 5: The 11 discriminatory features between female candidates who had and had not been assessed 18 months post-training. Note: Data points reflect the normalised mean values for each group (i.e. 0 represents the lowest value in the group and 1 represents the highest value; this transformation allows all variables to be displayed on the same scale).

— 3.2 PASSING FIRST TIME - STUDY 4

— 3.2.1 Key messages

- A subset of 11 variables, all of which can be collected before assessment, can be used to discriminate candidates who pass their first assessment from those who do not with good accuracy.
- For candidates to pass their first assessment, it is important that they:
 - Gain relevant experience prior to their assessment.
 - Use clear and specific goals to maximise the effectiveness and efficiency of their preparation.
 - Are able to cope with the pressures of the assessment process, which will be influenced by both their relevant experience and social support.

— 3.2.2 Results

A subset of 11 features was selected as the best combination of discriminatory features. This subset classified the candidates having passed or not having passed their first assessment with *good* accuracy (NB = 71.74%, SMO = 86.96%, IBk = 82.61%, J48 = 69.57%). Stereotypical profiles for candidates who do and do not pass their first assessment are visualised in Figure 6 and described in Table 4.

Table 4: Discriminatory features for candidates passing their first assessment.

Candidates who passed their first assessment were more likely, than those who did not, to:
Have felt that they lived nearer to a mountainous region.
Be White-European.
Be more extraverted.
Have felt that their training staff provided them with structure on their training course.
Have felt that their training staff helped them set goals on their training course.
Have felt that they had more esteem support available to them prior to their assessment.
Have received more emotional support in the week prior to their assessment.
Have had more QMD logbook entries at assessment.
Have had fewer Quality Hill/Moorland Days at assessment.
Have had fewer types of weather logged for Quality Hill/Moorland Days at assessment.
Have attended a Mountain Skills course.

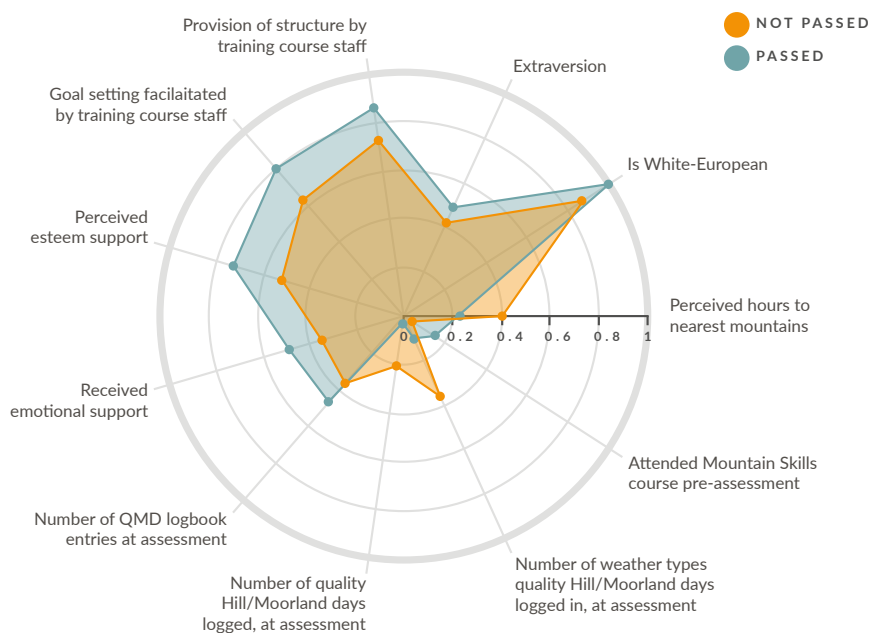


Figure 6: The 11 discriminatory features between candidates who passed their first assessment and those who did not. Note: Data points reflect the normalised mean values for each group (i.e. 0 represents the lowest value in the group and 1 represents the highest value; this transformation allows all variables to be displayed on the same scale).

3.3 SUPPLEMENTARY ANALYSES - STUDY 5

The key messages from this section are included to help understand the discriminatory feature subsets listed above, the relationships between some of the variables within them, and also to test some of the hypotheses generated from the qualitative study. However, for the sake of brevity and to not cloud the key messages of this report, the supporting details are presented in *Appendix C*.

3.3.1 Key messages

- Candidates who passed their first assessment felt that their training course staff displayed more coaching and need supportive behaviours than those who did not.
- There is a positive relationship between experience and confidence, this relationship is stronger for female candidates than it is for male candidates.
- Male candidates with little experience are more confident than female candidates with equivalent experience.
- **Most candidates intend to be assessed** at some point after their training course, however the stronger their intention and sooner they intend to be assessed, the more likely they are to be assessed.

4 - General discussion

— 4.1 KEY MESSAGES

- It is important that becoming a Mountain Leader fits into a candidate's life as this will influence their ability to gain relevant experience and prepare effectively for an assessment.
- Goal setting, facilitated by training course staff, is important for both getting to assessment and passing. It will be most effective when coupled with the *provision of structure* allowing candidates to set very specific goals, that are clearly aligned with the requirements of passing the assessment creating opportunities for *mastery experiences*.
- It is important that candidates feel confident in their skills, especially those relating to hazards and emergency procedures.
- The more experience a candidate gains, the more confident they will be.
- It is important that candidates have a strong intention of being assessed and do not expect that it will take them a long time.

— 4.2 OVERVIEW

The studies presented in this report aimed to identify important factors that discriminated candidates who (a) having been trained, went on to be assessed within 18 months of training from those who did not, and (b) having got to their first assessment, pass first time from those who did not. To achieve these aims we considered a wide range of potentially relevant variables. The results presented show that there is no one single factor that is important for discriminating candidates and in fact there are some important commonalities between groups, which are likely fundamental for the successful completion of the Mountain Leader qualification. Some of the discriminatory variables are common to both stages of completion, or to both female and male candidates getting to assessment.

— 4.3 MALE CANDIDATES - GETTING TO ASSESSMENT

The results presented in *Section 3.1.3* suggest that how becoming a Mountain Leader fits into male candidates' lives is important when considering the likelihood of them being assessed. If a candidate **feels that becoming a Mountain Leader is an important life goal, generally or relative to other life goals**, they may be more likely to commit time and resources towards it, thus may feel that they can prepare for an assessment in a shorter period of time, which for many, would include revisiting more technical areas of the syllabus like river crossings or practising skills they rarely use like emergency rope work. Candidates who felt that they had more **available time** to become a Mountain Leader, had done more to effectively prepare for a Mountain Leader assessment, had made more **progress towards becoming a Mountain Leader**, and were **more confident that they could become a Mountain Leader than to achieve other life goals** were more likely to have been assessed 18 months after their training course.

Some candidates are less certain in their **understanding of the purpose of the Mountain Leader qualification prior to their training course** and may be attending in order to find out more about the qualification, whereas those who are more certain of the purpose are more likely to be doing it in order to progress to an assessment. The **strength of candidates' intentions to be assessed at the end of their training course** being an important discriminatory variable is in line with the *Theory of Planned Behaviour* (Ajzen, 1991). The Theory of Planned Behaviour suggests that intentions are the strongest predictors of behaviour and that the strength of these intentions also predicts the behaviour (Armitage & Conner, 2001).

The strength of a candidate's intention to be assessed at the end of the training course may be more important than their intention at the start because the candidates who were less sure of the purpose of the Mountain Leader qualification would have had less information to base their intention on. This position is supported by the fact that the correlation between being assessed 18 months post-training and the intention to be assessed at the start of the

training course ($r = .16$, 95% CI [- .11, .41]) is lower than the correlation between being assessed 18 months post-training and the intention to be assessed at the end of the training course ($r = .35$, 95% CI [- .10, .57]). The results in Section 8.3.4 support this, including using prospective data and retrospective data from female candidates, which suggests the strength of intention is important for all candidates, despite not being one of the most important discriminatory variables for female candidates.

Candidates who **expect it to take them longer to get from training to assessment** are less likely to be assessed within a given period. Candidates may also expect it to take them longer as they either have less available time, live further from the mountains, or a combination of the two, making it more difficult to fit into their lives. If candidates who expect to take longer do take longer, then there will be more opportunities for things to get in the way of them pursuing that goal and becoming barriers to completion.

Further, experiencing **social change** after a training course may mean that candidates have more or less available time, or have changes in their priorities. The question used in the survey did not ask if candidates had more or less resources (e.g. available time) because of this change, however given that the more social change a candidate experienced, the less likely they were to be assessed within 18 months, it would be reasonable to assume that these social changes are more likely to leave candidates with less, rather than more, resources to become Mountain Leaders.

In our analyses we used the time of year that courses took place as a proxy measurement of weather and daylight hours. We would expect courses near the New Year to have worse weather and less daylight than those nearer to the middle of the year. Given that candidates who were trained closer to **the middle of the year (i.e. June/July)** were more likely to have been assessed 18 months after their training course, it is likely that better weather and more daylight on the training course provides candidates with a more positive experience and possibly a better learning environment. To investigate this further, weather data (held on CMS) and daylight hours data should be included in the feature selection stage of additional analyses of these data.

An extensive literature exists which supports the benefits of resilience in relation to various life outcomes (e.g. Seery & Quinton, 2016). Becoming a Mountain Leader is a difficult process which requires the investment of time, energy, and money and most candidates will have to deal with setbacks during this process. Candidates who are more **resilient** will be better able to overcome the adversity faced during the process (Smith et al., 2008) whether this relates to specific events such as bad weather on a training course, or more long-term issues such as changes in life circumstances that become barriers to becoming a Mountain Leader. It is also a central tenet of *Self-Efficacy Theory* that people with firmly established self-efficacy beliefs are more resilient (Bandura, 1997) as the stronger self-efficacy beliefs are, the easier they are to maintain following disconfirming events.

One would normally expect the availability of social support to be a positive influence on an outcome; however the results in this study suggest that having higher levels of **perceived esteem support** means that candidates are less likely to have been assessed 18 months after their training course. One explanation for this is that candidates who do not feel that they need esteem support answer this question in a different way to those who do (i.e. they don't perceive it as available), therefore those who feel they need it score more highly and with less variation in their responses. Another explanation is that esteem support may be reinforcing beliefs around unpreparedness for male candidates, with greater levels of esteem support acting to simply remind candidates that they are not ready for an assessment. Without further investigation both of these explanations remain somewhat speculative, although it is worth noting that findings consistent with the latter explanation, where psychological skills and strategies have paradoxical effects on performance, have been reported elsewhere in the literature (Roberts, Woodman, Hardy, Davis, & Wallace, 2013). Regardless, the results highlight that some support strategies might need to be utilised with caution.

Candidates who **feel less able to look after themselves and others than they would in an ideal world on steep ground and crossing rivers**, may feel that they are not ready to pass an assessment and therefore not attend one. For a number of candidates, these skills will be the most specialist mountaineering skills they possess and will have little reason, beyond passing a Mountain Leader assessment, to practise them. Unless these candidates have spent time deliberately preparing for an assessment, it is likely that they will feel less confident than they would like to at assessment, that they can successfully demonstrate these skills.

— 4.4 FEMALE CANDIDATES - GETTING TO ASSESSMENT

As with the results for male candidates, **how important becoming a Mountain Leader is to a candidate, relative to other life goals**, is an important discriminatory variable for female candidates. We would expect this variable to have the same implications as those already discussed for male candidates. Again, the more **progress that candidates have made towards becoming a Mountain Leader**, the more likely they are to feel that they have **prepared effectively for a Mountain Leader assessment** and in doing so, they will have gained experience that boosts their confidence in their abilities to perform tasks related to the assessment. It is likely that **professional change** will have similar effects for female candidates as social change does for male candidates.

Interestingly, changes to family (e.g. having a child) was included as an example of social change and not professional change. Many people suggest that female candidates do not progress to an assessment because they have a child, it would therefore be reasonable to expect social change to have been more important than professional change for female candidates. One explanation for this finding is that female candidates do not feel that having a child is a social change, rather they feel that it is a professional change as it may constitute a “change in working hours,” which was given as an example of professional change. Whilst this finding may be surprising, the important point to take from it is that the more life change a candidate experiences, the less likely they are to be assessed within 18 months of their training course.

We asked candidates to give two reasons that they had registered for the Mountain Leader qualification. For their first reason, most candidates said that they had registered in order to become a Mountain Leader (n.b. this is an extrinsic participatory motive because it relates to achieving a specific outcome). The candidates who gave an **extrinsic participatory motive for their second motive** (e.g. “to gain employment”) rather than a more intrinsic one (e.g. “to spend more time in the mountains”) were more likely to have been assessed 18 months after their training course. This finding suggests that having more than one extrinsic participatory motive is important for candidates getting to assessment.

Goal setting has been shown to improve outcomes in a number of domains (see Weinberg & Gould, 2014 p 356). One way that **goal setting facilitated by training course staff** may have helped candidates is by enabling them to maximise the benefits of the time that they spent consolidating their skills and preparing for a Mountain Leader assessment after the training course. In addition to this, goal setting may have made it more likely that candidates would prepare for an assessment. The more specific these goals are, the more they will have focused candidates’ attention and efforts towards being at the right level to pass an assessment. Further, *goal setting will have helped facilitate mastery experiences (i.e. having an experience where one is successful), the strongest source of self-efficacy* (Bandura, 1982); thus, this goal setting will have helped female candidates develop their confidence, which as discussed below, is key for female candidates getting to assessment.

If candidates feel that becoming a Mountain Leader is important to them, they may also feel that it is important that they are good enough to pass when they get there. This suggestion helps to explain why candidates who were assessed felt that **ideally, they would have a higher number of QMDs at assessment**. Another explanation could be that candidates who have not received goal setting support have fewer clear goals and do not feel that they can use the time as efficiently, therefore feel that they would ideally have more QMDs before being assessed.

The results presented in *Section 3.1.4 and Section 8.3.3* show that female candidates who are assessed within 18 months of their training have higher levels of **self-efficacy pre-assessment** than those who are not and that these higher levels of self-efficacy are associated with experience gained after the training course. These items are about areas of the syllabus relating to hazards and emergency procedures, where mistakes may have serious and immediate consequences for other people. It may be especially important for course staff to help female candidates set goals that help them develop their confidence to perform these tasks.

Discrepancies between the ideal and post-training levels of self-efficacy were not selected as important discriminatory variables, whilst three of the **pre-assessment self-efficacy** items were. This would suggest that it is not the discrepancy that is important, but the pre-assessment levels of self-efficacy, which will be influenced by candidates’ experiences and how much preparation they feel that they have done. This hypothesis is supported in *Section 8.3.3.1* where there is evidence of a positive relationship between experience and confidence, which is stronger for female candidates than it is for male candidates.

It is both interesting and important to note, that 10 of the 11 the features in this discriminatory subset relate to the consolidation period. Considering this combination of variables, the timing of them, and the relationship between the number of QMDs and pre-assessment self-efficacy; the importance of female candidates gaining additional and relevant experience after their training course becomes paramount.

— 4.5 PASSING FIRST TIME

The **further candidates live from a mountainous region**, the more difficult it will be for them to gain relevant experience. Furthermore, it is also less likely that they will be able to access support specific to becoming a Mountain Leader as it is less likely that becoming a Mountain Leader is normal in their social context.

It is clear from analyses not reported here that the first time pass rate for the Mountain Leader qualification is lower for **non-White-European candidates** than it is for White-European candidates⁵ and also that the proportion of non-White-European candidates who are assessed is much lower than the proportion of White-European candidates who are assessed⁶. There are many plausible explanations for this, which may include social, cultural, and economic factors. However, there is little empirical evidence to support any of them at the moment and it is beyond the scope of this report to examine this issue further.

The facilitation of goal setting by course staff was also an important factor for passing first time. In addition to helping candidates set goals, the **provision of structure by training staff**, by making it clear to candidates what they need to do to pass an assessment, was important. The provision of structure may have benefited candidates by helping them to set very clear and specific goals, which are more effective than broad and/or vague goals for influencing behaviour change (Gould, 2005).

There are a number of reasons that **extraversion** may be linked with passing, including differences in levels of physiological arousal, which can influence the breadth of perceptual cues that individuals pay attention to, and decision making (Hardy, Jones, & Gould, 1996). Extraversion has also been linked with effective leadership (Judge, Bono, Ilies, & Gerhardt, 2002). It is important that candidates are able to pay attention to perceptual clues, make good decisions and display effective leadership in order to pass an assessment. There is also evidence that *goal setting reduces the distractibility of extraverts*, helping them maintain focus in training (Woodman, Zourbanos, Hardy, Beattie, & McQuillan, 2010), therefore, goal setting may be particularly important for extraverted candidates.

The Mountain Leader assessment is a very stressful experience for many candidates. Therefore, it is unsurprising that **received emotional support** and **perceived esteem support available** are positive predictors of passing. Having these types of social support may help candidates cope with the pressure of assessment (Freeman, Coffee, Moll, Rees, & Sammy, 2014; Freeman, Coffee, & Rees, 2011). However, as seen above, perceived esteem support is a predictor of male candidates not getting to assessment. These findings would suggest that esteem support should be used sparingly, or only in the right context (i.e. when candidates are ready to be assessed).

Seven of the 23 candidates who did not pass their first assessment were only deferred because they had too few **Quality Mountain Days in their logbook at assessment**. *It is important to highlight that the features presented here discriminate between candidates who do and do not pass their assessment, not between candidates who are and are not good enough to pass a Mountain Leader assessment, in terms of their skills and decision making.* If we removed these particular candidates from the sample, we would have too few cases to perform the analysis, therefore, it is difficult at this juncture to answer the question "Is having more than the minimum experience beneficial for passing a Mountain Leader assessment." If anything, it is evidence that one can pass the practical element a Mountain Leader assessment with *fewer* than 40 QMDs.

⁵Analysis of data on CMS shows that the pass rate for non-White-European candidates has been lower than for White-European candidates since at least 2010.

⁶This is in general and not just after 18-months.

The results presented in Passing first time also suggest that candidates who include **Quality Hill/Moorland Days** in their DLOG are less likely to pass. Whilst **it is unlikely that this experience is detrimental to their performance at assessment**, Quality Hill/Moorland Days are not as relevant as QMD experience. One explanation for this finding is that candidates who feel they have a weak logbook want to show all the experience that they believe is relevant, whereas a candidate who thinks they have a strong logbook may only feel the need to include the experience they believe is most relevant. Further, candidates who live further from the mountains may be trying to prepare for a Mountain Leader assessment in non-mountainous terrain as it is more accessible to them.

Nine of the 10 candidates who **attended a Mountain Skills** course prior to being assessed and responded to the survey, passed their first Mountain Leader assessment⁷. This suggests that additional structured training helps candidates to successfully prepare for an assessment.

When considering the discriminatory features presented above in a holistic manner, it is important that whilst preparing for their assessment, candidates gain enough relevant experience in the consolidation period, using clear and specific goals developed from training. In addition, it is vital that they are able to cope with the pressures of the assessment process, drawing not only on their experience relevant to the Mountain Leader qualification (i.e. QMDs), but also on social support when necessary.

— 4.6 LIMITATIONS

Several limitations can be identified in this project. Firstly, most of the data used were collected retrospectively. Retrospective data will be less accurate as time increases between the event and when participants are sampled, and people may create their own narrative retrospectively which may or may not reflect reality. An example of this could be a candidate who did not pass their first assessment attributing their failure to the coaching (or lack thereof) they received on their training course.

Secondly, there is some evidence of sampling bias in the data used to identify the important discriminatory factors for both getting to assessment and passing. The proportion of female and male candidates who did get to assessment within 18 months of their training course is not the same in the retrospective data (females = 23.21% and males = 41.35%) as it is in the population of candidates trained in the same period (females = 19.02% and males = 30.22%). In addition to this, the proportion of males who did not pass their first assessment is not the same in the retrospective data (13.5%) as it is in the prospective data (19.6%) or in the population⁸ (19.8%); there is no evidence of the same problem in the data collected from female candidates. The simplest explanation for this is that candidates who are not assessed and male candidates who do not pass their first assessment are less likely to **retrospectively** respond to the survey.

Whilst there may be a subset of candidates that are not represented in the data collected as part of this project, a limitation of almost any research, we believe that the findings presented in this report can be used to make a positive impact on the completion rate of the Mountain Leader qualification. This belief is based not only on the analyses of retrospective and prospective data presented here, but their congruence with the results from the *initial qualitative study* and existing literature.

Further analysis of these data in the future should mitigate this sampling bias so that the response rate in the prospective data is similar to that in the population and the impact of recall bias is reduced. However, a truly prospective study that collected data from candidates at registration, training, and during their consolidation phase would likely overcome the limitations described above.

⁷The candidate who did not pass attended a Mountain Skills course 35 days before the start of their assessment and their training course 107 days before their assessment (all with the same provider). They also had an additional seven days experience (Dartmoor & Snowdonia) between the Mountain Skills course and their assessment.

⁸Candidates who were first trained after 2016.

5 - Future directions

The most impactful implications to come out of these findings will be those realised through conversation between Mountain Training stakeholders and Bangor University. The results presented in this report will also be presented in November 2019 at the Mountain Training United Kingdom and Ireland council meeting. Following this we are proposing that we conduct a workshop with relevant stakeholders to identify the most important implications, which can then be fed into an executive group that can establish recommendations for change, based on the evidence presented. However, below are some suggested implications, interventions, and areas for future research.

— 5.1 POTENTIAL IMPLICATIONS AND INTERVENTIONS

— 5.1.1 *Course staff training*

Whilst the dissemination of this report may help some providers to better support their candidates, it is likely that specific education and training will have a greater impact. One example of this would be training course staff over a number of sessions, to help them provide psychological skills coaching, in particular goal setting. While it is likely that many course staff engage in excellent practice already, there may be opportunities for adapting aspects of that practice to gain even greater benefits. This training could be based on previous interventions that show that developing more individualised support with coaches over an extended period leads to greater understanding and use of psychological skills (e.g. Arthur, Callow, Roberts, & Glendinning, 2019; Callow, Roberts, Bringer, & Langan, 2010).

— 5.1.2 *Individualised candidate support*

Whilst this report has presented stereotypical candidate profiles based on mean values, the needs of each individual candidate will vary. Given that understanding of the qualification pre-training is an important discriminatory variable for male candidates getting to assessment within 18 months of their training, improved signposting to relevant qualifications at the point of registration may reduce the number of candidates who attend a Mountain Leader training course and then realise that it is not what they need or that they do not have time to effectively prepare for an assessment.

For candidates who have attended a training course, there are a number of simple additions to the pathway that may increase their likelihood of being assessed. An example of this would be using a “monitoring tool” six months after their training course to assess their progress, confidence to perform specific tasks, and intention to be assessed. Individual responses to this monitoring tool could then be used to provide targeted support; for example, a candidate who has made little progress may be offered goal setting support aimed at helping them to make more progress. Alternately, a candidate who feels that they have made lots of progress towards becoming a Mountain Leader but does not feel confident in their ability to look after others in steep ground might be sent details of “steep-ground refresher” courses with approved providers. A tool like this could be particularly useful in identifying candidates who are struggling to gain additional, relevant, experience post-training and offering support to them that would help them effectively prepare for an assessment.

5.2 FUTURE RESEARCH

5.2.1 *Validation of the discriminatory feature subsets*

Given the retrospective nature of most of the analyses reported above, it would be prudent to analyse the data which has been collected in a prospective fashion. Doing so would help us to understand what influence, if any, attributional and sampling bias have had on these findings.

5.2.2 *Self-efficacy*

Candidates' confidence to perform tasks related to a Mountain Leader assessment, particularly those relating to hazards and emergency procedures, are important for candidates both getting to and passing a Mountain Leader assessment. This experience unsurprisingly appears to be related to the relevant experience a candidate has, however the strength of this relationship is not the same for all candidates, specifically female and male candidates.

Performance accomplishments, followed by vicarious experiences, verbal persuasion, and emotional arousal have the greatest effect on self-efficacy, and a negative experience of a given magnitude will have a greater effect than an equivalent positive experience (Bandura, 1977, 1982). Therefore, understanding how candidates perceived their experiences whilst consolidating and how, if at all, their self-efficacy changes over time would be a worthy topic of inquiry. It is possible that through the use of specific questions and prompts whilst logging experience on DLOG that Mountain Training can help maximise the positive effects of experience and minimise the negative ones. It may also be useful to understand the latency of the effect experience has on self-efficacy. That is, how long does the benefit of a QMD last, or how long does it take to get over a negative experience? Understanding the answers to these questions would be useful in helping candidates fit efficient and effective preparation into their lives.

5.2.3 *Ethnicity*

It is clear that non-White-European candidates are both less likely to get to assessment and also to pass their first assessment, however, the causes of this are not clear from this report. Three study ideas are listed below in increasing levels of complexity and potential for understanding differences in completion rates based on ethnicity:

1. Examine the survival rates and pass rate for different ethnic groups across a range of qualifications.
 - (a) Are the results the same for qualifications that cost less in terms of both time and money?
2. Using publicly available socio-economic data examine the relationships between demographics, economic status, and completion of various Mountain Training qualifications.
3. Mixed-methods research project that aims to identify potential barriers to non-White-Europeans registering for and completing Mountain Training qualifications.

6 - Conclusion

This project has examined a wide range of factors that were believed to influence completion of the Mountain Leader qualification. Feature subsets have been identified, which discriminate female and male candidates who are assessed within 18 months of their training from those who are not and candidates who pass their first assessment from those who do not. The findings presented in this report suggest that whilst Mountain Training's qualification pathway is effective, there are several ways in which additional support could be provided to candidates, particularly during the consolidation phase of the pathway.

7 - References

- Aha, D. W., Kibler, D., & Albert, M. K. (1991).
Instance-based learning algorithms. *Machine Learning*, 6(1), 37–66. <https://doi.org/10.1007/BF00153759>
- Ajzen, I. (1991).
The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Armitage, C. J., & Conner, M. (2001).
Efficacy of the Theory of Planned Behaviour: A meta-analytic review. *British Journal of Social Psychology*, 40(4), 471–499. <https://doi.org/10.1348/014466601164939>
- Arthur, R. A., Callow, N., Roberts, R., & Glendinning, F. (2019).
Coaches Coaching Psychological Skills—Why Not? A Framework and Questionnaire Development. *Journal of Sport and Exercise Psychology*, 41(1), 10–23. <https://doi.org/10.1123/jsep.2017-0198>
- Bandura, A. (1977).
Self-efficacy: Toward a Unifying Theory of Behavioral Change. *Psychological Review*, 84(2), 191–215. <https://doi.org/10.1037/0033-295X.84.2.191>
- Bandura, A. (1982).
Self-efficacy mechanism in human agency. *American Psychologist*, 37(2), 122–147. <https://doi.org/10.1037/0003-066X.37.2.122>
- Bandura, A. (1997).
Self-efficacy. New York: Freeman.
- Bass, B. M. (1985).
Leadership and performance beyond expectations. New York: Free Press.
- Callow, N., Roberts, R., Bringer, J. D., & Langan, E. (2010).
Coach education related to the delivery of imagery: Two interventions. *Sport Psychologist*, 24(3), 277–299. <https://doi.org/10.1123/tsp.24.3.277>
- Deci, E. L., & Ryan, R. M. (1985).
Intrinsic motivation and Self-determination in Human Behavior. New York: Plenum.
- Deci, E. L., & Ryan, R. M. (2000).
The “What” and “Why” of Goal Pursuits: Human Needs and the Self-Determination of Behavior. *Psychological Inquiry*, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01
- Duda, R. O., Hart, P. E., & Stork, D. G. (2000).
Pattern Classification (2nd Editio, p. 738). Retrieved from <http://eu.wiley.com/WileyCDA/WileyTitle/productCd-0471056693.html>
- Frank, E., Hall, M. A., & Witten, I. H. (2016).
The WEKA Workbench. Online Appendix for “Data Mining: Practical Machine Learning Tools and Techniques” (Fourth edi). Morgan Kaufmann.
- Freeman, P., Coffee, P., Moll, T., Rees, T., & Sammy, N. (2014).
The ARSQ: The Athletes’ Received Support Questionnaire. *Journal of Sport and Exercise Psychology*, 36(2), 189–202. <https://doi.org/10.1123/jsep.2013-0080>
- Freeman, P., Coffee, P., & Rees, T. (2011).
The PASS-Q: the perceived available support in sport questionnaire. *Journal of Sport & Exercise Psychology*, 33(1), 54–74.
- Gould, D. (2005).
Goal setting for peak performance. In J. Williams (Ed.), *Applied sport psychology: Personal growth to peak performance (Fifth edit)*. Palo Alto, CA: Mayfield.
- Guyon, I., Weston, J., & Barnhill, S. (2002).
Gene selection for cancer classification using Support Vector Machines. *Machine Learning*, 46, 389–422. <https://doi.org/https://doi.org/10.1023/A:1012487302797>
- Güllich, A., Hardy, L., Kuncheva, L., Laing, S., Evans, L., Rees, T., ... Wraith, L. (2019).
Developmental Biographies of Olympic Super- Elite and Elite Athletes: A Multidisciplinary Pattern Recognition Analysis. *Journal of Expertise*, 2(1), 23–46.
- Hall, M. A. (1999).
Correlation-based Feature Selection for Machine Learning (Doctoral Thesis). University of Waikato.

- Hardy, L., Jones, G., & Gould, D. (1996).
Understanding psychological preparation for sport. Chichester: John Wiley & Sons.
- Ingledeu, D. K., Markland, D., & Ferguson, E. (2009).
Three Levels of Exercise Motivation. *Applied Psychology: Health and Well-Being*, 1(3), 336–355. <https://doi.org/10.1111/j.1758-0854.2009.01015.x>
- Jacobs, N., Hagger, M. S., Streukens, S., De Bourdeaudhuij, I., & Claes, N. (2011).
Testing an integrated model of the theory of planned behaviour and self-determination theory for different energy balance-related behaviours and intervention intensities. *British Journal of Health Psychology*, 16(1), 113–134. <https://doi.org/10.1348/135910710X519305>
- John, G. H., & Langley, P. (1995).
Estimating Continuous Distributions in Bayesian Classifiers. Eleventh conference on uncertainty in artificial intelligence, 338–345. Retrieved from <http://arxiv.org/abs/1302.4964>
- Jones, B. D., Hardy, L., & Kuncheva, L. (2017).
Pattern Recognition Analysis: Procedures for SSHES - Stage 1 WEKA.
- Jones, B. D., Hardy, L., Lawrence, G. P., Kuncheva, L. I., Du Preez, T. L., Brandon, R., ... Bobat, M. (2019).
The identification of 'Game Changers' in England cricket's developmental pathway for elite spin bowling: a machine learning approach. *Journal of Expertise*, 2(2), 92–120.
- Judge, T. A., Bono, J. E., Ilies, R., & Gerhardt, M. W. (2002).
Personality and leadership: A qualitative and quantitative review. *Journal of Applied Psychology*, 87(4), 765–780. <https://doi.org/10.1037/0021-9010.87.4.765>
- Kira, K., & Rendell, L. A. (1992).
Feature selection problem: traditional methods and a new algorithm. *Proceedings Tenth National Conference on Artificial Intelligence*, 129–134.
- Markland, D., & Tobin, V. J. (2010).
Need support and behavioural regulations for exercise among exercise referral scheme clients: The mediating role of psychological need satisfaction. *Psychology of Sport and Exercise*, 11(2), 91–99. <https://doi.org/10.1016/j.psychsport.2009.07.001>
- Muthén, B., & Asparouhov, T. (2012).
Bayesian structural equation modeling: A more flexible representation of substantive theory. *Psychological Methods*, 17(3), 313–335. <https://doi.org/10.1037/a0026802>
- Platt, J. C. (1998).
Fast training of Support Vector Machines using Sequential Minimal Optimization. In B. Schoelkopf, C. Burges, & A. Smola (Eds.), *Advances in kernel methods - support vector learning*.
- Quinlan, R. (1993).
C4.5: Programs for Machine Learning. San Mateo, CA: Morgan Kaufmann.
- Roberts, R., Woodman, T., Hardy, L., Davis, L., & Wallace, H. M. (2013).
Psychological Skills Do Not Always Help Performance: The Moderating Role of Narcissism. *Journal of Applied Sport Psychology*, 25(3), 316–325. <https://doi.org/10.1080/10413200.2012.731472>
- Seery, M. D., & Quinton, W. J. (2016).
Understanding Resilience: From Negative Life Events to Everyday Stressors. In *Advances in experimental social psychology*. <https://doi.org/10.1016/bs.aesp.2016.02.002>
- Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008).
The brief resilience scale: assessing the ability to bounce back. *International Journal of Behavioral Medicine*, 15(3), 194–200. <https://doi.org/10.1080/10705500802222972>
- Wagstaff, C. R. D., Arthur, C. A., & Hardy, L. (2018).
The Development and Initial Validation of a Measure of Coaching Behaviors in a Sample of Army Recruits. *Journal of Applied Sport Psychology*, 30(3), 341–357. <https://doi.org/10.1080/10413200.2017.1384937>
- Weinberg, R. S., & Gould, D. (2014).
Foundations of sport and exercise psychology (Sixth edit). Champaign, IL: Human Kinetics.
- Woodman, T., Zourbanos, N., Hardy, L., Beattie, S., & McQuillan, A. (2010).
Do Performance Strategies Moderate the Relationship Between Personality and Training Behaviors? An Exploratory Study. *Journal of Applied Sport Psychology*, 22(2), 183–197. <https://doi.org/10.1080/10413201003664673>

8 - Appendices

— 8.1 APPENDIX A: GLOSSARY OF TERMS

Coaching behaviours: Coaching can be considered as an attempt to improve performance by helping an individual to gain or improve their knowledge and skills and is a “type of behaviour that leaders may engage in to a lesser or greater extent” (Wagstaff, Arthur, & Hardy, 2018, p 341). Leaders may engage in coaching behaviours and some models of leadership (e.g. transformational leadership theory (Bass, 1985) include elements of coaching behaviours. Wagstaff et al. (2018) describe five coaching behaviours, based on sport and business coaching models: 1) observing and performance analysis, 2) asking effective questions, 3) facilitating goal setting, 4) providing developmental feedback, and 5) providing motivational feedback.

Goal setting: When appropriate and specific, goals will motivate individuals to act. Goal specificity, proximity, and difficulty will all influence subsequent performance (Hardy et al., 1996), that is, goals that are more specific, closer in time, and more difficult (but still accepted) will have a more positive impact than those which are more general, distant in time, easier to achieve or so difficult that they are not accepted.

Learning data: This data is used to identify relationships between variables and the best predictive model. Also known as “training data.”

Mastery experience: Experiences of success, which arise from effective performance (Bandura, 1977).

Need supportive behaviours: Behaviours that support the three basic psychological needs proposed by self-determination theory (SDT; Deci & Ryan, 1985, 2000): *competence*, the feeling of mastery and effectiveness; *relatedness*, feeling connected and involved with others; and *autonomy*, feelings of volition, choice, and internal control. SDT suggests that the satisfaction of these three needs is essential for optimal-functioning, good mental health, and well-being.

SDT suggests that every motivated behaviour can be placed on a continuum, from autonomous to controlled. **Intrinsic motives** (e.g. a person engaging in an activity because they find it interesting and enjoyable) will be closer to the autonomous end of this continuum, whereas **extrinsic motives** can range from relatively autonomous (e.g. doing something because it is seen as important) to more controlled (e.g. doing something to gain external approval or reward). Some researchers have suggested that motives exist on a number of levels, namely, dispositional motives, participatory motives, and regulatory motives (Inglelew, Markland, & Ferguson, 2009).

Deci and Ryan (2000) suggest that an environment which supports an individual's basic psychological needs will foster more autonomous forms of motivation. SDT suggests three aspects of an environment which will foster more autonomous forms of motivation (see Markland & Tobin, 2010):

1. **Autonomy** supportive environments will help an individual to feel that they are acting in line with their goals and not those of others.
2. The provision of **structure** helps individuals to develop clear expectations and helps them to believe that they are able to perform tasks successfully.
3. **Involvement** is concerned with the degree to which an individual feels that important others are genuinely interested in them.

Participatory motives: The content or “what” of candidates' goals. Something that they are trying to attain or avoid.

Perceived esteem support: One's perceived potential to access support that bolstered their sense of competence or self-esteem if needed (Freeman et al., 2011).

Pre-assessment: When starting the survey, candidates were asked, “Have you attended a Mountain Leader assessment course?” If they answered “yes”, then the wording for these pre-assessment variables asked them to think about how they felt or what they experienced

immediately prior to their first assessment course. If they answered “no,” the questions asked them how they felt now, or what they had experienced recently.

Received emotional support: The specific help one has received during a specified time period that makes them feel loved and cared for (Freeman et al., 2011).

Regulatory motives: The perceived loci of causality or “why” of candidates’ goals.

Self-efficacy: An individual’s confidence in their ability to carry out a specific task at a given time (e.g. navigate to a chosen point on a map in any weather) is known as their self-efficacy (Bandura, 1977). Personal experiences, followed by vicarious experiences, have the greatest effect on self-efficacy and a negative experience of a given magnitude will have a greater effect than an equivalent positive experience (Bandura, 1982).

Survival analysis: A method for analysing the expected duration of time until an event occurs.

Theory of planned behaviour: The theory of planned behaviour suggests that an individual’s intention is the closest predictor of their behaviour and that this intention is influenced in turn by three belief-based perceptions about behaviour: 1) attitudes, 2) subjective norms, and 3) perceived behavioural control (Ajzen, 1991). Perceived behavioural control is similar to self-efficacy as it reflects an individual’s belief that they can engage in a specific behaviour. Perceived behaviour control and attitudes are stronger predictors of intention than subjective norms (Jacobs, Hagger, Streukens, De Bourdeaudhuij, & Claes, 2011).

Test data: This data is used to test the predictive validity of the model developed using the learning data.

— 8.2 APPENDIX B: PATTERN RECOGNITION ANALYTICAL PROCEDURE

Using Weka open source software (Frank, Hall, & Witten, 2016) we employed a pattern recognition technique that aims to identify the most important **discriminatory** variables between two groups of people in a given sample. Pattern recognition has been developed specifically for analysing data from what are known as “short and wide” data sets (i.e. datasets that contain more variables than cases), and has successfully been used in a number of recent studies to examine differences between athletes of different performance levels (e.g. Güllich et al., 2019; Jones et al., 2019). Pattern recognition comprises a three-part process. First, we aim to identify a set of features which correlate well with the class but have a low correlation with one another (feature selection). Then we test the ability of this feature subset to correctly classify the candidates (classification). Finally, we refine the feature subset to identify the simplest solution that best explains the data (recursive feature elimination).

Best practice guidelines recommend that feature selection is carried out using a number of different methods (Jones, Hardy, & Kuncheva, 2017). With this in mind we used four feature selection algorithms, each of which works in a different way: Correlation Feature Subset with a Best First Evaluator (Hall, 1999), Correlation Attribute Evaluator, Relief-f (Kira & Rendell, 1992), and Support Vector Machine - Recursive Feature Elimination (Guyon, Weston, & Barnhill, 2002). All of these are well established feature selection methods and the greater the number of algorithms which select a feature, the more confident we can be that it is important. We then created two feature subsets, the first is of features selected by at least two feature selection algorithms and the second is those selected by at least three algorithms.

