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Why do We Feel Mastery?

An exploratory study on climbers regarding the concept of Mastery, informed by Flow and Functional Wellbeing.

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Forfatter: Kristin Andreassen

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Veileder: Joar Vittersø

Forord

Denne oppgaven handler om mestringsfølelse sett i lys av klatring. Mestringsfølelse er uttrykk som blir generøst benyttet i det norske språket og virker å være en integrert del av den norske kultur, men hva innebærer dette begrepet egentlig? Dette var jeg og min veileder Joar Vittersø interessert i å undersøke nærmere.

Inspirasjonen til å se på mestringsfølelse gjennom klatring kom fra min egen lidenskap for å befinne meg i vertikale landskap. Klatring har vært noe som har bidratt til min egen mestringsfølelse, noe som får meg til å returnere til fjellene igjen og igjen, til tross for (og kanskje nettopp på grunn av) utfordringene og oppsluktheten den type aktivitet bringer med seg. Det gjør noe med en – å være høyt oppe og se ut og ned, relasjonene man bygger til sine klatrepartnere og tilstedeværelsen man oppnår når livet kun handler om meter for meter.

Joar Vittersø holdt forelesninger for oss gjennom studietiden, og jeg ble tidlig fasinert av hans kloke og jordnære vesen, kunnskapsnivå, og hans forskning innen lykke og livskvalitet. Det virket annerledes enn mye av forskningen som foregår innenfor psykologifeltet i dag, og fremstår for meg som høyst klinisk relevant i et felt og en tid som stadig mer dreier seg om patologi.

I prosessen med å skrive denne oppgaven har forholdet mellom utfordring og ferdigheter vært til tider ujevn, hvor Joar har ledet med en stødig hånd og bidratt med majoriteten av de statistiske analysene, pedagogiske forklaringer for en turist innen statistikken og gode råd om utforming av oppgaven.

Jeg vil rette en stor takk til professor Joar Vittersø, for alle dine kloke bidrag, tilbakemeldinger, og tålmodighet. Videre vil jeg takke alle klatrerne som sa seg villige til å delta i studiet, og til venner og familie for støtte og oppmuntring gjennom skriveprosessen. Til slutt: takk til fjellene, for at de står – og står – og står der.

Kristin Andreassen, Lofoten, 4. Mai, 2020

Abstract

What experiences lead to feelings of mastery? This research's function was to tease out more experiential factors that lend to feelings of mastery through the context of rock climbing. In this exploratory study, theories and research such as the Flow theory by Csikszentmihalyi, and the Functional Well-Being Approach by Joar Vittersø are reviewed in order to consider mastery in the wellbeing context. Climbing as an activity served a compelling setting to look into the dynamics at play. To further investigate the feelings of mastery, 38 climbers were recruited to describe their experience after climbing a rock route. A questionnaire was used to collect participants verbal reports, as well as demographic data. Additionally a "feelometer" allowed participants to illustrate their emotional experience during the climb in diagrams that we provided. Descriptive, correlational, and several multi-level analyses were used to examine the data, and granted a few noteworthy results: eudaimonic feelings of immersion during climbing significantly predict feelings of mastery, whereas hedonic feelings of pleasure have a direct negative effect on mastery. Additionally, factors such as on-line mastery and the level of climber experience influence the feeling of mastery. Results indicate that skills, or the balance between skills and challenge, have little explanatory power regarding the feelings of mastery. Mastery appears to originate, in part, as a consequence of diverse emotions that present themselves during an activity, as challenge increases. We found that while climbing can feel uncomfortable during the experience, the memory of it afterwards is pleasurable. Study results were inconsistent on the within- and between level of analyses, and call for future research. Results are additionally discussed with reference to the imbalance model of flow, memory bias and the issue of retrospectively self-reported emotions.

Introduction

Part of the human condition is to learn and develop our skills. It is adaptive and ensures our survival, but it also plays an essential part in our wellbeing and experience of meaning. Activity theories state that being active is the life force, as action is essential for the development of biological structures, but also for most psychological actions, down to the very development of our cognitive structures (Fischer & Bidell, 2006).

Going back as far as ancient time, philosophers such as Aristotle asserted that all living organisms are driven towards goals, or telos – a higher purpose (Vittersø, 2018). Modern theories such as the self-determination theory (Deci & Ryan, 1985) have expanded this idea by stating that we as humans are largely driven by psychological needs of competence, autonomy and relatedness, a tendency they named organismic growth.

Mastery and the feelings of mastery can be seen as the fruits that being active bears, and has been under the lens of elaborate research in order to understand how mastery motivates and affects us. Bentham named mastery the "pleasure of skill" back in 1843, and this idea has since been entertained and contested by many theorists attempting to explain why we are motivated to learn and develop our skills. One field that facilitates this kind of advance is mountain climbing, where climbers get to challenge their skills while experiencing positive or intense feelings (Hetland et al., 2018).

Feeling of mastery is a term generously used in the Norwegian language to describe why we are motivated to engage in different activities. A quick google search on the Norwegian term "mestringsfølelse" yield about 232 000 results for different articles referring to the subject. In 2014 the Norwegian ministry of education and research even put feeling of mastery as one of the objectives for learning for elementary school students (Norwegian ministry of education, 2014). As it is our impression that the feeling of mastery is commonly utilized as a way to size a feeling-outcome of an activity, we found it interesting to explore in

more detail the experiential factors encompassed by feeling of mastery, to potentially learn new information. As some of the main theories reviewed in this paper have not explicitly considered feelings of mastery, we were curious as to if some of the results could be viewed through these perspectives.

Specifically the aim of this study was to investigate which experiences can explain the feeling of mastery during an enthralling experience such as climbing. To examine this the principal researcher asked climbers to answer a questionnaire and fill out a "feelometer" (see the Methods section). This was done by meeting the participants at different climbing areas in Norway, Sweden and Spain. Climbers who agreed to participate were asked to delve into their experience by answering the survey after ascending a route. The analyzed data yielded some interesting results.

Climbing seem to offer an arena where people can increase their levels of skill and mastery, and it appears that we are motivated to keep doing this through the emotions that arise from engaging in this type of monkey business (Hetland et al., 2018). The grading system that exists in climbing allows climbers to have a relatively good idea of their skill level, the activity hence served as a suitable way to investigate the interplay of skill and challenge, and its effect on the feelings of mastery.

The present report describes and analyses existing theories and research and applies them to an exploration of experiential factors that contribute to feelings of mastery. Following, theories of mastery and the feelings of mastery will be reviewed. Next, Flow and Functional Well-Being will be summarised and reviewed. Then expert knowledge and here-and- now vs retrospective emotions will be assessed, before introducing climbing and climbing terminology to set the stage for the methods, results and discussion sections below.

Theories of mastery

As a broad generalization, one could say that mastery has to do with the interaction between an individual's resources and how well the person deals with demands from a given task or undertaking (Svartdal, 2018, 29. august*)*. Mastery is a broad term used across various contexts and has been subject to extensive research. Different aspects of the concept are emphasized in existing studies, making a singular definition reductionistic. Following are some takes on the subject matter.

Mastery is in many studies linked to an individual's attributes. Semmer (2009) collectively referred to these as "resourcefulness belief systems", which encompasses attributes such as internal locus of control (Rotter, 1966), sense of coherence (Antonovsky, 1987) and self-efficacy (Bandura & Walters, 1977). Agency is another attribute that appears inextricably connected to mastery. Bandura (2001, 2006) defines being an agent as someone who can intentionally influence one's functioning and life circumstances – someone who presumes active and causal contributions to behavior and development. The most central mechanism of agency according to Bandura is a person's belief regarding their capabilities to exercise control over events in their lives, a concept which could overlap with the resourcefulness belief systems (Semmer, 2009).

