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The feeling of skiing:
an Exploratory Study of the Emotions of Skiiers

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ABSTRACT:

This study inspected and compared the results of verbal and visual analysis in 94 Skiers. Trait and state scores as was acquired with Basic Emotion Trait Test and Basic Emotion State Test. These where further compared with Visual data. Heart Rate measures and the speed of the participants was measured and synchronized with the data. The visual data was acquired through filming the face of the participants as they were skiing down a mountain in Northern Norway. The film was then analyzed with Face Reader, which measures 490 points in a face and suggests rather accurately the experienced emotion. The Face Reader proves to be a good supplemental tool in exploring emotions online under circumstances where verbal measurements are unavailable. The study found that the facial expression of surprise correlated strongly with fear, and that fear was closely related to interest. The study further found that happinesss as an emotion seems to stand for itself as a rather unique emotion. The study also found that happiness was most prominent at the midst of the decent and that fear was present during the majority of the decent.

FOREWORD:

This project have been most interesting, stimulating, high-paced and highly enriching. There have been over a hundred hours of data collection in a way no one have collected data before and the line of new challenges are ever increasing. As this project is at the scientific frontline, there was few people to gather information from, and even the developers of our main data manipulating software was in for an eye opener as we hired them in for training.

The journey started as I sought after a topic involving facial expressions and positive psychology. I was quickly introduced to one of freshest scientist in the Institute of Psychology, an outdoors man by the name of Audun Hetland who studies extreme sports. He offered me to join the project but guaranteed me that it would not be easy. He was right. A lot of work is required but the fact that this PhD. student is inspiring and engaging made the work enjoyable. This project is not only his invention, but his development through a series of years which he now gladly invites his fellow scientists to join in on. The pace is high, and even after technical setbacks for weeks at a time the project steadily moves forward and attracts attention from some of the nation's biggest media sources.

I have performed all the statistics with guidance from my advisor, with the exception of the transformations and the manipulations of the outliers which Vittersø performed. I have used data mostly from my own collection, but also from Audun Hetland's collection from 2010/11 the year before and more recently, Eirik Kjelstrups data from April until today. We are all in this project together and work to get as many participants as possible.

I have provided approximately half of the references in this article but have collected and examined over 120 articles related to the many topics this projects expands across. The article it self have been subject to extensive revisions through the whole writing process and have been narrowed down to fit the target of a bachelor thesis.

Acknowledgement

Firstly I would like to thank my advisor, Audun Hetland for the chance to be a part of a truly enriching study project filled with challenges, innovation and a specter of emotions. I am also must grateful for the chances he gave me to present the project on both NRK, TV2 and as a lecture for Fri Flyt's High Camp. Further, I would like to thank Joar Vittersø for his expertise on the field of emotions and his advanced understanding of statistics, as well as Tove Irene Dahl for her strategic support and guidance. Lastly, I would like to thank the Northern Insights Which is a huge interdisciplinary project incorporating the six biggest research institutions, all funded by the Norwegian Research Council.

How does it really feel to ski? If you ask a passionate backcountry skier he might overencomber you with superlatives. There is no reliable statistics, but the number of people engaging in backcountry skiing has increased manifold the last years. This development can be seen in conjunction with the steep rise in many so called alternative sports such as kiting, mountain biking, surfing, longboarding, skydiving, base-jumping and river paddling (Campbell & Johnson, 2005; Celsi, Rose, & Leigh, 1993; Puchan, 2004; Slanger, 1997; Soreide, Ellingsen, & Knutson, 2007; Willig, 2008)

The participants often refer to the experience of intense emotions as the chief motivating factor for their actions. However, even though these activities attract an ever-increasing number of participants, relatively little is known about the phenomena scientifically. A PSYCH info search with keywords like ski and emotions returned less than 80 hits. Of these, only a handful was relevant to backcountry skiers, and none had any online measures of emotions. A major aim with this study is therefore to expand our knowledge about the emotional experiences of backcountry skiing.

Arousal is an inherent characteristics of these types of activities. However, high arousal can impair the recall of short-term emotions (Revelle, 1992). To remedy this situation we have equipped the skiers with helmet-mounted cameras filming their face as they ski. This film will later be run through a software that extract emotional data from facial expressions. Hence, a second aim is to compare the online measures of emotion with the self-reported emotions.