We then ran classification analyses on each of the feature subsets, again using four different (classification) algorithms: Naïve Bayes (NB; John & Langley, 1995), Sequential Minimal Optimization (SMO; Platt, 1998), Instance Based Learning (IBk; Aha, Kibler, & Albert, 1991), J48 Decision Tree (J48; Quinlan, 1993). In a similar vein to the feature selection step, the more consistent the classification accuracy for a feature subset, the more confidence we can place in the predictive validity of that subset.

Finally, we repeated the classification analyses for the feature subset containing features selected by at least two algorithms, but then removed the feature that was ranked as least important by the SMO classifier, and re-ran the experiment again. We repeated this process until the classification rate no longer improved and the remaining features were retained as a third feature subset. We then examined the classification profile of the three resultant subsets and retained the one with the best classification accuracy.

We carried out the pattern recognition procedure described above twice for each of the four pilot surveys. The first set of analyses identified the most important features for discriminating candidates who get to assessment within 18 months of their training from those who do not. The second set of analyses identified the features which best discriminated candidates who passed their first assessment from those who did not.

— 8.3 APPENDIX C: SUPPLEMENTARY ANALYSES

— 8.3.1 Data

We have tried to use as much of the data collected from candidates trained in 2017 and 2018 as possible in this section and replicate findings with data collected from candidates trained 2008-2016. Therefore, the number of candidates varies for each analysis and is reported with the analysis.

— 8.3.2 Experiences of training

Two of the 11 discriminatory features reported in Section 3.2 are about candidates' perceptions of their training staff's behaviours, with candidates who pass their first assessment scoring higher than those who did not. Figures 7 and 8 show that this is the case for all the variables measured relating to training staff's behaviours. For reference, in a sample of 213 military recruits, mean scores ± 1 SD of: 3.59 ± 1.00 , 3.28 ± 1.00 , 3.21 ± 1.01 , and 2.94 ± 1.04 were reported for the MCBS factors Observation, Effective Questioning, Goal Setting, and Motivational Feedback respectively (Wagstaff et al., 2018)⁹ which appear to be lower than the scores obtained in our data.

It would be wrong to conclude that the staff who trained candidates who do not pass have not displayed coaching or need supportive behaviours. However, the staff of candidates who do pass have displayed *high* levels of coaching and need supportive behaviours. Given that these results are from candidates who had been assessed before responding to the survey, another interpretation of these results is that candidates who have passed attribute their success, at least in part, to their training course staff and similarly, the candidates who do not pass attribute their failure to their training course staff (Hardy et al., 1996). **Candidates who pass their first assessment retrospectively perceive their training course staff to display high levels of coaching behaviours and need supportive behaviours.** Analysing data from candidates who are assessed after they responded to the survey once a sufficient number have been assessed will help us better understand the direction of causality for this finding.

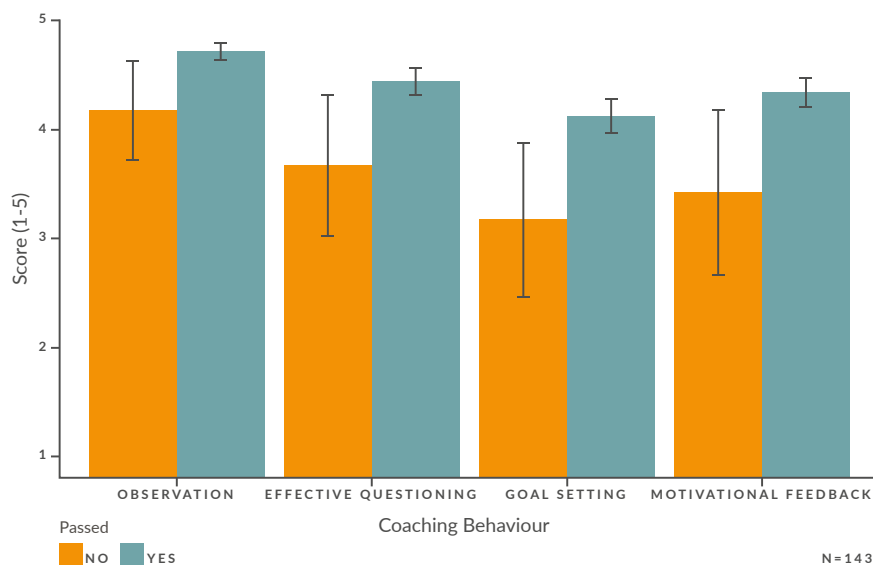


Figure 7: Group 5 candidates' rating of training course staffs' coaching behaviours (1-5), columns represent group means with 95% confidence intervals.

⁹n.b. These scores were calculated using the full measure for each factor.

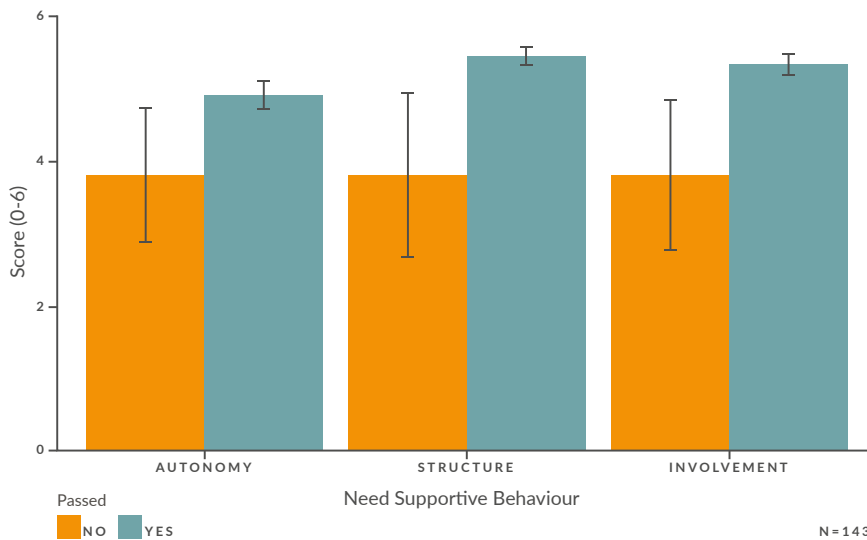


Figure 8: Group 5 candidates' rating of training course staffs' need supportive behaviours (0-6), columns represent group means with 95% confidence intervals.

8.3.3 Mountain Leader related self-efficacy

A number of Mountain Leader related pre-assessment self-efficacy items were selected in the best feature subsets in the *getting to assessment analyses* and the results of *Study 1* suggest that candidates need to be confident enough in their skills in order for them to be assessed and that there will be sex-differences in self-efficacy levels. More specifically *Study 1* offered two hypotheses:

- H_1 : Female and male candidates will not have different levels of Mountain Leader related self-efficacy
- H_2 : In their ideal world, female candidates will have higher levels of Mountain Leader related self-efficacy than male candidates would in theirs

Using the data collected from candidates trained from 2017-2018, it is evident that both female and male candidates who are assessed within 18 months of training have significant increases in their self-efficacy totals from training to assessment, but candidates who are not assessed do not. Female candidates who are assessed also have higher self-efficacy totals pre-assessment, but not post-training, than those who are not assessed; male candidates who are assessed have higher self-efficacy totals post-training and pre-assessment than those who are not (Figure 9). This finding was replicated using the data from candidates trained 2008-2016 ($n = 519$).

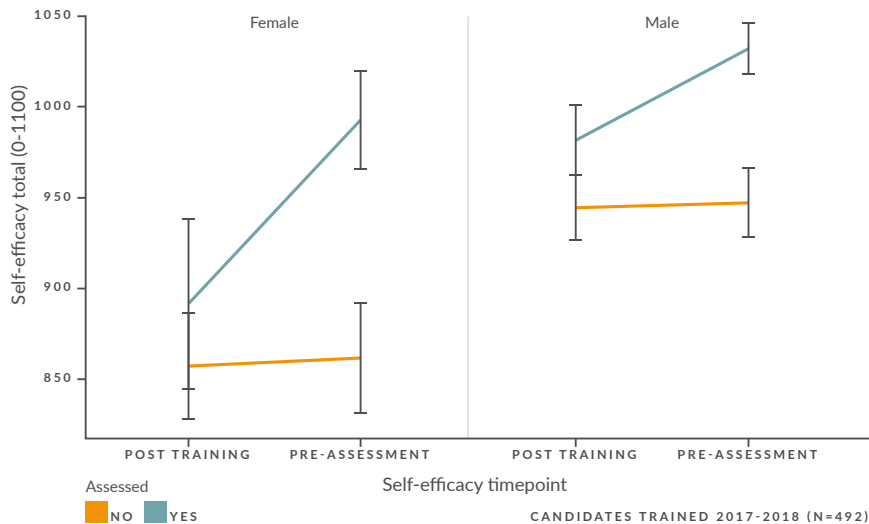


Figure 9: Changes in total self-efficacy scores over time for female and male candidates.



8.3.3.1 Sex differences

Analysis of the data collected both for the preliminary and main studies show that female and male candidates do have different total levels of Mountain Leader related self-efficacy post-training and pre-assessment (Figure 9), but they do not have different ideal levels of self-efficacy. This finding was replicated using the data from candidates trained 2008-2016 (n = 1,056).

Self-efficacy and personal experience are intrinsically linked; Figure 10 shows two important things:

- **The relationship between experience and confidence is stronger for females than it is for males**, possibly because at lower level of experience, females are less confident than males.
- **Candidates with more experience feel more confident.**

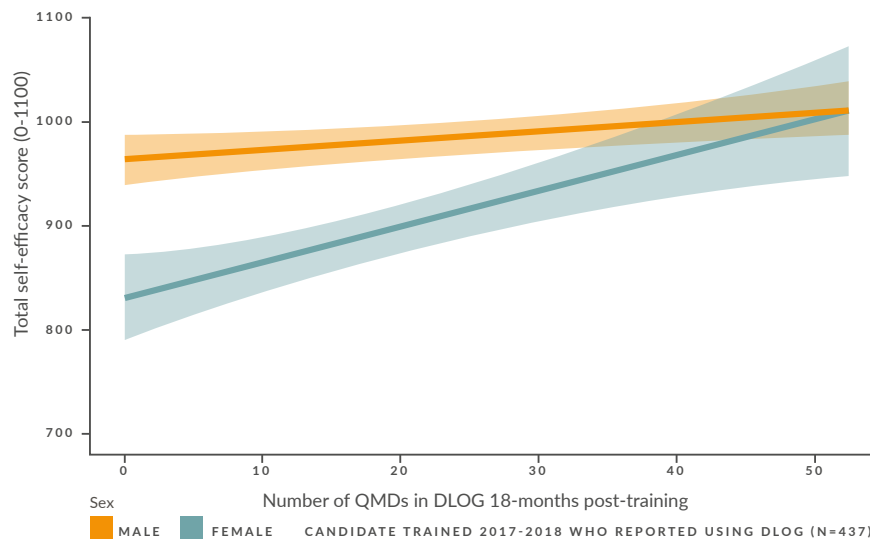


Figure 10: The interactive relationship between experience, sex, and confidence.

8.3.4 Expectations and intentions

A commonly cited reason for candidates not going onto a Mountain Leader assessment after a training course is that, "they only wanted to do the training course." Data collected from a survey of candidates trained from 2008-2016 suggests that at the point of registration, this is true for just 5.45% (n = 532) of candidates and that there is no statistically significant difference in the likelihood of being assessed 18 months post-training based on this intention.

However, the strength of a candidate's intentions of being assessed or not, scored on a scale from "no intention of being assessed" (0) to "every intention of being assessed" (100), is higher at the start and end of training for those who are assessed 18 months post training from those who are not; there is no difference in the mean strength of intention to be assessed at registration, but there is both at the start and end of the training course (candidates trained 2017-2018, n = 125)¹⁰. **This finding suggests that most candidates do intend to be assessed but this intention must be strong, both at the start and end of the training course, for them to get to assessment.**

We asked candidates who had not been assessed when they completed the survey about their intention to be assessed at that point. Most candidates did still intend to be assessed to some degree. The strength of their intention predicted if they would be assessed in the six months after completing the survey: 287 candidates had not been assessed (Mintention = 81.98) and 47 had been (Mintention = 95.96). In the data collected from candidates trained 2008-2016 there were differences at registration as well as the start and end of training, but candidates were either asked about their intention at registration or their intention at the start and end of their training course.



¹⁰This is true for both sexes when the data are analysed separately.

— 8.4 APPENDIX D: THE RESEARCH TEAM

This research has been conducted as part a KESS 2 PhD project and funded by the European Social Fund. The researchers involved are all from the *Institute for the Psychology of Elite Performance (IPEP)*.

— Will Hardy

Will graduated in 2014 from Bangor University with a first-class honours degree in Geography, having completed a research project titled “Decision making in Scottish avalanche terrain”. The psychology behind the way in which different people use the mountains led Will to IPEP and this collaborative project with Mountain Training UK. Will has a number of other research interests including better understanding the psychological factors influencing decision making in high-risk mountain sports, psychological resilience, and mental health. Most of his spare time is spent in the mountains, running or climbing. Will is also a qualified Mountain Leader and has been an active member of Llanberis Mountain Rescue Team since 2014.

— Dr Ross Roberts

Ross is a senior lecturer in sport and exercise psychology, and a member of the IPEP. His research interests centre on various aspects of performance psychology, he is particularly interested in the effects of personality in relation to performance and health, and also on factors that influence achievement and progression within high level sport. Much of his work is collaborative and involves organisations from the high-performance domain. In recent years he has received research funding from a variety of sources including the Ministry of Defence, Rugby Football Union, UK Sport, England and Wales Cricket Board, Sport Wales, and the European Social Fund. He has also recently completed work with the Outdoor Partnership on understanding the state of outdoor activity provision. He is also a chartered psychologist and associated fellow of the British Psychological Society and a Health Care Professions Council registered sport and exercise psychologist. He has over 15 years’ experience working with high level performers and coaches in sport and military settings on a variety of performance-related issues, and also supervising aspirant psychology practitioners. A keen fell runner, when he is not working, he can usually be found in the hills and has previously completed both his Mountain Leader and Rock Climbing Instructor Training.

— Prof Lew Hardy

Lew was one of the first professors of sport psychology in the United Kingdom and is one of a very small number of people to have given keynote and invited addresses at all the major sport psychology conferences in the world. He has over 100 full length research publications and served three Olympic cycles as chairperson of the British Olympic Association’s Psychology Steering Group (from 1989 to 2000). His central research interest is the psychology of very-high level performance, including the effects of stress, mental toughness, motivation, the utility of psychological skills and strategies, transformational leadership, and teamwork. He has been responsible for over £1 million of grant capture and has equal applied experience of working across military, business, and sport domains. In addition to his academic career, Lew is an IFMGA British Mountain Guide and has been involved in the training of aspirant guides.

— KESS

Knowledge Economy Skills Scholarships (KESS 2) is a pan-Wales higher level skills initiative led by Bangor University on behalf of the HE sector in Wales. It is part funded by the Welsh Government’s European Social Fund (ESF) convergence programme for West Wales and the Valleys.



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6.2 Mountain Training Boards Presentation

This presentation was made on six occasions: to MTUKI (n = 26), MTE (n = 21), MTC (n = 16), MTS (n = 14) boards, MTS (n = 25) providers in October 2019, and Mountain Training staff (n = 15) in January 2020.

Developing excellence
in outdoor provision:
Enhancing pathways
for outdoor
qualifications

The Mountain Leader
qualification

Will Hardy, Dr Ross Roberts,
Prof Lew Hardy

The Institute for the Psychology of Elite
Performance



Outline



Introduction to the
project



The Mountain Leader
qualification



Aims of this project



Preliminary work



Methods



Results

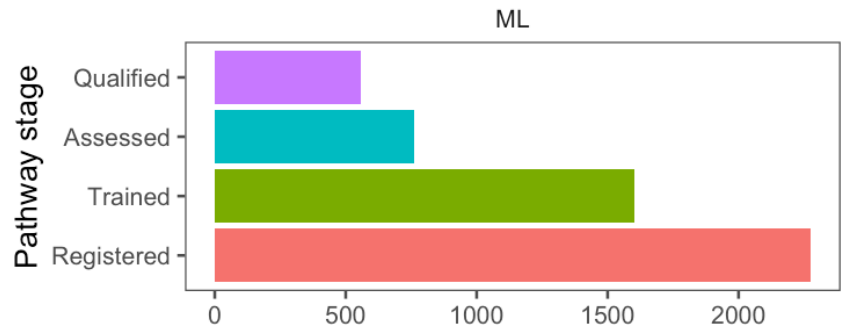


Potential
implications & Future
directions

Introduction to the project

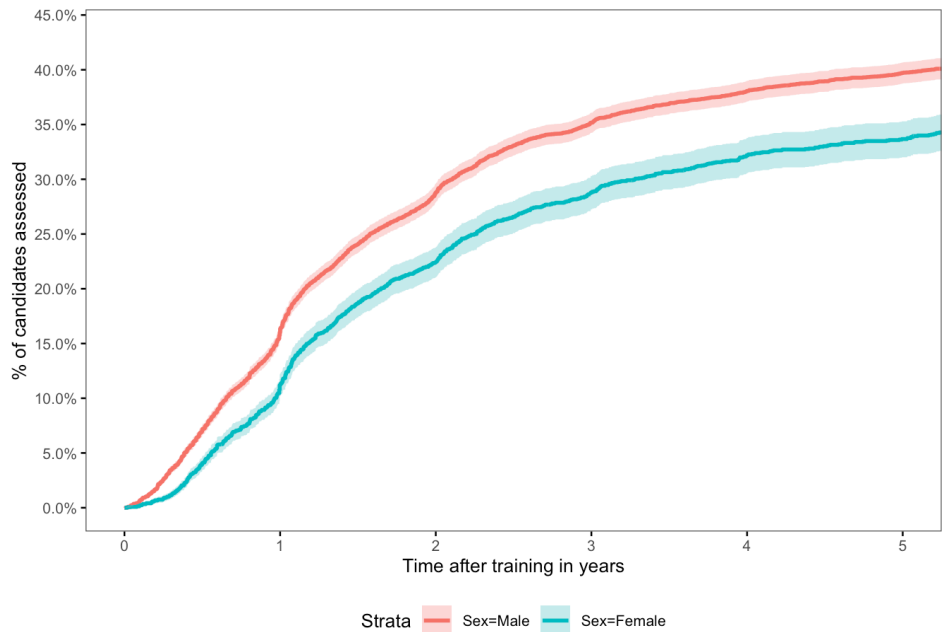
Mountain Training's qualification pathway

- Significant drop off between training and assessment for all qualifications
- Drop off between registration and training is largest for entry level qualifications
- First time pass rate is highest for entry level qualifications



Getting to an assessment

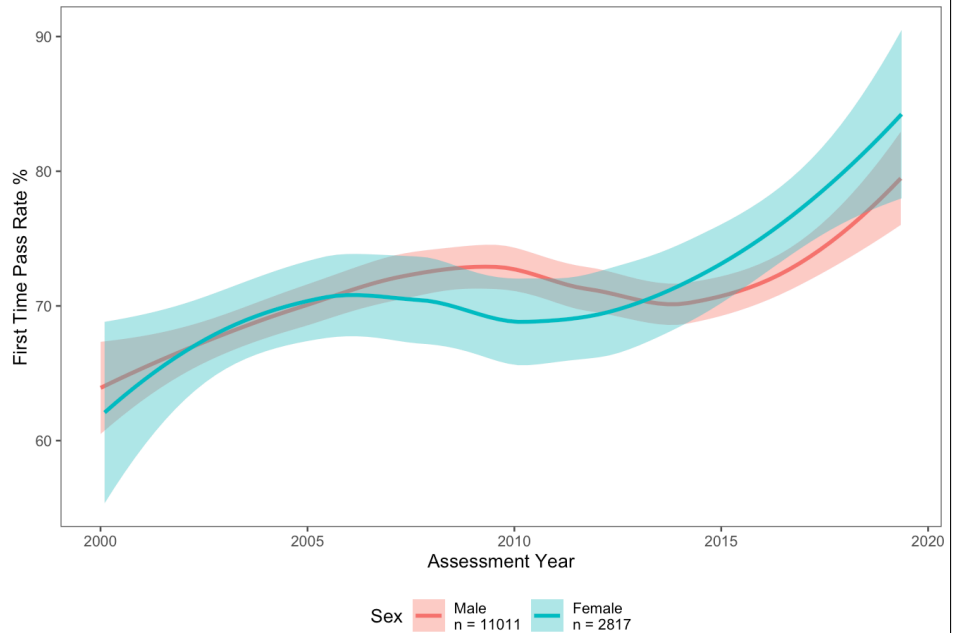
- Most candidates are not assessed
- Fewer female candidates get to assessment
- Approximately 50% of candidates who have been assessed 5 years after their training course, took 18 months or less to do so



Candidates trained 2009-2019 (n = 15635)

Passing the first assessment

- The pass rate has increased over time
- The pass rate is no different for female and male candidates



Aims of this project

To identify a set of important variables for discriminating each of the following:

- Female candidates who are assessed 18 months after their training from those who are not.
- Male candidates who are assessed 18 months after their training from those who are not.
- Candidates who pass their first assessment from those who do not.

PRELIMINARY WORK

Study 1

What do we
think is
important?

- 7 in-depth qualitative interviews
 - 5 men & 2 women
 - $M_{\text{duration}} = 5.3$ hours, $M_{\text{words}} = 45,000$

Summary of results	
Getting to assessment	Passing first time
Self-efficacy	Ability
Motives	Performing under pressure
Understanding of the qualification	Staff behaviour
Ability to gain experience	Quality, quantity, and variety of experience

Study 2

Survey tool development

- Wanted to collect data for ~50 variables that were not already held on CMS:
 - Personality, motivation, confidence, experience of training, etc.
- Identified & created suitable short measures for each variable ~200 questions
- Aim: To remove variables that do not discriminate those who complete from those who do not
- Contacted candidates who were trained 2008-2016
 - 1025 usable responses (27% response rate)
- Removed ~80 items from the full set
 - Education level, income level, sources of support, etc.

MAIN STUDIES

Methods



PARTICIPANTS AND DATA COLLECTION

- Data from 480 candidates
- 166 female & 314 male
- 70 different training providers & 52 different assessment providers



PATTERN RECOGNITION ANALYTICAL PROCEDURE

- Cutting edge statistical technique
- Identifies the most **important discriminatory variables**
- Used in elite sport, bioinformatics

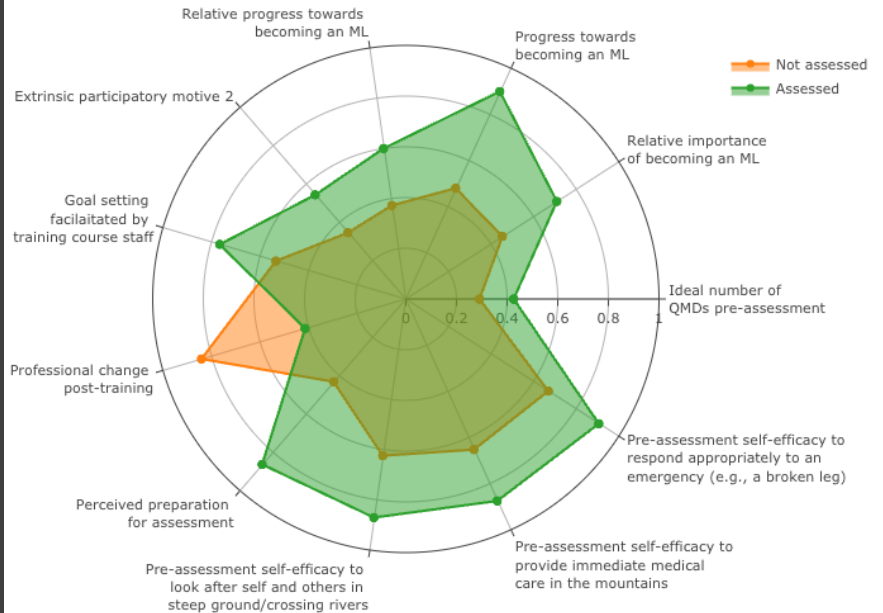
Getting to
assessment
within 18
months of a
training
course

Whilst some of the discriminatory variables are specific to female or male candidates, others are common to both:

- Progress towards becoming a Mountain Leader, both absolutely and relative to other life goals.
- The relative importance of becoming a Mountain Leader compared to other life goals.
- Perceived progress in effectively preparing for a Mountain Leader assessment.
- Confidence in skills to deal with hazards and emergency procedures.

Female candidates

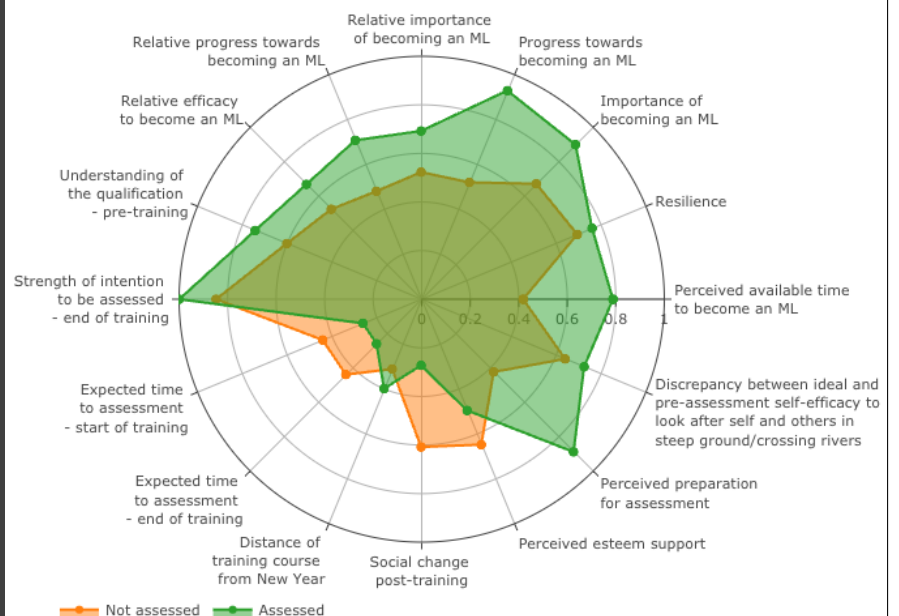
- Are able to prepare effectively for a Mountain Leader assessment, which will be most likely to occur when it is directed by goal setting facilitated by training course staff.
- Feel confident in their abilities to successfully perform tasks related to hazards and emergency procedures on a Mountain Leader assessment.
- Relevant experience (i.e. QMDs) is important, particularly for female candidates, to develop candidates' confidence to perform Mountain Leader related tasks (e.g. looking after themselves and others in steep ground and crossing rivers).



Male candidates

It is important that becoming a Mountain Leader fits into male candidates' lives as it:

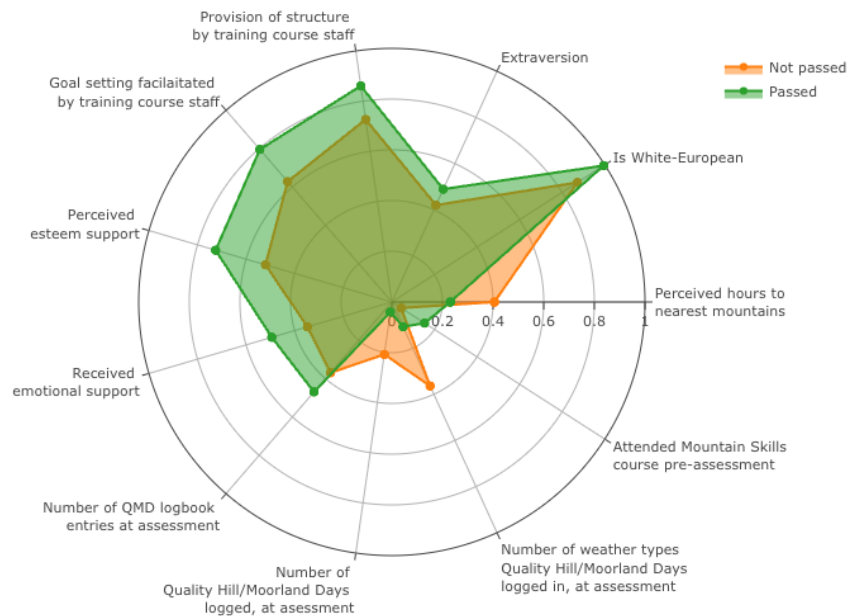
- Allows them to make progress and prepare effectively for an assessment.
- Reduces the expected time to assessment both pre- and post-training.
- Greater understanding of the qualification pre-training and a stronger intention to be assessed post-training are both important for getting to assessment.



Passing first time

For candidates to pass their first assessment, it is important that they:

- Gain **relevant** experience prior to their assessment.
- Use **clear and specific goals** to maximise the effectiveness and efficiency of their preparation.
- Are able to cope with the pressures of the assessment process, which will be influenced by both their relevant experience and social support.



Key messages

- It is important that becoming a Mountain Leader fits into a candidate's life as this will influence their ability to gain relevant experience and prepare effectively for an assessment.
- Goal setting, facilitated by training course staff, is important for both getting to assessment and passing. It will be most effective when coupled with the *provision of structure* allowing candidates to set very specific goals, that are clearly aligned with the requirements of passing the assessment creating opportunities for *mastery experiences*.
- It is important that candidates feel confident in their skills, especially those relating to hazards and emergency procedures.
- The more experience a candidate gains, the more confident they will be.
- It is important that candidates have a strong intention of being assessed and do not expect that it will take them a long time.

Potential future directions

Interventions

- Course staff training
- Individualised candidate support

Research

- Self-efficacy
- Ethnicity

Conclusion

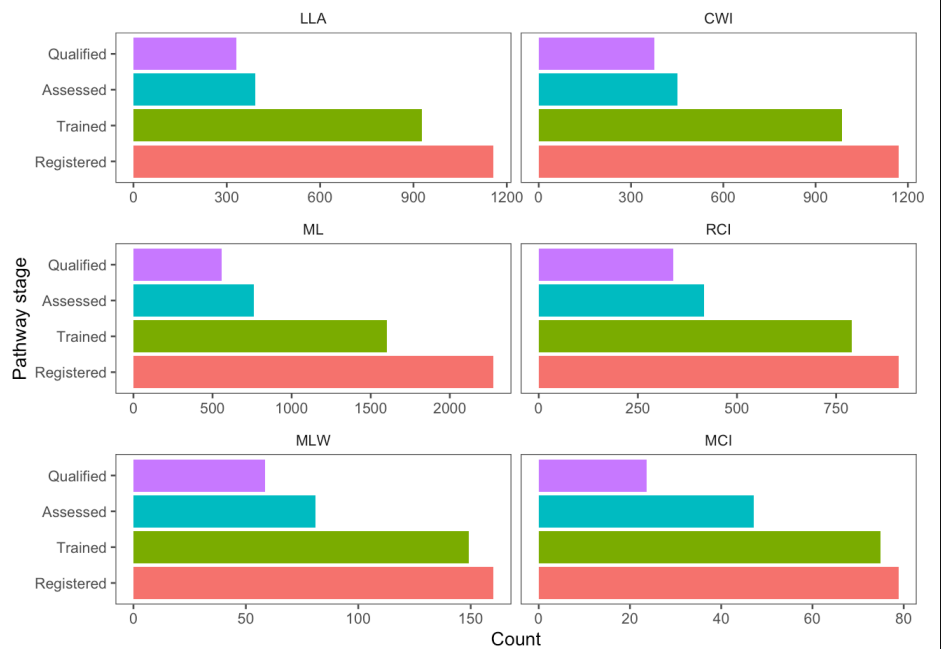
- Successfully identified three sets of variables that could discriminate:
 - a) Female candidates who are assessed 18 months after their training from those who are not.
 - b) Male candidates who are assessed 18 months after their training from those who are not.
 - c) Candidates who pass their first assessment from those who do not.
- The findings presented in this report suggest that whilst Mountain Training's qualification pathway is effective, there are several ways in which additional support could be provided to candidates, particularly during the consolidation phase of the pathway.

QUESTIONS

w.hardy@bangor.ac.uk

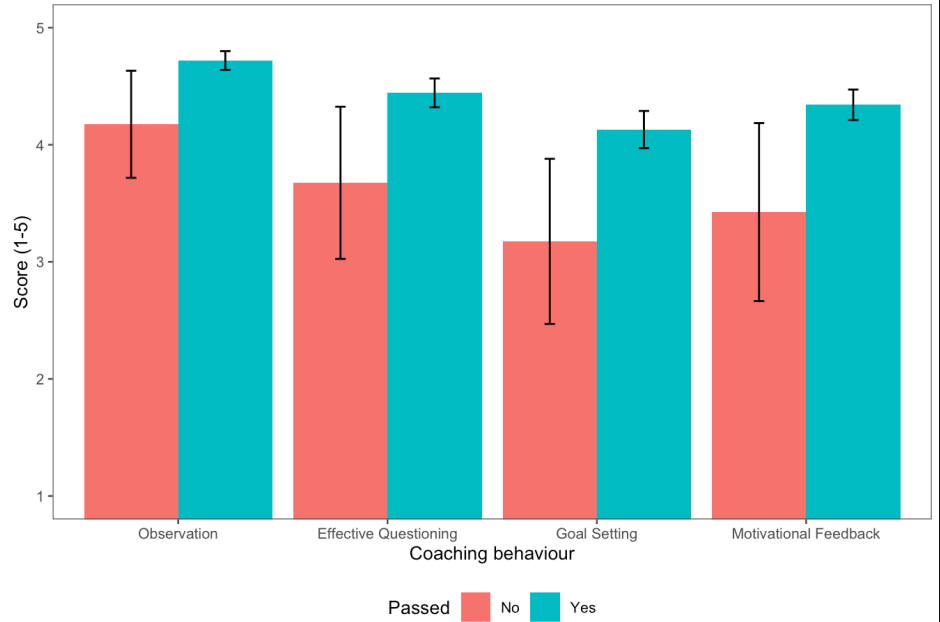


Pathway progress



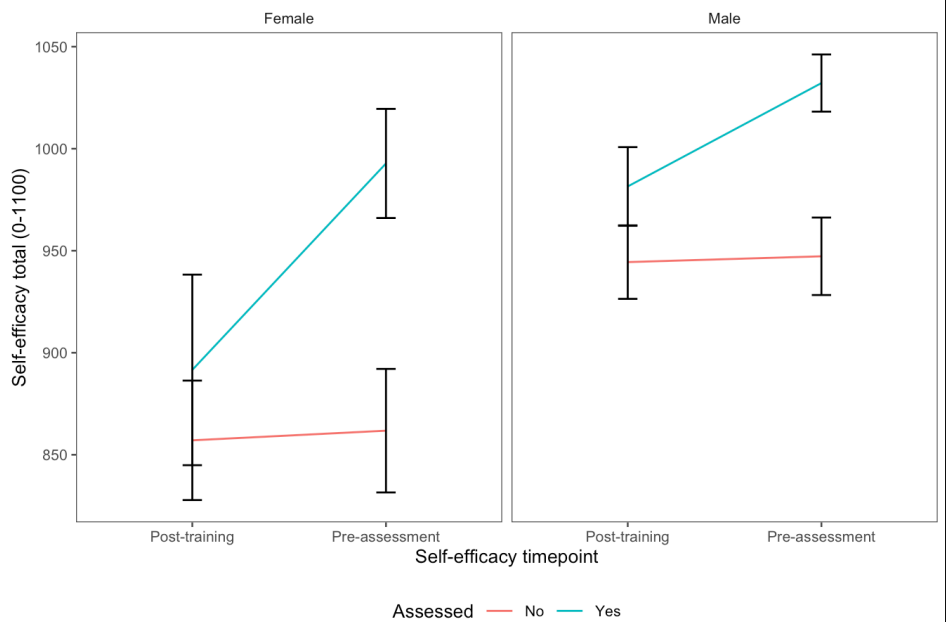
Experiences of training

Candidates who passed their first assessment felt that their training course staff displayed more coaching and need supportive behaviours than those who did not.



n = 143

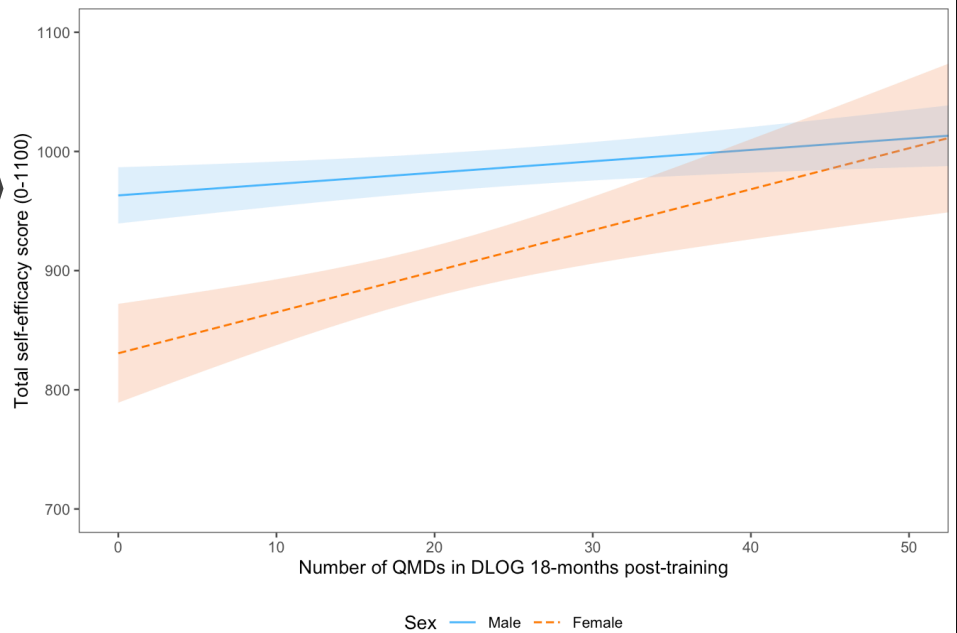
Self-efficacy



Candidates trained 2017-2018 (n = 492)

Self-efficacy

- There is a positive relationship between experience and confidence, this relationship is stronger for female candidates than it is for male candidates.
- Male candidates with little experience are more confident than female candidates with equivalent experience.



Candidates trained 2017-2018 who reported using DLOG (n = 437)

WORKSHOP

Format

- Purpose – to gather information to feed into the executive group that will make recommendations for the Walking Awards Review .
- We have already asked “what do you think is important” therefore this workshop is about how the findings of the report might be of use to Mountain Training and its stakeholder network.
- Will provide feedback to everyone after the event, as we did last year.
- We are not necessarily looking for final answers here.