Carol Dweck (1999) has also looked into mastery through her extensive research on mastery oriented thinking, a concept that also appear to overlap with a persons attributes. She found a difference in people and how they make use of this type of approach. She found that students who utilize mastery oriented thinking often put more effort into getting practical about how to accomplish something and less effort into pondering whether they are smart. She found that mastery oriented students are aware of what they don't know and will aim their efforts towards closing the gap between the known and the unknown. Mastery orientation is characterized by the belief that success is the result of effort and use of

appropriate strategies, and is impaired by helplessness (which stops people from applying themselves to the problem at hand and becomes self-destructive). A mastery oriented person live by "the harder it gets, the harder I try"-type of motivation (Dweck, 1999). This type of thinking must expand beyond the realm of studying and can be extended to climbing, where a climber's success and attributions will be affected by how they grab the opportunities for learning.

In the existing literature, mastery is not only described as part of a person's attributes, but further as an innate drive or need. In attempting to explain why mastery is important, Robert White (1959) coined the term "effectance motivation," where he argues that we are driven by an instinctive urge towards competence. White contends that gaining competence has been of evolutionary significance, and whilst most of us are not consciously aware of this underlying drive, it still plays a role when engaging in different activities. According to White, the subjective reward lies in the satisfaction of imposing an effect on the environment.

The Self-Determination Theory (SDT) by Deci and Ryan (1985; 2000) is another renowned theory that attempts to explain why we engage in activities. The SDT states that humans are deeply driven by the psychological need for competence, autonomy and relatedness, as a way to achieve psychological growth. As challenges often provide situations to fulfill these needs, people find themselves, to varying degrees, seeking challenging situations, such as climbing. Competence, especially, seems to be linked to mastery as meeting the need for competence could require gaining mastery of tasks and learning different skills. When people accomplish this, they are more likely to take actions to achieve their goals. The way Deci and Ryan describe the concept, a person can be high in self-determination, which means they can take responsibility for their actions, believe they can do something to fix a problem and will take the necessary measures to correct it. Extrinsic

motivators and feedback are factors that can help or hinder a person's sense of self-efficacy (Deci & Ryan, 1985; 2000).

As seen above, a number of theories attempt to explain the concept of mastery and link it to attributes and attitudes, basic drive, and needs for competence. The following section will explore the feeling aspects of mastery.

The feelings of mastery

George Loewenstein looked closer at the feelings of mastery in his book, *Exotic Preferences: behavioral economics and human motivation* (2007) through the lens of mountain climbing. Loewenstein argues that climbers are motivated to scale mountains because they *can* – it's something they are good at. He refers to accounts of climbing, describing it as a state where the burdens and complexities of everyday life wither away, and life becomes a matter of using your experience and skills in the here and now (and likens it to the experience of flow). Loewenstein argues that the experience of mastery involves a feeling of control, a factor that is powerfully reinforcing for people in general and for climbers can help reduce fear and stay calm. He argues that the feeling of control often can disappear after a climber has experienced a serious accident (Loewenstein, 2007).

Looking into the feeling part of effectance motivation, White (1959) contended the reward that arise from imposing an effect on our environment is stimulus conditions that offer difference-in-sameness, which leads to a novel response. White claims that this is not an end in itself, but something that give us focalized attention and affects our level of interest. White indicates that effectance motivation is connected to satisfaction and interest when comparing it to our sex-drive and stating:

> Sex may now be completely and purposefully divorced from reproduction but nevertheless pursued for the pleasure it can yield. Similarly, effectance motivation may lead to continuing exploratory interests or active adventures when in fact there is

> no longer any gain in actual competence or any need for it in terms of survival. In both cases the motive is capable of yielding surplus satisfaction well beyond what is necessary to get the biological work done. (White, 1959, p. 323)

Flow Theory. Bentham (1843) likened the feelings of mastery to the "pleasure of skill". This aligns with the argument that it is generally pleasurable to engage in an activity that we master, and unpleasant when we don't. One such theory is extensively covered by Mihaly Csikszentmihalyi, through his theories on flow experiences (1975;1992). The Hungarian-American researcher describes flow as an "optimal experience", a state that yields feelings of exhilaration and deep enjoyment, often experienced while engaged in activities that challenge us mentally and/or physically to accomplish something. To reach such a state, Csikszentmihalyi emphasizes that we need a realistic goal where our skills match the opportunities for action. When this is actualized, the experience can become autotelic: intrinsically rewarding (Csikszentmihalyi, 1992). He identified six factors involved in the flow state: focus on the present moment, merging of action and awareness, a loss of self-reflection, a sense of agency over the situation, distortion of the experience of time, and the aforementioned autotelic experience.

Csikszentmihalyi presents a model representing the dynamics that take place to maintain flow. If the challenges are too high, we become anxious, and when the challenges are too low, we become bored (Csikszentmihalyi & Rathunde, 2014). The idea is that these feelings will motivate us to adjust the skills or challenge necessary to reenter the flow state.

When it comes to mastering something, we have to assume that a prerequisite for an experience of mastery is skill in whatever field we choose to engage in. Works by Ericsson and his colleagues are in line with flow-theory on key points, but also argue that skill development is tedious, repetitive and requires a lot of energy - efforts that are not characteristically pleasurable (Ericsson, Krampe, & Tesch-Römer, 1993). In their studies,

Ericsson and his co-authors show that there are inherent differences between amateurs and professionals in how they engage in acquiring a skill and how much time they spend trying to reach their full potential. They estimate that attaining expert levels of performance takes up to 10 years and assumes elaborate access to time and energy for practice. They formulate the feelings regarding such practice as following:

> The lack of inherent reward or enjoyment in practice as distinct from the enjoyment of the result (improvement) is consistent with the fact that individuals in a domain rarely initiate practice spontaneously. (Ericsson, et al. 1993, p. 368-369)

Ericsson (1996) argues that flow does not necessarily lead to mastery. Skilled performers may sometimes seek out flow experiences in their domain, but the flow zone may have little presence when it comes to the effortful training or practice that actually leads to mastery.

Vittersø (2018) emphasizes that Csikszentmihalyi's writing on the feeling part of flow is inconsistent where flow has been described both as distinctively positive (happiness, satisfaction, pleasure etc.) and as an emotionless state, where the good feelings arise after-the-fact. Løvoll and Vittersø (2014) offer a different take on the feelings involved in flow. By studying students in Norwegian outdoor programs, they found that positive feelings could be inherent in the experience that motivate us for flow. This work is influenced by Gudrun Eckblad (1981) and her Assimilation Resistance model. Through a multi-curve model, Eckblad illustrated different feelings generated from the resistance offered by an activity, where the various feelings reach their peak as assimilation resistance increases. This model illustrates that at lower levels of assimilation resistance, we feel pleasure. As the resistance heightens, feelings of interest, curiosity and challenge peak. At the highest levels of resistance, Eckblad illustrates surging feelings of challenge and frustration. Eckblad's work goes to show that emotions could be evaluative responses involved in the challenge of reaching a goal.

Vittersø and Løvoll's study (2014) is in line with Eckblad's theories, where they found that different feelings were connected to challenges and skills. Pleasure, happiness and satisfaction were connected to skills, whereas interest, engagement and enthusiasm were connected to challenge. Their study illustrates the complexity of feelings that arise as challenges increase. A similar finding was indicated by Hetland and Vittersø (2012) through studying extreme athlete base jumpers. Here they found indications suggesting that it is feelings such as engagement, interest and enthusiasm that make extreme sports special and motivating, and not as much feelings of pleasure or happiness. The next section is dedicated to looking into a system that captures the complexity of feelings involved in experiences that differ from flow theory.