Previous research (Hetland, 2012) has shown that the levels of reported emotions in this type of experience may vary significantly as the episode unfolds. To capture this variation we have divided the skiing into seven episodes and ask the skiers to report their corresponding

emotions. We also ask them to report their emotions for the total episode as a whole. A final aim is therefore to see what parts of the experience predicts the total evaluation.

Skiing

Skiing have been in the traditions of arctic inhabitants for millennia's (Alnæs, Brenna, & Nordli, 2007). Skiing has served as such a tool for more than 7000 years now (Berg & fremme, 1996) and have aided arctic inhabitants with swift transportations in snow filled landscapes. Many great expeditions were made possible with the ski and the first man to cross Greenland said that "(…) all our prospects of success were based upon the efficacy of skis" (Nansen, 1923). Today, skies have evolved to something more than a mean of transportation. The first open and official ski competition was held in Tromsø in northern Norway, March 21. 1843. Rapidly it grew in popularity and the first winter Olympics where held in Chamonix in 1924 (Bomann-Larsen, 1993). Different use of the skies have led to a development of different types of sports, varying after the terrain they are used in. As perhaps Fritjof Nansens expedition that lead to the increased interest in skiing and igniting sparks over the whole world, another development of skiing activity taking place in the alps, lead to an activity called Randoneé skiing or more popular known as backcountry skiing.

Backcountry skiing

Backcountry skiing, which may be described as the activity of ascending a mountain by means of your own muscle energy and riding it down on a ski or snowboard, have risen to become a popular winter sport the last decade. It is suggested that randoneè skiing may have had its birth in 1854 when the golden age of alpinism started (Unsworth, 1992). This is the eara when British mountaineers scaled several of the tallest peaks in the European alps for the first time. Their drive is suggested by Kirchner (1950) to come from Darwins publication of

the origin of species (Darwin et al., 1859), where man sought means to prove that they were the best specimens. This lead to a rapid development of both gear and techniques, which made steep skiing more manageable, and more accessible (Horgen, 2011). This growth have lasted until today where local skiing guides frequently comment on the increased number of skiers in the mountain. To estimate the membership of this activity, Horgen (2011) discerned from numbers published by a number of different sources, including the Norwegian statistical bureau, that 8% of the Norwegian population exercised this sport in 2007. As the data of worldwide participation of this sport is challenging to collect (Hägeli, 2005; Odden, 2005), data from popular retailers such as Backcountry.com, one of the world top dealers of randoneé equipment, had an increase of 167% from 2005 to 2007 (Dietrich 2008) which suggest a distinct growth.

Another more grim way of recognizing the growth is by looking at the avalanche fatalities the last decade. The average fatality rates in USA due to avalanches have tripled from 1990 to 2007 (Dietrich, 2008). The same growth is found in Norway if you compare the first six years of this millennia with the last seven(Anonymous, 2012). However, the director of the second largest sports retailer XXL in Norway, report that this growth is slowing down and a Canadian survey report the same (Hägeli, 2005). But a steady increase in Norway from the 1980's til today is quite likely (Horgen, 2011; Odden, 2005). As of this presented research, it is challenging to predict whether this increase will continue in the future.

Skiers are reporting that they ski because it is the best feeling in the world. It is then likely that this skier does his activity because there are some positive emotions in this activity.

Emotions

To Investigate the feeling of skiing, a general knowledge of the nature of emotions is required. Summing up several decades of research, Oatley and his colleagues (2006) beautifully defined emotions as “Multi-component responses to challenges or opportunities that are important to the individual’s goals, particularly social ones”(Oatley, Keltner, & Jenkins, 2006).

As Oatly suggest that emotions are multi-component responses, he refers to the agreement on that emotions is an umbrella term. The emotion itself constitute of the subjective feeling, (perhaps the communicative side of emotions), the bodily responses, and the behavior that result. The next part of the definition, states that the emotions are “(…) responses to challenges or opportunities that are important to the individuals goal”. Oatley clearly states the functionality of emotions, and, among others (Ekman, 1993; Izard, 2007; Mason & Capitanio, 2012; Ortony & Turner, 1990) also points out that we have a set of different emotions with different qualities and purpose. Historically however, the view of emotions has changed drastically over time.