Points to consider

- Is this something that Mountain Training should consider and try and do something about, if so, are there any implications associated with it; or, is simply knowing about it enough, but why don't we need to do anything about it?
- What implications are there for candidates, providers, course staff, professional associations, and Mountain Training?
- Are there any new questions that this raises? I.e., what do we need to know?
- Are there examples of practices in near neighbour sports (or elsewhere) that might be relevant?
- How, if at all, might the finding and implication(s) be different for other Mountain Training Qualifications (higher and/or lower)?

QUESTIONS

w.hardy@bangor.ac.uk



6.3 Mountain Training UK Coaching Provider Presentation

This presentation was made once, to *all* MTUKI coaching providers ($n = 22$), in November 2019.

Developing excellence
in outdoor provision:
Enhancing pathways
for outdoor
qualifications

The Mountain Leader
qualification

Will Hardy, Dr Ross Roberts,
Prof Lew Hardy

The Institute for the Psychology of Elite
Performance



Aims of this
session



To communicate research
findings



Provide supporting theory

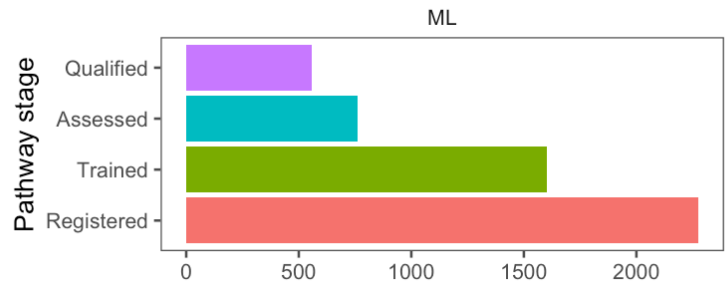


To consider the findings in
relation to the coaching
qualifications

Introduction to the project

Mountain Training's qualification pathway

- Significant drop off between training and assessment for all qualifications
- Drop off between registration and training is largest for entry level qualifications
- First time pass rate is highest for entry level qualifications



Getting to an assessment

Five years after their training:

- ~35% of female candidates have been assessed
- ~40% of male candidates have been assessed



Most candidates are not assessed



Female candidates are less likely to be assessed



Female and male candidates take the same amount of time to get to assessment

Passing the first assessment



THE PASS RATE HAS INCREASED FROM ~65% IN 2000 TO ~80% IN 2019



THE PASS RATE IS NO DIFFERENT FOR FEMALE AND MALE CANDIDATES

Methods



Qualitative data from experienced course staff

- 7 in-depth qualitative interviews
- 5 men & 2 women
- M_{duration} = 5.3 hours
- M_{words} = 45,000



Quantitative data from candidates

- Data from 480 candidates
- 35% female
- 70 different training providers
- 52 different assessment providers



Identified most important discriminatory variables

KEY FINDINGS & SUPPORTING THEORY

Training staff behaviour is important for candidates both getting to and passing their assessment.

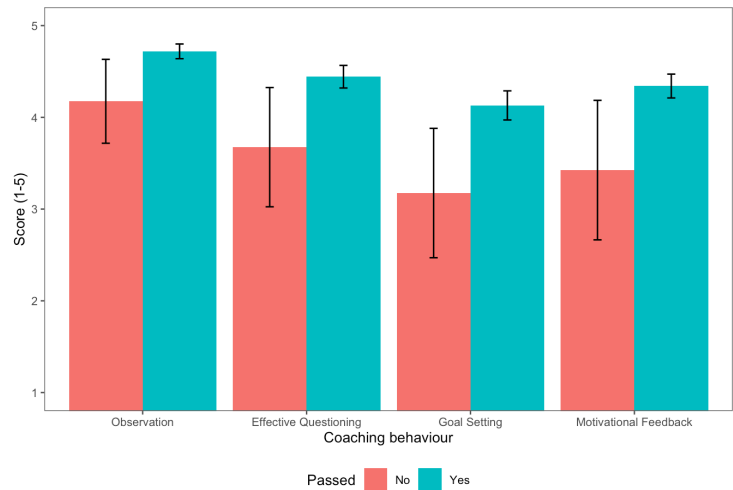
Goal setting, facilitated by training course staff, is important for both getting to assessment and passing.

It will be most effective when coupled with the **provision of structure** helping candidates to set very specific goals, that are clearly aligned with the requirements of passing the assessment.

This will create opportunities for candidate to experience success due to effective performance (**mastery experiences**).

Training staff behaviour is important for candidates both getting to and passing their assessment.

Goal setting is not the only coaching behaviour

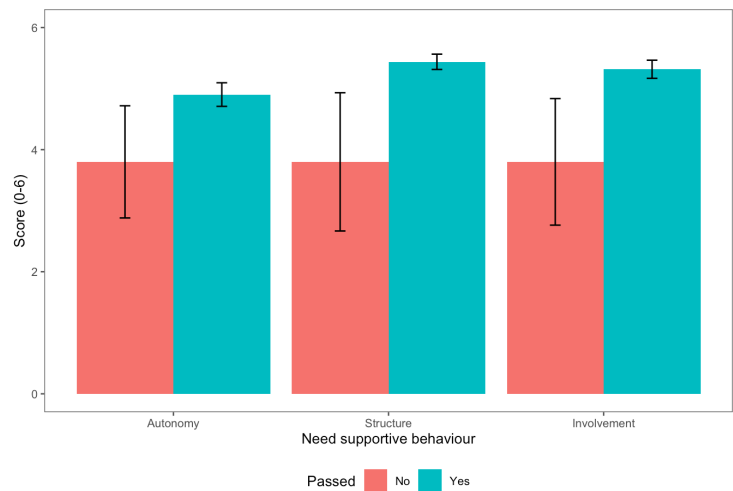


n = 143

Training staff behaviour is important for candidates both getting to and passing their assessment.

Need supportive behaviours will foster more autonomous forms of motivation

- Autonomy: helps candidates feel that they are **acting in line with their own goals** (and not those of others)
- Structure: helps candidates develop **clear expectations** and helps them **believe that they can perform tasks successfully**
- Involvement: the degree to which **candidates feel staff are genuinely interested in them**

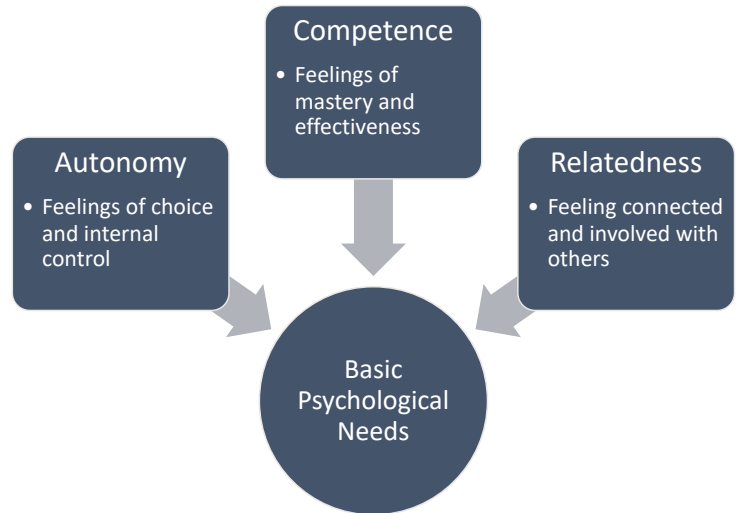


n = 143

Basic psychological needs

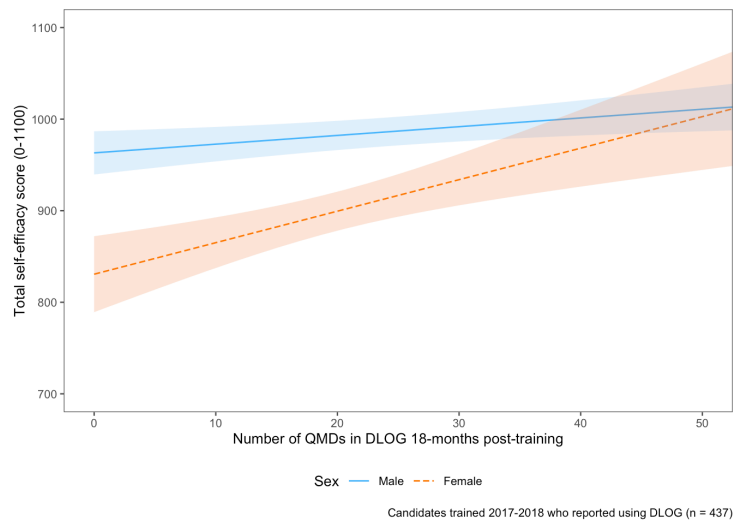


- Self-determination theory (SDT) suggests that there are three basic psychological needs.
- SDT suggests that these needs must be satisfied for: optimal functioning, good mental health, and well-being.



Relevant experience is important for candidates to feel confident in their abilities, particularly for female candidates.

- The more relevant experience a candidate has the more confident they will be
- The relationship between experience and confidence is stronger for female candidates than for male candidates



Individual candidates will have different needs.


Molly Mountains

- Has moved to N Wales to become an outdoor instructor having spent a year climbing and skiing in Chamonix
- Works part-time in a café and living in their van
- Identifies as a “mountaineer”

Chris Classroom

- Has been hillwalking for years but no mountaineering experience
- School wants them to become a Mountain Leader
- Is worried about being “good enough”

Types of social support



Type of support	Description
Esteem	Bolstering a person's sense of competence or self-esteem (e.g., giving an individual positive feedback on his or her skills and abilities, expressing a belief that the person is capable of coping with a stressful event)
Emotional	The ability to turn to others for comfort and security during times of stress, leading the person to feel that he or she is cared for by others
Informational	Providing the individual with advice or guidance
Tangible	Concrete assistance, where someone is given the necessary resources (e.g., financial assistance, physical help with tasks) to cope with something

It is important that becoming a Mountain Leader “fits into” candidates’ lives.



Expectations

Of being assessed
Time to assessment



Importance

Prioritisation of
preparation



Efficacy to become a Mountain Leader



Life changes (professional/social)

It is important that candidates feel confident in their skills to deal with hazards and emergency procedures in order to get to an assessment.



Self-efficacy



Relevant personal experience



Vicarious experience

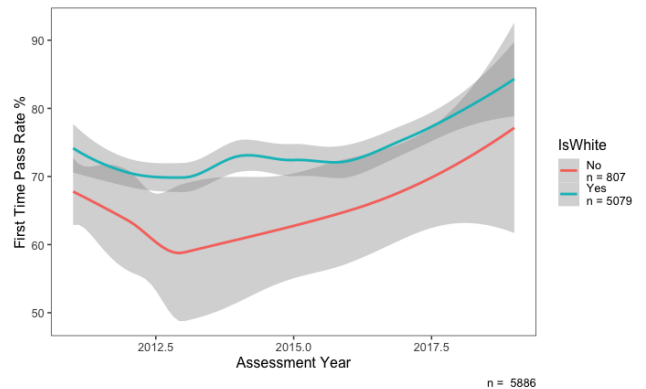
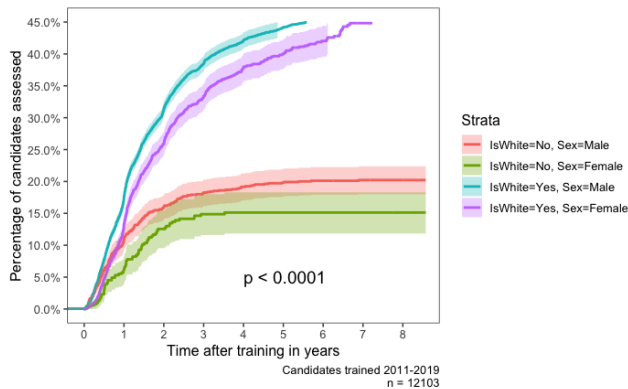


Verbal persuasion



Emotional state

Non-white European candidates are much less likely to be assessed and are also less likely to pass their first assessment than white European candidates.



Conclusion

The findings presented in the report suggest that whilst Mountain Training’s qualification pathway is effective, there are several ways in which additional support could be provided to candidates, particularly during the consolidation phase of the pathway.

Potential
future
directions



Interventions

Course staff training
Individualised candidate support



Research

Ethnicity
Self-efficacy

QUESTIONS

w.hardy@bangor.ac.uk



WORKSHOP

Format

- Purpose – to understand how these findings may (or may not) relate to the coaching qualifications.
- Will provide feedback to everyone after the event.
- We are not necessarily looking for final answers here.

! Points to consider

- Is this something that Mountain Training should consider and try and do something about, if so, are there any implications associated with it; or, is simply knowing about it enough, but why don't we need to do anything about it?
 - In general and specifically relating to the coaching qualifications
- What implications are there for candidates, providers, course staff, professional associations, and Mountain Training?
- Are there any new questions that this raises? I.e., what do we need to know?
- Are there examples of practices in near neighbour sports (or elsewhere) that might be relevant?

QUESTIONS

w.hardy@bangor.ac.uk



6.4 Mountain Training Scotland

Following the presentations to Mountain Training Scotland, they were keen to understand if there were any differences to the important factors in completion of their qualifications to those identified in the report. This resulted in a project with two key outputs. There were two key outputs agreed for this project: 1) A report containing summary statistics for pathway progress for Mountain Training Scotland Mountain Leader candidates and for Winter Mountain Leader candidates trained 2009-2019, and 2) A report identifying differences between MTS candidates who complete the Mountain Leader qualification and those who do not.

6.4.1 Part A: Mountain Training Scotland Mountain Leader and Winter Mountain Leader Completion Statistics

6.4.1.1 Introduction.

- Following the presentation of results from the collaborative research project between Bangor University and Mountain Training UK and Ireland (Hardy et al., 2019b), Mountain Training Scotland (MTS) commissioned this report to provide some basic statistics about completion rates of Mountain Leader (ML) candidates registered with MTS and for the Winter Mountain Leader qualification (WML).
- This report provides summary statistics for pathway progress for Mountain Training Scotland Mountain Leader candidates and for Winter Mountain Leader candidates 2009-2019.
- This report has three main sections, a description of the data used for the analyses, results for the ML, and results for the WML. Both of the results sections follow the same format: (a) a section about candidates getting to a training course having registered, (b) a section about candidates getting to an assessment course having been trained, and (c) a section on candidates passing their first assessment.

6.4.1.2 Data.

- The data for these analyses are taken from a backup of Mountain Trainings Candidate Management System (CMS) created on 12/08/2019.
- The results for each analysis covers the period: 12/08/2009 to 12/08/2019.

6.4.1.2.1 Demographics.

- There are a total of 35 non female/male candidates in this sample, which is too few to form a meaningful subgroup, therefore they have not been included as a sub-group in the analyses.
- Ethnicity was added to CMS in 2012. Most candidates who registered before 2012 do not have an ethnicity on CMS unless they have added their ethnicity since. Whilst it is likely that a large proportion of these candidates are white we cannot assume that they all are, therefore they have been excluded from analysis including ethnicity.
- There are a total of 130 candidates who have registered for either the ML or WML with MTS whose ethnicity is not either “White - European” or “White - Other.” None of the non-white ethnic groups would form a large enough subgroup to include in the analyses, therefore we have collapsed ethnic groups into white and non-white.
- Candidates were excluded from the analyses if:
 - They are marked as deceased on CMS (n = 42).
 - Pathway dates are not in order on CMS (e.g., has been assessed before their training date; n = 586), only 42 of whom registered for the ML after 2000. It is likely that this is due to inaccuracies in historic records, thus will have little influence on the results of the analyses presented in this report.
- A summary of the candidates included in the analyses can be seen in Table 6.1 - it is important to note that not all candidates will be included in each analysis due to missingness of their data.

6.4.1.2.2 Outcomes. There are three outcomes considered in this report, **trained**, **assessed**, and **passed**:

- Candidates who have been *trained* must have completed the training course and not have withdrawn from the course.
- Candidates who have *been assessed* may have passed, deferred, failed, or have withdrawn from the course.

Table 6.1: MTS ML and WML candidate demographics

Sex	White	n
Female	FALSE	28
	TRUE	925
	-	181
Gender neutral	FALSE	1
	TRUE	4
	-	7
Male	FALSE	68
	TRUE	2872
	-	574
Not specified	TRUE	2
-	-	3

Note: "NA" represents missing data, for example, candidates who do not have an ethnicity assigned on CMS.

- Candidates who *did not pass their first assessment* may have been deferred, failed, or have withdrawn from the course.

6.4.1.3 Methods.

6.4.1.3.1 Survival Analyses.

- Kaplan-Meier survival curve were plotted using the `survival` package in R (Harrell, 2015; Therneau, 2020; R Core Team, 2020).
- Differences between groups were tested for using a log-rank test; $p < .05$ denotes a significant difference, *however this should be interpreted with caution when the sample size is low.*
- **Number at risk** is the number of candidates still included in the analysis (i.e., a candidate who was trained five years ago will be included up to the five-year point on the x-axis, but not beyond).
- **Number of events** is the number of trainings/assessments that have occurred up to that time point.
- Example from Figure 6.1:
 - At 0 years after registering on the x-axis, there are 2360 male candidates and

916 female candidates *at risk* of being trained and there have been 13 and 2 *events* for male and female candidates respectively (i.e., they have been trained).¹

- Two years after registering, there are 783 male and 250 female candidates who remain at risk of being trained and 1326 male and 555 female candidates who have been trained. Considering the female candidates, clearly the number of candidates originally at risk minus the number who have been trained two years after registering is not equal to the number of candidates who remain at risk. The missing candidates have been *censored* from the analysis (i.e., they registered for the ML less than two years before the data for this analysis was collected and therefore have been excluded from the analysis).

6.4.1.3.2 Pass Rates.

- Where there were enough candidates, we used regression techniques to test for changes in the pass rate over time and for differences in the pass rate between groups. The results are then presented in graphs with a solid line representing a moving average of the pass rate surrounded by a *ribbon* that represents the 95% confidence interval for the estimate of the pass rate. A wider ribbon denotes greater uncertainty.
- When there were not enough candidates to analyse the data as described above, we present the pass rates in tables as descriptive (and not inferential) statistics.

¹It is likely that these candidates registered immediately before or on their training course.

6.4.1.4 Mountain Leader.

6.4.1.4.1 Getting to Training.

- Average time from registration to training for all candidates: mean = 2.12 and median = 0.6 years.
- Significantly more female candidates than male candidates get to training, after two years 59% and 64% respectively (Figure 6.1).

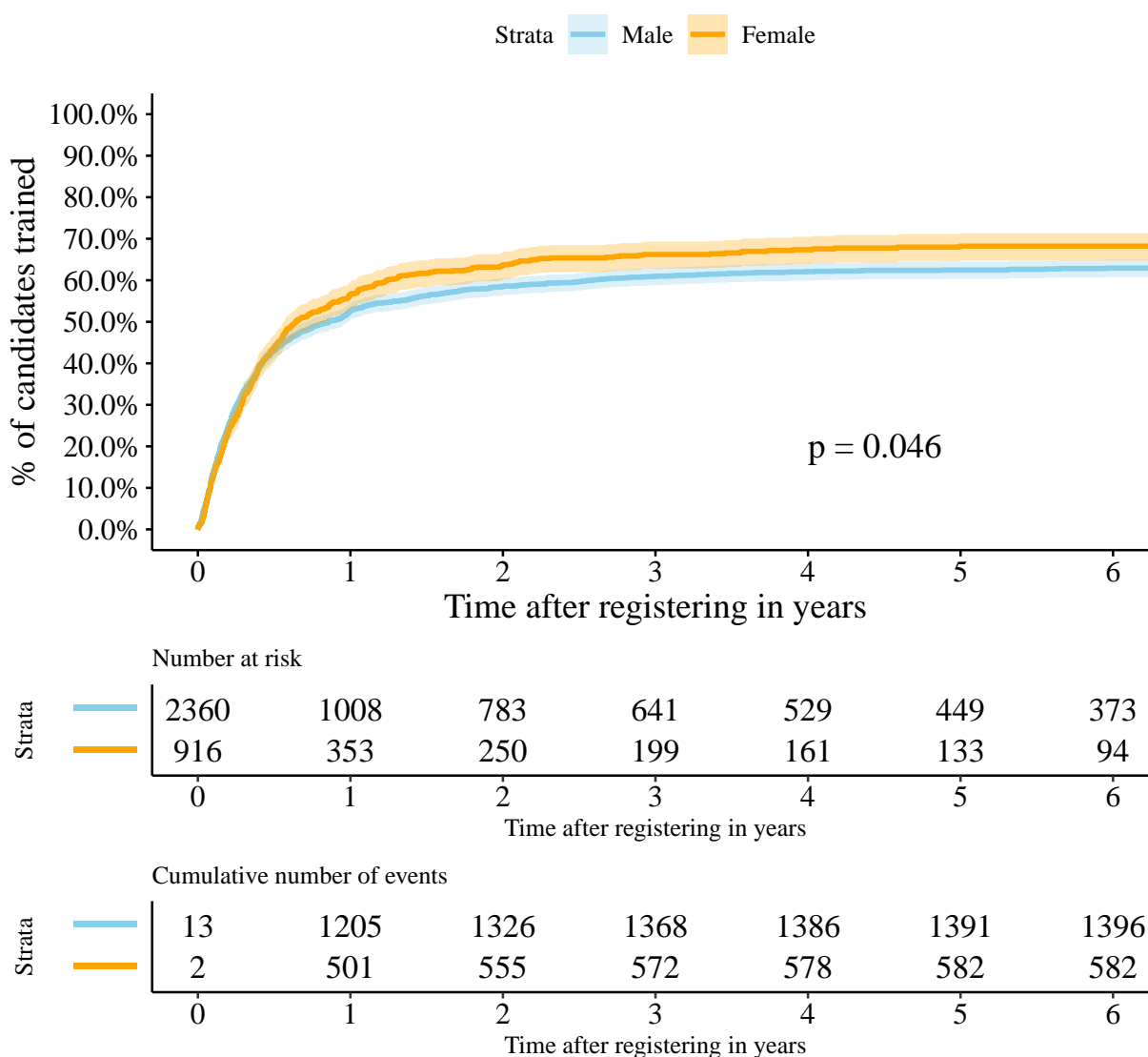


Figure 6.1: Time to Mountain Leader training from registration, split by sex

- No significant differences in the proportion of white and non-white candidates getting to training, after two years 62% and 57% respectively (Figure 6.2).

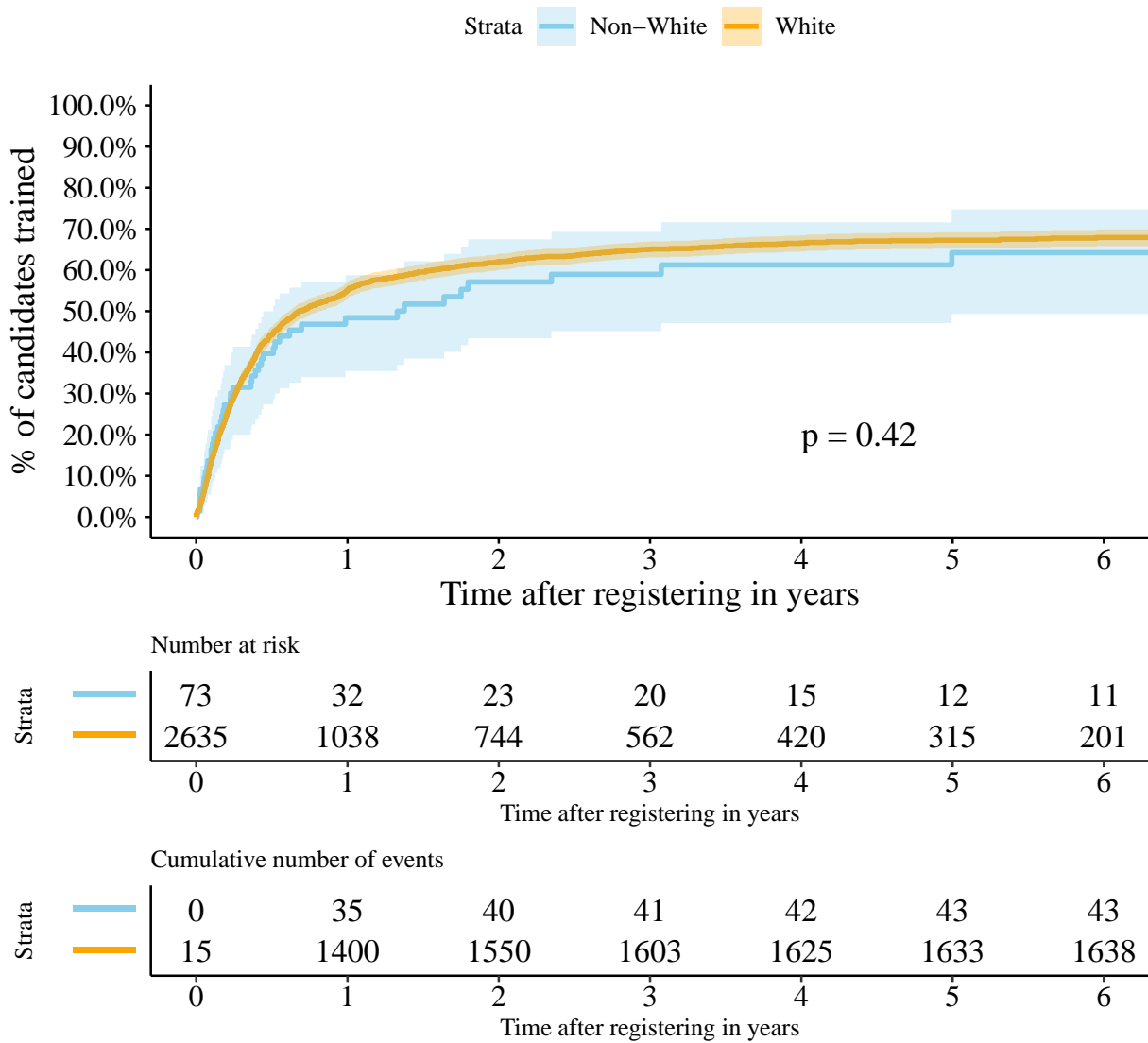


Figure 6.2: Time to Mountain Leader training from registration, split by ethnicity

6.4.1.4.2 Getting to Assessment.

- Average time to assessment for all candidates: mean = 3.89 and median = 2.44 years.
- Significantly more male candidates than female candidates get to assessment, after four years 43% and 39% respectively (Figure 6.1).

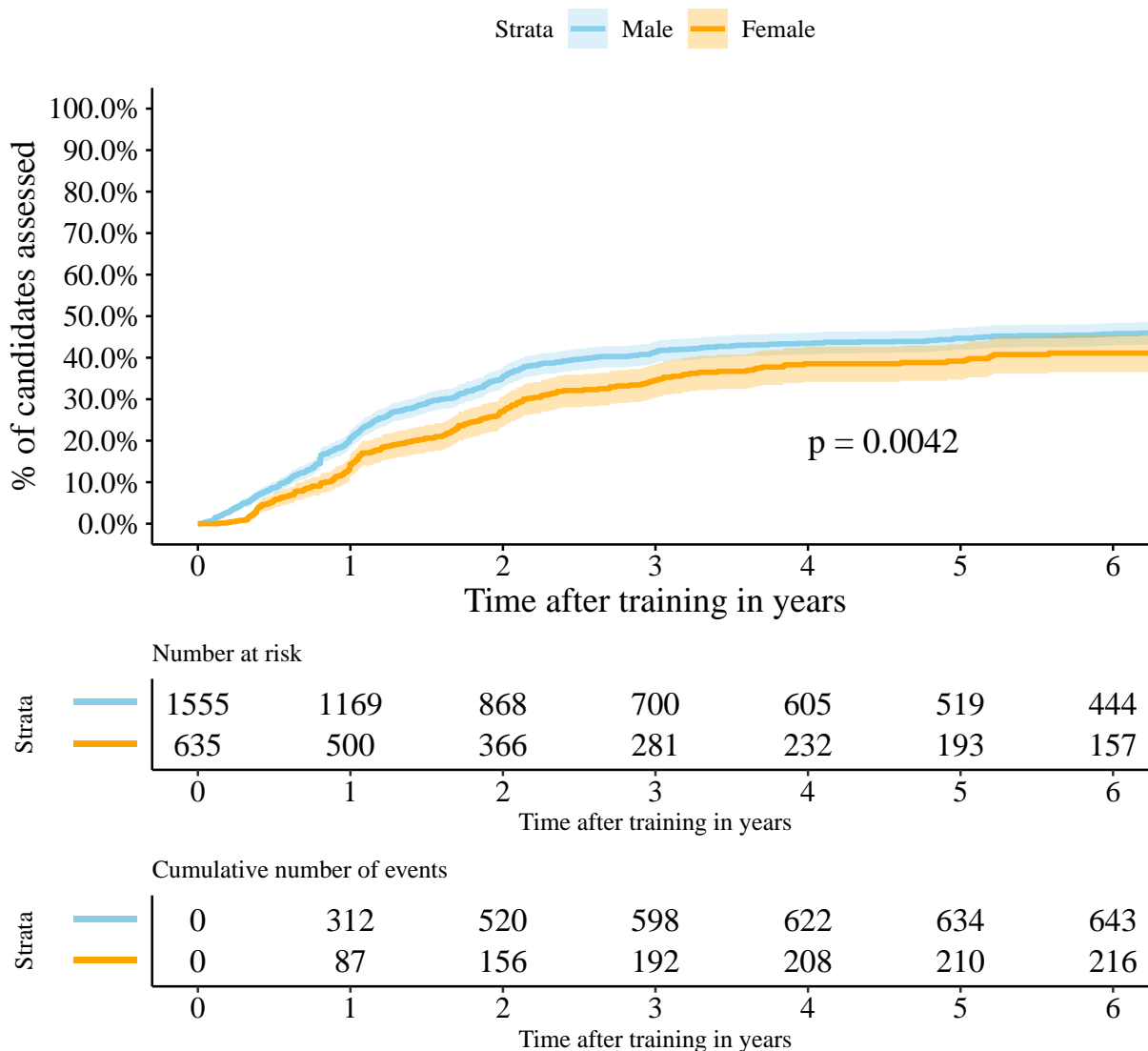


Figure 6.3: Time to Mountain Leader assessment from training, split by sex

- No significant differences in the proportion of white and non-white candidates getting to assessment, after four years 47% and 49% respectively (Figure 6.2).

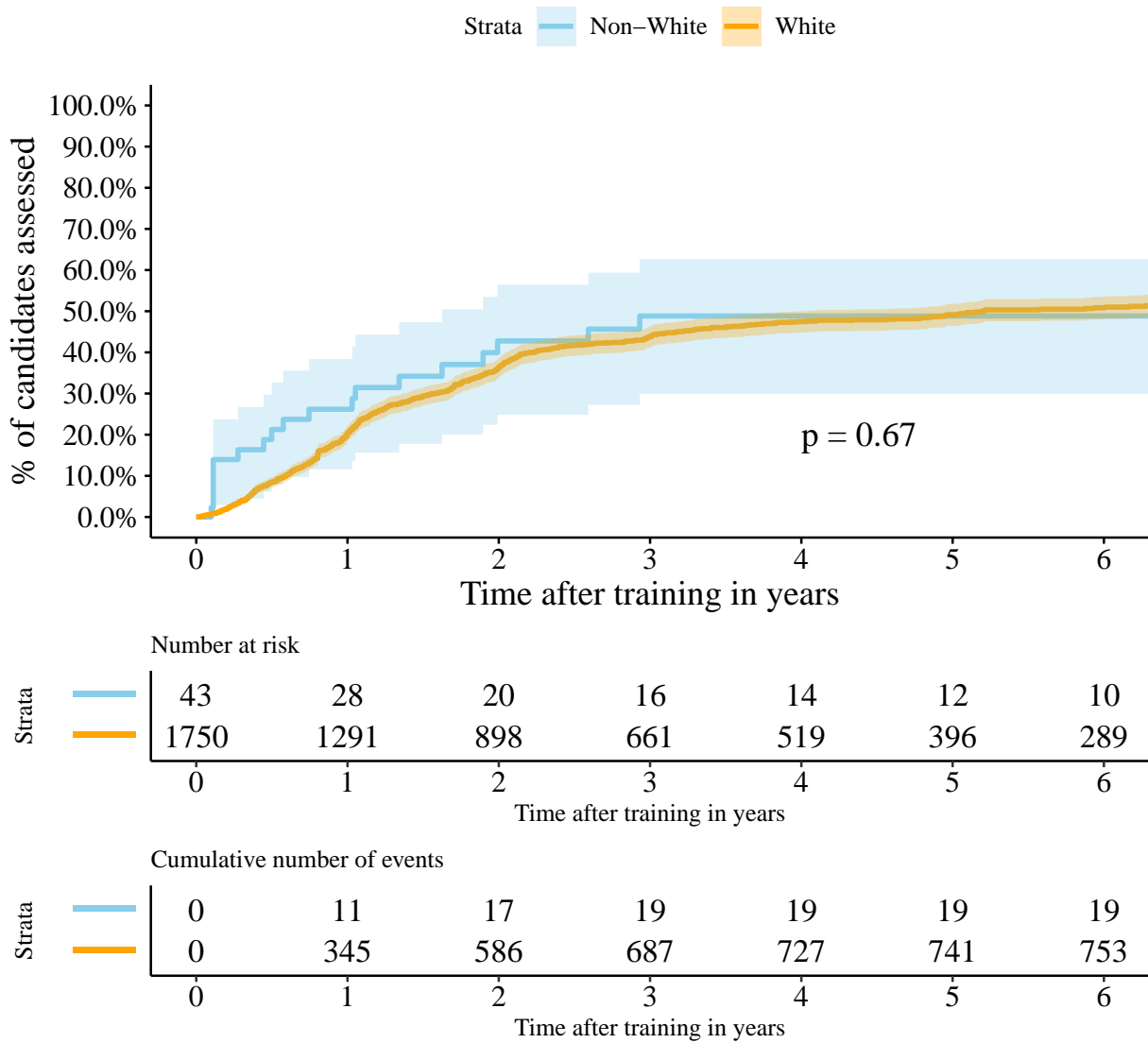


Figure 6.4: Time to Mountain Leader assessment from training, split by ethnicity

Table 6.2: MTS ML first time pass rates per year by ethnicity

White	Pass rate (%)	n
FALSE	60.0	20
TRUE	71.2	904

6.4.1.4.3 First Assessment

- No significant differences in the proportion of female and male candidates passing their first assessment, nor has the pass rate changed over time (Figure 6.5). The mean pass rate was 70 %.

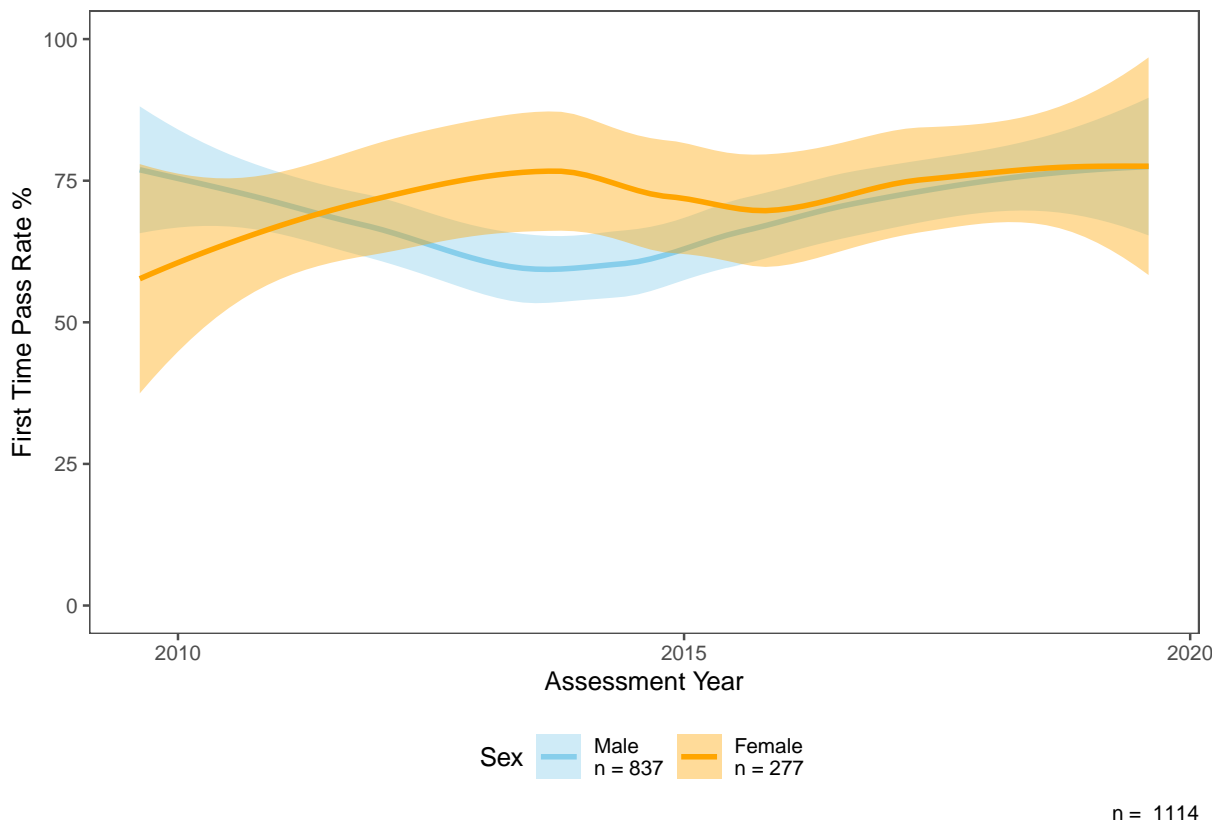


Figure 6.5: Pass rates for MTS ML female and male candidates

- There were too few non-white MTS ML candidates to make a meaningful comparison with white MTS ML candidates, the pass rates are reported in Table 6.2.

6.4.1.5 Winter Mountain Leader.

6.4.1.5.1 Getting to Training.

- Average time from registration to training for all candidates: mean = 1.17 and median = 0.28 years.
- No significant differences in the proportion of female and male candidates getting to training, after two years 84% and 82% respectively (Figure 6.6).