Functional Well-Being

Expanding on the works of Eckblad, Piaget, but also theories of flow (Csikszentmihalyi, 1990, 2012), intrinsic motivation (Deci, 1972; Deci & Ryan, 1985; 2000) self-determination (Deci & Ryan, 1985) and appraisal theory (Lazarus, 1991), Vittersø (2016; 2013, 2016; 2018) created the Functional wellbeing approach. In this model, Vittersø offers a three-level taxonomy of well-being based on two basic endeavors of all living organisms: the regulation of stability and the regulation of change. Vittersø's well-being approach is based on these types of adaptation, where hedonic well-being is distinguished from eudaimonic well-being. Hedonic well-being is related to regulating stability to regain homeostasis. Any disharmony will produce feelings of displeasure and motivate us toward regaining equilibrium. In the hedonic third level of the taxonomy Vittersø makes a distinction between pleasure as a feeling (being happy **in** your life), and pleasure as an attitude (being happy **with** your life), where humans strive towards both (Vittersø, 2018).

Eudaimonic wellbeing is related to feelings and processes involved when leaving the comfort zone of pleasantness and engaging in change: the process of growing as a human

being. Vittersø summarizes these as feelings of engagement, curiosity, interest and even awe: the feelings that are involved in overcoming a challenge (referred to as "growth feelings" in the third level in the eudaimonic part of the taxonomy). Growth processes enable learning and development, a process where Vittersø states that even moral development take place. Eudaimonic well-being has been described as being happy **fulfilling** your life (J Vittersø, 2018).

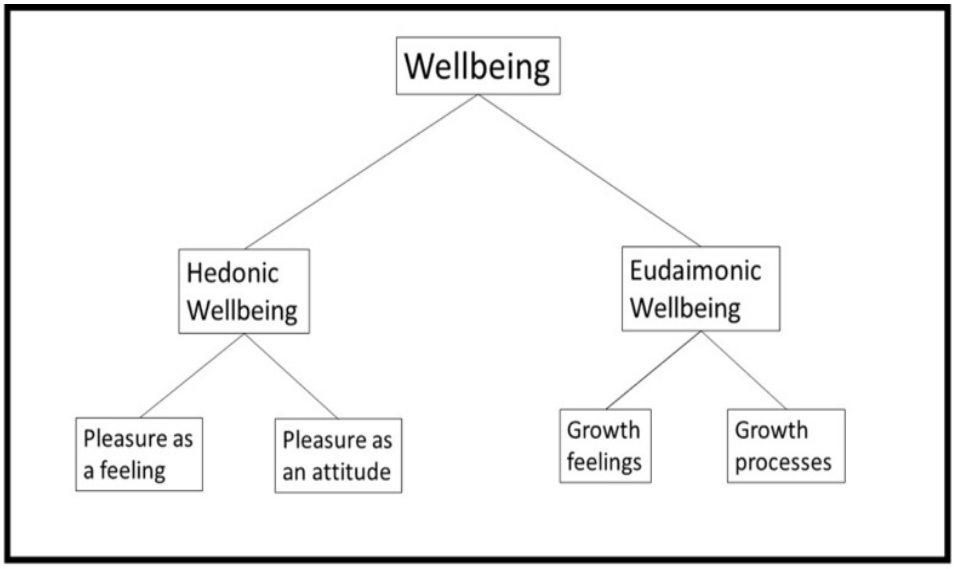

Figure 1. The taxonomy of human wellbeing proposed by the Functional wellbeing approach.

The Functional wellbeing approach taxonomy,copied from Vittersø (2018).

Within the field of Psychology, Functional wellbeing research has been advanced through the investigation of recreational activities. A study by Hetland, Vittersø, Bø Wie, Kjelstrup, Mittner & Dahl (2018) looked into the emotions of skiers through examining their facially expressed emotions while backcountry skiing. Here they found that skiers experience intense feelings while in flow, and the feelings of contentment and happiness come after having mastered something difficult. This is in line with the functional well-being approach in that it shows that moment-to-moment and emotional feelings are two separate mental operations. The moment to-moment feelings cue task difficulty, whereas the emotional feelings cue goals and values (Hetland et al., 2018).

So, how does it feel to master something? As seen, the above research and theories differ and has linked feelings of mastery to control (Loewenstein, 2007), focalized attention and interest (White, 1959), pleasure (Csikszentmihalyi, 1990), and changes from hedonic to eudaimonic feelings as challenges surge (Vittersø, 2016). Following, a take on the (im)balance between challenge and skills.

The balance between challenges and skills

As previously mentioned, one of the fundamental pillars in flow theory is that there has to be a balance between challenge and skill in order to create enjoyment and enter the flow zone (Csikszentmihalyi & Nakamura, 2010). The validity of this idea has been challenged by several researchers. One study by Graham Bradly looked into work-induced changes in feelings of mastery. He found that while increased challenge could deplete workers' energy and vigor it could enhance workers' motivation, self-efficacy and personal growth, an effect he contributes to growth in mastery (Bradley, 2010). This finding indicates that a relatively higher level of challenge could be necessary to experience mastery, or one could extend it to flow. This is in accordance with the 2014 study by Løvoll and Vittersø that showed that an equal level between skill and challenge has little explanatory power over the intensity of our experience, nor is it a good predictor of flow experiences (Lovoll & Vitterso, 2014), a theory that has been called the "imbalance model" of flow (Vittersø, 2018).

The power of an equal skill-challenge ratio has also been examined by other researchers, for example Ellis, Voelkl, and Morris (1994), where they found that in a ratio of high skill-low challenge, the highest levels of enjoyment and positivity of affect were found. In Csikszentmihalyis flow theory, this would be the "boredom"-channel. Ellis and his colleagues hence point out that "boredom" may not capture the essence of the low challenge-high skill experiences (Ellis et al., 1994).

Expert knowledge

What separates a novice from an expert in their abilities to engage in an activity? Research by Bradley, Paul And Seeman (2006) defines the knowledge of an expert to entail both cognitive elements (viewpoints and beliefs) and technical elements (skills and abilities). They found an expert to have high experience (explicit knowledge), as well as cognitive abilities to structure the experience with the help of tacit knowledge (schema based) that differ from that of a novice. To paraphrase Bradley et al. (2006), an expert tacitly knows which information is more significant to solve a problem. A novice utilizes more obvious and simpler relationships when attempting to solve a task (Bradley et al., 2006). Expert and novice climbers could differ in this same way, where expert climbers can make use out of both their explicit and implicit knowledge in a different way in solving a climbing route. Looking back at the experience, the more experienced climber has more practice and nuanced knowledge to base the over-all assessment of their performance. The more experienced climber will thus possibly be differently equipped for considering whether or not they mastered the task, or at least base it on different information than the novice would.

Here-and-now vs retrospective emotions

Another aspect relevant to the feelings of mastery is the issue of memory bias. It seems that humans have been equipped with the ability to alter their memory of an experience from the actual experience of it. This might be adaptive and has us going back to situations that in the moment seemed meaningless, frightful or the like. Climbers commonly name this tendency the difference between “type 1” and “type 2” fun, where the former refers to climbing that is fun *while* climbing, and the latter refers to climbing that is only fun when looking back at it when you are safely back down on the ground. In more scientific terms, Kahneman named this the difference between two selves: the experiencing self and the remembering self, where the latter is prone to biases that color the experience in a different

way than what it may actually have been like (Kahneman & Riis, 2005). In one study, participants immersed their hands in cold water for over 60 seconds, and again in another trial for 30 seconds longer, as the temperature was gradually raised. They found that adding a better ending gave participants a different experience and given a choice, most subjects chose to repeat the longer trial, exposing how the ending played a role in their evaluation (Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993).

Construal Level Theory (Trope & Liberman, 2003) explains a similar phenomenon to memory bias when stating that the more temporally distant an experience become, the more abstract and over-all the event is likely to be recalled as. Trope and Liberman (2003) claims that information can be construed at high or low levels, contingent on the abstractness of it. High level construals are more general, broad and goal relevant, whereas low level construals are more concrete and detailed. This effect was found, for example, by Jinhyung et al. (2014) where they found meaning to increase with temporal distance, where participants reported pleasure at lower levels of construal.