Sixty years ago, emotions where explained by activation theories as arousal that can be either high or low on a one-dimensional scale (Duffy, 1962). Thirty years later, a valence (or pleasantness) dimension was added to the arousal dimension and all emotions could then be placed in this two dimensional diagram (Russell, 1980). Others claimed that one could conceptualize positive affect and negative affect as the two fundamental dimensions of emotional experience (Watson, Clark, & Tellegen, 1988). A third camp supported the notion of basic emotions.

Basic Emotions

Since the 1960's, a growing body of researchers suggested as Aristotle, Descartes and Darwin, that there are several distinct emotions such as fear, joy, interest, anger, and sadness. How many there are and which is the most basic is still debated. Most researchers agree that there is at least four; Anger, happiness, sadness and scared. Further, these distinct emotions are manifested in different facial expressions also observable across different cultures (Ekman, 1993; Izard, 2007). Ekman as an example, traveled to New Guinea and was amongst the first to verify Darwins suggestions that emotions was universal (Ekman, 1993). These distinct emotions are presumed related to characteristic action tendencies such as approach, inaction, avoidance or attack (Frijda, 1987) and are labeled basic emotions.

In an attempt to distinguish the basic emotions from other emotional states, Izard (2007) suggest to view them as natural kinds, which is a concept for a group of objects or phenomena's who share enough components and characteristics to be significantly alike. 1

With the perspective of natural kinds, basic emotions are then a result of ongoing affective-cognitive processes as we interact with the world. The components of emotions, which are neural, expressive and feeling/motivational, helps us humans to react and adapt to an ever-changing world. This process of reacting and adapting often go rapidly automatic, and unconsciously. According to Izard (2007) we are born with a set of basic emotions, but this system is subject to developmental change as we can learn to inhibit impulses and to a larger degree, direct our emotions.

Of the shared components in basic emotions, there are consensus around five topics. The first concerns that emotions involve a bodily factor which is capable to express signals (J. Panksepp, 2000) This is seen early in development as the toddlers smile is crucial for sosio-emotional attachment between infant and caregiver. Secondly, if a basic emotion is to occur, it

may depend on the perception of a stimulus. As an example, in infancy, a mothers face may serve an important enough function as to elicit a smile in the infant. However, not all theorist agree that a basic emotion needs to be triggered (Öhman, 2005). Thirdly, basic emotions have a feeling component which is rooted in a neurological process (Lundqvist, 2005). Often, feelings derive from a sensory input. Humans can often separate the difference between an external and an internal stimuli because they derive from different cognitive structures (Edelman, 2006). Further, the motivational properties of basic emotions are non-cyclic in the sense that they do not occur in intervals such as with thirst or hunger. Basic emotions are constantly providing a source of motivation for adaptive purposes. Lastly, the regulatory properties of basic emotions have the effect of increasing, reducing or sustaining the activity of motor or cognitive responses (Cole, Martin, & Dennis, 2004). Fear as an example increases motor activity as the individual is about to flee, while interest have the ability to sustain focus on a topic, activity or phenomenon that stimulates learning and exploration (Fredrickson, 1998).

As the aspiring field of positive psychology evolved a decade ago, the focus on positive emotions flourished. One of the first to grasp the subject of positive emotions was Fredrickson (1998). She noted that research on emotions mainly focused on the negative emotions. The reason for the sidestepping of the positive emotions are that they have to few immediate evolutionary adoptive functions. They also lack clear actions that accompany the emotions which makes the emotion itself hard to study. The positive emotions do however, serve important functions in humans and are by some suggested to be the cornerstone of human development.

Interest, is regarded as a positive emotion as it does not activate the body to uncomfortable levels of activation nor leads to any specific actions. Rather, it falls nicely under Fredrickson (1998)’s paradigm of thought action repertoire. This concept states that the

basic emotions trigger a chain of thoughts rather that the well-established concept of action tendencies where the reaction to the emotion lead to an explicit action with the individual. As an example, fear will often lead to withdrawal and anger often to attack. In the thought action paradigm, the positive emotions, which often not have explicit action accompanying this emotion, lead to cognition, which often preempts the current constant cognitive affective state of mind. Interest is such a positive emotion where a stimuli important enough, yet not unsafe enough, may lead to a change of focus (Silvia, 2001). As an example, one may picture a skier who finds a slope steep enough to offer him novelty and challenge, while not yet being steep enough to be perceived as scary. Interest is evidently important in human development as the infant, only a few hours after conception, will spend more time with novel stimuli (Izard, 2007). Fredrickson (1998) further suggest that interest resembles Deci and Ryan's (2008) intrinsic motivation and Csikszentmihalyi's flow concept (Csikszentmihalyi & LeFevre, 1989). Thus, the function of interest may be that it have long term benefits of driving humans to explore, learn and focus on tasks or phenomena's.