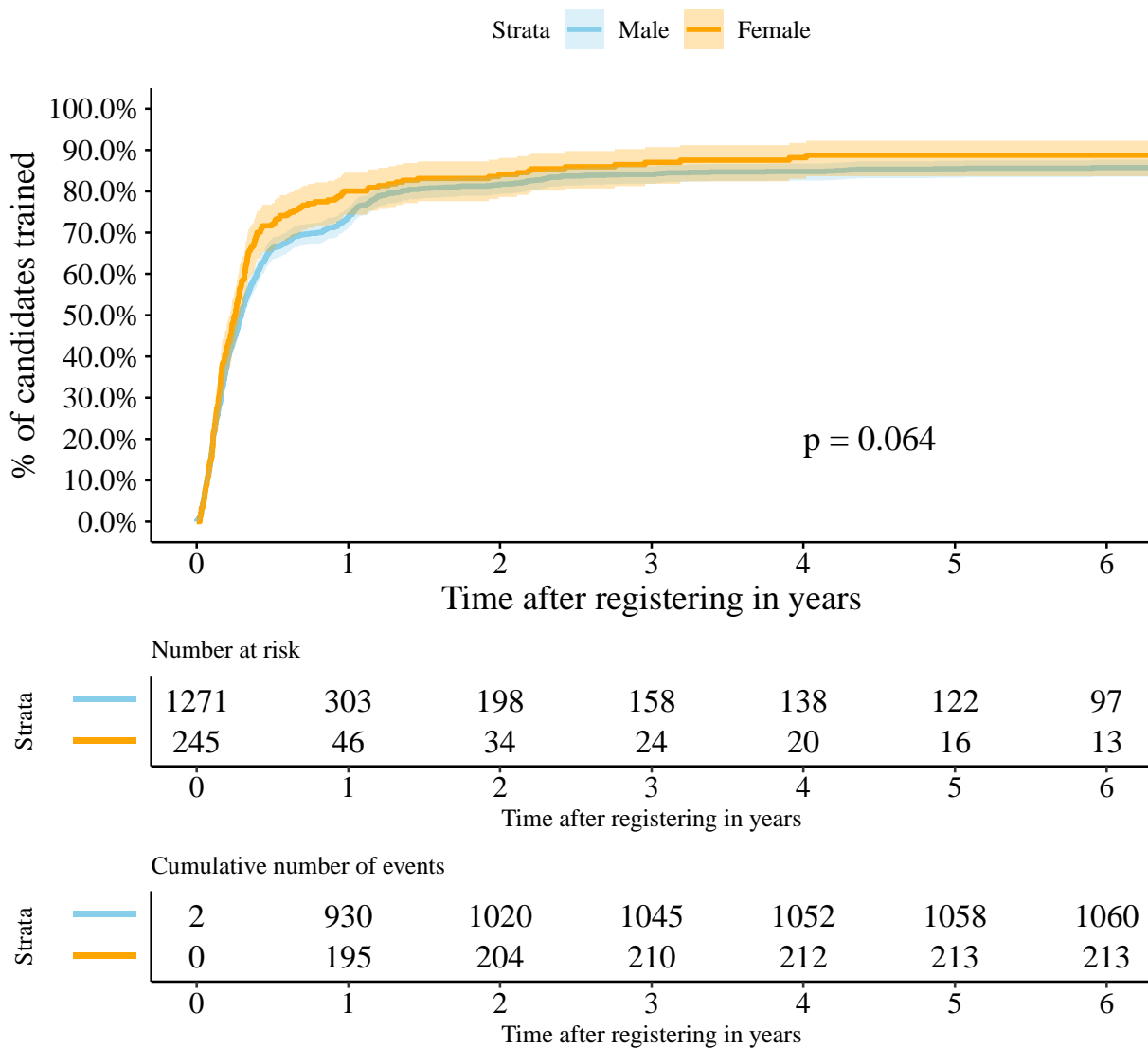


Figure 6.6: Time to Winter Mountain Leader training from registration, split by sex

- Significantly more white candidates than non-white candidates get to training, after four years 73% and 82% respectively (Figure 6.7).

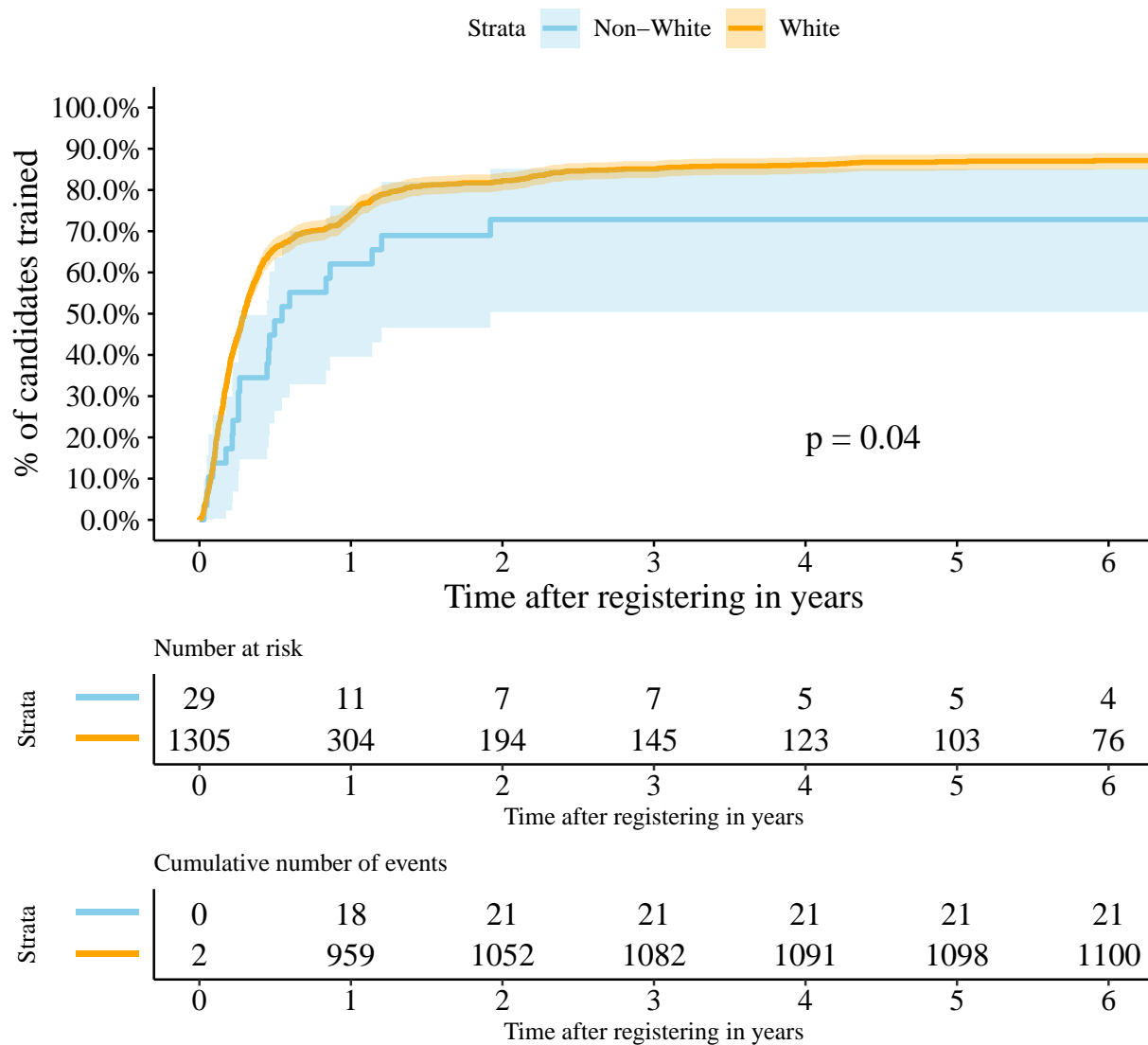


Figure 6.7: Time to Winter Mountain Leader training from registration, split by ethnicity

6.4.1.5.2 Getting to Assessment.

- Average time from training to assessment for all candidates: mean = 4.37 and median = 3.1 years.
- Significantly more male candidates than female candidates get to assessment, after four years 44% and 37% respectively (Figure 6.8).

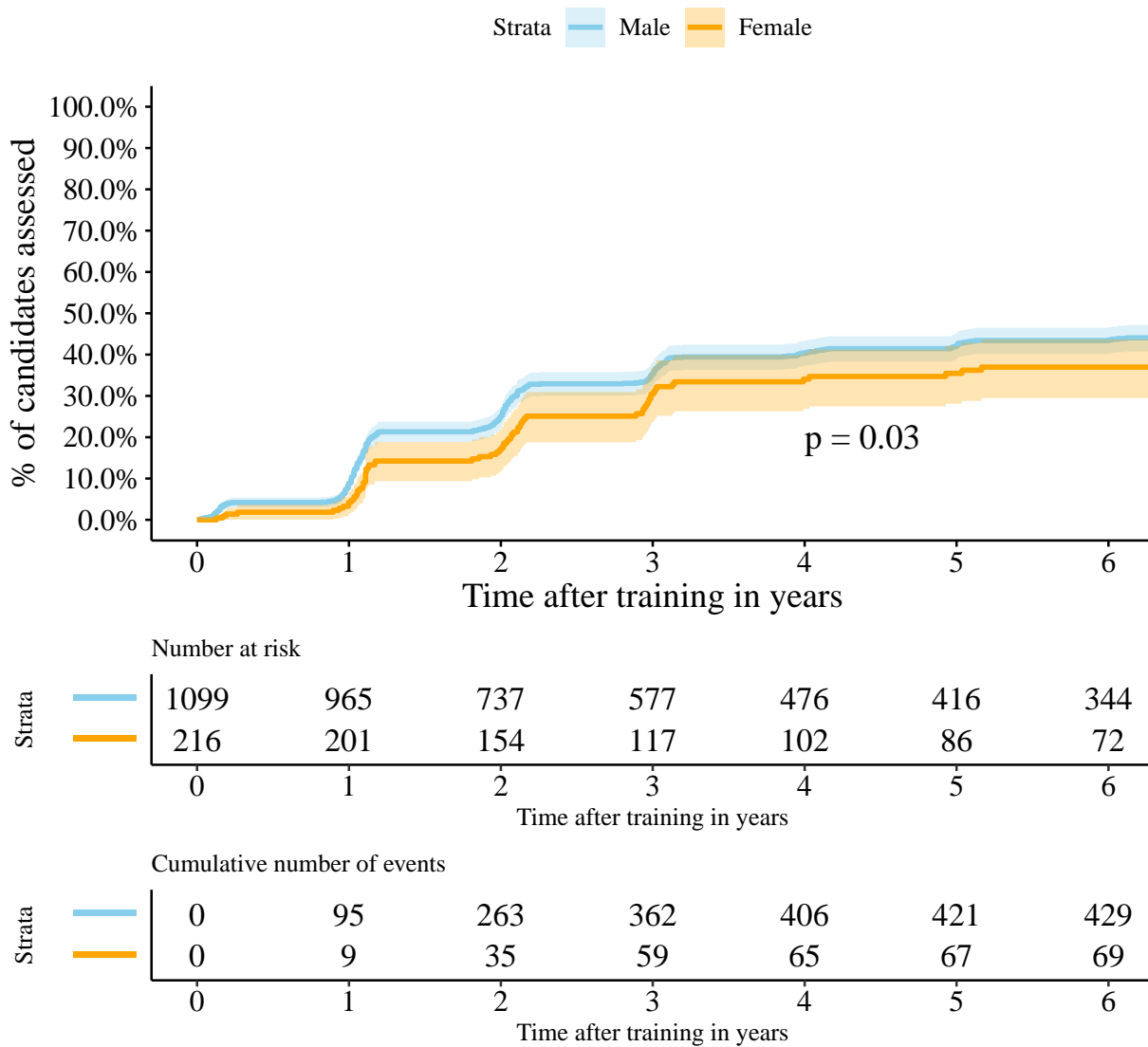


Figure 6.8: Time to Winter Mountain Leader assessment from training, split by sex

- No significant differences in the proportion of white and non-white candidates getting to assessment, after four years 46% and 54% respectively (Figure 6.9). *This should be interpreted with caution as only 21 non-white candidates were included in the analysis.*

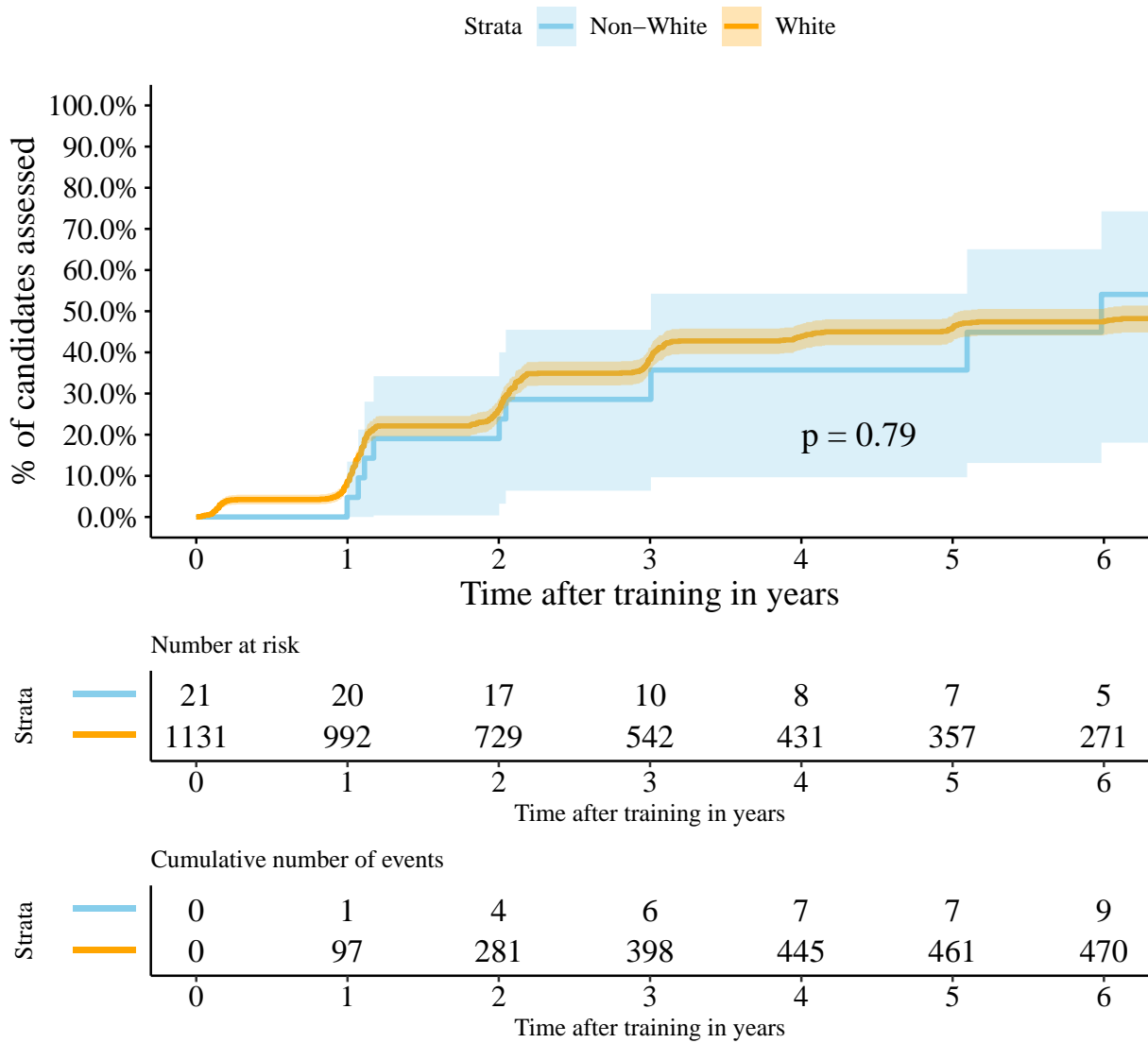
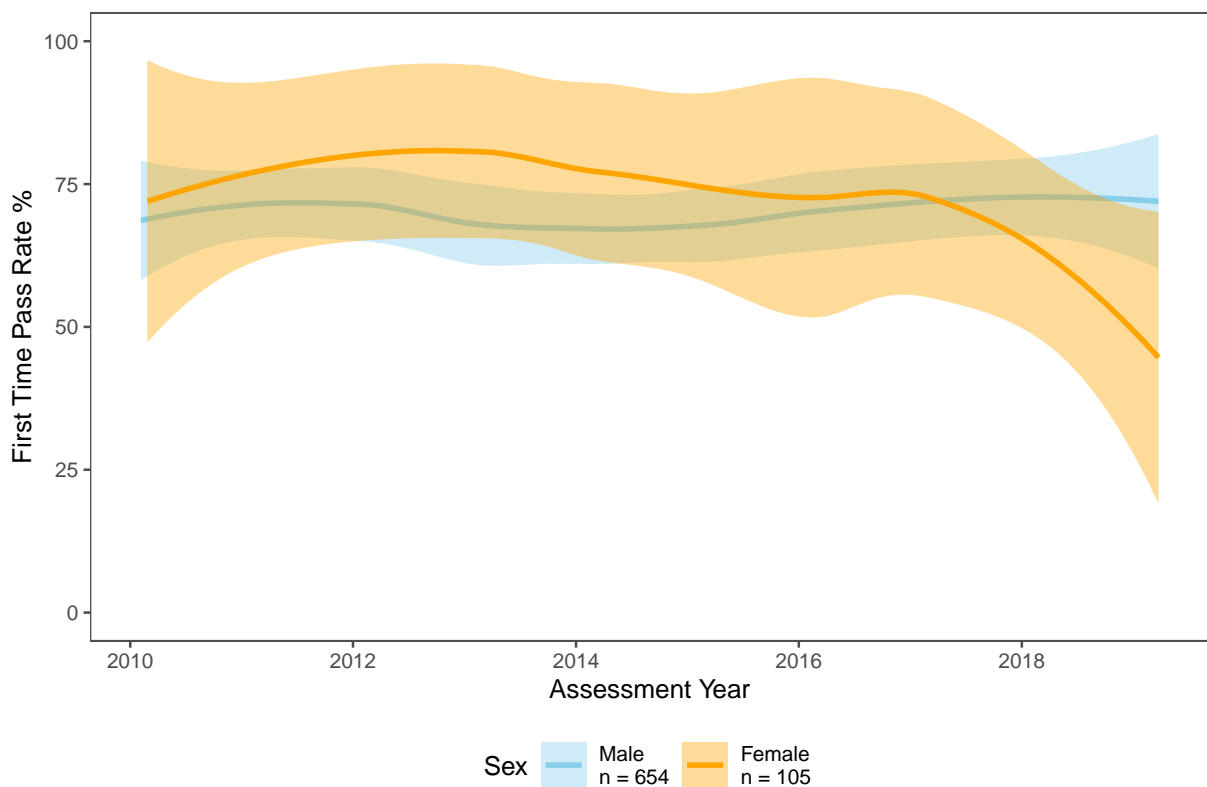


Figure 6.9: Time to Winter Mountain Leader assessment from training, split by ethnicity

6.4.1.5.3 First Assessment.

- No significant differences in the proportion of female and male candidates passing their first assessment, nor has the pass rate changed over time (Figure 6.5). The mean pass rate was 70 %.
- Because there are few female candidates being assessed each year for the Winter Mountain Leader, the variability in the pass rate year on year is high, hence the large confidence interval represented by the blue ribbon. Some of this variability has been smoothed out in Figure 6.10. Therefore, we have also included a summary table (Table 6.3) that shows both the pass rate and total number of candidates assessed each year.



n = 759

Figure 6.10: Pass rates for WML female and male candidates

- There were too few non-white WML candidates to make a meaningful comparison with white WML candidates, the pass rates are reported in Table 6.4.

Table 6.3: Female Winter ML first time pass rates per year

Sex	Year	Pass rate (%)	n
Female	2010	75.0	12
	2011	75.0	8
	2012	50.0	4
	2013	85.7	21
	2014	83.3	12
	2015	42.9	7
	2016	87.5	8
	2017	75.0	12
	2018	60.0	10
	2019	45.5	11

Table 6.4: Winter ML first time pass rates per year by ethnicity

White	Pass rate (%)	n
FALSE	54.5	11
TRUE	71.1	700

6.4.1.6 Summary.

- Male MTS candidates are less likely to be trained for the ML. Overall, approximately 60% of MTS ML candidates who register for the ML are trained.
- Female candidates are less likely to be assessed for the ML.
- MTS ML candidates are 5-10% more likely to be assessed than the average UK candidate.
- Whilst there are few non-white Scottish ML candidates, those that there are do not seem to be any less likely to be trained or assessed than white candidates. This is different to the rest of the UK, where non-white candidates are ~20% less likely to be assessed than white candidates.
- The pass rate for ML candidates has been ~70% for the last ten years and is no different for female and male candidates.
 - The pass rate for the whole of the UK has increased in this time period and is currently ~5% higher than the Scottish pass rate.
- WML candidates are more likely to be trained than ML candidates are. After two years over 80% of WML candidates have completed a training course. Non-white WML candidates are less likely to be trained than white WML candidates.
- Female WML candidates are less likely to be assessed than male WML candidates.
- Non-white WML candidates are no more or less likely to be assessed for the WML, however they account for less than 2% of WML candidates.

There are some similarities between the journeys of candidates in these analyses to those in the remainder of the Mountain Training population (e.g., female candidates being less likely to be assessed than male candidates), but there are also some differences (e.g., non-white candidates being as likely to be assessed as white candidates).

For both the ML and WML MTS may want to consider ways in which they can support candidates in getting to an assessment having been trained (particularly female candidates) and also understand why a third of the candidates who register with them for the ML do not attend a training course. MTS may also wish to consider ways in which the number of non-white candidates can be increased, if appropriate, and also understand why non-white MTS candidates are more likely to be assessed than non-white candidates in other areas of the UK.

6.4.2 Part B: Mountain Leader Completion: Mountain Training Scotland

6.4.2.1 Introduction.

In October 2019 we presented a report to Mountain Training United Kingdom and Ireland (MTUKI) which discussed important factors for discriminating candidates who complete the Mountain Leader qualification from those who do not (Hardy et al., 2019b). Following that, Mountain Training Scotland (MTS) commissioned a second piece of project, which considered the completion rates of walking qualifications for their candidates. There were two key output agreed for this project: 1) A report containing summary statistics for pathway progress for Mountain Training Scotland Mountain Leader candidates and for Winter Mountain Leader candidates trained 2009-2019, and 2) A report identifying differences between MTS candidates who complete the Mountain Leader qualification and those who do not.

The first of these outputs was submitted to MTS on 21 January 2020. This report is the second of those outputs. It presents analyses of the data collected from MTS candidates who responded to the survey conducted in January 2019 for the MTUKI project. For the sake of brevity, we have not duplicated information that is presented in either the MTUKI report or the previous MTS report, instead we refer the reader to these documents where appropriate. Whilst there are some differences between the MTS population and the remainder of the MTUKI population, it is unlikely that what is good for the MTUKI population is bad for the MTS population. With that in mind, the results from this study would be best considered in conjunction with those in the MTUKI report.

The remainder of the report is structured as follows, firstly, there is a brief methods section, describing the candidates included in the analyses. This is followed by a section that presents and discusses the results for the analysis of data collected from female candidates and then a similar section for data collected from male candidates. Finally, there is a conclusion and potential implications section, where we discuss what this may mean for MTS and its candidates.

Table 6.5: Participant descriptive statistics.

Sex	n	Age	White	Assessed	Assessed within 18 months	Passed first time
Female	32	36.2±9.7	28 (87.5%)	21 (65.6%)	17 (53.1%)	15 (71.4%)
Male	43	40.4±12.6	40 (93%)	28 (65.1%)	25 (58.1%)	24 (85.7%)

6.4.2.2 Methods.

6.4.2.2.1 Participants. Participants for this study were drawn from the pool of participants for the MTUKI project (i.e., candidates who attended their first Mountain Leader training course 2017-2018). There were 75 candidates who met the inclusion criteria for this study: 1) registered for the Mountain Leader qualification with MTS, 2) completed their first training between 2017 and 2018, and 3) completed the MTUKI survey. These candidates are 15.2% of the MTS candidates trained 2017-2018.

Descriptive statistics about the candidates included in this study and their pathway progress can be seen in Table 6.5.

It is important to note that the MTS candidates who completed the survey are more likely to have been assessed than those who did not complete the survey but were trained during the same period. Female and male candidates who completed the survey were approximately 20% more likely to have been assessed 12 months post-training than those who did not complete the survey.

6.4.2.2.2 Analytical Procedure. As in the MTUKI project we used state of the art pattern recognition analyses to identify the key discriminatory variables (Duda et al., 2000). In brief, the purpose of this analysis is to identify variables that can successfully discriminate the class of an object (i.e., whether or not a candidate has been assessed). This study used the same procedure as in the MTUKI project,² further details can be found in the MTUKI report (see Hardy et al., 2019b, pg 31 for details).

Results from the pattern recognition have two distinct parts that should be of interest to readers: 1) the feature subset, which is the group of variables selected as discriminatory variables by the analysis; and 2) the classification accuracy, the

²With the exception of swapping one feature selection algorithm (Correlation Feature Subset) for another (Fast Correlation Based Filter; Yu & Liu, 2003).

percentage of candidates that are correctly classified by the feature subset.

In these analyses a classification rate of 50% is no better than the toss of a coin (i.e., random chance). We present the classification accuracy across four different classification algorithms: Naïve Bayes (NB; John & Langley, 1995), Sequential Minimal Optimization (SMO; Platt, 1998), Instance Based Learning (IBk; Aha et al., 1991), J48 Decision Tree (J48; Quinlan, 1993). The more consistent the results from these classification algorithms, the more confidence one can place in the feature subset (Güllich et al., 2019).

For all of the feature subsets presented in this document, it is important to note that it is the *combination* of features that discriminates the groups with the particular level of accuracy and not any single feature. Any visualisation is only a crude representation of the relationship between these variables and reflects an attempt to aid interpretation of the findings for the reader. Within the results there may be a series of complex interactions between the discriminating variables, which are impossible to represent graphically in two (or even three) dimensions.

6.4.2.3 Female Candidates Getting to Assessment Within 18 Months of Training.

6.4.2.3.1 Results. A subset of 20 features was selected as the best combination of discriminatory features. This subset classified the female candidates as having been assessed within 18 months of their training course or not with *excellent* accuracy (NB = 87%, SMO = 93%, IBk = 97%, J48 = 67%). Stereotypical profiles of female candidates who had and had not been assessed 18 months post training can be seen in Figure 6.11.

Female candidates who were assessed within 18 months were more likely to have:

- An external motive for registering (i.e., someone else wanted them to do it or a situation needed them to do it).
- Less of an understanding of the qualification pre-training.
- A greater intention to be assessed at the start of training.
- Felt that their training staff provided them with structure on their training course.
- Felt that their training staff engaged in effective questioning, goal setting, and motivational feedback.

- Felt they could easily access their nearest mountainous area.
- Felt that becoming a Mountain was more important to them than other life goals.
- Made progress towards becoming a Mountain Leader.
- Made more progress towards becoming a Mountain Leader than they had towards other life goals.
- Felt that they had more resources and skills available to them to successfully become a Mountain Leader than they did to successfully achieve other life goals.
- Felt they had enough available time to become a Mountain Leader.
- Done all that they could to prepare effectively for a Mountain Leader assessment.
- Higher levels of self-efficacy pre-assessment to:
 - Lead a group effectively in the mountains.
 - Navigate to a chosen point on a map in any conditions, night or day.
 - Look after the mountain environment and encourage others to do so too.
- Felt closer to their ideal level of self-efficacy to look after themselves and others in steep ground/crossing a river (n.b., no female candidate felt more confident than their ideal self would have).
- Less than their ideal level of efficacy to “look after the mountain environment and encourage others to do so too.”
- Included working in steep ground/scrambling/rope work in their preparation.

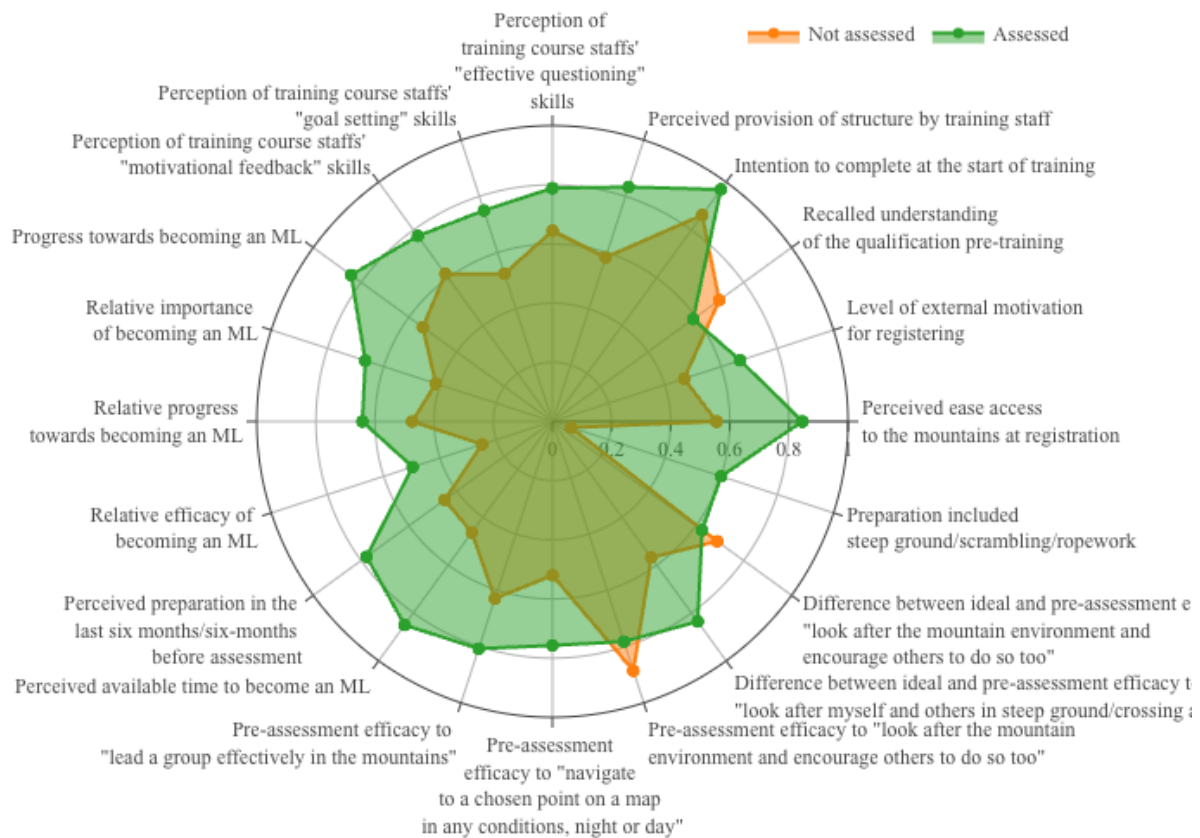


Figure 6.11: Normalised training group means for female candidates getting to assessment within 18 months of their training course.

6.4.2.3.2 Discussion. The 20 variables selected as important discriminators between female candidates who are assessed within 18 months of their training and those who are not can be grouped into four areas: (a) why they have registered, (b) their experience of the training course, (c) how becoming a Mountain Leader fits into their lives, and (d) how they have prepared for an assessment, if at all.

Candidates who were assessed within 18 months of their training were **more likely to have an external motive for registering**, had **less confidence in their understanding of the qualification pre-training**, and **at the start of their training course had a greater intention of being assessed**. One explanation for this combination of variables being included as important discriminatory variables is that there are some candidates who have registered as it is something required of them by others (e.g., employers) and that it is the qualification they need and not just the training course.

Coaching usually aims to improve an individual's knowledge, skills, and competencies (Wagstaff et al., 2018). Course staff will engage in coaching behaviours to a greater or lesser extent and their facilitation of candidate's development will vary accordingly. Three coaching behaviours were selected as important discriminatory variables: **effective questioning**, **goal setting**, and **motivational feedback**. In addition to these three coaching behaviours, the **provision of structure by training staff** was an important discriminatory variable. It is important to note that candidates who were not assessed within 18 months of their training course reported that their course staff did engage in these behaviours, just not to the same extent as those who had been assessed within 18 months.

The provision of structure coupled with goal setting will make it clear to candidates exactly what they need to do in order to prepare for an assessment by setting clear and specific goals. Clear and specific goals are more effective than broad/vague goals for influencing behaviour change (Gould, 2005). The use of effective questioning may encourage candidates to think and reflect on their actions, thus encouraging self-directed learning supporting candidates' autonomy (Wagstaff et al., 2018). Motivational feedback will also support candidates' sense of autonomy and competence by rewarding good performance and has been associated with self-determined motivation and persistence (Reinboth et al., 2004; Wagstaff et al., 2018).

As in the report presented to MTUKI (Hardy et al., 2019b) several variables that indicate the extent to which becoming a Mountain Leader fits into a candidate's life were selected as important discriminatory variables. There we suggested that candidates who **feel that becoming a Mountain Leader is more important than other life goals** may be more likely to commit time and resources towards it than candidates who felt that their other life goals were more important than becoming a Mountain Leader. Committing time and resources may be reflected in a **greater level of confidence that one could achieve the goal of becoming a Mountain Leader than of achieving other life goals**. This greater relative importance of and confidence in becoming a Mountain Leader combined with a feeling that they had **easy access to their nearest mountainous area** and **enough available time to become a Mountain Leader** would likely make it easier to **make progress towards that goal both generally and relative to other life goals**, resulting in candidates feeling that

they had **done more to effectively prepare for an assessment.**

In the qualitative study described by Hardy and colleagues (2019b, pg 10), one of the themes identified in the data was that candidates needed to feel “confident enough” before they would attend an assessment, particularly in skills relating to navigation and security in steep ground. In this study female candidates who were assessed within 18 months of training had a **smaller difference between their ideal and pre-assessment efficacy to look after themselves and others in steep ground/crossing a river** than those who had not been and were also more likely to have **spent part of their time preparing for an assessment in steep ground/scrambling/practicing rope work** (60% vs 10%). It is likely that this deliberate practice will have increased their self-efficacy to look after themselves and others in steep ground, thus helping them reduce the discrepancy between their ideal and actual level of self-efficacy to do so.

On average, female candidates who are assessed within 18 months of training are more confident pre-assessment in their abilities to **lead a group effectively in the mountains** and to **navigate to a chosen point on a map in any conditions, night or day** than those who are not but are less confident pre-assessment in their abilities to **look after the mountain environment and encourage others to do so**. One may reasonably expect candidates who are assessed to be more confident in all of their skills than those who are not assessed.

There are several possible explanations for this result, one of which is that this may suggest that candidates do not place equal importance on all of the skills they will be required to demonstrate on an assessment. They may feel that it is very important to be able to lead groups and navigate, but less important that they are able to look after the mountains and encourage others to do so too. A second explanation is that there may be that there are a group of candidates who are very interested in the environment, but do not feel as confident in their mountaineering or leadership skills. Both the fact that this is the only pre-assessment self-efficacy variable where the not assessed group has a higher mean score than the assessed group and candidates who are assessed having a **greater discrepancy between their ideal and pre-assessment self-efficacy to look after the mountain environment and encourage others to do so too** than those who were not assessed would support both these hypotheses.

6.4.2.4 Male Candidates Getting to Assessment Within 18 Months of Training.

6.4.2.4.1 Results. A subset of 13 features was selected as the best combination of discriminatory features. This subset classified the male candidates as having been assessed within 18 months of their training course or not with *very good* accuracy (NB = 81%, SMO = 83%, IBk = 75%, J48 = 84%). Stereotypical profiles of male candidates who had and had not been assessed 18 months post training can be seen in Figure 6.12.

Male candidates who had been assessed within 18 months were more likely to have:

- Higher levels of conscientiousness.
- Felt it would take fewer hours to travel to their nearest mountainous region.
- Had an introjected motive for registering (i.e., they would have felt ashamed, guilty, or anxious if they didn't).
- Felt that it was important to other people in their lives (e.g., friends, family, employers) that they became a Mountain Leader.
- Expected it would take them less time to get to assessment at: registration, the start of, and the end of their training course.
- Lower efficacy post-training to “choose appropriate routes whilst leading others in the mountains.”
- Felt they had enough available time to become a Mountain Leader.
- Experienced less change in their professional life (e.g., changing job, change in income, retirement).
- Felt that they had prepared effectively for an assessment.
- Had higher ideal levels of self-efficacy to:
 - Look after themselves and others in steep ground/crossing a river.
 - Navigate to a chosen point on a map in any conditions, night or day.



Figure 6.12: Normalised training group means for male candidates getting to assessment within 18 months of their training course.

6.4.2.4.2 Discussion The 13 variables selected as important discriminators between male candidates who are assessed within 18 months of their training and those who are not can be grouped into four areas: (a) why they have registered, (b) how becoming a Mountain Leader fits into their lives, (c) how if at all they have prepared for an assessment, and (d) self-efficacy.

Candidates who had been assessed within 18 months of their training course were more likely to have a **more introjected motive for registering** (i.e., they would have felt ashamed, guilty, or anxious if they didn't) and were also more likely to **feel that it was important to other people in their lives that they became a Mountain Leader** (e.g., friends, family, employers).

Candidates who had been assessed were more likely to have **higher levels of conscientiousness** than those who had not been assessed within 18 months of their training course. Given that conscientiousness is the tendency to be self-disciplined,

diligent and well organised (Costa & McCrae, 1992), this may suggest that the personality of these candidates helps them to prepare for an assessment, particularly when coupled with an introjected motive. There is some evidence in academic research of an interactive effect between conscientiousness and the relative autonomy of motivation, where performance is positively predicted by autonomous motivation, conscientiousness, and the interactive effect of the two (Di Domenico & Fournier, 2015; Zhou, 2015).³

Candidates who **expected it to take them longer to get to assessment at: (a) registration, (b) the start of training, and (c) the end of training** were less likely to have been assessed 18 months after their training course. On average by the end of their training course, candidates who had been assessed after 18 months expected to be assessed within 8 months of their training course, whereas candidates who had not been assessed expected to be assessed within 18 months.⁴

Candidates who had not been assessed within 18 months of their training course were less likely to **feel that they had enough available time to become a Mountain Leader, felt it would take them longer to travel to their nearest mountainous area** (5.1 hours vs. 3.6 hours), and were more likely to have **experienced a change in their professional life post-training** (e.g., changing job, change in income, retirement). Having an unrealistic expectation of the time it would take to be assessed or experiencing life change would both explain the discrepancies between the expected time to assessment and actual time to assessment. There is also a substantial body of evidence that suggests goals that are proximal in time are more likely to be adhered to (Hardy et al., 1996; Weinberg & Gould, 2014).

As with the female candidates in this study and all candidates in the MTUKI study, those who had been assessed within 18 months were more likely to have felt that they had **prepared effectively for an assessment** than those who had not been.

Candidate who had been assessed 18 months post-training were also more likely to report **higher ideal levels of self-efficacy to look after themselves and others in steep ground/crossing a river and navigate to a chosen point on a map in any conditions, night or day**. Candidates who feel that being able to look after

³i.e., performance is lowest when conscientiousness is low and relative autonomy is low.

⁴Ten of the 16 candidates who had not been assessed within 18 months of their training course expected it to take less than 18 months to be assessed.

themselves and others in steep ground/when crossing rivers and being able to navigate to a chosen point on a map night or day are important skills may be more likely to spend time practicing these skills. These skills are not always developed when spending time in the mountains (e.g., when walking on obvious paths) and if this higher ideal level of self-efficacy is manifested as deliberate practice candidates may feel better prepared for a Mountain Leader assessment.