As previously mentioned, Csikszentmihalyi also brought up this issue when it comes to reporting flow-experiences, when claiming that people might be too deep into the experience to consciously register what is going on. The functional well being-approach disagrees with this line of thinking, saying that the momentary experience is filled with streams of experiences registered by the body's feeling system. Attempts have been made to overcome these types of memory bias by using direct ways to measure emotions during an experience, as Buckley (2016) did when he collected films from more than 4000 participants doing a variety of risk activities. He found a variety of emotions expressed while in the situation. Hetland and his co-authors did this with skiers in their 2018-study by using cameras to investigate facially expressed moment-to-moment emotions.

Next, an introduction to climbing, to set the stage for the means of our research.

An introduction to climbing and climbing terminology

In rock climbing the challenge (and fun) lies in getting to the top of a climbing route without weighing/hanging on the rope. This is called free climbing, and it is a common goal in modern climbing. There are several other forms of climbing that are recognized and practiced throughout the world, but this paper will only provide an introduction to free climbing, as all the participants answered questions based on attempting to free climb a single-pitch route (routes that are only one rope length, and you can be lowered back down to the ground).

Climbing routes have different gradings depending on the technical difficulty the specific route offers. Gradings provide an indication of the impending challenges ahead. The Norwegian grading system consists of grades ranging from grade 1, which corresponds to the technical difficulty of walking down a paved road, up to grade 10, where the options to hold on are few and far between (the system is further nuanced by – and +). The higher grades increase dramatically in steepness and/or technical moves that require great strength and skill.

As the mountain you climb on is naturally varied with different rock formations, the difficulty will vary greatly both within the same climbing area, and often within the same route. Usually, a route will have easier and more technical parts. In climbing terminology, the most difficult part(s) of a route is referred to as the “crux”, often alleviated by easier “transportation” between the harder parts. Physically, a climber will often encounter several challenges during a route that he or she must creatively solve by torqueing their body into various strenuous positions. This requires strength, flexibility and precision, in addition to attentiveness and boldness. As the common goal is to climb a route without weighing the rope, the climber finds herself balancing the fear of falling against the fear of failing to ascend the route.

Specific types of climbing have been categorized as a form of extreme sport, an umbrella term that tries to capture recreational activities that inhabit risks of injury or death (Willig, 2008). Although risk is an inherent part of rock climbing, this does not appear to be the main motive. This was found by Barlow, Woodman, and Hardy (2013) when they set out to challenge the widely held belief that high-risk participants are a homogenous sensation-seeking group. In their study they found that mountaineers are not as much sensation seekers as they are seekers of the agency and emotion regulating processes the sport provides, opportunities that are not readily available in everyday life (Barlow et al., 2013).

Summary thus far

In the above sections the principal researcher have looked into aspects and theories specifically regarding mastery and the feelings of mastery. Next, Flow and Functional wellbeing were presented, theories that have conflicting takes on which feelings arise from the challenge of a situation. Further, opposing findings about the power of an equal skill-challenge ratio in predicting flow experiences was reviewed, as was expert knowledge and the issue of retrospective reporting. Although these theories do not specifically consider feelings of mastery, the dynamics that are described appear relevant to mastery. To investigate the subtleties of the feelings of mastery we designed the study presented below, where we asked thirty-eight rock climbers to describe their experience of climbing a route.

Method

Participants

Thirty-eight recreational climbers from Norway, Sweden, Finland, England, Spain and Germany were recruited as a convenience sample for this study. Twenty-one (55%) were men, seventeen were women. Eighteen (47%) reported to be under the age of thirty, twenty reported to be between the age of thirty and fifty. Experience varied among participants, with a range including complete beginners to experienced climbers. The participants were recruited at different climbing crags (locations): in the Lofoten Islands in Norway, Bohuslän in Sweden

and El Chorro, Spain. Participation was voluntary, and all participants gave their informed consent to be included in the research project.

Some climbers were recruited on-site, others by agreements made in advance. The general attitude was positive as most of the climbers seemed interested in analyzing their own climbing experience. Simple biscuits at the crag and promises of a cold beer at a later time were offered in thanks for their efforts.

Measures

The data for our study came from two different sources: a questionnaire and a "feelometer" (Hetland & Vittersø, 2012). The questionnaire asked for subjective experiences during the climb and background variables, whereas the feelometer asked for a visual report of various on-line experiences (cf. Figures 1 and 2).

Challenges and skills. The first part of the questionnaire asked the participants to report their perceived levels of challenges, skills and mastery during the climb. The participants answered the following three questions: "as a whole, how much or how little challenge did this climb provide?", "as a whole, what were the levels of your skills during this climb?", and "as a whole, how much feeling of mastery did you experience during this climb?" Responses were given on a numerical response scale with 1 = very little and 7 = a lot as end-point labels for question one and three. The labels for question two were 1 = far too poor and 7 = more than good enough.

Overall feelings. The feelings during and/or after the climb overall were measured as a retrospective perspective. To investigate the feeling states, we asked them to place feelings of mastery, feelings of pleasure and contentment (hedonic feeling states), and engagement and immersion (eudaimonic feeling states) and whether they felt these more before, during or after the climb.

Background Variables. The last part of the questionnaire asked for demographic information: gender, age (choosing between under 30, between 30 and 50, and over 50 years), years of experience climbing indoors and outdoors, in addition to the hardest grade they had accomplished climbing for traditional-, sport- and indoor climbing.

The "Feelometer". The second part of the assessment asked people to fill out a "feelometer" as a way to obtain a visual report of their continuous emotional experience during the climb. This instrument asked the participants to draw a set of lines to obtain a moment-to-moment report of the episode (cf. Figures 1 and 2). The y-axis figured the intensity of the emotion (end-points labelled as little — a lot) and the difficulty of the route (end-points labelled as easy—difficult), and the x-axis represented the timeline of the climb (Start-End). The y-axis was 11 cm long, the x-axis 22 cm long. We asked the participants to draw in their experience in six different graphs: difficulty of the route from start to end (easy-difficult), balance between challenge and skills (BCS), feeling of mastery, pleasure/contentment, engagement/immersion, and fear.

To quantify this data, we measured every line at ten points. This was achieved by making a gridline on top of the participants' report graphs, where the y-axis was divided into 1-cm lines, and the x-axis was divided into 2-cm lines, providing ten different reference points for each individual graph, measured in millimeters. See a partial example of the measurement in figure 1.