Happiness is often synonymous with joy, and these feelings arise when situations are appraised as safe and familiar. Research on happiness have grown to an immense field of study where well established terms such as Hedonia, subjective well-being, and life satisfaction have been extensively studied (Vittersø, 2001; Vittersø & Søholt, 2011; Vittersø, Søholt, Hetland, Thoresen, & Røysamb, 2010). This paper will not further go in on those topics but continue with a comprehensible description of the basic emotion of happiness. Frijda (1986) labeled the action tendency of joy as free activation. In the free activation, play may result where the individual engages in activities that often foster skill learning and exploration. Play does not only lead to physical stimulation, but also intellectual. This, as with interest also fits nicely with Fredrickson (1998) thought action repertoire.

Fear is found in nearly all theories of basic emotion. Its action-tendencies are dramatic flight behaviors and strong place avoidances in animals and there have been no contradictory findings to this principle which is firmly rooted in neurological research (Jaak Panksepp, 2008). The amygdala have often been associated with fear, although not with provocation of unconditional fear, but with many emotive stimuli, including the classical conditioning of fear. Fear is an affectively valenced state. The fleeing behavior of fear is an evolutionary adaptive behavior where we increase our chances of survival if anything threatening comes about. Fear is deeply neurological rooted as we are primed to be afraid of snakes and spiders even though no such animal can kill you in as an example Norway. Fear is regarded as a negative emotion because it leads to an uncomfortable state of arousal, which is similar to high stress and anger. This state may damage health in several ways if individuals are long termed exposed. Fear of the dark is also reasonable as you do not have any control of your surroundings. Your body would then put you in a state where all the evolutionary primed lethal animals could be close to you. With actions tendencies so specific, fear is an embodied thought by mobilizing the appropriate autonomic support such as increasing the blood flow to larger muscle groups (Levenson, 2003).

The work for determining the universality of facial expressions is a result of decades of research and development of methods (Ekman, 1993). Ekman and Friesen developed the Facial Action coding system in the seventies which offered a precise way to measure distinct facial expressions (Ekman & Rosenberg, 1997). With tools such as these we can measure emotions as the activity is unfolding, and without interrupting. Further, applying facial examination techniques may uncover emotions that they may not explicitly verbalize (Ekman, 1993). However, there is research showing that people may report different emotions as no change is seen in the facial expression. The emotions can be measured using electromyography (Bartholow, Fabiani, Gratton, & Bettencourt, 2001). This suggest that in

order to capture the whole aspect of emotions, several techniques should be applied. One of these new techniques is called the Face Reader.

Face Reader

The Duch technology company Noldus (Technology Noldus Information, 2013), have for several decades developed scientific software for the social sciences. Among their many softwares is the Face Reader, which is an analysis program, computing a range of information about emotions in the face. Its theoretical framework is Ekmans Facial Coding System (Ekman & Rosenberg, 1997). Trained coders have coded several thousand images and this has provided the foundation for this software. Technically, the software measure 490 points and makes a digital mold of the face. As this mold changes, facial expressions are recorded. (Bommel, 2010; Fagermo, 2012; Kuderna-Iulian Benţa & den Uyl, 2009).

Aim of the study

The major aim of this study was to investigate the emotional experiences of skiers. Previous research (Hetland, 2012) has pointed out that these types of experiences vary extensively in regards of emotional experience. To better capture this variance we have developed a new tool where we mount a helmet camera in front of the skiers face. This film will then later be analyzed and the emotions extracted. A second aim is therefore to compare the self reported emotions with the visually reported facial emotions.

To try to capture this variation in self reported emotions as well, we have divided the decent into seven episodes and asked the skiers to report their emotions. We also asked them to give us a traditional over all report. Hence, a last aim is therefore to see what part of the decent predicts the over all evaluation.

Research questions

The above mentioned aims led us to the following research questions.

1. Different expressions of emotions: What are the similarities and differences between ski experiences as measured verbally or visually by Face Reader?
2. Peak end: To what extent do self-reported peak or end emotions predict the over all evaluation of pleasure, interest and fear.