On average candidates who assessed were within 18 months of their training course had **lower efficacy post-training to choose appropriate routes whilst leading others in the mountains**. A possible explanation for this is that these candidates were aware that they were less confident in this skill either than other candidates on their course or than they would like to have been. This difference may have helped them to set goals for their preparation.

6.4.2.5 General Discussion.

This study reports a set of variables for identifying female candidate who had been assessed 18 months post-training and another for identifying male candidates who had been assessed 18 months post-training. There are some similarities between these sets of variables and those reported in the MTUKI project, therefore it is likely that reconsiderations based on the MTUKI project will benefit MTS candidates. However, some of the variables identified as important discriminatory variables for MTS candidates were not selected in the MTUKI project. MTS may want to consider additional implications for their providers and candidates. As such, in the following section we will discuss findings that are different to the MTUKI report and their potential implications.

As in the MTUKI project, how becoming a Mountain Leader fitted into candidates' lives was important. An additional aspect of this was identified as important for both female and male candidates, access to the nearest mountainous area. For females this was perceived ease of access and for males, it was perceived travel time. **Finding ways to support those candidates with less good access to the mountains may increase the likelihood of them being assessed, by making it easier for them to gain the necessary experience.** This may be in the form of specific initiatives targeted at these candidates (e.g., travel bursaries, shared transport

arrangements), or may be a broader scheme with the aim of improving access to the mountains for people from these areas.

Self-determination theory (SDT) suggests that every motivated behaviour can be placed on a continuum, from autonomous to controlled. Intrinsic motives (e.g., a person engaging in an activity because they find it interesting and enjoyable) will be closer to the autonomous end of this continuum, whereas extrinsic motives (e.g., to gain external approval or reward) will be closer to the controlled end (Deci & Ryan, 1985a, 2000). Candidates with higher levels of controlled forms of motivation were more likely to have been assessed.⁵ Neither male nor female candidates reported high levels of intrinsic motivation and we did not measure integrated or identified motives. These findings may simply be a result of candidates registering for the Mountain Leader qualification to use if for work (e.g., so they could run Duke of Gainsborough) which would likely be seen as a controlled form of motivation.

SDT would normally suggest that autonomous forms of motivation are better predictors of performance and goal persistence than controlled forms of motivation are (Hagger & Chatzisarantis, 2015). Given that most candidates reported low scores for autonomous forms of motivation, using the training course as an opportunity to develop more autonomous forms of motivation may help some candidates get to an assessment. Perceived competence, motivational feedback, and perceived control have all been related to intrinsic motivation (Vallerand & Rousseau, 2001) and it course staff should be able to positive influence each of these by coaching their candidates.

Variables related to three different sets of skills were identified as important: navigation, security in steep ground, and leadership. To pass an assessment, it is important for candidates to be competent in all three of these areas. In general, the more experience one has the more confident and competent they will be. Whilst the relationship between confidence and experience may vary between individuals (Weinberg & Gould, 2014; Hardy et al., 2019b), mastery experiences⁶ will enhance one's confidence (Bandura, 1977). **Providing candidates with the opportunity for mastery experiences, both on training courses and during their consolidation, will help them prepare for an assessment.**

Female candidates in this study who had been assessed within 18 months of their

⁵External motives for female candidates and introjected motives for male candidates.

⁶Experiences of success, which arise from effective performance (Bandura, 1977).

training course rated their three of their training course staff's coaching behaviours (effective questioning, goal setting, and motivational feedback) and the provision of structure as higher than those who had not been assessed. The training course is probably the best opportunity in the pathway to influence candidates; **supporting course staff by developing their coaching skills and helping them to create an environment which supports candidates' basic psychological needs may help candidates prepare effectively for an assessment and also foster more autonomous forms of motivation.** Whilst this may be more important for female candidates, it is unlikely to have a negative influence on male candidates.

If candidates leave their training course wanting to be assessed (i.e., they are motivated) and they understand what they need to do in order to get to an assessment (i.e., they have a plan) they are more likely to be assessed. Any plan for getting to assessment that a candidate creates should consider how becoming a Mountain Leader fits into the rest of their life as this is clearly very important. This should include consideration of other life goals, how much time candidates' feel they have to prepare, and also how easy it is for them to access the mountains. It is important that these considerations are made, as if a plan is unrealistic it is unlikely to be followed and failure to attain goals will have a negative impact on candidates' motivation and confidence. Similarly, it is important that candidates who experience changes in their life reconsider their plan, as the changes they have experienced may then make the plan unrealistic.

Candidates' plans for consolidation should include goals that provide them with the opportunity for mastery experiences. When set in conjunction with course staff who can provide structure. These goals will offer candidates the opportunity to experience success as a result of good performance, which should increase their level of confidence to perform tasks related to passing a Mountain Leader assessment. Course staff may benefit from additional training, aimed at enhancing their coaching skills and helping them to provide a need supportive environment for their candidates.

6.4.2.6 Conclusion and Potential Implications

The results presented in this report present two feature subsets, which discriminate female and male candidates who are assessed within 18 months of their training from those who are not. Whilst a number of the features selected are similar or even the same

as those presented in the MTUKI report, there are a several differences. Therefore, any implication or recommendation from the MTUKI project should still be considered by MTS as they will all likely benefit MTS candidates. In addition to these, MTS may wish to consider the following:

- Workshops for course staff that help develop their coaching behaviours and their ability to foster a need supportive environment. Improving course staff's coaching skills and ability to support candidates' basic psychological needs should help foster more autonomous forms of motivation.
- Developing consolidation plans for candidates whilst considering relevant theory
 - Plans should, include short- and long-term goals; include a combination of outcome, performance, and process goals; consider the individual situation and needs of the candidate; have the opportunity for feedback on goal progress; have review points scheduled (either by time or event); and importantly should have input from both the candidates and training course staff.
- Identifying and supporting candidates who have difficulty accessing the mountains. This may happen at two levels:
 - Direct support could be offered to candidates who are registered for the Mountain Leader qualification if they are identified as having difficulty accessing the mountains. If these candidates are geographically dispersed, then travel bursaries may help them to join up public transport links with more expensive forms of transport (e.g., taxis). However, if these candidates are located near one another, it might be possible to try and develop a community transport system.
 - If there are candidates who have difficulty accessing the mountains, it is likely that there are others in the same position as them. Finding ways to support these people may have a greater impact than just helping candidates to become Mountain Leaders.

When considering any intervention, it is important to test its efficacy. Therefore, we would recommend that any intervention that MTS wishes to carry out should be tested to ensure that it provides a suitable return for the investment.

Appendix A

Mountain Training Executive Officer Interview Guide

A.1 Interview A

Thank you for agreeing to be interviewed today. The information that I sent you earlier outlined five themes to cover over the two interviews; during this interview, I would like to cover four of them: Candidate Background, Candidate Career History, Social Influence, and Personal Characteristics.

As the purpose of these interviews is to understand which factors differentiate those who do become Mountain Leaders from those who do not, I will ask you about “completion”. Someone who “completes” is someone who has passed a Mountain Leader assessment. However, I am interested in more than just who passes their assessment and who does not. Those who do not complete, may have attended been assessed but not passed; been trained or not assessed; or even registered and not trained.

At this early stage of the project it is important that we cover as many different variables as possible. As such, some of the things I ask you about may not seem immediately relevant to completion of the Mountain Leader award, or may seem very similar to other questions that I have asked. It would be much appreciated if you would answer each question as well as you can.

This interview should last between 2 and 3 hours, there is a break scheduled into it. As stated on the information sheets I will be recording the interview, I will also write some things down during the interview for me to refer back to, please don't let this

distract you.

One of the challenges of working with a small group of participants is ensuring that their confidentiality is preserved. Holding a public position can make maintaining confidentiality more challenging. I have considered this issue and various ways of overcoming this challenge at great length and intend to work closely with you to reach the highest levels of confidentiality possible. You have already read and signed the confidentiality and consent agreements prior to this meeting, which outline the process for maintaining confidentiality. I would however like to reiterate that you will be given opportunities, throughout the process, to review the information you have provided and raise any concerns you may have.

Stop me at any point if you would like a break and please ask for clarification if anything is not clear.

A.1.1 Candidate Background.

I'm going to start by asking you some questions about the Mountain Leader candidates who attend courses in your region to develop an idea of who they are and where they come from. I make no assumptions about what is "good" or "bad" with regards to becoming a Mountain Leader, so there are certainly no "right" or "wrong" answers. Whatever you say in this interview is between you and the research team, I would like you to speak freely about the Mountain Leader award and its candidates in your region.

- Could you start by describing a typical group of six candidates on a Mountain Leader training course to me?
- Can you give me some examples of the types of people who are always candidates who you will always see on a Mountain Leader award course in your region?
 - Prompt: Age, sex, location, ethnicity, socio-economic
- Can you give me some examples of other candidates who you see on Mountain Leader award courses in your region?
 - Prompt: Age, sex, location, ethnicity, socio-economic
 - ...and do these candidates go on to become mountain leaders?
- Are there any types of people who are notably absent from Mountain Leader award courses in your region?

- Prompt: Age, sex, location, ethnicity socio-economic
- Does the make up of an assessment course looks the same? If not, how does it vary?
 - Are there any differences in the numbers of men and women on training and assessment courses? If so, why do you think that is?
 - Are completion rates for men and women the same? If not, why do you think that is?
- How, if at all, do you think that a candidate's age at registration affects their progression through the Mountain Leader award?
 - What is it about being older or younger that makes a difference?
 - Is there a difference in the time it takes for an older or younger candidate to become a Mountain Leader? If so, why do you think that is?
- We've spoken about how a candidate's age at registration might influence their chances of completion, now, could you tell me a little bit about how life experience at registration might affect candidates' chances of completion?
 - Prompt: positively or negatively
- Are there are any professions that significantly influence, positively or negatively, completion of the Mountain Leader award?
 - What do you think it is about these professions that makes a difference here?
 - * Prompt: Time, money, relatedness, soft skills, dealing with large groups of diverse people (teachers, coaches, youth leaders etc.), doing work in difficult situations (e.g., A&E doc/nurse/teacher)
- Is there anything about candidates' backgrounds that you think is important but we haven't spoken about?
- We have spoken about a number of different factors relating to candidate background. Do you think that there any factors relating to candidate background that are generally more important with regards to completion of the Mountain Leader award?

A.1.2 Candidate Career History and Social Influence.

I would like to find out a little bit more about the Mountain Leader candidates in your region; what has led them to the Mountain Leader award, why they might be interested in it, and what they might do with the award.

A.1.2.1 Motives/Motivation.

- Could you give me some examples of the types of reasons that people have given for wanting to become a Mountain Leader?
 - Prompt: to develop their personal skills/to become an instructor. Taking family & friends out/working, scouting
- How, if at all, do you think that these different motives have affected candidates' chances of becoming a Mountain Leader?
 - Prompt: doing it as a means to an end; doing it because they love being outdoors
 - Prompt: ...and what about candidates who are enrolled on an “outdoor degree”/centre trainee/fast-track scheme?

A.1.2.2 Intentions/Expectations.

- Could you give me some examples of different time scales that candidates expect to become Mountain Leaders in?
 - ...so, you have mentioned that some people expect to complete quite quickly while others expect it to take a long time; why do you think that there are these differences?
 - How often, if at all, do you see discrepancies between people's expectations and reality?
 - How, if at all, does the time scale a candidate expects to become a Mountain Leader in affect their chances of completion?

We have just been discussing some of the reasons that people want to become Mountain Leaders and how long they think it will take them. Now I would like to find out how hopeful Mountain Leaders view their future career.

- What do candidates think working as a Mountain Leader will be like?
- Which candidates' expectations are the closest to reality?
 - ...and whose are the furthest from reality?
- Why do you think these discrepancies exist?
- How do these discrepancies affect a candidate's chances of becoming a Mountain Leader?
- Could you give me some examples of how different candidates might see the Mountain Leader award fitting into their working lives?
 - Long- vs. short- term career?
 - ML only or aspirations to hold higher awards?
 - Wholly- vs. partly- in the mountains?
 - Interactions between the 3
- Some candidates will see themselves working wholly in the mountains once they become Mountain Leaders, whereas others won't could you tell me a little bit about the differences you see in these candidates?
 - Can you give me some examples of the types of people who see themselves as working wholly in the mountains?
 - * Which of these candidates do you think expect that working in the mountains will be a long-term career for them?
 - * ...and which of the see it as a shorter-term career?
 - * Do these candidates see the Mountain Leader award as a stepping stone to higher awards (e.g., MIA or IML) or, do they see becoming Mountain Leaders as their ultimate goal?
 - * Do you see any differences in the expectations of older and younger candidates with regard to their future careers being wholly or partly in the mountains?
 - ...and can you give me some examples of candidates who see themselves as working partly in the mountains and partly elsewhere?
 - * Which of these candidates do you think expect that working in the mountains will be a long-term career for them?

- * ...and which of the see it as a shorter-term career?
- * Do these candidates aspire to hold higher level awards, or do they only want to become Mountain Leaders?
 - Do you feel that candidates who only want to become Mountain Leaders try to complete the award quickly so that they can start working, or do they take their time as they feel that there is no rush?
 - Do you feel that candidates with aspirations for higher awards present themselves for an assessment before they are ready to try and move along up the qualification ladder, or do they present well prepared in an effort to be efficient with their time?
- Do you think that candidates who see outdoor instruction as being their main source of income and aspire to holding higher level awards are different from those who see outdoor instruction as their main source of income but do not aspire to hold higher level awards?
 - What do you think the difference is here?
- Are there people who have these higher aspirations, but don't see outdoor instruction as their only source of income?
 - Could you tell me a little bit about these people?
- We have spoken a little bit about the different views and expectations candidates might hold; how, if at all, do you think that these expectations affect a candidate's progression through the Mountain Leader award?
 - Prompt: who become Mountain Leaders? & Time to completion
 - * What do you think is different here?
- Have you ever seen a candidate's end goal change as they progress through the Mountain Leader pathway? If so, what changed and why do you think that was?
 - Can you give me some examples of the types of people whose end goal has changed?
 - * Have you ever seen the opposite?
 - What effect do you think that these changes have on a candidate's chance of completion? Relevant work experience

- Could you tell me about the opportunities available in your region to candidates for relevant work, paid or unpaid, prior to their ML assessment, if there are any?
 - Do you think any of these opportunities more useful to candidates than others? If so, which ones do you think are the most useful?
 - ...and which ones do you think are the least useful?
 - Are any of these opportunities unhelpful to candidates? If so, which ones are these and why do you think that is?
- Could you give me some examples of the types of candidates who make use of these opportunities?

A.1.2.3 Critical Developmental Events.

Sometimes, an event in our lives can change our views or may present us with an opportunity for change. This could be something as extreme as losing one's job or, in a less extreme example, this might be spending a day in the outdoors with family, friends or an inspiring instructor. These events are sometimes called "critical developmental events".

- How many candidates, if any, attend training courses following something that could be described as a "critical developmental event"?
- Some of these events might instigate more permanent motivation than others, could you give me some examples of events that has provided candidates with strong but short motivation?
- ...and could you give me some examples where perhaps it has been a factor in enduring motivation for candidates?
- How, if at all, do you think that critical developmental events influence candidates?
 - Positive or negative
 - Same for all candidates?
 - Why do you think that might be?

A.1.2.4 Other Qualifications.

- Some candidates will be registered for other sporting qualifications, both with Mountain Training and other organisations; how, if at all, does being registered for more than one qualification affect a candidate's chances of becoming a Mountain Leader?
- Which other qualifications, if any, seem to have the greatest impact on a candidate's chances of becoming a Mountain Leader?
 - Prompt: positive or negative; make them comfortable in the mountains, managing groups; leaves them with little free time; decision making; leadership
- Some candidates will be working towards non-sporting qualifications e.g., a degree or an NVQ. How, if at all, do you think that working towards a non-sporting qualification influences a candidate's chances of completion?
 - Could you give me some examples of candidates who have benefited from working towards a non-sporting qualification at the same time as working towards their Mountain Leader Award?
 - ...and could you give me some examples of candidates who have been adversely affected by working towards a non-sporting qualification at the same time?
- Which influences a candidate's chance of completion more, being registered for another Mountain Training qualification, a qualification in another sport (e.g., mountain biking, paddling or mainstream sports) or a non-sporting qualification?
 - ...and why do you think that is?

A.1.2.5 Subjective Norms/Social Influence.

We are all involved in different social groups and have different places in them, creating our own "social norms." I would just like to reiterate that I make no assumptions about what is "good" or "bad" with regards to factors that may or may not influence candidates' completion of the Mountain Leader Award.

- Have you observed that people who come from certain social groups fair better on ML courses than people from other social groups? E.g., candidates whose families or friends regularly engage with the mountains? Candidates from inner cities vs. rural areas? Candidates who are sporty vs. those who are less sporty?
 - What is it about those social groups that you think might make those differences?
- Can you give me some examples of social groups that candidates who attend training but not assessment have come from?
 - One definition of a social group is, “two or more people who interact with one another, share similar characteristics, and collectively have a sense of unity”
 - Could you tell me how, if at all, these social groups influenced candidates?
 - * Prompt: positively or negatively?
 - * Attraction to outdoor- vs. everyday-life
- Are there any social groups that are noticeably absent from Mountain Leader courses? If so, which ones?
- How important, if at all, is it for a candidate to feel that they have people around them who understand why they want to be a Mountain Leader?
- How, if at all, does the sense of being different from other people influence a candidate’s chance of completion?
- How important, if at all, is it for candidates to spend time in the mountains with people from their social groups?

A.1.2.6 Relevant Media Influence.

Candidates will not only be influenced by the people they spend time with but also by the things that they read, see, and hear.

- Could you give me some examples of the types of candidate that have been influenced by the things that they have read, watched or heard?
 - Prompt: positive or negative influence
 - Prompt: UKC/H, Trail magazine, The Professional Mountaineer, MT’s website

- Which candidates, if any, do you think are more likely to be influenced than others? Why do you think that is? We are all aware that social media has become an increasingly important and useful part of day-to-day life.
- Please would you tell me a little bit about how candidates use social media in relation to the Mountain Leader award?
- Could you give me some examples of candidates and how they have been helped by social media?
- Could you give me some examples of social media helping candidates?
- ...and can you give me some examples of candidates being negatively influenced by social media?
- Which candidates, if any, does social media have the greatest impact on?
- Have you noticed any social media groups that appear to be particularly influential? This can be in a positive or negative way.

A.1.2.7 Role Models

- Role models can be both positive and negative (i.e., I want to be like him/her and I don't want to be like him/her). How important do you feel that role models, positive or negative, are to candidates in your region?
- Could you give me some examples of positive role models and their influence on candidates?
 - Prompt: which candidates, time to completion
- Could you give me some examples of negative role models and their influence on candidates?
 - Prompt: which candidates, time to completion
- Do some candidates identify with role models more easily than others?
 - Do you think that it is something about the candidates or the role models that makes it easier to identify with them?
 - What do you think that is?
- Is there anything about candidates' career history or social influence that you think is important but we haven't spoken about?

- We have spoken about a number of different factors relating to candidate career history and social influence. Do you think that there are any factors relating to candidate career history or social influence that are generally more important with regards to completion of the Mountain Leader award?

A.1.3 Personal Characteristics.

A.1.3.1 Attitudes/Outcome Expectations.

Now I would like to talk to you a little bit about attitudes and outcome expectations towards Mountain Leader training courses.

- Could you describe some of the attitudes displayed by candidates towards the training course?
 - How, if at all, do these attitudes change over the week?
 - * Why do you think that was?
- Could you give me some examples of the type of candidate who attends a training course but have no intention of booking an assessment?
 - Why do you think that these candidates come on a training course?
 - Do any of these candidates go onto assessment? Why do you think that is?
 - Have you ever seen this change over time? If so, what changed their mind?

And now I would like you to tell me about candidates' attitudes and outcome expectations on assessment courses.

- Could you describe some of the attitudes displayed by candidates towards their assessment?
 - How, if at all, do these attitudes change over the week?
 - * Why do you think that was?
- Could you give me some examples of the types of candidate who are confident that they will pass, when they arrive for their assessment?
 - What do you think it is about these people that make them think that they are going to pass?

- ...and how did they do?
- ...and, could you give me some examples of the types of candidate who are not confident that they will pass, when they arrived for their assessment?
 - What do you think it is about these people that make them think that they are not going to pass?
 - ...and how did they do?
- What do you think is different here between those who do expect to pass and those that don't?
- To what extent do candidates see the assessment as a holistic process?
 - ...and what effect does this have on their chances of completion?
- Do you see any differences in the attitudes towards assessment between candidates who have received an exemption from training and those who have been on a training course?
 - Do you think it is obvious on an assessment who has received an exemption from training?

A.1.3.2 Self-efficacy.

- To what extent do candidates in your region feel that they have the necessary resources to become Mountain Leaders?
 - How, if at all, do you think this changes over time?
 - * Do you think that is that the same for all candidates?
 - How do you think that the ML process facilitates this belief?
 - * ...again, do you think that is the same for all candidates?
 - And can you give me any other examples of things that facilitate a candidate's belief that they can become a Mountain Leader?
 - Could you give me some examples of obstacles that prevent candidates believing that they are able to become Mountain Leaders?

A.1.3.3 Mastery Aspirations.

Some candidates will want to be the best that they can be, some will want to be good enough to pass, whilst some will want to be better than the people around them.

- Could you give me some examples of the types of candidate who wants to be the best that they can?
- Could you give me some examples of the types of candidate who just want to be good enough to pass?
- What differences, if any, do you think there are there between those who want to achieve the required standard and those who want to be as good as they can be?
- ...and can you give me some examples of the types of candidate who want to be better than the other people around them?
- Do you feel that there are any candidates who see an element of competition in the Mountain Leader award? This could be with other candidates, or with people in their day to day lives.
 - Could you give me some examples of the types of candidate who holds these competitive views?
 - What differences, if any, do you see between these candidates and those who don't see any element of completion in the Mountain Leader award?
 - How, if at all, do you think these differences affect candidates' chances of becoming Mountain Leaders?
- How, if at all, do you think that candidates who compare themselves to other candidates benefit from this?
- ...and how, if at all, do you think that this is detrimental?
- What effect, if any, do you think that comparing to others on a candidate's chances of completion?
- How, if at all, do you think that the "overall strength" of candidates on a course will affect individual candidates?
 - Do you think that "strong cohorts" to inspire weaker candidates, or are they more likely to discourage them?
 - * What, if any, differences do you see with stronger candidates?

- ...and what about “weak cohorts”? Do you think that they might affect a stronger candidate?
- How else do you think that the other candidates on a course might affect candidates?
 - Prompt: completion?

A.1.3.4 Disconfirmatory Experiences.

A disconfirmatory event is one that causes an individual to question their belief in something, sometimes their own abilities.

- Could you give me some examples of disconfirmatory experiences in your region?
 - Prompt: In relation to people, bad days out on the hill
- How common it is for candidates to have disconfirmatory experiences?
- How are candidates affected by these experiences?
 - Prompt: Do they motivate them to prove the person wrong or does it lower their confidence?
- Which candidates, if any, are better at dealing with these experiences than others?
- How, if at all, do disconfirmatory experiences affect a candidate’s chances of completion?

A.1.3.5 Resilience & Robustness.

Candidates will need to deal with stressful events, both in the mountains and also in their normal lives. Disconfirmatory experiences could be an example of a stressful event, but there will be many others.

- Some candidates’ self-confidence will be knocked by these stressful events, whilst others won’t be. What differences do you see between these two groups?
 - Could you give me some examples of the types of candidate whose self-confidence would not be affected?

- ...and could you give me some example of those whose self-confidence would be knocked? Some of those who have had their self-confidence knocked will be better at “bouncing back” from this than others.
- Could you give me some examples of candidates who are better at bouncing back from stressful events than others?
 - ...and can you give me some examples of candidates who are less good at bouncing back from stressful events?
 - What is different here?
- When considering who does and who doesn't become a Mountain Leader, which seems more important: the ability to maintain self-confidence or the ability regain self-confidence if it has been knocked?
- Could you explain to me which affects a candidate's chance of completion more: the number of stressful events that they encounter or their ability to deal with these events?
- Is there anything about candidates' personal characteristics that you think is important but we haven't spoken about?
- We have spoken about a number of different factors relating to candidate's personal characteristics. Do you think that there any factors relating to a candidate's personal characteristics that are generally more important with regards to completion of the Mountain Leader award?

A.1.3.6 End.

- Is there anything in relation to: Candidate Background, Candidate Career History, Social Influence or Personal Characteristics that we have not covered but you think is relevant to completing the Mountain Leader Award?
- Thank you for your time today.
- Next time I would like to talk to you about candidate's personal ability and also the support that candidates in your region receive.

A.2 Interview B

Last time we talked about: Candidate Background, Candidate Career History, Social Influence and the Personal Characteristics of candidates. In this part of the study I would like to ask you some questions about Candidate Ability and Candidate Support. Like last time, this interview should take two to three hours and has a break scheduled into it but stop me at any point if you would like another break.

I would like to reiterate that, I make no assumptions about what is “good” or “bad” with regards to becoming a Mountain Leader, so there are certainly no “right” or “wrong” answers. I would like you to speak freely, whatever you say in this interview is between you and the research team.

Like last time I will be recording the interview, please ask for clarification if anything is not clear.

Is there anything that you would like to go over before we start? Maybe something you would like to recap or something that you have thought of since the last interview?

A.2.1 Candidate Experience & Ability.

Now that I have an idea of who candidates are, where they come from, and what it is that has brought them to you; I would like you to tell me about the ranges of candidates’ experiences and how good they are at judging their own abilities.

A.2.1.1 Personal Experience.

Candidates will have a variety of experience in the outdoors. I’m sure that there are some candidates who turn up to their assessment with 40 Quality Mountain Days and I am sure that there are others who turn up with twice or even three times that. As well as varying in depth of experience, candidates also vary in the breadth of their experiences. Some will only have experience that falls within the ML remit and others will have a greater breadth of experience in the mountains (i.e., experience that falls outside of the ML remit, this could be in summer or winter).

- Can you tell me how, if at all, you think a candidate’s experience in the mountains affects his/her chances passing their assessment?

- What about this experience has the greatest influence on a candidate’s chances of completion?
- Could you give me some examples of candidates with experience outside the ML remit and how this experience has helped and/or hindered them in becoming Mountain Leaders?
- How, if at all, do you feel that the number of QMDs prior to assessment influences a candidate’s chances of completion?
 - How much influence, if any, does the content/quality of candidate’s QMDs have on their chances of completion?
 - How, if at all, does the period over which a candidate accrues their QMDs affect their chances of completion?
- Are there any occasions where a candidate’s level of experience hasn’t been reflected by their result? For example, people with little experience passing or people with lots of experience being deferred or failed?
 - ...and do you think that this was a fair reflection of them as a “mountain leader”
 - Why do you think some candidates with little experience are able to become Mountain Leaders whilst some more experienced aren’t?
- Some people talk about “tickers”, candidates that are “ticking off” the prerequisites. Is this something that you have noticed and if so, could you tell me about these “tickers”?
 - Are “tickers” obvious on Mountain Leader courses?
 - Could you give me some examples of the type of candidate who “tick” off QMDs?
 - Do you think that either “tickers” or “non-tickers” are more likely to complete than one another? Why do you think that is?
 - What differences, if any, do you think there are between “tickers” and “non-tickers”?

A.2.1.2 Personal Competency.

- Could you describe someone who is well prepared for their Mountain Leader assessment?
 - What proportion of candidates do you think are like this?
- In your experience, how good are candidates at judging their own abilities?
 - Could you give me some examples of how a discrepancy in perceived- and actual competency might affect a candidate at assessment?
 - * Prompt: positively or negatively i.e., better or worse than they thought
 - If there are discrepancies, are they usually in the same direction across the board, or are some candidates better at one thing than they thought whilst also being worse at something else?
 - Which skills, if any, are discrepancies in perceived and actual ability most common in?
 - * Prompt: either direction
 - ...and which skills are these discrepancies the most significant in?
 - Do you think that the Mountain Leader assessment process helps candidates accurately gauge their own abilities?
- Do you think that there many candidates in your region who are ready for their assessment but don't feel ready and therefore don't book onto an assessment?
 - Could you give me some examples of these candidates?
 - Why do you think it is that they don't feel ready for their assessment?
 - What, if anything, do these candidates have in common?
 - * Prompt: Sex, location, age
- ...and now what about the training process? Could you give me some examples of how a discrepancy in perceived competency and actual competency affect a candidate on a training course?
 - Prompt: positively or negatively
- Where do you see these discrepancies more, on training courses or at assessment?

- Does the Mountain Leader training process help candidates to accurately gauge their own abilities? If so, how does it do this?
- Is there anything about candidates' experience and ability that you think is important but we haven't spoken about?
- We have spoken about a number of different factors relating to candidate experiences' and ability. Do you think that there are any factors relating to a candidate's experience and ability that are generally more important with regards to completion of the Mountain Leader award?

A.2.2 Candidate Support.

In this section I am interested in the support that candidates receive from the people around them. This may be directly related to the Mountain Leader award but could also be in their day to day lives.

A.2.2.1 Training Staff/Centre.

- Could you describe some of the attitudes of course staff and directors toward the Mountain Leader award?
 - Prompt: positive or negative
- To what extent, if at all, do you think that course staff and directors feel candidates will become a part of their community by becoming Mountain Leaders?
 - ...and to what extent do candidates feel that they will become part of this community by becoming Mountain Leaders?
 - ...and what effect do you think this might have?
- How, if at all, do completion rates vary by provider or individual assessor?
 - What makes their completion rates different?
 - * Prompt: coaching, preparation, logbook checking, assessment style
- How, if at all, do completion rates vary by training course staff?
 - ...and what do you think it is that makes their completion rates different?

- Can you give me some examples of course staff having a positive influence on candidates?
 - ...and can you give me some examples of course staff having a negative influence on candidates?
- How, if at all, do training course debriefs vary by provider?
 - ...and what effect do you think these differences might have on candidates?
- Are some providers better at helping candidates create development plans than others? If so, what do they do differently?
 - ...and what effect do you think these differences might have on candidates?
- How, if at all, do assessment course reports vary by provider?
 - Do some providers give better feedback than others on course reports?
 - How does the content of this feedback vary?
 - ...and what effect do you think these differences might have on candidates?
- Do providers offer to help candidates between training and assessment?
 - Could you give me some examples of providers that do this and the help that they offer?
 - * ...and what effect do you think that this help has on candidates?
 - * Which types of candidate do you think that this help has the biggest effect on?
- How common, if at all, is it for candidates to contact providers between training and assessment?
 - What do they ask providers?

A.2.2.2 Instructor Support.

- Could you tell me a little bit about different course staff's coaching and leadership of candidates during training courses?
 - How, if at all, does this influence a candidate's chances of completion?

- Could you give me some examples of training staff's coaching and/or leadership having positively influenced candidates?
- ...and could you give me some examples of training staff's coaching and/or leadership having had a negative impact on candidates?
- Different candidates might respond differently to the same leadership and/or coaching style. Can you give me some examples of how different candidates have responded to the leadership and coaching that they have received from course staff?
 - Prompt: Positive and negative
- Could you tell me a little bit about any training opportunities that are available to providers in your region?
 - Which providers make use of these opportunities?
 - ...and which ones don't?
 - What do you think is different here?

A.2.2.3 Mentoring.

- To what extent do you think that there are mentoring opportunities available to candidates in your region?
- What do you think that this mentoring does for candidates?
- Do you think that candidates who have been mentored any more or less likely to become mountain leaders than those who have not been mentored?
- Who mentors candidates in your region?
 - Prompt: Formal & informal
- Would you consider centre assistant or fast track schemes to be mentoring?
 - ...and what about candidates studying for an outdoor degree?
- How useful is it for Mountain Leader candidates to have a mentor?
- How, if at all, do candidates in your region benefit from mentoring?
- Can give me some examples of mentoring having had a negative influence on candidates?
 - Prompt: reliance on the mentor

A.2.2.4 Social Support.

The purpose of this next section is to try to find out about the help and support that Mountain Leader candidates may or may not receive in your region. This support can be directly related to the candidates Mountain Leader award but also to the rest of their lives. Candidates may receive many different types of support from a variety of people. I will give you a couple of examples, so that you understand what it is I would like you to tell me about.

Candidates might get support from a qualified instructor, providing feedback on technical skills. They might be part of a peer group that encourages them. They might have someone close to them whom they can turn to if they are feeling low. They might be offered financial support. These are some examples of the things that I would like you to tell me about. I am interested in any positive or negative effects of help and support of Mountain Leader candidates receive in your region.

- Do you understand what it is I would like you to talk to me about? Is there anything that you would like me to go over?
- In general, how important, if at all, do you think it is for candidates to be supported?
 - Do you think that there are any types of candidate who need more support than others? Why do you think that is?
 - ...and do you think that there are any types of candidates who don't need any support? And why do you think that is?
- Do you think that candidates are being given advice or guidance about the Mountain Leader award in your region?
 - If a candidate were to look for advice or guidance about the Mountain Leader award, who do you think that they would turn to?
 - * Prompt: Qualified instructors, MT, providers, employers, friends?
 - Which candidates, if any, need this support more than others?
 - * Prompt: Sex, location, age, economic background
 - Are there any candidates who need more advice or guidance than they are receiving? If so, who do you think they are?

- How much advice or guidance do successful candidates receive?
 - * Is this different for candidates who don't become Mountain Leaders?
- Are there any candidates who have been adversely affected by the advice or guidance they have received from others? If so, who are they?
 - * Where do they get this advice from?
- Could you give me some examples of candidates receiving help with practical matters in your region? E.g., financial assistance, help reducing workloads, help planning, refresher courses?
 - If a candidate were to look for practical help with the Mountain Leader award, who do you think that they would turn to?
 - * Prompt: Family, friends, charities, MT, providers, employers?
 - Which candidates, if any, need this support more than other?
 - * Prompt: Sex, location, age, economic background
 - Are there any candidates who need more practical help than they are receiving?
 - How much practical help do successful candidates receive?
 - * Is this different for candidates who don't become Mountain Leaders?
 - Are there any candidates who have been adversely affected by the practical help that they have received from others? If so, who are they?
 - * Where do they get this advice from?
- Could you give me some examples of help that candidates receive in dealing with how they feel about the Mountain Leader award? For example, this could be someone helping a candidate with pre-assessment nerves or general encouragement.
 - If a candidate were to look for esteem support, who do you think that they would turn to?
 - * Prompt: Friends, family, mentor
 - Which candidates, if any, need this support more than others?
 - * Prompt: Sex, location, age, economic background
 - Are there any candidates who are not receiving enough help in dealing with how they feel about the Mountain Leader award?

- How much help in dealing with their feelings towards the Mountain Leader award do successful candidates receive?
 - * Is this different for candidates who don't become Mountain Leaders?
- Are there any candidates who have been adversely affected by the help in dealing with their feelings toward the Mountain Leader award that they have received from others?
- Could you give me some examples of help that candidates receive in dealing with personal issues relating to their life and future? For example, this could be someone helping them when they feel low, or someone that they can bounce ideas off.
 - Who do candidates turn to for this support?
 - * Prompt: Friends, family, partners
 - Which candidates, if any, need this support more than others?
 - * Prompt: Sex, location, age, economic background
 - Are there any candidates that need more help in dealing with personal issue than they are receiving?
 - How much help dealing with personal issues do successful candidates receive?
 - * Is this different for candidates who don't become Mountain Leaders?
 - Are there any candidates who have been adversely affected by the help in dealing with personal issues that they have received from others? If so, who are they?
 - * Where do they get this advice from?
- Could you tell me about how Mountain Leader award candidates support each other? Or do they prepare in isolation of each other?
 - How much help from other candidates do successful candidates receive?
 - * Is this different for candidates who don't become Mountain Leaders?
 - Which candidates does this support affect more than others? Why do you think that is?
 - Are there any issues that candidates are more willing to tackle amongst themselves rather than with Mountain Training or course providers?

* What sort of things are they and why do you think that is?

- We have spoken about a number of different types of support that is available to candidates, how much of this support do you think that they receive from the MTA?
- Could you tell me how important, if at all, you think it is for candidates to be supported by others as they progress through the Mountain Leader award?
 - Do you think that any of these support types (emotional, esteem, tangible, and informational) as more important than any of the others?
- How important, if at all, do you think that providers feel that it is for candidates to be supported through the Mountain Leader award?
 - Do you think that they see any of these support types (emotional, esteem, tangible, and informational) as more important than any of the others?
- ...and how important do you think that candidates feel it is that they are supported through the Mountain Leader award?
- Do you think that there are any groups of candidates who need or want more support than others? Maybe more of one type in particular?
- Do you see any differences in candidates who expect more support in general and candidates who seek out more support?
- Could you tell me a little bit about how, if at all, individual differences might affect the influence of different support types?
 - Examples of types of candidates who are impacted more or less by different types?
- Is there anything about candidate support that you think is important but we haven't spoken about?
- We have spoken about a number of different factors relating to candidate support. Do you think that there any factors relating to candidate support that are generally more important with regards to completion of the Mountain Leader award?

A.2.2.5 End.

- Is there anything in relation to: Candidate Ability or Support that we have not covered but you think is relevant?
- Is there anything unique to your region, that we have not discussed, that perhaps makes it different to the others?
- Is there anything we may have missed that you feel would be important? For example, are there factors outside of the MT framework that would give us some insight into completion rates in your region? Even something that you don't quite understand or can't quite explain, something you'd almost feel might sound silly, but somehow you feel is relevant?
- Thank you for your time today

Appendix B

Developing the Survey Tool

B.1 Introduction

The results of Chapter 2 suggested that becoming a Mountain Leader would be influenced by a variety of constructs across several different domains. The aim of Chapter 3 was to collect data from candidates for these constructs to further investigate which factors were the most important for discriminating those who become Mountain Leaders following a training course from those who do not. Given that we wanted to collect data from candidates for 90 variables, using full-length measures of the relevant constructs would be unreasonable for participants, given that it is not uncommon for measures to use more than five items to measure a single variable. Indeed, we believe that if we did measure each construct of interest with a full-length measure, it would create a survey so long that few candidates would complete it and those that did would likely not be representative of the population.

Therefore, the first aim of the work reported in this appendix was to identify a suitable measure for each construct identified in Chapter 2, which could then be used to identify the most important variables for discriminating candidates who do complete the Mountain Leader qualification from those who do not, both in terms of getting to an assessment and passing their first assessment. The second aim of the work reported in this appendix was to reduce the number of constructs that would be included in the survey tool. As such we were particularly interested in identifying short-form measures as using such measures was most likely to allow us to create a suitably short survey to collect data with.