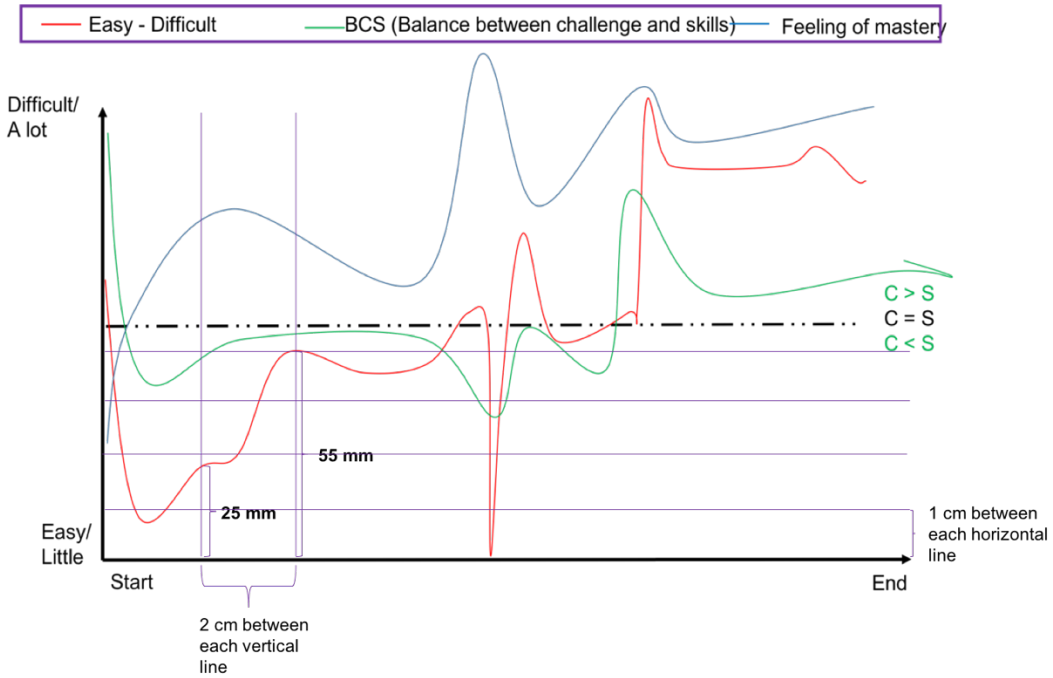

Figure 1. Example of a completed feelometer, page 1, including a partial example (purple lines) of the gridline made and two of the ten measurements done on the easy-difficult graph for the data punching. This method was repeated ten times for each graph.

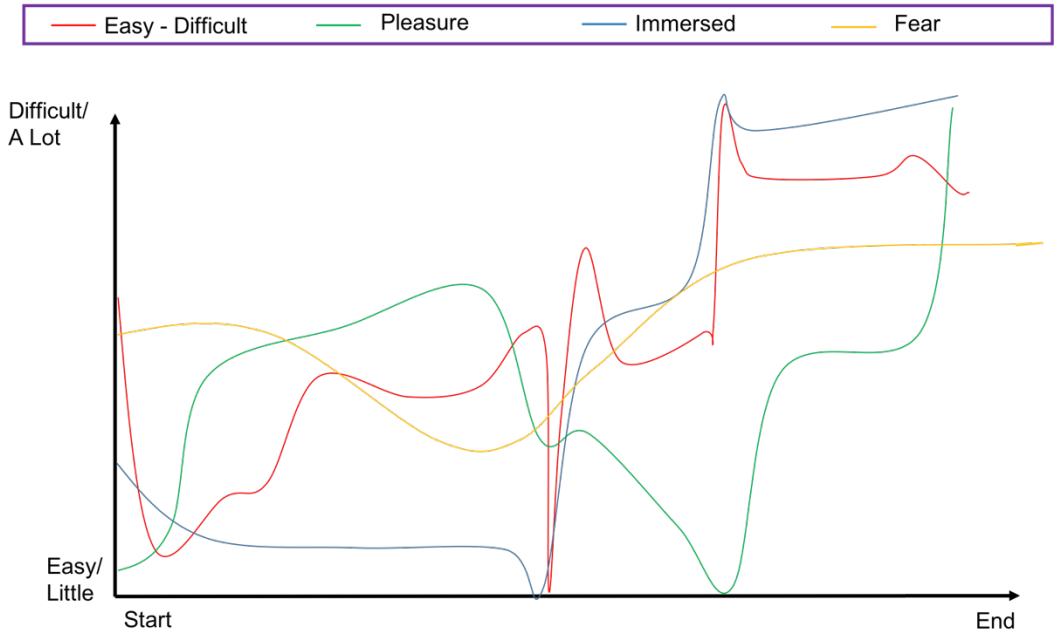

Figure 2. Example of a completed feelometer, page 2.

Procedure. After obtaining a written consent at the start of the questionnaire form from the participants at the climbing crag, they would climb a route, after which they were asked to reflect on their climbing experience by answering the questionnaire and feelometer. The measures were completed immediately after the climb with pen and paper, in order to

reduce the gap between the on-line experiences and the subsequent measurement of them to minimize the risk of memory bias.

Analysis of Data

The data was analyzed using IBM SPSS version 25, and Mplus version 8.0 (Muthén & Muthén, 2018) software.

First, the means, standard deviation and intercorrelations for the variables in the questionnaire were analyzed. These were measured at the between-participants level.

The data from the feelometer had a multi-level structure. Since each experience was measured at ten points for each participant, the repeated measurements at the within-participants level were nested under the between-participants level, comprising a two-level data structure. These data were analyzed with the SPSS mixed model syntax and with the multilevel options in Mplus.

With multilevel data, an intraclass correlation coefficient (ICC) can be calculated. The ICC can be thought of as the percentage of the total variance in a variable that is due to mean differences between participants (e.g., Bolger & Laurenceau, 2013). For example, when ICC = 0 for a variable, participants do not differ from another on the measure obtained for that variable (all participants have the same score in each situation, but the scores vary across situations). By contrast, if the ICC = 1, all variance in the variable is between participants (each participant has identical scores across all situations, but the scores differ between participant).

One of the feelometer variables addressed the balance between challenges and skills. We recoded this "balance between challenges and skills variable" (BCS) into dummy variables according to the following procedure: The variable was first Z-transformed at the within-participant level (i.e., $M = 0$ and $SD = 1$ for each participant). Next, the Z-transformed variable was recoded into these five dummy variables:

1. Very low challenges combined with very high skills (CSSS): CSB scores below -1.5 were coded 1, all other values were coded 0.

2. Low challenges combined with high skills (CSS): CSB scores between -1.5 and -0.5 were coded 1, all other values were coded 0.

3. A balance between challenges and skills (CS): CSB scores between -0.5 and 0.5 were coded 1, all other values were coded 0.

4. High challenges combined with low skills (CCS): CSB scores between 0.5 and 1.5 were coded 1, all other values were coded 0.

5. Very high challenges combined with very low skills (CCCS): CSB scores above 1.5 were coded 1, all other values were coded 0.

The dummy variables were used as independent variables in a series of multilevel regression analyses using the mixed model option in SPSS.

Another regression model was designed as a multilevel path model in Mplus. This model separated the retrospectively reported on-line feelings and experiences, and the experiences retrospectively reported for the whole episode. We did this to distinguish what the climbing felt like moment-to-moment from what it felt like when thinking about the unified experience, as these have been found to be distinct mental processes (Hetland et al., 2018).

Lastly, a separate cross-lag data file was generated to test possible causal effects of feelings at one on-line time point on the on-line time point immediately following. The data structure was achieved by constructing a long file with six variables as columns, and 38 (participants) x 9 (10 – 1 time points) on-line feelometer reports as row units. The first three columns of variables comprised the preceding feeling states, the last three columns comprised the feeling states immediately following their respective proceeding feelings. A two-level cross-lag regression analysis was conducted, with the 9 “feelometer” variables constituting

the within-level and the 38 participants constituting the between-level. The within-participants part of the analysis was conducted in Mplus, whereas the between-participants analysis was conducted in SPSS.

Results

Table 1 shows intercorrelations and descriptive statistics for the study variables. Skills and technical climbing grade were strongly correlated ($r = .54$, $p < .001$). There was a moderate correlation between the skills reported and the level of experience ($r = .50$, $p < .001$), and between the climbing grade and experience ($r = .67$, $p < .001$). Skills, experience and the hardest grade each participant have succeeded in climbing are all closely connected, and it comes as no surprise that these are correlated and overlap, as you have to be experienced to be a skillful climber and/or climb hard.