Method

A total of 94 Skiers (31% females, 13%missing) participated in this study which lasted both seasons of 2011/2012 and 2012/2013. The participants, with an age ranging from 20 to 54, where recruited by convenience, usually through social media, friends, and local media such as TV, Newspapers and Radio. The researcher must actively contact the participant to set a time and date on when to perform the study due to the dependence of the weather. This proves a challenge in the recruitment process. The only inclusion criteria is that the skier wants to go on a trip. The exploratory nature of our study demands a wide angle of data collection in order to preserve the ecological nature. By allowing the participants to choose their own trip, we hope to make the data collection as least artificial as possible and the participants will choose after their level of skill. This is an important aspect of our study, since one of the four requirements of having a complete extreme sport experience identified by Willig (2008) is challenge. This allows the participants to choose a trip matching their skill level.

Procedure:

Data from this study is gathered from six different sources: Two questionnaires, one heart rate (HR) measure, one measure of speed and one measure of the facial expressions. The questionnaires assessed (1) Background variables (Questionnaire A) and (2) Subjective

variables immediately after the trip (Questionnaire B) (View Appendix for the questionnaires). (3) HR was gathered during the decent. The facial expressions (4) were captured during the ride down. Speed (5) was measured, using a GPS device, under the participants ride down.

One day before the trip

The day before the hike, the participants filled out Questionnaire A. If by some reasons the participants failed to manage this, the questionnaire was completed on the morning of the hike on the researchers IPad with internet connection.

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The research assistant met up with the participants at the foot of the mountains. Here an informed consent was given and the participants were informed of their rights to withdraw from the study at any time without giving any reason. They were informed that the participants where themselves responsible for the choice of path and that the research leader not would interfere unless the safety was at stake. The scientist reserve the right to withdraw from the hike if he/she considers the hike to dangerous. The rest of the group may continue as they please.

As the participants geared up a HR monitor was given to each participant. Then a path camera, which captures the entire hike from the skier's point of view. Special constructed helmets where given to each participant for them to bring up the mountain. This helmet have a camera mount that extends out from the forehead and brings a camera 30 cm from the participants face. This camera is the facial camera and will capture the participants face on the ride down. Cameras were carried in the participants backpack to the top. All gear information was carefully kept in a book that would help the scientist link the videos and HR data to each participant.

Before the decent the participants were told to put on their helmets and find their cameras. The researcher then mounted both cameras on the helmets and restarted the HR monitor. The Conture camera, which captured the front view, was first turned on before the facial camera in order to synchronize more easily. The HR monitors were turned on lastly where we held the display of the watch in front of the camera. The researcher then followed the participants on distance, only interfering to help with the cameras if a fall should occur.

Immediately after the hike and management of the data materials

As the participants arrived at the car, the researcher turned off the cameras and HR monitor. The participants where then given Questionnaire B which should be completed within 30 minutes after the end of the trip. The film from the cameras was then transferred onto one of the author's computers and converted with Wondershare to a different file type. We loaded the avi. file into Face Reader and ran the analyses. This was then exported and loaded into a statistical software by the name of Observer XT also from Noldus.

Verbally Reported Emotions

State emotions were measured using the Basic Emotions State Test (BEST -Vittersø et al. 2005). BEST is a scale, consisting of three items of each three groups of feelings; negative emotions, pleasure, and engagement. The Items was presented in the middle of the questionnaire where the participants where instructed to circle the number that best described your emotions this instance. Each item was reported on a Likert-like response scale running form 1 (Not at all) to 7 (Very true).

These Items is then further collapsed into three subscales Pleasure (*happiness, contentment and enjoyment) (α=.93),* Engagement *(interest, enthusiasm and engagement) (α=.72),* and negative emotions (anger, fear and sadness) (α=.85).

Trait emotions were measured using the Basic Emotion Trait Test (BETT—Vittersø et al. 2005). BETT is a scale, consisting fifteen emotions each presented on a Likert-like scale running from 1 (Never) to 7 (Always). The emotions was presented after the question; "In general, how often do you experience each of the emotions listed below?" The interest and pleasure variables was further collapsed into two subscales; Pleasure (Joyful, Happy, Satisfied) (α=.91). Interest (Engaged, Inspired, Interested) (α=.80).

Verbally reported episodic emotions

A Feelometer (Hetland, 2012) enabled the participants to report each moment from the decent. The Feelometer is a modification from the original feelometer and uses a likert-like responding from instead of hand drawing. This allows a more precision as well as being more time efficient. The x-axis is the timeline of the episode and the y –axis shows the intensity of the episode.