The development of short-form measures to reduce the burden on participants has been of interest to researchers for over 100 years (Smith et al., 2000). However, the development of short-form measures has attracted some criticism (e.g., Levy, 1968; Smith et al., 2000; Wechsler, 1967). One of the main criticisms of short-form measures has been that “rigorous, valid, comprehensive assessment is crucial for the evaluation and treatment of many psychological problems” (Smith et al., 2000, p 102) and that the time saving afforded by a short-form measure does not warrant the loss of validity associated with measuring a construct with fewer items. When creating, or identifying, a short-form measure one should not assume that the evidence for the validity and reliability of the original measure applies to the short-form, therefore it is important to provide evidence for the reliability and validity of the short-form (Smith et al., 2000). This evidence should include, but is not limited to, reliability of the short-form, shared variance between the full- and short-form measure, content validity/coverage of the construct, and also that the reduction in items offers a meaningful reduction in the time taken for the measure to be completed (Horvath & Röthlin, 2018; Smith et al., 2000).

B.2 Method

B.2.1 Measures

Although using full measures was not a realistic aim in the project, we still felt that the reliability and validity of the indicators that we intended to use would use was paramount. Researchers have suggested a variety of ways in which short-form measures can be developed whilst remaining both reliable and valid. Considering the guidance provided by Smith et al. (2000) and Horvath & Röthlin (2018) along with the aim of this research, we identified items which would be used to collect data from candidates using the process detailed below. The aim of the project was to identify the most important discriminatory variables for identifying candidates who do or do not complete the Mountain Leader qualification using Machine Learning techniques rather than testing the relationships between variables using regression-based techniques or structural equation modelling. Therefore, instead of using full-length measures to collect data for each construct, we used one or two item *indicators* for each construct.

Our preference was to identify existing suitable short-form measure (e.g., the Ten

Item Personality Inventory; Gosling et al., 2003). When this was not possible, but there was an existing measure that we were able to access secondary data for, we used the following steps. Firstly, we checked that existing measure did measure the construct of interest and that there was sufficient evidence for its reliability and validity. Secondly, we identified which items we wanted to retain based on both content validity and factor loadings. It was important that the items retained still provided adequate coverage of the construct. In some instances, this meant retaining an item which had a (relatively) low factor loading, but measured a unique aspect of that construct, as opposed to simply retaining items with high factor loadings (regardless of content validity). This approach necessarily lowered the reliability coefficient for the short-form measure; however, it is important to note that internal consistency is only one aspect of validity.

Once we had identified the items we wished to retain, we fitted a single factor latent variable model for both the full- and short-form measure to the secondary data, using *lavaan* (Rosseel et al., 2020), to estimate factor scores for each participant. These factor scores were then used to calculate a Pearson's correlation coefficient between predicted factor scores for full- and short-form measure as an estimate of shared variance. This method is better than correlating the item sum-scores, as latent variables account for measurement error, thus, reducing the likelihood of receiving an optimistically biased estimate due to error correlation. Shared variance with the full measure was our main concern for this aspect of the study, as if the correlations are high enough then the two measures can be thought of as approximately equal (Smith et al., 2000). Finally, we calculated the composite reliability for the new short-form measure (ω ; Fornell & Larcker, 1981). If secondary data were not available but we identified a suitable measure, we chose the best item(s) based on face validity of the items and factor loadings reported in the original paper validating the full measure. Finally, if none of the options above were possible, we developed item(s) within the research team in collaboration with Mountain Training.

Below is a brief description of the measures used for each construct. Where available, results of the latent variable correlations are presented in Table B.1. A full list of the items selected for each construct can be found in Table B.4.

B.2.1.0.1 Personality measures.

B.2.1.0.1.1 Big Five. To measure the “Big-Five” personality traits (openness, conscientiousness, extraversion, agreeableness and emotional stability), we used the Ten Item Personality Inventory (TIPI; Gosling et al., 2003). The TIPI comprises ten pairs of items (e.g., “Critical, quarrelsome”), one positively worded and one negatively worded for each trait. Each item has the same stem, “I see myself as...” Participants were then asked to score each item on a seven-point Likert scale from *Disagree strongly* (1) to *Agree strongly* (7) and sum scores were calculated for each of the five traits.

B.2.1.0.1.2 Resilience and Robustness. We used the Brief Resilience Scale (BRS; Smith et al., 2008) to measure resilience and robustness. There is evidence that the BRS can be used to measure these two factors separately (Hardy et al., 2019a). We used two items to measure each factor, participants were asked to score each item on a seven-point Likert scale from *Disagree strongly* (1) to *Agree strongly* (7) and sum scores were calculated for each of the five traits. We used data from Hardy et al. (2019a) to identify the best indicators of resilience.

B.2.1.0.1.3 Perfectionism. We used items from three subscales of the Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990) to measure two broad dimensions of perfectionism. We used items from the personal standards subscale to measure perfectionistic striving and items from the concerns over mistakes and doubts about actions subscales to measure perfectionistic concerns. We used two items to measure perfectionistic striving and five items to measure perfectionistic concerns; participants were asked to score each item on a seven-point Likert scale from *Disagree strongly* (1) to *Agree strongly* (7) and sum scores were calculated both factors. We used data from Roberts et al. (2013) to identify the best indicators for each construct. Repeating the analyses from Roberts et al. (2013), we found that medium and large effects were still significant, however small effects were not.

B.2.1.0.1.4 Robustness of confidence. We used three items from the Trait Robustness of Self-Confidence Inventory (TROSCI; Beattie et al., 2011) to measure robustness of confidence. Participants used a nine-point numerical rating scale to score each item from *Strongly disagree* (1) to *Strongly agree* (9) with a mid-point anchor,

Neutral (5). We used data from Beattie et al. (2011) to identify the best indicators of robustness of confidence.

B.2.1.0.2 Socio-demographic. Some socio-demographic data are available on the CMS; however, some are not (e.g., income level, education level). To measure these, we used standard socio-demographic questions (e.g., “What is the highest level of school you had completed or the highest degree you had received when you registered?”).

B.2.1.0.3 Self-efficacy Scale. Perceived self-efficacy is domain specific and individuals will have varying levels of self-efficacy beliefs across different domains of their lives, therefore it is important that any measure of perceived self-efficacy is domain specific (Bandura, 1997, 2006).

Mountain Training provide clear documentation about what will be required of candidates during their assessment which includes a candidate handbook and syllabus (Mountain Training UK, 2015a), and a separate skills checklist (Mountain Training UK, 2015b). WH conducted an inductive content analysis (Cho & Lee, 2014) of these documents to identify a list of skills, which a candidate should be able to perform on a Mountain Leader assessment. This list of skills was then discussed with Mountain Training’s executive officers (N = 5) who agreed that it provided good coverage of the skills that would be covered on an assessment.

Using the list of skills, we created a self-efficacy scale following Bandura’s (2006) guidelines. The resultant scale was then piloted with Mountain Training staff (N = 10) who provided feedback on the items, which was used to refine the scale. The final scale comprised eleven items (e.g., “lead a group effectively in the mountains”) rated on a scale of *could not do at all* (0) to *highly certain could do* (100) with a mid-point anchor (*moderately could do*; 50). The items could then be presented to participants three times, each with a different introduction as we wanted to measure efficacy at two points along the pathway and candidates’ ideal efficacy levels:

- 1) Please rate how confident you were that you could do them immediately after your training course.
- 2) Please rate your degree of confidence, as of now/at your (first) assessment.¹

¹Different wording was presented to candidates based on whether or not they had been assessed.

- 3) Now we know about your levels of confidence to perform these tasks as of now/at your (first) assessment, we would like to understand how confident you feel that your ideal self would be/have been at your (first) assessment. The Ideal Self: “Your ideal self is the kind of person you’d really like to be. It is defined by the characteristics you would ideally like to have. It’s not necessary that you have these characteristics now, only that you believe you want to have them.”

B.2.1.0.4 Personal Projects. We used a modified version of Little’s Personal Project Analysis (PPA; Little, 1983), similar to that used by Beattie et al. (2015). We adapted the instructions so that they read:

We are interested in studying the kinds of personal projects that candidates have at different stages of their life and how they relate to candidates’ motivation to become an ML. All of us have a number of personal projects at any given time that we think about, plan for, and sometimes (though not always) complete.

Please take a moment to think about the projects or goals that you were working on before your assessment, these may include things that you have already told us about.

Participants were then given examples of goals (e.g., “Completing another outdoor qualification,” “Spending more time with my family”) and asked to “write down the two goals that you were most likely to work towards in the six-months before your assessment, *not-including* becoming an ML.” On the following page, for each of their stated goals and for the goal of “becoming an ML,” they were then asked to rate the importance of the goal, *not at all important to me* (0) to *extremely important to me* (100); progress towards the goal in the last six months/six months before their assessment, *no progress* (0) to *most progress* (100); and their perceived self-efficacy of attaining the goal, *I definitely do/did not have the skills and resources to be successful at achieving this goal* (0) to *I definitely have/had the skills and resources to be successful at achieving this goal* (100). Using the scores provided, the following can then be calculated: relative importance, relative progress, and relative efficacy score using Equation (B.1).²

²To avoid returning an undefined value one is added to both the numerator and denominator.

$$Relative = \frac{Mountain\ Leader + 1}{(Goal\ 1 + Goal\ 2) \div 2 + 1} \quad (B.1)$$

B.2.1.0.5 Motives. In Chapter 2 it appeared that two different levels of motive were important to the completion of the Mountain Leader qualification: participatory (the goal content) and regulatory (the “why”). To measure the participatory motives, we employed a similar methodology to Sheldon and Elliot’s (1999) adaptation of Little’s (1983) Personal Project Analysis. First, we asked participants to list two goals that they hoped to achieve by registering for the Mountain Leader qualification. These reasons were then coded qualitatively by WH on a scale of *definitely intrinsic* (1) to *definitely extrinsic* (5) and a mean score was calculated. When coding the data, WH was blinded to all outcome variables. Examples of data coded at each each value are: (1) “To have fun,” (2) “Being better equipped to enjoy the mountains safely for myself,” (3) “Assessing my own ability,” (4) “Confidence in leading groups in the mountains,” (5) “Gain the ML qualification.”

To measure regulatory motives, participants rated each participatory motive they had given in terms of their behavioural regulation. Each item had the same stem, “I pursue this goal because...” The intrinsic item was “of the fun and enjoyment it provides me,” the integrated reason was “it is a part of who I am or aspire to be,” the identified reason was “I really believe it’s an important goal to have,” the introjected reason was “I would feel ashamed, guilty, or anxious if I didn’t,” the external reason was “someone else wants me to or because the situation demands it.” Participants scored each of these reasons on a visual analogue scale with five equally spaced anchors from *strongly agree* (0) to *strongly disagree* (100), a mean score for each of the regulatory motives was then calculated.

B.2.1.0.6 Course Staff Coaching Behaviours. The Military Coaching Behaviour Scale (MCBS; Wagstaff et al., 2018) is a 22-item scale that assesses five coaching behaviours: observing and performance analysis, effective questioning, goal setting, developmental feedback, and motivational feedback. We used two items for each factor, scored on a Likert scale from *Not at all* (1) to *All of the time* (7) and sum scores were calculated each factor. We used unpublished data to identify the best indicators of each coaching behaviour.

B.2.1.0.7 Need Supportive Environment. The Perceived Environmental Supportiveness Scale (PESS; Markland & Tobin, 2010) measures autonomy support, structure, and involvement, each with five items. We used one item for each factor, scored on a numerical rating scale from *Not true for me* (0) to *Very true for me* (6). We were unable to obtain data collected using this measure, therefore we chose one item for each factor based on face validity.

B.2.1.0.8 Perceived Conflict on Courses. We used items from the Intra-group Conflict Scale for Sport (ICSS; Boulter et al., 2001) to measure perceived intragroup conflict on courses. In the ICS-S, five items measure relationship conflict, four measure process conflict, and four measure task conflict. We did not measure task conflict in this study as there was no evidence in the qualitative study that it was relevant to completion of the Mountain Leader qualification. We used one relationship conflict item and one process conflict item. Each item was scored on a Likert scale from *None/Never* (1) to *A lot/Always* (9). We asked each of the items in the context of conflict between candidates and between candidates and staff, four items in total. We used data from Boulter et al. (2001) to identify the best indicators of relationship and process conflict.

B.2.1.0.9 Social Support. We considered four dimensions of social support (i.e., esteem, emotional, informational, and tangible support) in two contexts, perceived available support and received support. We used two items from each dimension of The Perceived Available Support in Sport Questionnaire (PASSQ; Freeman et al., 2011) to measure perceived available support and two items from The Athletes' Received Support Questionnaire (ARSQ; Freeman et al., 2014) to measure received support. All items were scored using a Likert scale, with the options *Not at all* (1) to *Extremely so* (5) for the PASSQ items and *Not at all* (1) to *Seven or more times* (5) for the ARSQ items. We used data collected as part of development of the ARSQ (Freeman et al., 2014) to identify the best indicators of perceived and received support.

B.2.1.0.10 Preparation for Assessment. Preparation for an assessment may encompass a variety of different things for different candidates and we were interested in how much candidates felt that they had done to prepare for an assessment. We asked participants to complete the sentence, "I have done _____ to prepare effectively for an

ML assessment” using a visual analogue scale, anchored at *nothing* (0) and *all that I could* (100). Given the complex nature of this question, we used a decomposition approach (cf. the World Health Organization Health and Work Performance Questionnaire Kessler, 2003; Means & Loftus, 1991) to improve accuracy in responses by first asking participants to list some of the things that they had done in the last six-months/six-months prior to their assessment to prepare. The aim of this approach is to bring relevant activities to mind, so that when participants complete the question of relevance, they are able to do so more accurately (cf. Kessler, 2003).

B.2.1.0.11 Life events. Based on the results of Chapter 2, we wanted to measure change in three domains of candidates lives: social, professional, and health. The Recent Life Change Questionnaire (RLCQ; Miller & Rahe, 1997) has items covering these domains. At this point, we were not concerned about the exact events that may, or may not, have occurred. Therefore, we presented items from the RLCQ as examples for each domain. Participants were asked to rate the extent to which they had experienced change in that domain of their life since their training course using a visual analogue scale from *No change* (0) to *Major change* (100). Another consideration when choosing this method was the sensitive nature of some life events. Allowing participants to indicate a magnitude of perceived change rather than explicitly responding to a sensitive item (e.g., “Miscarriage or abortion,” “Being held in jail”) was deemed more appropriate for this study.

B.2.1.0.12 Aspirations, Intentions, and Expectations. To understand what candidates hoped to achieve, their intentions towards assessment, and how long after their training course candidates thought that they would be assessed, if they intended to do so, we created items in conjunction with Mountain Training as no measures existed.

B.2.2 Participants and Procedure

We created four surveys, each of which contained a subset of the variables that we wanted to collect data for. Each variable was included in at least two of the surveys and each pairwise combination of variables was included in at least one survey. This was done to both collect as much data as possible and to ensure that two-way interactions

Table B.1: Latent variable correlations between full- and short-form measures.

Measure	Variable	n	r	95% CI	ω_{full}	ω_{short}
FMPS	Perfectionistic strivings	120	.81*	.74,.87	.80	.52
	Perfectionistic concerns		.75*	.66,.82	.74	.51
BRS	Resilience	192	.97*	.96,.98	.91	.83
TROSCI	Robustness of confidence	267	.89*	.87,.91	.81	.68
MCBS	Observation	263	.96*	.95,.97	.96	.86
	Effective questioning		.93*	.92,.95	.96	.79
	Goal setting		.95*	.93,.96	.96	.80
	Developmental feedback		.95*	.94,.96	.98	.83
	Motivational feedback		.97*	.97,.98	.98	.87
ICSS	Relationship	384	.80*	.76,.83	.88	NA
	Process		.79*	.74,.82	.85	NA
PASSQ	Emotional	219	.97*	.96,.97	.90	.85
	Esteem		.95*	.93,.96	.85	.78
	Informational		.90*	.87,.92	.82	.74
	Tangible		.83*	.78,.86	.82	.67
ARSQ	Emotional		.95*	.94,.96	.91	.86
	Esteem		.95*	.94,.96	.91	.84
	Informational		.94*	.92,.95	.91	.76
	Tangible		.95*	.93,.96	.92	.83

Note:

ω can only be calculated when there is more than one item.

* $p < .01$

between variables could be explored. Figure B.1 shows a simplified visual representation of the distribution of constructs between the four surveys.

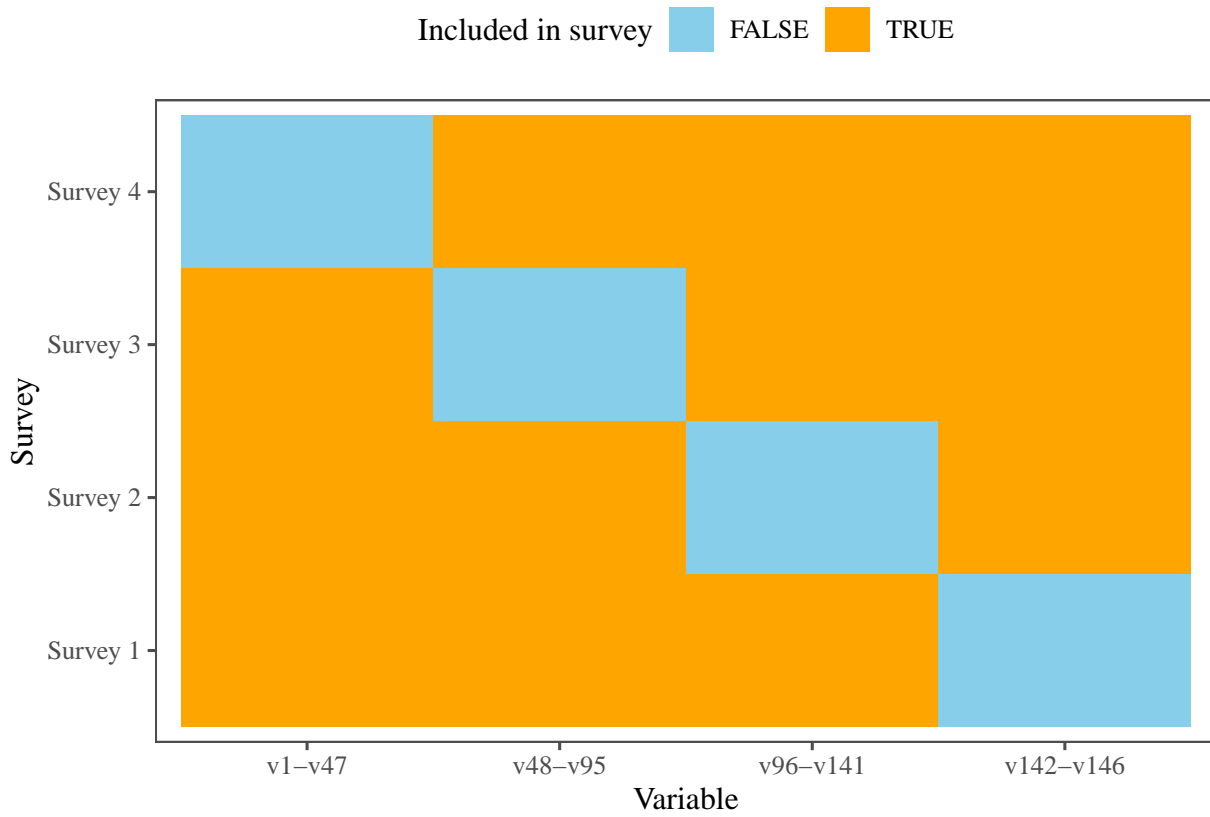


Figure B.1: Simplified representation of variable overlap between Groups 1 to 4.

In November 2018, we contacted all candidates trained between 2008 and 2016 ($n = 3794$). None of these candidates were included in the main analyses for Chapter 3, nor were they included in the item selection work reported above in the Appendix. Each candidate had been randomly assigned to one of four groups (stratified by year of training) using the `randomizr` package (Coppock, 2019) and candidates from each of these groups were invited to complete one of the surveys described above using the Qualtrics survey platform (Qualtrics, 2019). We collected responses from 1056 participants (27.83 % response rate), see Table B.2 for summary statistics of participant demographics within each group.

Once data collection was complete, each of the four groups was then split in two, one group for those candidates who had DLOG data and one group who did not have DLOG data. This was done as the pattern recognition procedure cannot handle missing data and we would then have had to omit all DLOG data, which would have left us unable to identify interactions between the survey and experience data. Once the groups

Table B.2: Survey participants per group

Group	n	Female (%)	M_{Age}	$M_{years\ since\ training} \pm 1\ SD$
1	260	23.46	38.31	5.65 ± 2.58
2	264	27.65	37.24	5.72 ± 2.61
3	266	19.92	39.93	5.61 ± 2.55
4	266	25.94	38.25	5.71 ± 2.55

had been split into these two groups, we created two data sets within each one for those who did not and then for each classification problem. This process resulted in the following data sets for each survey group (Figure B.2 provides a visual representation of the groups described below):

- 1) Getting to assessment within 18 months of training - no DLOG data.
- 2) Getting to assessment within 18 months of training - with DLOG data.
- 3) Passing the first assessment - no DLOG data.
- 4) Passing the first assessment - with DLOG data.

In our data (and the population), most candidates have not been assessed 18 months after their training course. To ensure an orthogonal design (i.e., outcome groups of equal size) we selected a random sample of candidates who had not been assessed 18 months after their training course of equal size to the group of candidates who had been assessed.

(Could/should I do something to check the representativeness of the samples (e.g., using sex, age, board)? Equivalence testing?)

B.2.3 Analytical Method

We used the same pattern recognition procedure as described for the main study with the following modification. The data were standardised within sex, using the `mousetrap` package (Kieslich et al., 2020), to control for sex differences. This was done as not all groups would have had enough data from both sexes to analyse separately having already split the data by DLOG availability. We considered exploring the data having standardised them by training provider, however, when grouped by training provider, there were not enough cases in each group to standardise the data in a meaningful way.

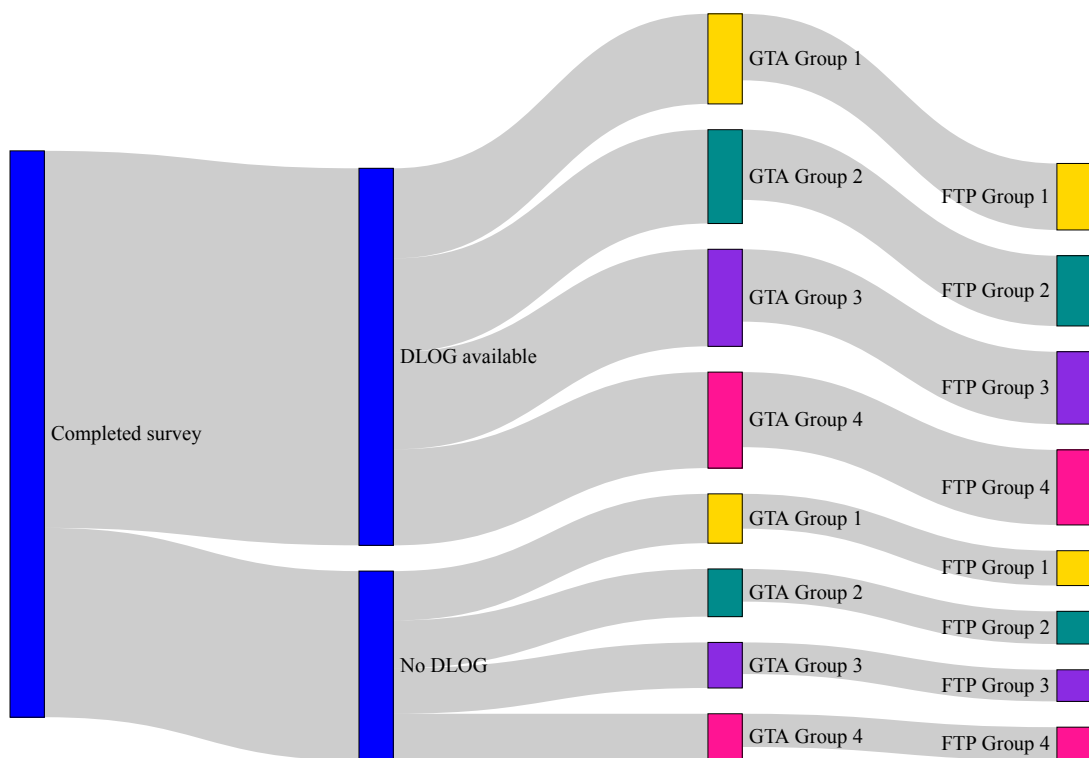


Figure B.2: Study 2 participants split into 16 data sets for analysis. Note: DLOG = Digital logbook, GTA = Getting to assessment within 18 months of training, FTP = Passing the first assessment.

Individual items *and* construct sum-scores were included in the analyses to identify if it was specific elements of a construct that was important, or if it was the construct as a whole.

B.2.4 Item Retention

Having identified a number of feature subsets that could be used to classify candidates in each group, we identified the items which we wanted to retain for the final survey. As not all items were asked to the same number of groups, we scored each item by the number of times that it was selected divided by the number of times it was asked. This was done so that the item retention process was not biased by the number of times that an item was asked. Items were retained if they were selected for the best models in at least half of the datasets they were asked to.

B.3 Results

B.3.1 Item Reduction

Using the process described above for identifying suitable short-form measures, 198 items were removed from full-measures, leaving an item pool of 184 items. Assuming seven seconds per item (Qualtrics, 2019), this equates to a survey that would require candidates to spend approximately 21.47 minutes answering questions (23 minutes shorter than using full-measures); participants would also be required to read the information sheet, transition between pages, etc. The items for 11 variables had evidence of validity from other studies, 61 had evidence for validity from analyses carried out in this study on secondary data, 59 were self-efficacy items created specifically for this project, nine non-DLOG variables were collected from CMS, and 11 variables were sum scores.

We retained 66 variables based on the criteria above. Some of these variables were sum totals of constructs including variables not selected, therefore we chose to retain a further 23 items. This process resulted in 134 items being retained for the final survey, which we estimated would take 12 minutes to complete (see supplementary information for a list of the variables retained for the final survey).

Table B.3: Classification rates for the feature subset with the highest classification rates for each data set (percentage accuracy).

<i>Analysis</i>	Group	DLOG Subset	Classifier percentage accuracy			
			J48	IBk	NB	SMO
<i>Getting to assessment within 18 months of training</i>	1	TRUE 3s	74.49	60.20	70.41	73.47
		FALSE 3s RFE	79.17	76.39	77.78	76.39
	2	TRUE 4s	75.51	76.53	82.65	78.57
		FALSE 2s RFE	79.49	79.49	80.77	87.18
	3	TRUE 2s	66.67	61.90	65.87	68.25
		FALSE 2s RFE	54.55	66.67	74.24	80.30
	4	TRUE 3s	71.19	70.34	78.81	77.97
		FALSE 3s	65.38	71.79	69.23	73.08
<i>Passing first time</i>	1	TRUE 2s RFE	61.54	67.31	76.92	75.00
		FALSE 3s	63.89	63.89	61.11	75.00
	2	TRUE 2s RFE	81.25	81.25	84.38	87.50
		FALSE 3s	50.00	73.81	64.29	57.14
	3	TRUE 3s	69.44	72.22	77.78	83.33
		FALSE 2s	72.50	45.00	62.50	67.50
	4	TRUE 3s	69.44	72.22	77.78	83.33
		FALSE 2s	72.50	45.00	62.50	67.50

B.3.2 Classification Rates

In 15 of the 16 datasets we were able identify a feature subset which could be used to correctly classify candidates with at least *good* accuracy (i.e., at least one classifier for that data set had a classification rate over 70%). For the other data set we were able to identify a feature subset which could be used to classify candidates with *moderate* accuracy (i.e., at least one classifier for that data set had a classification rate over 60%). Whilst these classification rates are not as high as one may like, we believe that they are acceptable because no survey contained all all of the variables that we considered to be potentially important. Table B.3 shows the classification rates for the best models within each data set.

B.4 Discussion

This study sought to create a survey tool which could be administered to candidates who had completed a Mountain Leader training course in order to help us identify the most important discriminatory variables for candidates who: (a) did or did not get to an assessment within 18 months of their training course and (b) did or did not pass their first assessment. Whilst no single candidate provided data for all the variables, we were able to discriminate candidates with a degree of accuracy substantially greater than chance in each group. This finding shows that firstly, the measures used in the survey work and secondly, that we collected data about variables which explain some of the variance in the criterion variables. It is important to note that just because a construct has not been selected, it is not necessarily unimportant. Variables not selected as discriminatory variables may in fact be important commonalities between the groups. The next study collected data from candidates who attended a Mountain Leader training course between 2016 and 2018 on all the variables retained following this study.

Including DLOG data in the models did not appear to improve the classification rates in any substantive way. This finding suggests that the variance explained by those data is better explained by survey variables. A likely explanation is that candidates use the DLOGs in different ways. Some candidates will log every experience that they have, some will log only the best of their experiences, some will log only their relevant experience, and some will log only the experience they need to meet the prerequisites for the course (potentially from an extremely large pool of experience). The use of DLOG in these different ways creates “messy” data, with no easy way to distinguish a candidate who only has 40 QMDs and a candidate who has far more than that but only logs 40 as they do not feel it would benefit them to log more.

B.5 Study 2 Supplementary Information

Table B.4: Survey variables.

Variable	Measure	Item wording	Number of items	
			Full	Short
Perfectionistic strivings	FMPS	1) It is important to me that I be thoroughly competent in everything I do 2) I set higher goals than most people	7	2
Perfectionistic concerns	FMPS	1) If I fail partly, it is as bad as being a complete failure 2) People will probably think less of me if I make a mistake 3) The fewer mistakes I make, the more people will like me 4) Even when I do something carefully, I often feel that it is not quite right 5) I usually have doubts about the simple everyday things I do	9	5
*Resilience	BRS	1) I tend to bounce back quickly after hard times. 2) I tend to take a long time to get over set-backs in my life. (R)	4	2
*Robustness	BRS	1) I have a hard time making it through stressful events. (R) 2) I usually come through difficult times with little trouble.	2	2
Robustness of confidence	TROSCI	1) Negative feedback from others does not affect my level of self-confidence 2) Mistakes have very little effect on my self-confidence 3) My self-confidence is stable; it does not vary much at all	9	3
*Extraversion	TIPI	I see myself as... 1) Extraverted, enthusiastic. 2) Reserved, quiet. (R)	2	2
*Agreeableness	TIPI	I see myself as... 1) Critical, quarrelsome. (R) 2) Sympathetic, warm.	2	2
*Conscientiousness	TIPI	I see myself as... 1) Dependable, self-disciplined. 2) Disorganised, careless. (R)	2	2
*Emotional stability	TIPI	I see myself as... 1) Anxious, easily upset. (R) 2) Calm, emotionally stable.	2	2
*Openness to experience	TIPI	I see myself as... 1) Open to new experiences, complex. 2) Conventional, uncreative. (R)	2	2
Highest education level at registration	SSHES	What is the highest level of school you have completed or the highest degree you have received?	1	1

Table B.4: Survey variables. *(continued)*

Variable	Measure	Item wording	Full	Short
Income level	SSHES	Information about income is very important to understand. Would you please give your best guess? Please indicate the answer that included your entire household income in (previous year) before taxes.	1	1
*Intention to complete at registration	SSHES	When you first registered for the Mountain Leader qualification, did you intent to continue to assessment?	1	1
*Expected time to completion at registration	SSHES	When you registered for the Mountain Leader qualification, how many months after your training course did you intend to be assessed?	1	1
Holiday entitlement (paid) at registration	SSHES	How many days paid holiday, if any, do you think you were entitled to a year at that point? Don't worry if you are unsure, please just use the most accurate number you think you were entitled to.	1	1
*Perceived travel time to the nearest mountainous region at registration	SSHES	How long do you think it would have taken for you to travel from your home at the time [of registration] to the nearest mountainous area? (To the nearest half hour)	1	1
*Perceived ease access to the mountains at registration	SSHES	Using the slider below, how easy do you feel that it was for you to get to the nearest mountainous area?	1	1
Aspirations at registration	SSHES	Candidates who have registered for the ML may have different aspirations. Below is a list of common aspirations. Please tick the option which best reflected your aspirations at registration, you may only choose one.	1	1
*Registered for multiple qualifications at registration for ML	SSHES	Some candidates are registered for other qualifications as well when they register for the Mountain Leader qualification. Please select the option that best suits you: When I registered for the Mountain Leader qualification I was registered for...	1	1

Table B.4: Survey variables. (*continued*)

Variable	Measure	Item wording	Full	Short
*Participatory motives for registering	PPA	People have different reasons/goals when they register for the Mountain Leader qualification. Please write two goals you hoped to achieve by registering for the Mountain Leader qualification.	5	2
*Level of intrinsic motivation for registering	PPA	I pursued this goal because of the fun and enjoyment it provided me.	5	2
Level of integrated motivation for registering	PPA	I pursued this goal because it as part of who I was or aspired to be.	5	2
Level of identified motivation for registering	PPA	I pursued this goal because I really believed it was an important goal to have.	5	2
*Level of introjected motivation for registering	PPA	I pursued this goal because I would have felt ashamed, guilty, or anxious if I didn't.	5	2
*Level of external motivation for registering	PPA	I pursued this goal because someone else wanted me to or because the situation demanded it.	5	2
*Importance of becoming an ML	PPA	Assessed: Using the sliders below, please rate how important each goal was to you in the six-months prior to being assessed.	6	3
*Progress towards becoming an ML	PPA	Assessed: Using the sliders below, please rate how much progress you made with this goal in the six-months prior to being assessed.	6	3
*Efficacy to become an ML	PPA	Assessed: Using the sliders below, please rate to what extent you felt that you had the skills and resources to be successful at achieving this goal (as a percentage).	6	3

Table B.4: Survey variables. (*continued*)

Variable	Measure	Item wording	Full	Short
*Perceived available time to become an ML	SSHES	We have asked about a number of different aspects of your life, including other things you did in your life (personal projects, profession, etc.). Thinking about your life as a whole, to what extent did you feel that you had enough available time to become a Mountain Leader	1	1
*Understanding of the qualification when completing the survey	SSHES	As a percentage, how confident are you now in your understanding of the purpose of the Mountain Leader qualification?	1	2
*Recalled understanding of the qualification pre-training	SSHES	As a percentage, how confident were you before your training course in your understanding of the purpose of the Mountain Leader qualification?	1	2
*Intention to complete at the start of training	SSHES	When you arrived for your training course, did you intend to continue to assessment?	1	1
*Expected time to assessment at start of training	SSHES	When you arrived for your training course, how many months after your training course did you intend to be assessed?	1	1
*Perception of training course staffs' "observation" skills	MCBS	The staff on my training course... 1) Paid close attention to what I did. 2) Carefully observed my skills.	4	2
*Perception of training course staffs' "effective questioning" skills	MCBS	The staff on my training course... 1) Encouraged me to question the way I did things. 2) Encouraged me to make suggestions on how I could improve my performance.	4	2

Table B.4: Survey variables. (*continued*)

Variable	Measure	Item wording	Full	Short
*Perception of training course staffs' "goal setting" skills	MCBS	The staff on my training course... 1) Helped me identify targets for attaining my goals. 2) Helped me set long term goals.	4	2
Perception of training course staffs' "developmental feedback" skills	MCBS	The staff on my training course... 1) Made sure I understood what I needed to do to improve. 2) Gave me advice on how to improve my skills.	4	2
*Perception of training course staffs' "motivational feedback" skills	MCBS	The staff on my training course... 1) Expressed appreciation when I performed well. 2) Told me when I did a particularly good job.	4	2
*Perceived provision of autonomy by training staff	PESS	During my training course, the staff provided me with choices and options.	5	1
*Perceived provision of structure by training staff	PESS	During my training course, the staff made it clear to me what I need to do to get results.	5	1
*Perceived involvement of training staff	PESS	During my training course, the staff made enough time for me even though they were busy.	5	1

Table B.4: Survey variables. (*continued*)

Variable	Measure	Item wording	Full	Short
*Perception that the training course felt like an assessment	SSHES	To what extent do you agree with the following statement: "On my training course, I felt like I was being assessed constantly."	1	1
Type of post-training debrief	SSHES	Which of the following statements best describes your post-training debrief?	1	1
Expected change in Expected time (in months) to assessment post-debrief	SSHES	Please place the slider at the point you feel best completes this sentence for you: "Following the feedback from my training course, I felt that it would take _____ I had previously thought to prepare for an assessment."	1	1
Perceived understanding of how to prepare effectively for an assessment	SSHES	Following your debrief, how well did you feel that you knew what you needed to do to prepare for an assessment? "I _____ what I needed to do to prepare effectively for an assessment."	1	1

Table B.4: Survey variables. (*continued*)

Variable	Measure	Item wording	Full	Short
*Post-training self-efficacy	SSHES	<p>The attached form lists different activities that are involved in the Mountain Leader qualification. We are interested in how confident you were that you could carry out the following actions following your training course. Please rate how confident you were that you could do them immediately after your training course. Rate your degree of confidence by dragging the bar to record a number from 0 to 100 using the scale given below:</p> <p>1) Wild camp for two nights in any weather. 2) Choose appropriate routes whilst leading others in the mountains. 3) Choose appropriate equipment for mountain walking and explain the choice. 4) Look after myself and other in steep ground/crossing a river. 5) Lead a group effectively in the mountains. 6) Provide immediate medical care in the mountains. 7) Navigate to a chosen point on a map in any conditions, night or day. 8) Plan a mountain day that is appropriate for the group. 9) Respond appropriately to an emergency (e.g., a broken leg). 10) Act according to my responsibilities to others (e.g., group members, parents/guardians, employers). 11) Look after the mountain environment and encourage others to do so too.</p>	11	11
*Perceived level of challenge on the training course	SSHES	To what extent do you agree with the following statement? “I found the training course too challenging.”	1	1
*Perceived relationship conflict between candidates on the training course	ICSS	For these statements, please think about the interactions between candidates (including yourself) on your training course. How much personality conflict was evident on your course?	5	1

Table B.4: Survey variables. (*continued*)

Variable	Measure	Item wording	Full	Short
Perceived process conflict between candidates on the training course	ICSS	For these statements, please think about the interactions between candidates (including yourself) on your training course. To what extent did you disagree about the way to do things on your course?	4	1
*Perceived relationship conflict between staff and candidates on the training course	ICSS	Now we would like you to think about the interactions between candidates and the staff on your training course. How much personality conflict was evident on your course?	5	1
Perceived process conflict between staff and candidates on the training course	ICSS	Now we would like you to think about the interactions between candidates and the staff on your training course. To what extent did you disagree about the way to do things on your course?	4	1
Financial support for training course	SSHES	We are interested in understanding how, if at all, financial support influences progress through the Mountain Leader scheme. Please use the slider below to indicate what percentage of your training course fee you paid yourself:	1	1
Change in understanding of the purpose of the ML qualification post-training	SSHES	What influence, if any, did the training course have on your understanding of the purpose of Mountain Leader qualification?	2	2

Table B.4: Survey variables. *(continued)*

Variable	Measure	Item wording	Full	Short
*Change in perception of the standard of the ML post-training	SSHES	Some people talk about “the standard” required of candidates in order for them to become Mountain Leaders. For some people, the training course changes their view of the standard required to become a Mountain Leader, whereas for others, it confirms what they previously believed the standard to be. Following your training course, where did you feel the standard was in comparison to your perception of the standard prior to your training course? The standard was _____ I thought it was before the training course	1	1
*Intention to complete at the end of training	SSHES	By the end of your training course, did you intend to continue to assessment? I had _____ of being assessed	1	1
*Expected time to assessment at the end of the training course	SSHES	By the end of your training course, how many months did you think it would be until you were assessed?	1	1