Table 2 presents the correlations between the timings of the feelings of mastery, pleasure and immersion and the different questionnaire variables. The timing variables were coded to make a correlation analysis possible. Here we found experience to be negatively correlated to mastery during the climb – meaning that the more experience the participants have within climbing, the less likely they were to report mastery only while climbing ($r = -.38$, $p = .020$). Further, the climbers who reported high experience reported feeling more mastery both during and after the experience (($r = .041$, $p = .011$). Table 2 moreover shows that challenge was negatively correlated to pleasure during the climb ($r = -.42$, $p = .008$), but still highly correlated to pleasure after the climb ($r = .54$, $p < .001$), indicating that pleasure enters the equation once the climbing is done. 63.2 % of participants reported pleasure after the climb. Table 2 also reveals a significant correlation between the climbing grade and immersion during the climb ($r = .33$, $p = .042$), showing that the higher the grade a person has succeeded in climbing, the more likely they are to report immersion during a climb. 81,6 % of the participants reported feeling immersed during the climb.

Multilevel analysis

The zero-order correlations and the intraclass correlations for the feelometer variables, are presented in Table 3. The high ICC for fear indicate that 69% of the variance in this variable is stable or trait variance. Only 30% of the variance comes from differences in the situations. In other words, some climbers experience a lot of fear regardless of the route they climb, whereas others feel little fear, regardless of the route they climb. By contrast, most of the variance in the balance between challenges and skills variable comes from differences in the situations, not differences between participants (ICC = 31). Table 3 also displays a high correlation between immersion and pleasure ($r = .55$, $p < .001$) on the between-participant level, but not on the within-level. This indicates that pleasure and immersion can be experienced at the same time and independently of each other on the between level of analysis, whereas the same effect is not found when looking at the different measurements within the same situation.

Next, we ran five separate multilevel regression analyses with each of the on-line variables - mastery, pleasure, immersion, fear and difficulty - as dependent variables, and the dummy-coded challenge-skill balance as the independent variables, all presented in Table 4. The low challenges-high skills condition (CSS) significantly predicted feelings of mastery ($B = 8.4$, $p = .031$), which means that a high skill imbalance was associated with more mastery. Further, those who reported equal challenge and skills, or those who reported a relative higher level of challenge showed no significant effect on feelings of mastery. Additionally, Table 4 corroborates the correlation analysis above showing that the more challenged the climbers felt, the more immersed they felt during the climb (CS: $B = 7.78$, $p = .044$, CCS: $B = 10$, $p = .013$, CCCS: $B = 15.7$, $p = .002$). This same effect is shown for fear (i.e., CCS: $B = 13.1$, $p< .001$ or CCCS: $B = 10.6$, $p = .003$).

To summarize, this level of analysis suggests that high skills was the only conditions that had an effect on mastery. Neither challenges, nor the balance between skills and challenge had a major effect on the feelings of mastery, although the variables did explain some of the variance in regards to how immersed and scared the climbers felt.

Path analyses

The final comparisons of on-line feelings of mastery and the feelings of mastery for the whole episode is shown by a multilevel path model, looking at the unique contribution of each variable. Figure 3 displays the between-participants relationships, presenting that participants who reported high on-line pleasure also tended to report less feelings of mastery for the whole episode (β = -.60, p = .003), after controlling for on-line immersion and on-line mastery. At the same time, mastery for the whole episode is positively affected by on-line mastery (β = .39, p = .041), immersion (β = .44, p = .024) and reported level of experience (β = .40, p = .010).

Illustrated in Figure 4, the within-participants regressions show that on-line pleasure has a direct positive effect on the on-line feelings of mastery (β = .32, p = .003). Immersion on the other hand, does not (β = .13, p = .313). On this within-level of analysis there was, like in table 3, not a significant correlation between on-line pleasure and immersion.

Figure 5 shows a cross-lagged regression model where the on-line feelings at time 2 (T2) are predicted by the on-line feelings at the time right before (T1). This figure shows high predictive power within feeling states, with standardized regression weights in the range between .77 to .83 at the between-participant level (all p's < .001), and in the range between .61 to .74 at the within-participant level (all p's < .001). Only one significant cross-over effect between feeling states was observed, from immersion at T1 to mastery at T2, (β = .08, p = .031 (p's > .067 for all other cross-over effects)).

Table 1

Correlations and Descriptive Statistics for the Study Variables in the Questionnaire (N= 38)

Variables	1	2	3	4	5	6	7
1. Gender	-						
2. Age	.01	-					
3. Experience	-.14	.47*	-				
4. Climbing Grade_Sport	-.07	.44*	.67*	-			
5. Challenge	-.03	-.00	.19	.12	-		
6. Skills	.16	.21	.50*	.54*	.12	-	
7. Feeling of mastery	.11	.04	.20	.28	.25	.20	-
Mean	.45	.53	8.83	6.37	5.11	5.00	5.55
SD	.50	.51	8.17	2.61	1.37	1.01	1.22

Note. * p <.05; Variable 3: years climbing; Variable 4: highest achieved sport climbing grade

Table 2

Correlations and Descriptive Statistics for the timing variables in the Questionnaire (N= 38.)

Variables	1	2	3	4	5	6	7	8	9
1. Mastery_during	-								
2. Mastery_after	-.69**	-							
3. Mastery_both	-.38*	-.41*	-						
4. Pleasure_during	.38*	-.31	.08	-					
5. Pleasure_after	-.28	.32	-.06	-.68**	-				
6. Pleasure_both	-.05	-.08	.17	-.22	-.57**	-			
7. Immersion_during	.25	-.28	.05	.25	-.22	.91	-		
8. Immersion_after	-.13	.19	-.08	-.09	.13	-.07	-.35*	-	
9. Immersion_both	-.20	.22	-.02	-.22	.18	.01	-.91**	-.07	-
Gender	-.07	-.12	.26	-.08	.03	.05	-.20	-.15	.19
Age	-.10	.06	.04	.10	-.40*	.41*	.23	-.17	-.17
Experience	-.38*	.05	.41*	.16	-.03	-.13	.13	-.04	-.12
Grade_Sport	-.28	.04	.30	.20	-.19	-.22	.33*	.10	-.40*
Challenge	-.18	.09	.11	-.42**	.54**	-.25	-.01	.11	-.03
Skills	-.27	-.05	.41	.00	-.05	.07	.14	.00	-.14
Feeling of mastery	-.24	.10	.18	-.24	.26	-.08	.05	.20	-.14
Mean	.39	.42	.18	.21	.63	.16	.82	.03	.16
SD	.50	.50	.39	.41	.49	.37	.39	.16	.37

Note. * p <.05; ** p < .01; during, after or both refer to the timing of when the participants felt mastery, pleasure and immersion.

Table 3

Intra Class Correlation (ICC) and Zero-Order Correlations for Within-Participants (Below the Diagonal) and Between-Participants (Above the Diagonal) for the Feelometer Variables (N= 38, S =10)

	Difficulty	BCS	Mastery	Pleasure	Immersion	Fear
Difficulty	1.00	.07	.34	-.02	.49*	.13
BCS	.61***	1.00	.17	.06	.65***	.02
Mastery	-.02	.06	1.00	.33	.35	.03
Pleasure	.01	-.11	.29**	1.00	.55***	-.15
Immersion	.29**	.32***	.16	.10	1.00	.24
Fear	.01	.21*	-.11	-.25	.31**	1.00
ICC	.33	.31	.34	.44	.41	.69

Note. BCS = Balance of challenges and skills. S = number of situations. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 4

Unstandardized Regression Coefficients (B) and t-Statistics for Five Multilevel Regression Models With On-Line Mastery, Pleasure, Immersed, Fear and Difficulty as Dependent Variables, and a Dummy Coded Challenges-Skills Balance as Independent Variables(N = 38, S = 10)

	Mastery		Pleasure		Immersed		Fear		Difficulty	
	B	t	B	t	B	t	B	t	B	t
Intercept	63.1	148***	64,8	13.7***	70.8	15.3***	36.3	7.6***	46.1	12.7***
CSS	8.4	2.2*	2.0	0.53	3.96	1.08	5.97	2.35*	9.22	2.94**
CS	5.2	1.3	-2.6	-0.64	7.78	2.03*	8.99	3.32***	20.9	6.36***
CCS	5.9	1.4	-4.12	-0.99	10	2.5*	13.1	4.65***	30	8.72***
CCCS	6.6	1.2	-3.7	-0.7	15.7	3.07**	10.6	3.01**	36.8	8.73***

Note. Very high skills (CSSS) used as reference category for the independent dummy variables, the other categories were: CSS = High skills; CS = Balance between challenges and skills; CCS= High challenge; CCCS =Very high challenge (see text for further details). S = number of situations * $p < .05$, ** $p < .01$, *** $p < .001$.