The decent was divided into seven episodes and the participants was asked to report their pleasure, interest and fear on a ten point Likert-like scale running from 0 (not interesting/pleasant no fear) to 10 (very interesting, very pleasant, much fear) The seven episode was presented by the following text; 1) At the top, one minute before start, 2) First part of skiing, 3) Before half way, 4) Half way down the mountain, 5) After half way, 6) Last part, 7) Immediately after you stopped.

Visually captured emotions

Basic emotions was captured with Face Reader (Noldus). Face Reader an analytical software recognizing the six basic emotions (Ekman, 1993), in addition to neutral by measuring 490 points in the face as mentioned above. The software utilize a range of premade

face models which it constantly matches with the participants face as well as pre analytic settings which enables the researcher to tailor the face model to the participant. An analysis is then exported and imported to Observer XT, which is a management and statistical program for the social sciences.

Heart Rate Measures

Heart Rate and speed was measured with Garmin Forerunner XT310. Heart Rate (HR) was measured each second and the speed was calculated with the built in Global Positioning System (GPS). HR was imported to a computer via Garmin Connect, which is a management software for your exercise data. HR and speed was synchronized with the film from the decent in Observer XT version 15.5. HR and speed was further exported together with the rest of the data to SPSS.

Analyses

The data was analyzed with the statistical software SPSS 21 IMB for Windows on the author's computer.

Results

The following table is formatted to emphasize the structure of the variables.

Table 1.

Emotions Reported Verbally and Visually

Sample Size (N), Means, Standard Deviations (SD), and Skewedness for the Study Variables

Variables	N	Mean	SD	Skewnes
BETT Happy	86.00	5.17	.98	-1.96
BETT Interest	86.00	3.29	1.10	.73
BETT Fear	86.00	3.10	.89	-.21
BEST Happy	64.00	5.60	1.24	-1.14
BEST Interest	64.00	5.02	1.13	-.45
BEST Fear	64.00	2.41	1.60	1.39
Max Speed Ski	35.00	26.49	28.25	.20
Mean Speed Ski	35.00	10.04	11.27	.46
Max Happy Ski	35.00	.95	.17	-5.61
Max Happy Ski (tr)	34.00	-.01	.01	-2.62
Max Happy ski out	31.00	-.01	.01	-1.09
Mean Happy Ski	35.00	.13	.12	1.71
Max Happy Pause	35.00	.96	.17	-5.88
Max Happy Pause (tr)	34.00	.00	.00	-3.16
Max Happy Pause (out)	33.00	.00	.00	-1.61
Mean Happy Pause	35.00	.17	.12	1.30
Max Surprised Ski	35.00	.65	.31	-.75
Mean Surprised Ski	35.00	.04	.04	1.02
Max Surprised Pause	35.00	.76	.27	-1.69
Max Surprised Pause (out)	32.00	.82	.16	-1.36
Mean Surprised Pause	35.00	.02	.02	1.48
Max Scared Ski	35.00	.24	.26	1.68
Mean Scared Ski	35.00	.00	.01	3.98
Mean Scared Ski (tr)	35.00	.05	.04	2.26
Mean Scared Ski (out	32.00	.04	.02	.14
Max Scared Pause	35.00	.38	.33	.71
Mean Scared Pause	35.00	.00	.01	3.24
Mean Scared Pause (tr)	35.00	.05	.04	1.69
Mean Scared Pause (out)	33.00	.04	.03	.53
Age	82.00	29.63	6.84	1.60
Gender	82.00	.37	.48	.57

Note. Gender male = 0; BETT = Basic Emotion Trait Test; BEST = Basic Emotion State Test.

All the significant findings with a skewness of |2.00| have been transformed either logarithmically or by squaring the highs and the low scores respectively according to West et. Al. (1995) Those transformations have been labeled (tr). If this transformation still did not lead to a skewness of |2.00|, then a visual inspection of outliers as defined by SPSS have been performed. These where labeled (out) for outliers.

A correlation matrix was made to inspect the verbally reported data. The trait of fear correlated positively with the trait of interest (r = .32, p = .003). As expected, a correlation between trait of interest and the situational interest was also found (r = .27, *p* = .034) and between trait fear and situational fear (r= .33, *p* =.010). A strong correlation is also found between BEST interest and BEST Happy (r = .74, *p* = < .001). What is also found is a para-significant correlation between trait happiness and situational happiness (r = .21, *p* = .99).