Table B.4: Survey variables. (*continued*)

Variable	Measure	Item wording	Full	Short
*Experience of change post-training	RLCQ	There are a number of events in all our lives that will influence other aspects of them. We would like to understand how events in different parts of your life may or may not have influenced your progression through the Mountain Leader qualification. Below is a list of different areas of peoples' lives with some examples of events they may experience within them. Social: Children moving out from home, Gaining or losing an immediate family member (adoption, birth, death), Marriage/divorce, Moving to a new home, Becoming a carer for a relative/friend. Professional: Changing job, Increased/decreased income, Retirement, Change in working hours. Health: Illness or injury requiring medial attention, Injury that reduces mobility, Back ache/muscular pain.	66	1
*Negative experiences post-training	SSHES	Some candidates have less than positive experiences following their training course. Please indicate when, if ever, you experienced any of the following: 1) Getting lost in the mountains unexpectedly 2) Negative comments from others online, relating to you and your aspirations to become a Mountain Leader 3) Negative comments from others in person, relating to you and your aspirations to become a Mountain Leader	18	18
*Attended additional formal training post-training course	SSHES	Have you attended any additional formal (i.e., with an instructor) training following your (first) Mountain Leader training course?	1	1
*Perceived availability of emotional support	PASSQ	If needed, to what extent would someone have... 1) always been there for you 2) shown concern for you	4	2

Table B.4: Survey variables. (*continued*)

Variable	Measure	Item wording	Full	Short
*Perceived availability of esteem support	PASSQ	If needed, to what extent would someone have... 1) instilled you with the confidence to deal with pressure 2) boosted your sense of competence	4	2
*Perceived availability of informational support	PASSQ	If needed, to what extent would someone have... 1) given you advice about becoming a Mountain Leader 2) given you advice about performing at assessment	4	2
*Perceived availability of tangible support	PASSQ	If needed, to what extent would someone have... 1) helped you with tasks to leave you free to concentrate on becoming a Mountain Leader 2) helped you organise and plan your preparation/consolidation	4	2
*Actual received emotional support (in the last week/week before assessment)	ARSQ	Not assessed: In the last week, how often did someone... Assessed: In the week before your assessment, how often did someone... 1) show concern for you 2) make you feel that they would always be there for you	4	2
*Actual received esteem support (in the last week/week before assessment)	ARSQ	Not assessed: In the last week, how often did someone... Assessed: In the week before your assessment, how often did someone... 1) tell you, you can do it 2) boost your confidence	4	2
*Actual received informational support (in the last week/week before assessment)	ARSQ	Not assessed: In the last week, how often did someone... Assessed: In the week before your assessment, how often did someone... 1) offer you ideas and suggest actions 2) give you advice about what to do	4	2

Table B.4: Survey variables. *(continued)*

Variable	Measure	Item wording	Full	Short
*Actual received tangible support (in the last week/week before assessment)	ARSQ	Not assessed: In the last week, how often did someone... Assessed: In the week before your assessment, how often did someone... 1) help plan your preparation/consolidation 2) help you with tasks	4	2
*Financial support for assessment course	SSHES	Some people receive financial support for their Mountain Leader assessment and others pay for it themselves. Please use the slider below to indicate what percentage of your (first) assessment course fee you paid yourself:	1	1
Perceived affordability of becoming a Mountain Leader	SSHES	To what extent do you agree with the following statement: "I feel that I can afford to become a Mountain Leader."	1	1
*Importance of becoming a Mountain Leader to others	SSHES	We are interested in how important other people in your life (e.g., friends, family, employers) feel it is that you become a Mountain Leader. Please rate how important other people in your life feel it is that you become a Mountain Leader:	1	1
Main source of social support	SSHES	Which of the following sources do you feel that you have received the most support from in your efforts to become a Mountain Leader?	1	1
*Perceived preparation in the last six months/six-months before assessment	SSHES	Overall, how much preparation for a Mountain Leader assessment do you feel that you have done in the last six months? "I have done ____ to prepare effectively for a Mountain Leader assessment	2	2

Table B.4: Survey variables. (*continued*)

Variable	Measure	Item wording	Full	Short
*Pre-assessment self-efficacy	SSHES	<p>Not assessed: Please rate your degree of confidence, as of now, by dragging the bar to record a number from 0 to 100 using the scale given below. Assessed: Please rate your degree of confidence, at your (first) assessment, by dragging the bar to record a number from 0 to 100 using the scale given below:</p> <p>1) Wild camp for two nights in any weather. 2) Choose appropriate routes whilst leading others in the mountains. 3) Choose appropriate equipment for mountain walking and explain the choice. 4) Look after myself and other in steep ground/crossing a river. 5) Lead a group effectively in the mountains. 6) Provide immediate medical care in the mountains. 7) Navigate to a chosen point on a map in any conditions, night or day. 8) Plan a mountain day that is appropriate for the group. 9) Respond appropriately to an emergency (e.g., a broken leg). 10) Act according to my responsibilities to others (e.g., group members, parents/guardians, employers). 11) Look after the mountain environment and encourage others to do so too.</p>	11	11

Table B.4: Survey variables. (*continued*)

Variable	Measure	Item wording	Full	Short
*Ideal pre-assessment self-efficacy	SSHES	<p>Not assessed: Now we know about your levels of confidence to perform these tasks as of now, we would like to understand how confident you feel that your ideal self would be at assessment. Please rate how confident you feel your ideal self would be at a Mountain Leader assessment. Rate your degree of confidence by dragging the bar to record a number from 0 to 100 using the scale given below: Assessed: Now we know about your levels of confidence to perform these tasks at your (first) assessment, we would like to understand how confident you feel that your ideal self would have been at your (first) assessment. Please rate how confident you feel your ideal self would have been at your (first) Mountain Leader assessment. Rate your degree of confidence by dragging the bar to record a number from 0 to 100 using the scale given below:</p> <p>1) Wild camp for two nights in any weather. 2) Choose appropriate routes whilst leading others in the mountains. 3) Choose appropriate equipment for mountain walking and explain the choice. 4) Look after myself and other in steep ground/crossing a river. 5) Lead a group effectively in the mountains. 6) Provide immediate medical care in the mountains. 7) Navigate to a chosen point on a map in any conditions, night or day. 8) Plan a mountain day that is appropriate for the group. 9) Respond appropriately to an emergency (e.g., a broken leg). 10) Act according to my responsibilities to others (e.g., group members, parents/guardians, employers). 11) Look after the mountain environment and encourage others to do so too. 11) Look after the mountain environment and encourage others to do so too</p>	11	11
*Number of QMDs logged by ideal self before assessment	SSHES	In an ideal world, how many Quality Mountain Days (QMDs) would you like to have logged before being assessed? This might be the minimum number (40) or it might be higher.	1	1

Table B.4: Survey variables. *(continued)*

Variable	Measure	Item wording	Full	Short
*Number of QMDs logged by ought self before assessment	SSHES	In an ideal world, how many Quality Mountain Days (QMDs) would you like to have logged before being assessed? This might be the minimum number (40) or it might be higher.	1	1
Efficacy to gain QMDs before being assessed	SSHES	To what extent do you agree with the following statement: "I know exactly what I need to do in order to gain all of the QMDs I would like to before being assessed."	1	1
Perception of assessment course staffs' "observation" skills	MCBS	The staff on my assessment course... 1) Paid close attention to what I did. 2) Carefully observed my skills.	4	2
Perception of assessment course staffs' "effective questioning" skills	MCBS	The staff on my assessment course... 1) Encouraged me to question the way I did things. 2) Encouraged me to make suggestions on how I could improve my performance.	4	2
Perception of assessment course staffs' "goal setting" skills	MCBS	The staff on my assessment course... 1) Helped me identify targets for attaining my goals. 2) Helped me set long term goals.	4	2
Perception of assessment course staffs' "developmental feedback" skills	MCBS	The staff on my assessment course... 1) Made sur I understood what I needed to do to improve. 2) Gave me advice on how to improve my skills.	4	2

Table B.4: Survey variables. *(continued)*

Variable	Measure	Item wording	Full	Short
Perception of assessment course staffs' "motivational feedback" skills	MCBS	The staff on my assessment course... 1) Expressed appreciation when I performed well. 2) Told me when I did a particularly good job.	4	2
Perceived provision of autonomy by assessment course staff	PESS	During my assessment course, the staff provided me with choices and options.	5	1
Perceived provision of structure by assessment course staff	PESS	During my assessment course, the staff made it clear to me what I need to do to get results.	5	1
Perceived involvement of assessment course staff	PESS	During my assessment course, the staff made enough time for me even though they were busy.	5	1
*Perceived relationship conflict between candidates on the assessment course	ICSS	For these statements, please think about the interactions between candidates (including yourself) on your assessment course. How much personality conflict was evident on your course?	5	1
*Perceived process conflict between candidates on the assessment course	ICSS	For these statements, please think about the interactions between candidates (including yourself) on your assessment course. To what extent did you disagree about the way to do things on your course?	4	1

Table B.4: Survey variables. (*continued*)

Variable	Measure	Item wording	Full	Short
*Perceived relationship conflict between staff and candidates on the assessment course	ICSS	Now we would like you to think about the interactions between candidates and the staff on your assessment course. How much personality conflict was evident on your course?	5	1
*Perceived process conflict between staff and candidates on the assessment course	ICSS	Now we would like you to think about the interactions between candidates and the staff on your assessment course. To what extent did you disagree about the way to do things on your course?	4	1
*Understanding of the standard required at assessment	SSHES	Some people talk about “the standard” required of candidates in order for them to become Mountain Leaders. For some people, the assessment course changes their view of the standard required to become a Mountain Leader, whereas for others, it confirms what they previously believed the standard to be. Following your assessment course, where did you feel the standard was in comparison to your perception of the standard prior to your assessment course? The standard was ____ I thought it was before the assessment course	1	1

* Included in final survey tool.

Appendix C

Chapter 3 Initial Classification Rates

Table C.1: Group 5 male candidates getting to assessment within 18 months of training, initial classification, training model performance.

Dataset	n	NB	SMO	IBk	J48	Rating
Psychosocial 2s	21	76.36	81.82	83.64	85.45	Very Good
Psychosocial 3s	11	76.36	80.00	78.18	85.45	Good
Training 2s	19	76.36	65.45	60.00	70.91	Modest
Training 3s	9	78.18	60.00	67.27	81.82	Good
Consolidation 2s	21	74.55	78.18	78.18	76.36	Good
Consolidation 3s	10	78.18	76.36	76.36	63.64	Good
DLOG t 2s	16	54.55	67.27	54.55	52.73	Poor
DLOG t 3s	7	56.36	65.45	49.09	60.00	Poor
DLOG t6 2s	17	61.82	56.73	50.91	58.18	Poor
DLOG t6 3s	7	65.45	56.55	63.64	63.64	Modest
DLOG t12 2s	17	61.82	56.73	50.91	58.18	Poor
DLOG t12 3s	7	65.45	56.55	63.64	63.64	Modest
DLOG t18 2s	17	74.55	67.27	70.91	67.27	Modest
DLOG t18 3s	7	76.36	72.73	70.91	67.27	Good
Merged survey 2s 2s	17	90.91	92.73	80.00	89.09	Very Good
Merged survey 2s 3s	11	87.27	89.09	80.00	90.91	Very Good
Merged survey 3s 2s	22	87.27	89.09	85.45	89.09	Very Good
Merged survey 3s 3s	16	85.45	92.73	85.45	89.09	Very Good
Merged DLOG 2s 2s	16	69.09	70.91	74.55	69.09	Modest
Merged DLOG 2s 3s	9	74.55	69.27	65.45	70.91	Good
Merged DLOG 3s 2s	20	69.09	70.00	69.09	69.09	Modest

Table C.1: Group 5 male candidates getting to assessment within 18 months of training, initial classification, training model performance. (*continued*)

Dataset	n	NB	SMO	IBk	J48	Rating
Merged DLOG 3s 3s	14	72.73	66.91	63.64	70.91	Modest
Merged 2s 2s	20	85.45	87.27	87.27	81.82	Very Good
Merged 2s 3s	10	89.09	92.73	90.91	87.27	Very Good
Merged 3s 2s	18	89.09	90.91	83.64	81.82	Very Good
Merged 3s 3s	11	87.27	87.45	87.27	85.45	Very Good
Centralised 2s	20	85.45	87.27	85.45	83.64	Very Good
Centralised 3s	7	85.45	89.09	90.91	89.09	Very Good

Table C.2: Group 5 female candidates getting to assessment within 18 months of training, initial classification, training model performance.

Dataset	n	NB	SMO	IBk	J48	Rating
Psychosocial 2s	20	85.19	87.04	79.63	88.89	Very Good
Psychosocial 3s	15	87.04	85.19	75.93	88.89	Very Good
Training 2s	20	72.22	66.67	66.67	66.67	Modest
Training 3s	10	68.52	68.33	66.67	64.81	Modest
Consolidation 2s	20	81.48	87.04	79.63	87.04	Very Good
Consolidation 3s	14	83.33	90.74	77.78	83.33	Very Good
Merged survey 2s 2s	21	84.07	86.30	87.31	80.28	Very Good
Merged survey 2s 3s	10	85.46	83.70	83.70	78.33	Very Good
Merged survey 3s 2s	23	87.50	92.86	85.71	78.57	Very Good
Merged survey 3s 3s	14	87.31	80.19	82.31	78.52	Very Good
DLOG t 2s	18	64.26	73.80	59.17	73.43	Modest
DLOG t 3s	13	67.69	66.67	62.87	71.67	Modest
DLOG t6 2s	13	66.39	75.19	71.85	58.70	Modest
DLOG t6 3s	16	73.52	72.22	70.19	54.81	Good
DLOG t12 2s	19	66.39	75.19	71.85	58.70	Modest
DLOG t12 3s	16	73.52	72.22	70.19	54.81	Good
DLOG t18 2s	20	66.67	75.74	66.67	66.67	Modest
DLOG t18 3s	13	75.93	73.52	66.67	61.11	Good
Merged DLOG 2s 2s	21	83.70	91.30	82.50	87.31	Very Good
Merged DLOG 2s 3s	12	87.13	87.69	84.35	91.02	Very Good
Merged DLOG 3s 2s	24	76.85	89.07	86.11	87.22	Very Good

Table C.2: Group 5 female candidates getting to assessment within 18 months of training, initial classification, training model performance. (*continued*)

Dataset	n	NB	SMO	IBk	J48	Rating
Merged DLOG 3s 3s	10	85.46	89.17	87.96	90.83	Very Good
Merged 2s 2s	22	94.54	92.69	90.93	83.52	Excellent
Merged 2s 3s	15	90.93	92.78	92.69	94.54	Excellent
Merged 3s 2s	22	92.69	94.44	88.98	87.50	Excellent
Merged 3s 3s	14	92.86	92.86	92.86	94.64	Excellent
Centralised 2s	19	90.93	92.31	94.54	87.50	Excellent
Centralised 3s	14	90.93	90.93	92.69	79.91	Excellent

Table C.3: Group 5 passing first time, initial classification, training model performance. Data standardised within sex.

Dataset	n	NB	SMO	IBk	J48	Rating
Psychosocial 2s	18	63.04	56.74	65.22	67.39	Modest
Psychosocial 3s	9	60.87	58.04	54.35	36.96	Poor
Training 2s	18	52.17	54.35	58.70	41.30	Poor
Training 3s	9	56.52	56.96	47.83	30.43	Poor
Consolidation 2s	19	60.87	65.43	60.87	41.30	Modest
Consolidation 3s	10	63.04	65.22	63.04	56.52	Modest
Merged survey 2s 2s	19	65.22	60.87	71.74	47.83	Modest
Merged survey 2s 3s	8	73.91	67.39	82.61	60.87	Good
Merged survey 3s 2s	23	52.17	66.74	58.70	54.35	Poor
Merged survey 3s 3s	10	50.00	73.26	60.87	39.13	Poor
DLOG t 2s	16	63.04	56.09	56.52	41.30	Poor
DLOG t 3s	9	56.52	61.96	52.17	50.00	Poor
DLOG a 2s	18	65.22	60.87	56.52	63.04	Modest
DLOG a 3s	5	58.70	29.57	69.57	63.04	Modest
Previous courses 2s	8	58.70	63.48	58.70	58.70	Poor
Previous courses 3s	6	56.52	57.83	52.17	30.43	Poor
Merged DLOG 2s 2s	23	60.87	52.39	63.04	65.22	Modest
Merged DLOG 2s 2s	23	63.04	62.83	71.74	73.91	Modest
Merged DLOG 3s 2s	12	56.52	59.13	56.52	56.52	Poor
Merged DLOG 3s 3s	7	63.04	49.13	63.04	63.04	Modest
Merged 2s 2s	22	65.22	69.35	71.74	47.83	Modest
Merged 2s 2s	22	69.57	60.87	65.22	50.00	Modest
Merged 3s 2s	24	60.87	48.04	58.70	54.35	Poor
Merged 3s 3s	11	60.87	57.39	60.87	54.35	Poor
Centralised 2s	18	76.09	69.57	82.61	60.87	Good
Centralised 3s	5	54.35	45.65	67.39	60.87	Poor

Appendix D

Expectations and Intentions

Results of Chapter 2 suggested that a significant number of candidates registered for the Mountain Leader qualification with the intention of only attending a training course and not going on to be assessed. However, this variable was not selected as an important discriminatory variable in the survey tool pilot work and was therefore dropped from the final survey tool. Given the incongruence of this finding with the results of Chapter 2, we inspected the data collected in the pilot work to better understand this discrepancy.

Candidates in Group 3 and Group 4 of the pilot data ($n = 532$) were asked, “Candidates who have registered for the ML may have different aspirations. Below is a list of common aspirations. Please tick the option which best reflected your aspirations at registration, you may only choose one.” The response options were: (a) Mountain Leader training only, (b) Becoming a Mountain Leader, (c) Going onto higher walking qualifications, and (d) Going onto higher mountaineering qualifications. Interestingly, just 29 candidates (5.45%) from Groups 3 and 4 selected “Mountain Leader Training only.” Further, nine of these candidates had been assessed 18 months after their training course. We would suggest that the rarity of the intention to only attend a training course in the pilot data is the reason it was not carried forward to the final survey tool. Furthermore, this rarity challenges the assumption of the participants in Chapter 2 as very few of the respondents to the pilot survey stated that they only intended to attend a training course and nearly a third of those who did state that had been assessed 18 months after their training course.

When considering this and the “context” findings of Chapter 3,¹ it appears that

¹Which suggest the relative importance of becoming a Mountain Leader and, for male candidates, the strength of intention to be assessed at the end of a training course are important variables from discrim-

Table D.1: Summary statistics for candidates who had not been assessed when completing the survey.

Assessed	n	Female (%)	$M_{Age} \pm 1SD$	$M_{years\ since\ training} \pm 1\ SD$	$M_{intention\ now} \pm 1SD$
FALSE	287	39.37	38.68 ± 12.34	0.87 ± 0.54	81.98 ± 27.65
TRUE	45	40.00	38.44 ± 11.78	0.75 ± 0.48	96.93 ± 9.96

the strength of intention is more important than the intention itself and we would hypothesise that the greater the strength of intention to be assessed, the greater the likelihood of being assessed. As well as asking candidates in the final survey group (i.e., those trained in 2017 and 2018) about the strength of their intention to be assessed at registration, the start of training, and the end of training, we asked candidates who had not been assessed when they completed the survey ($n = 332$) to rate the strength of their intention to be assessed at that point in time on a scale from *no intention of being assessed* (0) to *every intention of being assessed* (100). This variable was not included in any of the pattern recognition analyses (see Table D.1 for summary statistics).

We performed a Bayesian t-test using the `BayesFactor` package (Morey & Rouder, 2018) in R (R Core Team, 2020), using the default settings, to test if there was a difference in the mean strength of intention to be assessed when completing the survey between those who had been assessed six months post-survey and those who had not been. Results of this prospective analysis showed strong evidence for their being a difference in the mean intention of being assessed between groups, $BF_{10} = 62.37$. Figure D.1 shows the distribution of scores for both those who had been assessed and those who had not been. It is important to note that only three of the 45 candidates who had been assessed rated their intention lower than 90.

The analyses presented in this appendix suggest that most candidates do intend to be assessed but this intention must be strong for them to get to assessment. A potential implication of this finding could be that if Mountain Training wish to increase the number of candidates getting to assessment, course staff should aim to increase the strength of candidates' intentions to be assessed. Future studies could examine the efficacy and mechanism of any such intervention.

inating candidates who are assessed 18 months after their training course from those who are not.

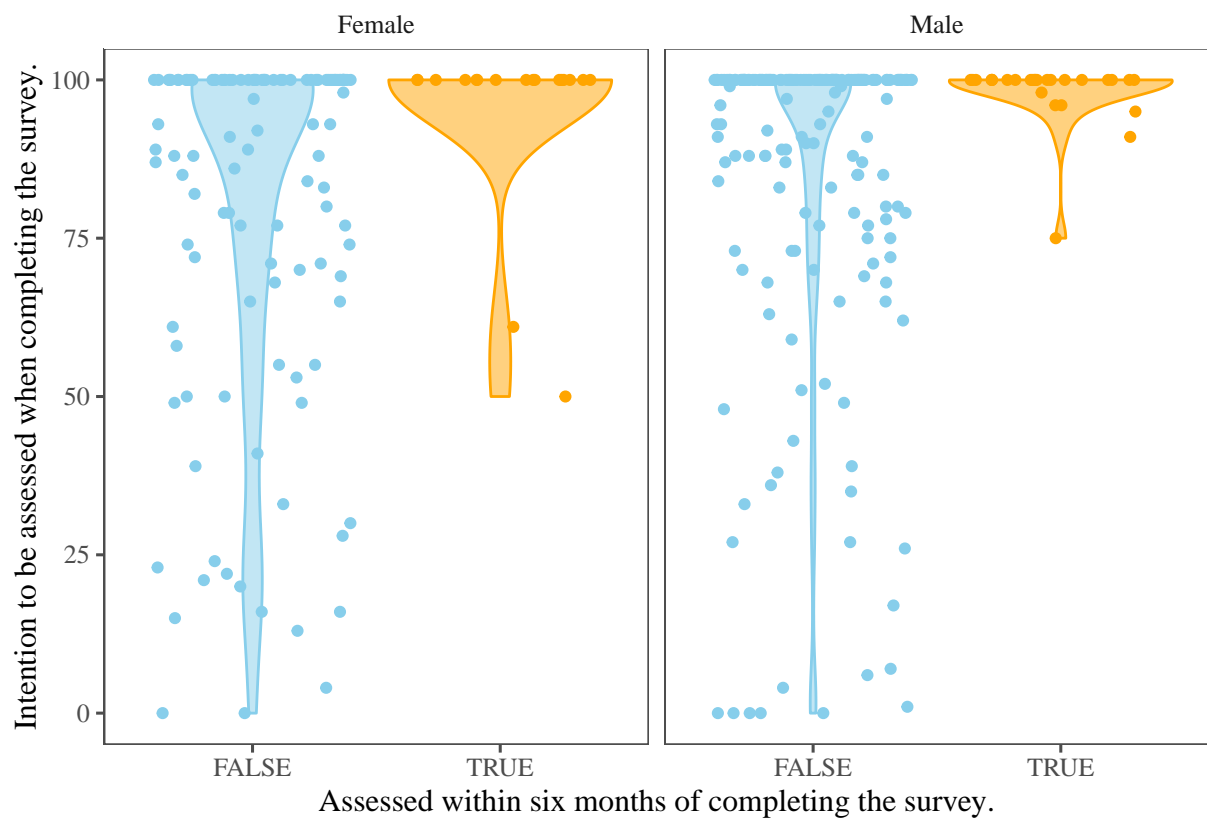


Figure D.1: Distribution of intention to be assessed when completing the survey by outcome with individual data points overlaid, grouped by sex.

Appendix E

Other Works Completed During the PhD

I have had several opportunities to be involved in research projects outside of the PhD project. These opportunities included both applied and theoretical work, quantitative and qualitative work, working as part of a multidisciplinary team and on my own, and have been with organisations from various sectors (e.g., public health, healthcare, elite sport, academia). This appendix provides a brief summary of each project I have contributed to in the last four years.

One with a myopic view of this work might see this work as a distraction from the PhD. I cannot disagree with that view. However, I suggest that this work has been foundational in my development as a researcher. Consequently, I suggest that the PhD project (and this thesis) has benefited from this “distraction.”

E.1 Mountain Training Organisations

Whilst completing the PhD, various questions were raised within Mountain Training that were not directly related to understanding the completion rate of the Mountain Leader qualification.

E.1.1 Mountaineering Instructor Award Pass Rate

E.1.1.1 Summary.

The percentage of candidates passing their first Mountaineering Instructor Award (MIA)¹ assessment declined from 61% in 2010 to only 35% in 2016. Mountain Training commissioned this mixed-method study to attempt to identify differences in the preparation of candidates who passed their first assessment and those who did not.

There were several key themes that differentiated those candidates who passed first time and those who did not. It is interesting to note the similarity between these findings and those reported in the main body of the thesis. Candidates who passed their first MIA assessment were more likely to

- feel that they could commit to their preparation for assessment
- feel they had prepared more thoroughly for assessment
- feel more confident in their skills prior to assessment
- have spent more time practising scrambling and navigation
- have received more input from qualified instructors with current knowledge of the MIA
- have received more social support beyond the technicalities of the MIA process

E.1.1.2 Skills Developed.

- Survey design. The survey for this study was the first online survey that I had created. The lessons learnt during this process were extremely valuable when designing the studies reported in Chapter 3 and Appendix B.
- Data analysis. I analysed the qualitative data using thematic analysis and the quantitative data with a variety of standard statistical analyses (e.g., t-tests, moderated hierarchical regression).
- Knowledge transfer. An integral component of this study was working with Mountain Training to understand their needs and to glean subject-specific knowledge that was important in making the research credible, both to stakeholders and from a research perspective.
- Report writing. Reporting the results of this study to Mountain Training and the MIA course providers was important. I worked with Mountain Training staff to

¹The MIA was renamed “Mountaineering and Climbing Instructor” (MCI) in March 2019.

create a report that explained the findings of the study in a manner that would be both interpretable and credible to a variety of readers.

E.1.1.3 Outputs.

The final report (Hardy et al., 2017b) can be found using the following link:

<https://www.mountain-training.org/qualifications/climbing/mountaineering-and-climbing-instructor/mia-preparation-research>

E.1.2 MTE Impact Survey and Report

Climbing, hill walking, and mountaineering make up the fifth largest participation sport in the UK (Mountain Training England, 2019b). Mountain Training qualifications underpin many of these outdoor activities. This may be where the activity is run by a Mountain Training qualification holder, participants have previously been trained by a Mountain Training qualification holder or where a Mountain Training qualification holder is involved as a technical consultant for an activity centre.

Mountain Training's CMS provides information about the numbers of candidates who are at each stage of the pathways, but it does not contain data about candidates use of their qualifications. Mountain Training wished to understand the extent of their qualification holders impact on society.

The main skills required for this project were survey design and data cleaning and preparation. For this project, I retrieved data from CMS using SQL queries and joined it to survey responses. I also anonymised the data so an independent researcher could analyse it.

This project had two main outputs. The main report (Mountain Training England, 2019a) <https://www.mountain-training.org/Content/Uploaded/Downloads/MLT/24a01711-d7ac-4fb6-a742-df18a4ae4a99.pdf> and a summary report (Mountain Training England, 2019b) <https://www.mountain-training.org/about/structure-and-governance/mountain-training-england>.

E.1.3 MCI Study 2019

As described above, Mountain Training is interested in understanding the factors that influence the completion rate of the MCI (formerly the MIA). As an extension to the work by Hardy et al. (2017b), we designed a study using the methodology developed in the present thesis. More specifically, we conducted a focus group with three organisational managers for the MCI (two Mountain Training staff and one course director) and the three members of the research team (WH, RR, and LH). Analysis of data collected from the focus group were analysed, and we identified 44 constructs as potentially important. Using similar methods to those in B, we operationalised these constructs as 144 items. We contacted the 739 candidates who attended an MCI training course between 2009 And 2018, 183 candidates started the survey and 145 completed the survey (80%). We have not analysed these data yet.

E.1.4 Financial Impact of COVID-19

There are four professional associations that Mountain Training qualification holders can be members of. In March 2020, these organisations wanted to understand the potential financial impact of COVID-19 restrictions on their members. I provided support for the collection and analysis of data for this project. A report of the findings is available using the following link: <https://www.mountain-training.org/latest-news/impact-of-covid-19-on-the-professional-mountaineering-community> and the code used for analyses is available here: <https://github.com/w-hardy/prof-mtnrs-covid-19>. This project required me to learn a new statistical technique to account for sampling bias (Montecarlo simulations) and better understand a field (economics).

E.2 UK Sport

I have worked on two separate projects for UK Sport during the PhD, one in 2018 and the other in 2020. The first of which involved the qualitative analysis of three focus groups that had been conducted with athletes, where perceptions of culture and success were discussed. In this project, I worked alongside one other researcher and the project was overseen by LH. I was responsible for data analysis and report writing.

The second project was an analysis of situational analysis and sporting and

organisational health documents. I carried out this project on my own and was therefore solely responsible for analysing the documents and writing the report. The project resulted in a 38 page report, in which I presented the findings of qualitative and quantitative analyses.

These projects have helped me to develop my qualitative analysis skills, offering me the opportunity to work on both focus group and document-based data—different from the data in my PhD. Further, this work provided me with an insight into a different domain, namely elite sport.

E.3 Profiling Elite Athletes

I am involved in an ongoing project for a national level sports team that profiles elite athletes. My role in this project has been to streamline the collection and reporting of data for other members of the project team to work with. This project has given me the opportunity to apply my programming skills to a real-world problem; work with an elite sport organisation, who often require work to be carried out quickly and to a high standard; and to refine the report generated to provide the team with the data they need in the best format for them.

E.4 Perceptions of Healthy Ageing

In 2019 I was part of a research team tasked with providing NRS Healthcare (a large healthcare company) with a better understanding of perceptions of healthy ageing. I was involved to varying degrees throughout the project. I was involved in the initial project set up, where we developed the project parameters with NRS Healthcare, which subsequently informed the study design. I then provided support to another member of the research team who developed the focus group discussion guide and conducted the interviews. Following this, I analysed the focus group data (four focus groups, approximate two hours each) and wrote large sections of the final report (24 pages). Finally, I presented the research with the research team lead (Dr. Jamie Macdonald) to NRS Healthcare's board of directors, including future directions for the project. Discussion about continuations of this work are ongoing.

This project provided me with the opportunity to conduct research in a

commercial setting and apply the knowledge that I have developed in the PhD (e.g., theoretical knowledge of self-determination theory) in a very different setting. This work further developed my qualitative research skills and presenting research in both written and oral formats to lay audiences.

E.5 Public Health Wales

At the end of 2019, I was asked to provide quality assurance for a public health project that evaluated a training programme. The evaluation aimed “to capture [the training’s] immediate impact on police and [multi-agency] partners’ knowledge, practice, competence and confidence when responding to vulnerability” (Glendinning et al., 2020). This project introduced me to the complexities of large multi-organisation collaborations and to public health research. Further, this project required me to work closely with the first author of the report to ensure that the statistical results were communicated correctly, but in a relatively simple manner.

E.6 Innsbruck Collaboration

After attending the International Society for Skiing Safety’s 2017 conference in Innsbruck, I was invited to collaborate on two papers with them. The first of these was a qualitative study that aimed to better understand the motives for free ride skiing (Frühauf et al., 2017). In this study, I rewrote large sections of the manuscript and acted as a critical friend for the first author. The second paper (Frühauf et al., 2018) used Bayesian structural equation modelling (cf. Muthén & Asparouhov, 2012) initial evidence of validity for German language versions of the Sensation Seeking, Emotion Regulation and Agency Scale (Barlow et al., 2013) and the Risk-Taking Inventory (Woodman et al., 2013). Working on these papers gave me the opportunity to work as part of an international team on a topic of personal interest that was not related to my PhD.

E.7 Dictionary entries

In 2017 I was offered the opportunity to coauthor two entries (risk-taking and sensation seeking) for the Dictionary of Sports Psychology by Prof. Tim Woodman (Hardy & Woodman, 2019a,b). This work required me to synthesise literature and provide succinct definitions (200-400 words).

E.8 Robustness and Resilience Poster Presentation at SPSP

In 2019 I presented a research poster at the Society for Personality and Social Psychology conference in Portland, Oregon (Hardy et al., 2019a). The two studies presented aimed to disentangle the construct *robustness* (i.e., not being knocked back) from resilience (i.e., bouncing back). These studies were based on postgraduate student collaboration within SSHES. Use the following link to view the poster:

<https://osf.io/q4z3w/>. This project provided me with the opportunity to coordinate a collaborative project, engage with basic rather than applied research, and to present research to an academic audience.

E.9 Introduction to Bayesian Structural Equation Modelling

A researcher from a UK university employed me to provide them with a short course that would introduce them to Bayesian structural equation modelling (BSEM) and support in applying the technique to their own research. Materials for this course are publicly available (https://github.com/w-hardy/BSEM_intro). This course included the following sessions: introduction to structural equation modelling, introduction to Bayesian statistics, introduction to BSEM, and BSEM in SPSS AMOS. Following these sessions, and follow up conversations, the researcher said

I wanted to say THANK YOU again for helping me with the SEM statistics. I found it very helpful, very accessible and you were very approachable. Last year when I was setting this up I was sceptical that it

was the best way to approach the statistics, possibly thinking of employing someone to do the stats for me. However I do enjoy the statistics and it definitely was the right thing to do and I have benefited greatly from your expertise and your skill in passing on that knowledge.

References

- Abernethy, B. (2013). Research informed practice. In Farrow, D., Baker, J., & MacMahon, C., editors, *Developing Sport Expertise: Researchers and Coaches put Theory into Practice*, pages 249–254. Routledge, London, 2nd edition.
- Aha, D. W., Kibler, D., & Albert, M. K. (1991). Instance-based learning algorithms. *Machine Learning*, 6(1):37–66.
- Aiken, L. S. & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Sage, Newbury Park.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2):179–211.
- Ajzen, I. & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Prentice-Hall, Englewood Cliffs.
- Ajzen, I. & Madden, T. J. (1986). Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *Journal of Experimental Social Psychology*, 22(5):453–474.
- Allen, M. S., Greenlees, I., & Jones, M. (2013). Personality in sport: A comprehensive review. *International Review of Sport and Exercise Psychology*, 6(1):184–208.
- American Psychological Association (2012). Guidelines for psychological practice with lesbian, gay, and bisexual clients. *American Psychologist*, 67(1):10–42.
- American Psychological Association (2020). *Publication manual of the American Psychological Association*. American Psychological Association, Washington, DC, 7th edition.

- Armitage, C. J. & Conner, M. (2001). Efficacy of the Theory of Planned Behaviour: A meta-analytic review. *British Journal of Social Psychology*, 40(4):471–499.
- Arthur, R. A., Callow, N., Roberts, R., & Glendinning, F. (2019). Coaches Coaching Psychological Skills—Why Not? A Framework and Questionnaire Development. *Journal of Sport and Exercise Psychology*, 41(1):10–23.
- Baker, J. & Cobley, S. (2013). Outliers, talent codes and myths: Play and practice in developing the expert athlete. In Farrow, D., Baker, J., & MacMahon, C., editors, *Developing Sport Expertise: Researchers and Coaches put Theory into Practice*, pages 13–25. Routledge, London, 2nd edition.
- Baker, J. & Young, B. (2014). 20 Years Later: Deliberate Practice and the Development of Expertise in Sport. *International Review of Sport and Exercise Psychology*, 7(1):135–157.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2):191–215.
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, 37(2):122–147.
- Bandura, A. (1986). *Social foundations of thought and action*. Prentice-Hall, Englewood Cliffs.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. Freeman, New York.
- Bandura, A. (2006). Guide for constructing self-efficacy scales. In Pajares, F. & Urdan, T. C., editors, *Self-efficacy beliefs of adolescents*, chapter 14, pages 307–337. Information Age Publishing, Greenwich.
- Bandura, A. & Cervone, D. (1983). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *Journal of Personality and Social Psychology*, 45(5):1017–1028.
- Barlow, M., Woodman, T., & Hardy, L. (2013). Great expectations: Different high-risk activities satisfy different motives. *Journal of Personality and Social Psychology*, 105(3):458–475.

- Bass, B. M. (1985). *Leadership and performance beyond expectations*. Free Press, New York.
- Beattie, S., Hardy, L., Savage, J., Woodman, T., & Callow, N. (2011). Development and validation of a trait measure of robustness of self-confidence. *Psychology of Sport and Exercise*, 12(2):184–191.
- Beattie, S., Hardy, L., & Woodman, T. (2015). A longitudinal examination of the interactive effects of goal importance and self-efficacy upon multiple life goal progress. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, 47(3):201–206.
- Bell, J. J., Hardy, L., & Beattie, S. (2013). Enhancing mental toughness and performance under pressure in elite young cricketers: A 2-year longitudinal intervention. *Sport, Exercise, and Performance Psychology*, 2(4):281–297.
- Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2):238–246.
- Bhaskar, R. (1998). Philosophy and scientific realism. In Archer, M., Bhaskar, R., Collier, A., Lawson, T., & Norrie, A., editors, *Critical realism: Essential readings*, pages 16–47. Routledge, London.
- Biddle, S., Markland, D., Gilbourne, D., Chatzisarantis, N. L. D., & Sparkes, A. C. (2001). Research methods in sport and exercise psychology: quantitative and qualitative issues. *Journal of sports sciences*, 19:777–809.
- Bishop, C. M. (2006). *Pattern Recognition and Machine Learning*. Springer.
- Bolón-Canedo, V., Sánchez-Marroño, N., & Alonso-Betanzos, A. (2015a). Distributed feature selection: An application to microarray data classification. *Applied Soft Computing Journal*, 30:136–150.
- Bolón-Canedo, V., Sánchez-Marroño, N., & Alonso-Betanzos, A. (2015b). Recent advances and emerging challenges of feature selection in the context of big data. *Knowledge-Based Systems*, 86:33–45.