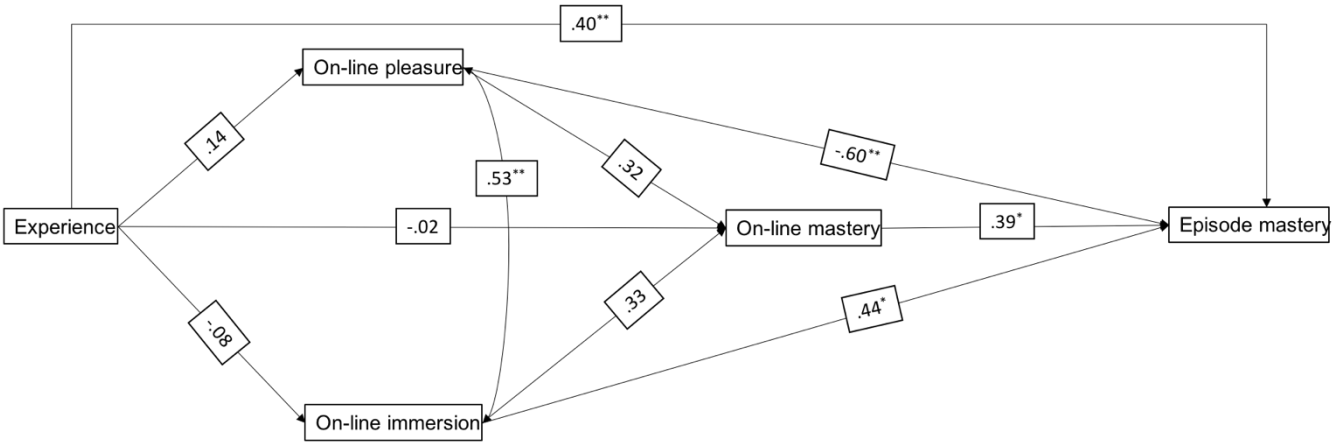

Figure 3. Between-level analysis path model showing relations between reported on-line feelings and experience regressed on mastery for the whole episode

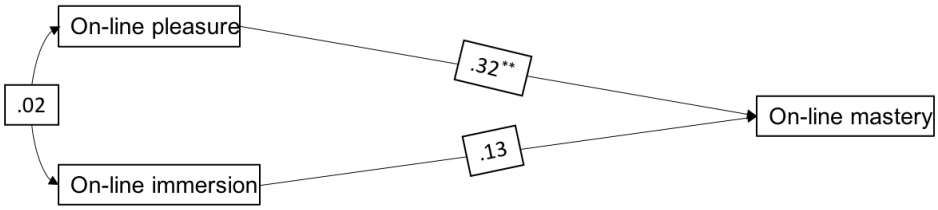

Figure 4. Within-level analysis path model showing relations between reported on-line pleasure and immersion regressed on on-line mastery.

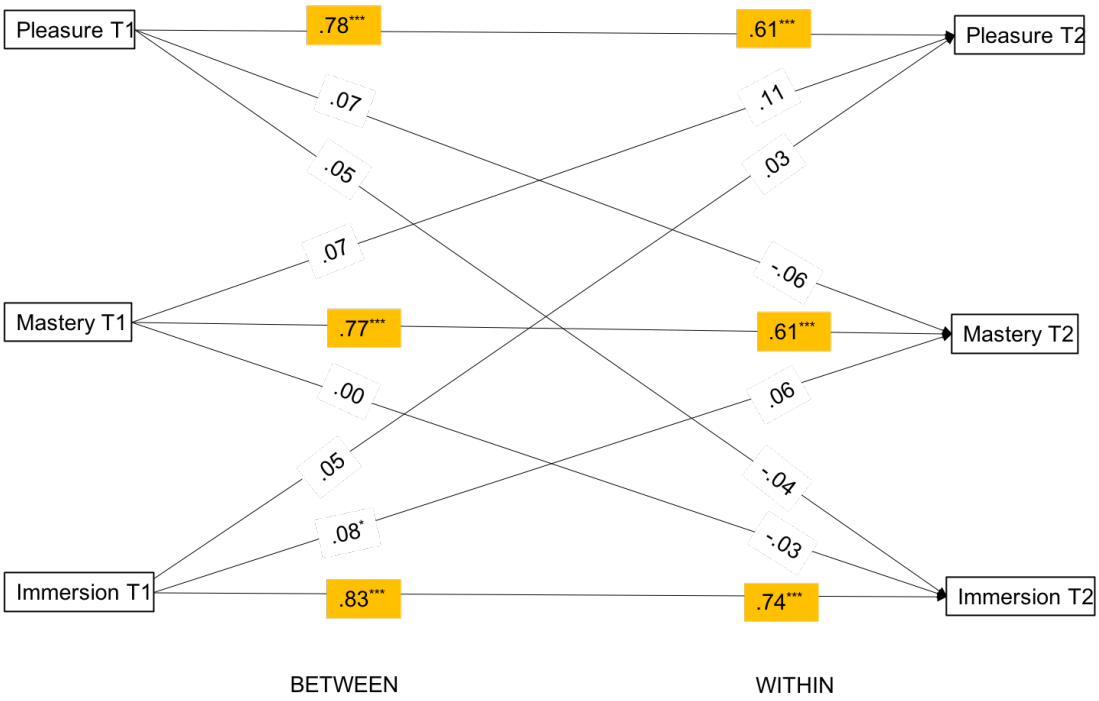

Figure 5. Path model showing the relations between pleasure at t1 and t2, mastery at t1 and t2, and immersion at t1 and t2 for both between-level and within-level analysis. Only one cross-over effect between immersion t1 and mastery t2, the remaining indicated by non-significant paths.

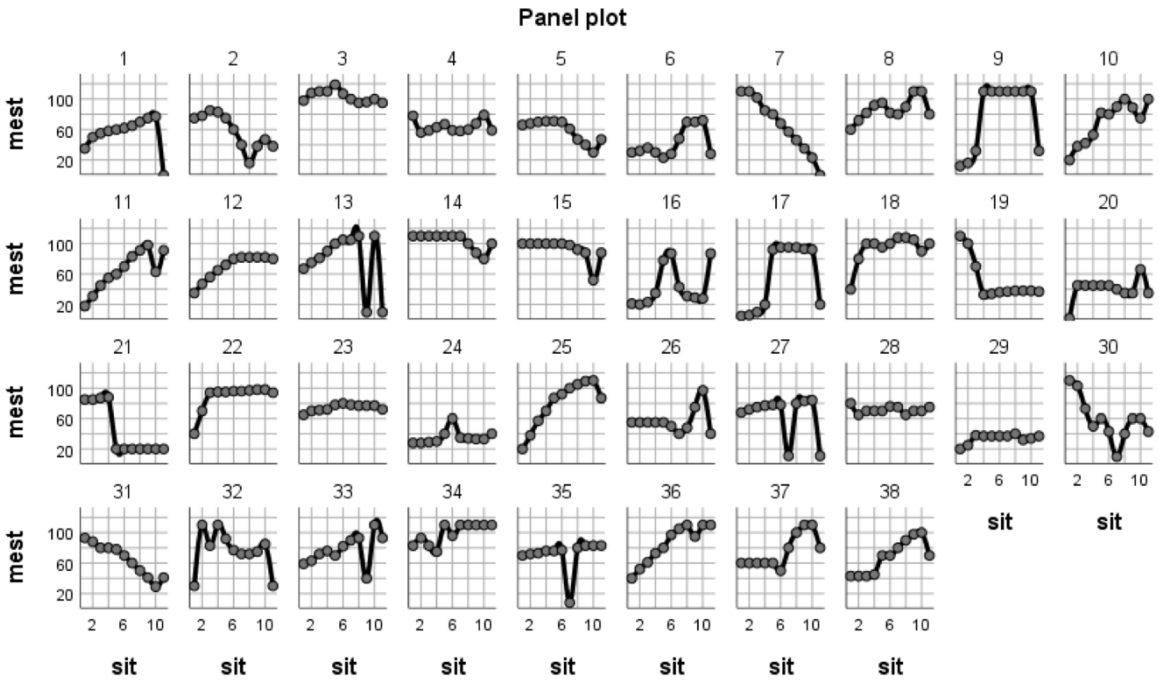

Figure 6. Panel plot showing each participants report of mastery during the climb (measured at 10 points). The participants all climbed different routes, making it difficult to discover a pattern of mastery within the same route.

Discussion

The current study found that the more experienced climbers reported mastery both during and after the climb, whereas the less experienced climbers reported mastery only during the climb. Next, the more challenged the climbers were during the climb, the less pleasure they felt while climbing, but interestingly, they reported more pleasure after the climb. Additionally, the harder the climbing grade the participants had reported doing historically, the more immersed they felt during the climb.

Our multi-level analyses first found that fear is a trait variable, and not one that necessarily derived from the difference of the situations, whereas the variance between challenge and skills primarily came from the situations the climbers were in. Further, our multilevel regression found that the low challenges-high skills conditions were the only level where mastery was significantly predicted. In conditions where challenges were higher, the climbers reported feeling more immersion and fear. Finally, the path models presented similar results, as listed above, where those with more experience reported more mastery for the

whole episode on the between-level of analysis. The path models also conveyed the negative effect of on-line pleasure on episode mastery. On-line mastery and immersion, on the other hand, were reliable predictors of feelings of mastery.

As demonstrated, skills, experience and the technical climbing grade were highly correlated. Becoming a skillful/experienced climber and climbing higher grades takes time and effortful practice. It has been demonstrated that innate abilities have a negligible influence on performance (Ericsson et al., 1993). Following Ericsson's (1996) line of arguments, an experience of mastery is achieved through willful and focused training, possibly demonstrated by our study where the more experienced climbers reported mastery both during and after the climb. Viewing this finding through the expert-knowledge research by Bradley et al. (2006) one could suppose that the experienced climbers ability to judge the climb is more nuanced, and based on different feedback than that of a novice climber. The less experienced climbers felt more mastery only during the climb, which could indicate that they base their experience of mastery on more immediate, on-line experiences. These types of findings would need further research to look closer at how expert climbers evaluate their performance differently from a beginner.

Further, the results are partly congruent with theories that have looked into the power of different emotions to affect the outcome of our experience, the Functional Well-Being approach by Vittersø (2016; 2013, 2016; 2018) being one of these. Utilizing and expanding Vittersø's approach, one could say that our study suggests (on a between-level) that eudaimonic feelings like on-line immersion can positively predict the overall feeling of mastery, whereas hedonic feelings of on-line pleasure has the opposite effect. This result resembles Hetland and his colleagues' study (2018), where they found that skiers appeared happier when they were having a break than when they were going downhill. While actively skiing, participants experienced more intense feelings of interest, engagement and immersion

produced by the challenge at hand, and reported more hedonic feelings of pleasure after. This is explained by the Functional Well-Being Approach, which states that the hedonic feelings come as a consequence of positively evaluating their endeavor after-the-fact. Viewing our findings through this lens we could say that the moment-to-moment feelings that take place during the climb are different from the emotional evaluations that come after the fact, something that Hetland and his colleagues (2018) identify as two different mental operations. The above findings suggest that hedonic feelings of pleasure and eudaimonic feelings of immersion during an (intense) experience, such as climbing, could have opposite effects on the overall report of mastery.

There is a pattern in our findings where immersion and fear are related to an imbalance between challenge and skills, in the conditions where the challenges were higher. Intuitively, it makes sense that as the challenges increase, the more difficult the climb becomes and the more fear kicks in. Fear, as discussed in Hetland et al. (2018), seems not to be an emotion that extreme sport athletes seek, but rather one that is "there", something that has to be overcome. This research, along with Hetland et al.'s study adds valuable nuance to why athletes in sports like climbing are motivated to engage in these types of activities.

According to both Flow- and Functional wellbeing theory, immersion and pleasure should be curvilinearly related to the balance between challenge and skills, but our results only hinted at this effect for these feelings. We found that as challenge intensifies, pleasure gradually lowers and immersion gradually increases. This might be in line with Eckblad's curvilinear model stated in Vittersø (2018), where pleasure is illustrated specifically as a feeling that presents itself at low levels of assimilation resistance, but more studies are needed to look into this interaction between climbing experiences and feelings. Generally, the level of challenge, or the balance between skills and challenge did little in the way of explaining feelings of mastery. Feelings of mastery, in our results, were salient when going from very

high skills (CSSS) to high skills (CSS). This indicates that mastery is experienced as most intense when we don't experience a high level of challenge, or when our skills are much higher.

The above findings can partly be viewed through the "imbalance model" by Løvoll and Vittersø (2014), which goes against the common flow-theory. This model demonstrate that we are motivated for action by the very feelings offered in the flow experience itself, and these feelings are in part a result of an imbalance between the level of challenge and skills.

Finally, higher challenges during the climb were negatively linked to pleasure during the climb, but positively linked to pleasure when looking back at the experience. This shows that while involvement in activities such as climbing can be uncomfortable, the memory of the experience can still be pleasurable. This is in accordance with the construal level theory (Trope & Liberman, 2003), which emphasizes that the more distant an experience becomes, the more abstract the representation of it becomes. Since pleasure is more of an overall kind of affect than immersion, one may speculate that pleasure also becomes a more salient part of the memory of a situation, when recalled at some temporal distance.

Limitations and future research

The present study had 38 participants, which compromises the statistical power of the research and can increase the risk of Type-II errors. Future studies should aim to increase the sample to avoid this risk. Further, this study was based on retrospective reporting through questionnaires. Kahneman (2005) state that retrospective reporting is affected by the fact that participants' retrieval and temporal integration of emotional experiences are subject to mistakes. In the present study, an attempt was made to limit this bias by asking participants to complete the questionnaire and "feelometer" immediately after their climb. Future studies could devise ways to directly measure emotions to further investigate the feelings that lead to an experience of mastery.

Climbing, as an activity, may be unique in the experiences it offers, which makes generalizations about the feelings of mastery uncertain. Our results should therefore be cautiously interpreted in terms of their power to explain tendencies of mastery in general, as they might not reflect the dynamics between mastery and additional variables during other activities. Future studies could therefore attempt to look into the subtleties of mastery through other endeavors.

Conclusions

This study's function was to tease out experiential factors that are involved in feelings of mastery, and consider if these could be seen through the lens of existing research. Exploratory by nature, the current study sought to answer research questions, rather than test specific hypotheses. The study expands pre-existing research by considering feelings of mastery through the context of rock climbing. Established theories, such as Flow and Functional wellbeing models, have not explicitly considered feelings of mastery. Some of our results are opposing, which show some the complexity of feelings like mastery, immersion and pleasure, but also implies a need for future research to investigate these dynamics further.

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