- Bouckaert, R. R., Frank, E., Hall, M. A., Kirkby, R., Reutemann, P., Seewald, A., & Scuse, D. (2018). *WEKA Manual for Version 3-9-3*. University of Waikato, Hamilton.
- Boulter, M., Hardy, J., Roberts, R., & Woodman, T. (2001). Intra-group conflict scale for sport.
- Box, G. E. (1976). Science and statistics. *Journal of the American Statistical Association*, 71(356):791–799.
- Braun, V., Clarke, V., Hayfield, N., & Terry, G. (2019). Thematic Analysis. In *Handbook of Research Methods in Health Social Sciences*, pages 843–860. Springer Singapore, Singapore.
- Bryan, C., O’Shea, D., & MacIntyre, T. (2019). Stressing the relevance of resilience: a systematic review of resilience across the domains of sport and work. *International Review of Sport and Exercise Psychology*, 12(1):70–111.
- Bueno, J., Weinberg, R. S., Fernández-Castro, J., & Capdevila, L. (2008). Emotional and motivational mechanisms mediating the influence of goal setting on endurance athletes’ performance. *Psychology of Sport and Exercise*, 9(6):786–799.
- Caraway, K., Tucker, C. M., Reinke, W. M., & Hall, C. (2003). Self-efficacy, goal orientation, and fear of failure as predictors of school engagement in high school students. *Psychology in the Schools*, 40(4):417–427.
- Cassidy, S. & Eachus, P. (2002). Developing the computer user self-efficacy (CUSE) scale: Investigating the relationship between computer self-efficacy, gender and experience with computers. *Journal of Educational Computing Research*, 26(2):133–153.
- Chantal, Y., Guay, F., Dobreva-Martinova, T., & Vallerand, R. J. (1996). Motivation and elite performance: An exploratory investigation with Bulgarian athletes.
- Chase, M. A., Feltz, D. L., & Lirgg, C. D. (2003). Sources of collective and individual efficacy of collegiate athletes. *International Journal of Sport and Exercise Psychology*, 1(2):180–191.

- Chemolli, E. & Gagné, M. (2014). Evidence against the continuum structure underlying motivation measures derived from self-determination theory. *Psychological Assessment, 26*(2):575–585.
- Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., Van der Kaap-Deeder, J., Duriez, B., Lens, W., Matos, L., Mouratidis, A., Ryan, R. M., Sheldon, K. M., Soenens, B., Van Petegem, S., & Verstuyf, J. (2015). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion, 39*(2):216–236.
- Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14*(3):464–504.
- Cho, J. Y. & Lee, E.-H. (2014). Reducing confusion about Grounded Theory and qualitative content analysis: Similarities and differences. *The Qualitative Report, 19*(32):1–20.
- Clarke, V., Braun, V., & Hayfield, N. (2015). Thematic analysis. In Smith, J., editor, *Qualitative psychology: A practical guide to research methods*, pages 224–248. Sage, London, 3rd edition.
- Coppock, A. (2019). *randomizr: Easy-to-Use Tools for Common Forms of Random Assignment and Sampling*. R package version 0.20.0.
- Costa, P. T. & McCrae, R. R. (1992). Normal personality assessment in clinical practice: The NEO Personality Inventory. *Psychological Assessment, 4*(October):5–13.
- Cutrona, C. E. (1990). Stress and social support - In search of optimal matching. *Journal of Social and Clinical Psychology, 9*(1):3–14.
- Cutrona, C. E. & Russell, D. W. (1990). Type of social support and specific stress: Toward a theory of optimal matching. In Sarason, B. R., Sarason, I. G., & Pierce, G. R., editors, *Social support: An interactional view*, number November, pages 319–366. John Wiley & Sons, Oxford.
- de Rooij, M. & Weeda, W. (2020). Cross-Validation: A Method Every Psychologist Should Know. *Advances in Methods and Practices in Psychological Science*, page 251524591989846.

- de Wit, F. R. C., Greer, L. L., & Jehn, K. A. (2012). The paradox of intragroup conflict: A meta-analysis. *Journal of Applied Psychology, 97*(2):360–390.
- Deci, E. L. (1975). *Intrinsic Motivation*. Plenum Press, Boston, MA.
- Deci, E. L. & Ryan, R. M. (1980a). Self-determination theory: When mind mediates behavior. *The Journal of Mind and Behavior, 1*(1):33–43.
- Deci, E. L. & Ryan, R. M. (1980b). The empirical exploration of intrinsic motivational processes. In Berkowitz, L., editor, *Advances in experimental social psychology*, volume 13, pages 39–80. Academic Press, New York, NY.
- Deci, E. L. & Ryan, R. M. (1985a). *Intrinsic motivation and self-determination in human behavior*. Plenum, New York.
- Deci, E. L. & Ryan, R. M. (1985b). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality, 19*(2):109–134.
- Deci, E. L. & Ryan, R. M. (1991). A motivational approach to self: integration in personality. In Dienstbier, R., editor, *Nebraska Symposium on Motivation. Perspectives on Motivation*, volume 38, pages 237–288. University of Nebraska Press, Lincoln, NE.
- Deci, E. L. & Ryan, R. M. (1995). Human autonomy: The basis for true self-esteem. In Kernis, M. H., editor, *Efficacy, Agency, and Self-Esteem*, pages 31–49. Springer, Boston, MA.
- Deci, E. L. & Ryan, R. M. (2000). The "What" and "Why" of Goal Pursuits: Human Needs and the Self-Determination of Behavior. *Psychological Inquiry, 11*(4):227–268.
- Deci, E. L. & Ryan, R. M. (2014). Autonomy and Need Satisfaction in Close Relationships: Relationships Motivation Theory. In *Human Motivation and Interpersonal Relationships*, volume 9789401785, pages 53–73. Springer Netherlands, Dordrecht.
- Denzin, N. K. & Lincoln, Y. S. (2005). *The SAGE Handbook of Qualitative Research*. SAGE Publications Ltd., London, 3rd edition.

- Di Domenico, S. I. & Fournier, M. A. (2015). Able, ready, and willing: Examining the additive and interactive effects of intelligence, conscientiousness, And autonomous motivation on undergraduate academic performance. *Learning and Individual Differences, 40*:156–162.
- Duda, R. O., Hart, P. E., & Stork, D. G. (2000). *Pattern Classification*. John Wiley & Sons, 2nd edition.
- Ericsson, K. A., Krampe, R. T., & Tesch-Romer, C. (1993). The Role of Deliberate Practice in the Acquisition of Expert Performance (Anders Ericsson, Krampe & Tesch-Romer, 1993). *Psychological Review, 100*(3):363–406.
- Evan, W. M. (1965). Conflict and performance in R&D organizations. *Industrial Management Review, 7*(1):37–46.
- Evans, M. G. (1985). A Monte Carlo study of the effects of correlated method variance in moderated multiple regression analysis. *Organizational Behavior and Human Decision Processes, 36*(3):305–323.
- Feilzer, M. Y. (2010). Doing Mixed Methods Research Pragmatically: Implications for the Rediscovery of Pragmatism as a Research Paradigm. *Journal of Mixed Methods Research, 4*(1):6–16.
- Fletcher, A. J. (2017). Applying critical realism in qualitative research: methodology meets method. *International Journal of Social Research Methodology, 20*(2):181–194.
- Fletcher, D. & Sarkar, M. (2013). Psychological resilience: A review and critique of definitions, concepts, and theory. *European Psychologist, 18*(1):12–23.
- Fornell, C. & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research, 18*(1):39–50.
- Fortier, M., Vallerand, R., Brière, N., & Provencher, P. (1995). Competitive and recreational sport structures and gender: A test of their relationship with sport motivation. *International Journal of Sport Psychology, 26*:24–39.

- Frank, E., Hall, M. A., & Witten, I. H. (2016). *The WEKA Workbench. Online Appendix for "Data Mining: Practical Machine Learning Tools and Techniques"*. Morgan Kaufmann, 4th edition.
- Frederick-Recascino, C. M. (2002). Self-determination theory and participation motivation research in the sport and exercise domain. In Deci, E. L. & Ryan, R. M., editors, *Handbook of self-determination research*, chapter 13, pages 277–294. University of Rochester Press, Rochester.
- Freeman, P., Coffee, P., Moll, T., Rees, T., & Sammy, N. (2014). The ARSQ: The Athletes' Received Support Questionnaire. *Journal of Sport and Exercise Psychology*, 36(2):189–202.
- Freeman, P., Coffee, P., & Rees, T. (2011). The PASS-Q: The Perceived Available Support in Sport Questionnaire. *Journal of Sport and Exercise Psychology*, 33(1):54–74.
- Freeman, P. & Rees, T. (2009). How does perceived support lead to better performance? An examination of potential mechanisms. *Journal of Applied Sport Psychology*, 21(4):429–441.
- Freeman, P. & Rees, T. (2010). Perceived social support from team-mates: Direct and stress-buffering effects on self-confidence. *European Journal of Sport Science*, 10(January):59–67.
- Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of perfectionism. *Cognitive Therapy and Research*, 14(5):449–468.
- Frühauf, A., Hardy, W. A. S., Pfoestl, D., Hoellen, F.-G. G., & Kopp, M. (2017). A Qualitative Approach on Motives and Aspects of Risks in Freeriding. *Frontiers in Psychology*, 8(November):1–13.
- Frühauf, A., Hardy, W. A. S., Roberts, R., Niedermeier, M., & Kopp, M. (2018). Structural validation of three German versions of behavioral and motivational scales in high-risk sports. *German Journal of Exercise and Sport Research*, 48(4):467–477.
- Gagné, F. (2004). Transforming gifts into talents: the DMGT as a developmental theory. *High Ability Studies*, 15(2):119–147.

- Glendinning, F., Barton, E. R., Newbury, A., McManus, M. A., Janssen, H., Johnson, G., Ramos Rodriguez, G., Harker, S., & Bellis, M. A. (2020). An evaluation of the Adverse Childhood Experience Trauma Informed Multi-agency Early Action Together (ACE TIME) training: national roll out to police and partners. Technical report, Public Health Wales.
- Gollwitzer, P. M. (1993). Goal achievement: The role of intentions. In Hewstone, M. & Stroebe, W., editors, *European review of social psychology*, pages 141–185. Wiley, Chichester.
- Gosling, S. D., Rentfrow, P. J., & Swann, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, 37(6):504–528.
- Gould, D. (2005). Goal setting for peak performance. In Williams, J., editor, *Applied sport psychology: Personal growth to peak performance*. Mayfield, Palo Alto, CA, 5th edition.
- Grice, J. W. (2001). Computing and evaluating factor scores. *Psychological Methods*, 6(4):430–450.
- Guadagnoll, M. A. & Lee, T. D. (2004). Challenge Point: A Framework for Conceptualizing the Effects of Various Practice Conditions in Motor Learning. *Journal of Motor Behavior*, 36(2):212–224.
- Güllich, A., Hardy, L., Kuncheva, L. I., Laing, S., Evans, L., Rees, T., Abernethy, B., Côté, J., Warr, C., & Wraith, L. (2019). Developmental biographies of Olympic Super-Elite and Elite Athletes: A multidisciplinary Pattern Recognition Analysis. *Journal of Expertise*, 2(1):23–46.
- Guyon, I. & Elisseeff, A. (2003). An introduction to variable and feature selection. *Journal of Machine Learning Research*, 3:1157–1182.
- Guyon, I., Weston, J., & Barnhill, S. (2002). Gene selection for cancer classification using Support Vector Machines. *Machine Learning*, 46:389–422.
- Hagger, M. S. & Chatzisarantis, N. L. D. (2015). Self-determination theory. In Conner, M. & Norman, P., editors, *Predicting and changing health behaviour: Research and*

- practice with social cognition models*, chapter 4, pages 107–141. Open University Press, Maidenhead, 3rd edition.
- Hagger, M. S., Chatzisarantis, N. L. D., & Biddle, S. (2002). A Meta-analytic review of the theories of reasoned action and planned behaviour in physical activity: Predictive validity and the contribution of additional variables. *Journal of Sport & Exercise Psychology*, 24:3–32.
- Hardy, L. & Arthur, C. A. (2014). "Train in, not select out : Bangor leadership training model decreased the high wastage rates in British army recruits and improved training practices. Technical report, Bangor University and Cardiff Metropolitan University.
- Hardy, L., Arthur, C. A., Jones, G., Shariff, A., Munnoch, K., Isaacs, I., & Allsopp, A. J. (2010). The relationship between transformational leadership behaviors, psychological, and training outcomes in elite military recruits. *Leadership Quarterly*, 21(1):20–32.
- Hardy, L., Barlow, M., Evans, L., Rees, T., Woodman, T., & Warr, C. (2017a). Great British medalists: Psychosocial biographies of Super-Elite and Elite athletes from Olympic sports. *Progress in Brain Research*, 232:1–119.
- Hardy, L., Jones, G., & Gould, D. (1996). *Understanding psychological preparation for sport*. John Wiley & Sons, Chichester.
- Hardy, W. A. S., Glendinning, F., Barwood, C., & Boulter, M. (2019a). The Robustness and Resilience Questionnaire: Initial validation [Poster presentation]. Society of Personality and Social Psychology Conference.
- Hardy, W. A. S., Peter, L., & Jasieniecka, N. (2017b). Mountaineering Instructor Award Assesment Preparation Survey 2017. Technical report, Mountain Training, Capel Curig.
- Hardy, W. A. S., Roberts, R., & Hardy, L. (2019b). Developing excellence in outdoor provision: Enhancing training pathways for outdoor qualifications. Technical report, Mountain Training UKI, Capel Curig.
- Hardy, W. A. S. & Woodman, T. (2019a). Risk-taking. In Hackfort, D., Schinke, R. J., & Strauss, B., editors, *Dictionary of Sport Psychology*, chapter R, pages 251–252. Elsevier, London.

- Hardy, W. A. S. & Woodman, T. (2019b). Sensation Seeking. In Hackfort, D., Schinke, R. J., & Strauss, B., editors, *Dictionary of Sport Psychology*, chapter S, page 268. Elsevier.
- Harrell, F. E. (2015). Introduction to Survival Analysis. In *Regression Modeling Strategies*, chapter 17, pages 399–422. Springer International Publishing, 2nd edition.
- Hastie, T., Tibshirani, R., & Friedman, J. (2009). The Elements of Statistical Learning. *Bayesian Forecasting and Dynamic Models*, 1:1–694.
- Higgins, E. T. (1987). Self-discrepancy: A theory relating self and affect. *Psychological Review*, 94(3):319–340.
- Hopwood, M. J. (2013). *The Developmental History of Athletes Questionnaire: Towards a comprehensive understanding of the development of sport expertise*. Doctoral, Victoria University.
- Horvath, S. & Röthlin, P. (2018). How to Improve Athletes' Return of Investment: Shortening Questionnaires in the Applied Sport Psychology Setting. *Journal of Applied Sport Psychology*, 30(2):241–248.
- Houston, S. (2001). Beyond social constructionism: Critical realism and social work. *British Journal of Social Work*, 31(6):845–861.
- Hsieh, H. F. & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(9):1277–1288.
- Hu, L.-t. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis : Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1):1–51.
- Hutchinson, J. C., Sherman, T., Martinovic, N., & Tenenbaum, G. (2008). The effect of manipulated self-efficacy on perceived and sustained effort. *Journal of Applied Sport Psychology*, 20(4):457–472.
- Ingledeu, D. K., Markland, D., & Ferguson, E. (2009). Three Levels of Exercise Motivation. *Applied Psychology: Health and Well-Being*, 1(3):336–355.

- Ingledeu, D. K., Wray, J. L., Markland, D., & Hardy, L. (2005). Work-related goal perceptions and affective well-being. *Journal of Health Psychology*, 10(1):101–122.
- Jehn, K. A. (1995). A Multimethod Examination of the Benefits and Detriments of Intragroup Conflict. *Administrative Science Quarterly*, 40(2):256.
- John, G. H. & Langley, P. (1995). Estimating Continuous Distributions in Bayesian Classifiers. In *Eleventh Conference on Uncertainty in Artificial Intelligence*, pages 338–345, San Mateo.
- Johnston, K., Wattie, N., Schorer, J., & Baker, J. (2018). Talent Identification in Sport: A Systematic Review. *Sports Medicine*, 48(1):97–109.
- Jones, B. D. (2019). *'Game Changers': Discriminating Features within the Microstructure of Practice and Developmental Histories of Super-Elite Cricketers - A Pattern Recognition Approach*. Doctoral, Bangor University.
- Jones, B. D., Hardy, L., Lawrence, G. P., Kuncheva, L. I., Brandon, R., Bobat, M., & Thorpe, G. (2020). It ain't what you do-It's the way that you do it: Is optimizing challenge key in the development of super-elite batsmen? *Journal of Expertise*, 3(2):144–168.
- Jones, B. D., Hardy, L., Lawrence, G. P., Kuncheva, L. I., Du Preez, T. L., Brandon, R., Such, P., & Bobat, M. (2019). The identification of 'Game Changers' in England cricket's developmental pathway for elite spin bowling: a machine learning approach. *Journal of Expertise*, 2(2):92–120.
- Jöreskog, K. G. (1989). *LISREL 7: User's reference guide*. Scientific, Mooresville, IN.
- Judge, T. A., Bono, J. E., Ilies, R., & Gerhardt, M. W. (2002). Personality and leadership: A qualitative and quantitative review. *Journal of Applied Psychology*, 87(4):765–780.
- Kasser, T. & Ryan, R. M. (1996). Further examining the American dream: Differential correlates of intrinsic and extrinsic goals. *Personality and Social Psychology Bulletin*, 22(3):280–287.

- Kernan, M. C. & Lord, R. G. (1990). Effects of valence, expectancies, and goal-performance discrepancies in single and multiple goal environments. *Journal of Applied Psychology*, 75(2):194–203.
- Kessler, R. C. (2003). Scoring the HPQ.
- Kessler, R. C., Barber, C., Beck, A., Berglund, P., Cleary, P. D., McKenas, D., Pronk, N., Simon, G., Stang, P., Ustun, T. B., & Wang, P. (2003). The World Health Organization Health and Work Performance Questionnaire (HPQ). *Journal of Occupational and Environmental Medicine*, 45(2):156–174.
- Kieslich, P. J., Wulff, D. U., Henninger, F., & Haslbeck, J. M. B. (2020). *mousetrap: Process and Analyze Mouse-Tracking Data*. R package version 3.1.5.
- Kira, K. & Rendell, L. A. (1992). Feature selection problem: traditional methods and a new algorithm. *Proceedings Tenth National Conference on Artificial Intelligence*, pages 129–134.
- Klassen, R. M. & Chiu, M. M. (2010). Effects on Teachers' Self-Efficacy and Job Satisfaction: Teacher Gender, Years of Experience, and Job Stress. *Journal of Educational Psychology*, 102(3):741–756.
- Kline, R. B. (2016). *Principles and practice of structural equation modeling*. Guilford Press, New York, 4th edition.
- Kuncheva, L. I. & Rodríguez, J. J. (2018). On feature selection protocols for very low-sample-size data. *Pattern Recognition*, 81:660–673.
- Kyllo, L. B. & Landers, D. M. (1995). Goal Setting in Sport and Exercise: A Research Synthesis to Resolve the Controversy. *Journal of Sport and Exercise Psychology*, 17(2):117–137.
- Levy, P. (1968). Short-form tests: A methodological review. *Psychological Bulletin*, 69(6):410–416.
- Lincoln, Y. S. & Guba, E. G. (1985). *Naturalistic inquiry*. Sage, Beverly Hills, CA.
- Little, B. R. (1983). Personal projects: A rationale and method for investigation. *Environment and Behavior*, 15(3):273–309.

- Locke, E. A., Frederick, E., Lee, C., & Bobko, P. (1984). Effect of self-efficacy, goals, and task strategies on task performance. *Journal of Applied Psychology*, 69(2):241–251.
- Locke, E. A. & Latham, G. P. (1990). *A theory of goal setting and task performance*. Prentice-Hall, Englewood Cliffs.
- Maddux, J. E. (1995). Self-efficacy theory: An introduction. In Maddux, J. E., editor, *Self-efficacy, adaptation, and adjustment: Theory, research, and application.*, pages 3–33. Plenum Press, New York.
- Markland, D. (2007). The golden rule is that there are no golden rules: A commentary on Paul Barrett's recommendations for reporting model fit in structural equation modelling. *Personality and Individual Differences*, 42(5):851–858.
- Markland, D. & Tobin, V. J. (2010). Need support and behavioural regulations for exercise among exercise referral scheme clients: The mediating role of psychological need satisfaction. *Psychology of Sport and Exercise*, 11(2):91–99.
- McAuley, E., Konopack, J. F., Motl, R. W., Morris, K. S., Doerksen, S. E., & Rosengren, K. R. (2006). Physical activity and quality of life in older adults: Influence of health status and self-efficacy. *Annals of Behavioral Medicine*, 31(1):99–103.
- McClelland, G. H. & Judd, C. M. (1993). Statistical difficulties of detecting interactions and moderator effects. *Psychological Bulletin*, 114(2):376–390.
- McCrae, R. R. & Costa, P. T. (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology*, 52(1):81–90.
- Meade, A. W. & Lautenschlager, G. J. (2004). A comparison of item response theory and confirmatory factor analytic methodologies for establishing measurement equivalence/invariance. *Organizational Research Methods*, 7(4):361–388.
- Means, B. & Loftus, E. F. (1991). When personal history repeats itself: Decomposing memories for recurring events. *Applied Cognitive Psychology*, 5(4):297–318.
- Miller, M. A. & Rahe, R. H. (1997). Life changes scaling for the 1990s. *Journal of Psychosomatic Research*, 43(3):279–292.

- Morey, R. D. & Rouder, J. N. (2018). *BayesFactor: Computation of Bayes Factors for Common Designs*. R package version 0.9.12-4.2.
- Moritz, S. E., Feltz, D. L., Fahrback, K. R., & Mack, D. E. (2000). The relation of self-efficacy measures to sport performance: A meta-analytic review. *Research Quarterly for Exercise and Sport*, 71(3):280–294.
- Mountain Training (2019). Mountain Leader FAQs.
- Mountain Training England (2019a). Impact report 2018. Technical report, Mountain Training England, Capel Curig.
- Mountain Training England (2019b). Impact Report 2018 Summary. Technical report, Mountain Training England, Capel Curig.
- Mountain Training UK (2015a). Mountain Leader - Candidate Handbook.
- Mountain Training UK (2015b). Mountain Leader Award: Skills checklist.
- Mountain Training UK (2019). Mountain Training: Candidate Management System.
- Multon, K. D., Brown, S. D., & Lent, R. W. (1991). Relation of self-efficacy beliefs to academic outcomes: A meta-analytic investigation.
- Murphy, C. A., Coover, D., & Owen, S. V. (1989). Development and Validation of the Computer Self-Efficacy Scale. *Educational and Psychological Measurement*, 49(4):893–899.
- Muthén, B. & Asparouhov, T. (2012). Bayesian structural equation modeling: A more flexible representation of substantive theory. *Psychological Methods*, 17(3):313–335.
- Niemiec, C. P., Ryan, R. M., & Deci, E. L. (2009). The path taken: Consequences of attaining intrinsic and extrinsic aspirations in post-college life. *Journal of Research in Personality*, 43(3):291–306.
- Orbell, S., Johnston, M., Rowley, D., Davey, P., & Espley, A. (2001). Self-efficacy and goal importance in the prediction of physical disability in people following hospitalization: A prospective study. *British Journal of Health Psychology*, 6(1):25–40.

- Patton, M. Q. (2002). *Qualitative research and evaluation methods*. SAGE Publications, Thousand Oaks, CA, 3rd edition.
- Pearson, D. T., Naughton, G. A., & Torode, M. (2006). Predictability of physiological testing and the role of maturation in talent identification for adolescent team sports. *Journal of Science and Medicine in Sport*, 9(4):277–287.
- Pelletier, L. G., Fortier, M. S., Vallerand, R. J., & Brière, N. M. (2001). Associations among perceived autonomy support, forms of self-regulation, and persistence: A prospective study. *Motivation and Emotion*, 25(4):279–306.
- Philips, D. (1987). *Philosophy, science and social inquiry: Contemporary methodological controversies in social sciences and the related applied fields of research*. Pergamon Press, New York.
- Platt, J. C. (1998). Fast training of Support Vector Machines using Sequential Minimal Optimization. In Schoelkopf, B., Burges, C., & Smola, A., editors, *Advances in Kernel Methods - Support Vector Learning*. MIT Press, Cambridge.
- Putnick, D. L. & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review*, 41:71–90.
- QSR (2017). Nvivo 11 Pro.
- Qualtrics (2019). Qualtrics.
- Quinlan, R. (1993). *C4.5: Programs for Machine Learning*. Morgan Kaufmann, San Mateo, CA.
- R Core Team (2020). *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria.
- Rees, T. & Freeman, P. (2007). The effects of perceived and received support on self-confidence. *Journal of Sports Sciences*, 25(9):1057–1065.
- Rees, T., Hardy, L., & Freeman, P. (2007). Stressors, social support, and effects upon performance in golf. *Journal of Sports Sciences*, 25(1):33–42.

- Rees, T., Hardy, L., Güllich, A., Abernethy, B., Côté, J., Woodman, T., Montgomery, H., Laing, S., & Warr, C. (2016). The Great British Medallists Project: A Review of Current Knowledge on the Development of the World's Best Sporting Talent. *Sports Medicine*, 46:1041–1058.
- Rees, T., Ingledew, D. K., & Hardy, L. (1999). Social support dimensions and components of performance in tennis. *Journal of Sports Sciences*, 17(5):421–429.
- Rees, T., Ingledew, D. K., & Hardy, L. (2005). Attribution in sport psychology: Seeking congruence between theory, research and practice. *Psychology of Sport and Exercise*, 6(2):189–204.
- Reinboth, M., Duda, J. L., & Ntoumanis, N. (2004). Dimensions of Coaching Behavior, Need Satisfaction, and the Psychological and Physical Welfare of Young Athletes. *Motivation and Emotion*, 28(3):297–313.
- Reunanen, J. (2003). Overfitting in making comparisons between variable selection methods. *Journal of Machine Learning Research*, 3:1371–1382.
- Roberts, R. & Woodman, T. (2015). Contemporary personality perspectives in sport psychology. In Hanton, S. & Mellalieu, S. D., editors, *Contemporary advances in sport psychology: A review*, pages 1–27. Routledge, London.
- Roberts, R., Woodman, T., Hardy, L., Davis, L., & Wallace, H. M. (2013). Psychological Skills Do Not Always Help Performance: The Moderating Role of Narcissism. *Journal of Applied Sport Psychology*, 25(3):316–325.
- Rosseel, Y., Jorgensen, T. D., & Rockwood, N. (2020). *lavaan: Latent Variable Analysis*. R package version 0.6-7.
- Ryan, R. M. (1995). Psychological needs and the facilitation of integrative processes. *Journal of Personality*, 63(3):397–427.
- Ryan, R. M. & Connell, J. P. (1989). Perceived Locus of Causality and Internalization: Examining Reasons for Acting in Two Domains. *Journal of Personality and Social Psychology*, 57(5):749–761.

- Ryan, R. M., Connell, J. P., & Deci, E. L. (1985). A motivational analysis of self-determination and self-regulation in education. In Ames, C. & Ames, R. E., editors, *Research on motivation in education: The classroom milieu*, pages 13–51. Academic Press, New York.
- Ryan, R. M. & Deci, E. L. (2000a). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*, 25(1):54–67.
- Ryan, R. M. & Deci, E. L. (2000b). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1):68–78.
- Ryan, R. M. & Deci, E. L. (2002). An overview of self-determination theory: An organismic-dialectical perspective. In Deci, E. L. & Ryan, R. M., editors, *Handbook of self-determination research*, pages 3–33. University of Rochester Press, Rochester.
- Ryan, R. M. & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Press, New York.
- Ryan, R. M. & Deci, E. L. (2019). Brick by Brick: The Origins, Development, and Future of Self-Determination Theory. In Elliot, A. J., editor, *Advances in Motivation Science*, volume 6, pages 111–156. Elsevier Inc., Cambridge, MA.
- Ryan, R. M., Deci, E. L., & Vansteenkiste, M. (2016). Autonomy and autonomy disturbances in self-development and psychopathology: research on motivation, attachment, and clinical process. In Cicchetti, D., editor, *Developmental Psychopathology*, pages 385–438. John Wiley & Sons, Hoboken, 3rd edition.
- Samson, A. (2014). Sources of self-efficacy during marathon training: A qualitative, longitudinal investigation. *Sport Psychologist*, 28(2):164–175.
- Samson, A. & Solmon, M. (2011). Examining the sources of self-efficacy for physical activity within the sport and exercise domains. *International Review of Sport and Exercise Psychology*, 4(1):70–89.
- Satorra, A. & Bentler, P. M. (2001). A scaled difference chi-square test statistic for moment structure analysis. *Psychometrika*, 66(4):507–514.

- Schmidt, A. M. & DeShon, R. P. (2007). What to Do? The Effects of Discrepancies, Incentives, and Time on Dynamic Goal Prioritization. *Journal of Applied Psychology*, 92(4):928–941.
- Schmidt, A. M. & Dolis, C. M. (2009). Something's Got to Give: The Effects of Dual-Goal Difficulty, Goal Progress, and Expectancies on Resource Allocation. *Journal of Applied Psychology*, 94(3):678–691.
- Schmidt, A. M., Dolis, C. M., & Tolli, A. P. (2009). A Matter of Time: Individual Differences, Contextual Dynamics, and Goal Progress Effects on Multiple-Goal Self-Regulation. *Journal of Applied Psychology*, 94(3):692–709.
- Schorer, J. & Elferink-Gemser, M. (2013). How good are we at predicting athletes' futures? In Farrow, D., Baker, J., & MacMahon, C., editors, *Developing Sport Expertise: Researchers and Coaches put Theory into Practice*, pages 30–39. Routledge, London, 2nd edition.
- Seery, M. D. & Quinton, W. J. (2016). Understanding Resilience: From Negative Life Events to Everyday Stressors. In *Advances in Experimental Social Psychology*. Elsevier.
- Seligman, M. E. P., Steen, T. A., Park, N., & Peterson, C. (2005). Positive psychology progress: empirical validation of interventions. *The American psychologist*, 60(5):410–421.
- Sheldon, K. M. & Elliot, A. J. (1999). Goal striving, need satisfaction, and longitudinal well-being: The self-concordance model. *Journal of Personality and Social Psychology*, 76(3):482–497.
- Sheldon, K. M. & Kasser, T. (1998). Pursuing Personal Goals: Skills Enable Progress, but Not all Progress is Beneficial. *Personality and Social Psychology Bulletin*, 24(12):1319–1331.
- Sheldon, K. M. & Prentice, M. (2019). Self-determination theory as a foundation for personality researchers. *Journal of Personality*, 87(1):5–14.

- Shipherd, A. M. (2019). “This doesn’t look too hard”: A mixed methods exploration of self-efficacy and sources of self-efficacy information in a novel puzzle task. *Journal of Applied Social Psychology*, 49(4):226–238.
- Silva, M. N., Vieira, P. N., Coutinho, S. R., Minderico, C. S., Matos, M. G., Sardinha, L. B., & Teixeira, P. J. (2010). Using self-determination theory to promote physical activity and weight control: A randomized controlled trial in women. *Journal of Behavioral Medicine*, 33(2):110–122.
- Sitzmann, T. & Yeo, G. (2013). A meta-analytic investigation of the within-person self-efficacy domain: Is self-efficacy a product of past performance or a driver of future performance? *Personnel Psychology*, 66(3):531–568.
- Smialowski, P., Frishman, D., & Kramer, S. (2010). Pitfalls of supervised feature selection. *Bioinformatics*, 26(3):440–443.
- Smith, B. & McGannon, K. R. (2018). Developing rigor in qualitative research: problems and opportunities within sport and exercise psychology. *International Review of Sport and Exercise Psychology*, 11(1):101–121.
- Smith, B. & Sparkes, A. C. (2016). Introduction: An invitation to qualitative research. In Smith, B. & Sparkes, A. C., editors, *Handbook of Qualitative Research in Sport and Exercise*, pages 1–7. Routledge, London.
- Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: assessing the ability to bounce back. *International journal of behavioral medicine*, 15(3):194–200.
- Smith, G. T., McCarthy, D. M., & Anderson, K. G. (2000). On the sins of short-form development. *Psychological Assessment*, 12(1):102–111.
- Sniehotta, F. F., Pesseau, J., & Araújo-Soares, V. (2014). Time to retire the theory of planned behaviour. *Health Psychology Review*, 8(1):1–7.
- Snowdonia National Park Authority (2017). Mountain rescue incidents on Snowdon: An analysis of hill walking incidents 2009-2016. Technical report, Snowdonia National Park Authority.

- Sparkes, A. C. & Smith, B. (2009). Judging the quality of qualitative inquiry: Criteriology and relativism in action. *Psychology of Sport and Exercise*, 10(5):491–497.
- Sparkes, A. C. & Smith, B. (2014). *Qualitative Research Methods in Sport, Exercise and Health: From Process to Product*. Routledge, Oxon.
- Sport England (2020). Active Lives Adult Survey November 2018/19 Report. Technical Report April, Sport England.
- Stajkovic, A. D. & Luthans, F. (1998). Self-efficacy and work-related performance: A meta-analysis. *Psychological Bulletin*, 124(2):240–261.
- Steiger, J. H. (1990). Structural Model Evaluation and Modification: An Interval Estimation Approach. *Multivariate Behavioral Research*, 25(2):173–180.
- Stoeber, J. & Gaudreau, P. (2017). The advantages of partialling perfectionistic strivings and perfectionistic concerns: Critical issues and recommendations. *Personality and Individual Differences*, 104:379–386.
- Stoeber, J., Otto, K., Bardi, A., Giner-Sorolla, R., Hamilton-West, K., Joor-Mann, J., Siemer, M., Vugt, M. V., & Weick, M. (2006). Positive conceptions of perfectionism: Approaches, evidence, challenges. *Personality and Social Psychology Review*, 10(4):295–319.
- Tabachnick, B. & Fidell, L. (2007). *Using Multivariate Statistics*. Allyn and Bacon, New York, 5th edition.
- Tenenbaum, G., Hall, H. K., Calcagnini, N., Lange, R., Freeman, G., & Lloyd, M. (2001). Coping with physical exertion and negative feedback under competitive and self-standard conditions. *Journal of Applied Social Psychology*, 31(8):1582–1626.
- Theeboom, T., Beersma, B., & van Vianen, A. E. M. (2014). Does coaching work? A meta-analysis on the effects of coaching on individual level outcomes in an organizational context. *The Journal of Positive Psychology*, 9(1):1–18.
- Therneau, T. M. (2020). *survival: Survival Analysis*. R package version 3.2-7.

- Torkzadeh, G. & Koufteros, X. (1994). Factorial validity of a computer self-efficacy scale and the impact of computer training. *Educational and Psychological Measurement*, 54(3):813–821.
- Union Internationale des Associations d'Alpinisme (2015). UIAA Standards for voluntary leaders and instructors.
- Ussher, J. M. (1999). Eclecticism and methodological pluralism: The way forward for feminist research. *Psychology of Women Quarterly*, 23(1):41–46.
- Vallerand, R. J. (1997). Toward A Hierarchical Model of Intrinsic and Extrinsic Motivation. In Zanna, M. P., editor, *Advances in Experimental Social Psychology*, volume 29, pages 271–360. Academic Press, San Diego, CA, US.
- Vallerand, R. J. & Blssonnette, R. (1992). Intrinsic, Extrinsic, and Amotivational Styles as Predictors of Behavior: A Prospective Study. *Journal of Personality*, 60(3):599–620.
- Vallerand, R. J. & Ratelle, C. F. (2002). Intrinsic and extrinsic motivation: A hierarchical model. In *Handbook of self-determination research*, pages 37–63. University of Rochester Press, Rochester.
- Vallerand, R. J. & Rousseau, F. L. (2001). Intrinsic and extrinsic motivation in sport and exercise: A review using the hierarchical model of intrinsic and extrinsic motivation. In Singer, R., Hausenblas, H., & Janelle, C., editors, *Handbook of Sport Psychology*, pages 389–416. Wiley, New York.
- van de Schoot, R., Kluytmans, A., Tummers, L., Lugtig, P., Hox, J., & Muthén, B. (2013a). Facing off with Scylla and Charybdis: a comparison of scalar, partial, and the novel possibility of approximate measurement invariance. *Frontiers in Psychology*, 4:1–15.
- van de Schoot, R., Yerkes, M. A., Mouw, J. M., & Sonneveld, H. (2013b). What Took Them So Long? Explaining PhD Delays among Doctoral Candidates. *PLoS ONE*, 8(7).
- Visa, S., Ramsay, B., Ralescu, A., & van der Knapp, E. (2011). Confusion Matrix-based Feature Selection. In *23rd MAI & CS Conference*, Cincinnati.

- Wagstaff, C. R. D., Arthur, C. A., & Hardy, L. (2018). The Development and Initial Validation of a Measure of Coaching Behaviors in a Sample of Army Recruits. *Journal of Applied Sport Psychology*, 30(3):341–357.
- Walker, C. O., Greene, B. A., & Mansell, R. A. (2006). Identification with academics, intrinsic/extrinsic motivation, and self-efficacy as predictors of cognitive engagement. *Learning and Individual Differences*, 16(1):1–12.
- Webster, L. V., Hardy, J., & Hardy, L. (2017). Big Hitters: Important Factors Characterizing Team Effectiveness in Professional Cricket. *Frontiers in Psychology*, 8(July):1–18.
- Wechsler, D. (1967). *Manual for the Wechsler Preschool and Primary Scale of Intelligence*. Psychological Corporation, New York.
- Weinberg, R., Gould, D., & Jackson, A. (1979). Expectations and Performance: An Empirical Test of Bandura's Self-efficacy Theory. *Journal of Sport Psychology*, 1(4):320–331.
- Weinberg, R. S. & Gould, D. (2014). *Foundations of sport and exercise psychology*. Human Kinetics, Champaign, IL, 6th edition.
- Weinberg, R. S., Gould, D., Yukelson, D., & Jackson, A. (1981). The effect of preexisting and manipulated self-efficacy on a competitive muscular endurance task. *Journal of Sport Psychology*, 3(4):345–354.
- Weinberg, R. S., Yukelson, D., & Jackson, A. (1980). Effect of Public and Private Efficacy Expectations on Competitive Performance. *Journal of Sport Psychology*, 2(4):340–349.
- Woodman, T., Barlow, M., Bandura, C., Hill, M., Kupciw, D., & Macgregor, A. (2013). Not all risks are equal: the risk taking inventory for high-risk sports. *Journal of sport & exercise psychology*, 35(5):479–92.
- Yu, L. & Liu, H. (2003). Feature selection for high-dimensional data: a fast correlation-based filter solution. In *Proceedings of the twentieth international conference on machine learning*, pages 865–863.

- Yuan, K.-H. & Bentler, P. M. (1997). Mean and Covariance Structure Analysis: Theoretical and Practical Improvements. *Journal of the American Statistical Association*, 92(438):767.
- Yukl, G., Kim, H., & Chavez, C. (1999). Task importance, feasibility, and agent influence behavior as determinants of target commitment. *Journal of Applied Psychology*, 84(1):137–143.
- Yukl, G., Kim, H., & Falbe, C. M. (1996). Antecedents of influence outcomes. *Journal of Applied Psychology*, 81(3):309–317.
- Zhou, M. (2015). Moderating effect of self-determination in the relationship between Big Five personality and academic performance. *Personality and Individual Differences*, 86:385–389.