Table 2

Verbal Measures. Pearson Correlation Matrix of Basic Emotion Trait Test's (BETT) Correlation to Basic Emotion State Test (BEST) Measured in Questionnaires.

Variables	1.	2.	3.	4.	5.	6.	7.	8.
1. Trait Happy	1.00	.12	.03	.21	.06	-.08	.01	.17
2. Trait Interest	.12	1.00	.32**	.14	.27*	.08	.16	.04
3. Trait Fear	.03	.32**	1.00	-.17	.10	.33**	.31**	-.02
4. Situational Happy	.21	.14	-.17	1.00	.74**	-.13	.04	-.07
5. Situational Interest	.06	.27*	.10	.74**	1.00	-.04	.01	-.05
6. Situational Fear	-.08	.08	.33**	-.13	-.04	1.00	.40**	-.10
7. Gender	.01	.16	.31**	.04	.01	.40**	1.00	-.04
8. Age	.17	.04	-.02	-.07	-.05	-.10	-.04	1.00

Note. * = p< .05; ** =p< .01; *** =p< .001 (2-tailed).

Table 3

Visual Measures. Pearson Correlation Matrix of Facial Expression Measurements.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. Max Speed Ski	1.00	.94**	-.21	-.04	-.03	.10	.12	.28	-.01	.48**	-.28	.03	-.08	.27	-.29	.08
2. Mean Speed Ski	.94**	1.00	-.11	.05	.00	.16	.07	.27	.02	.42*	-.33	.01	-.10	.27	-.35*	.10
3. Max Happy Ski (out)	-.21	-.11	1.00	.51**	.39*	.28	.06	-.02	.10	-.14	.06	.06	.12	.06	.14	-.28
4. Mean Happy Ski	-.04	.05	.51**	1.00	.38*	.78**	-.09	.01	-.14	-.19	-.13	-.01	.05	.15	-.13	.00
5. Max Happy Pause (out)	-.03	.00	.39*	.38*	1.00	.39*	.30	.21	-.23	-.14	-.07	-.16	.09	.00	.27	-.21
6. Mean Happy Pause	.10	.16	.28	.78**	.39*	1.00	.20	.26	-.28	-.10	-.12	-.11	-.02	.00	-.11	.06
7. Max Surprised Ski	.12	.07	.06	-.09	.30	.20	1.00	.66**	.35	.44**	.35*	.48**	.53**	.44**	.44*	-.21
8. Mean Surprised Ski	.28	.27	-.02	.01	.21	.26	.66**	1.00	.30	.64**	.03	.49**	.20	.33	.27	-.31
9. Max Surprised Pause (out)	-.01	.02	.10	-.14	-.23	-.28	.35	.30	1.00	.53**	.12	.35	.28	.37*	.20	-.26
10. Mean Surprised Pause	.48**	.42*	-.14	-.19	-.14	-.10	.44**	.64**	.53**	1.00	-.03	.44*	.06	.50**	-.03	-.43*
11. Max Scared Ski	-.28	-.33	.06	-.13	-.07	-.12	.35*	.03	.12	-.03	1.00	.53**	.65**	.47**	.48**	-.01
12. Mean Scared Ski (out)	.03	.01	.06	-.01	-.16	-.11	.48**	.49**	.35	.44*	.53**	1.00	.42*	.68**	.47**	-.23
13. Max Scared Pause	-.08	-.10	.12	.05	.09	-.02	.53**	.20	.28	.06	.65**	.42*	1.00	.65**	.31	-.05
14. Mean Scared Pause (out)	.27	.27	.06	.15	.00	.00	.44**	.33	.37*	.50**	.47**	.68**	.65**	1.00	.25	-.17
15. Gender	-.29	-.35*	.14	-.13	.27	-.11	.44*	.27	.20	-.03	.48**	.47**	.31	.25	1.00	-.04
16. Age	.08	.10	-.28	.00	-.21	.06	-.21	-.31	-.26	-.43*	-.01	-.23	-.05	-.17	-.04	1.00

Note. * = p< .05; ** =p< .01; *** =p< .001 (2-tailed).

The correlations from the Face Reader variables reveal two trends. Max surprise correlates positively with all forms of fear: max scared ski (r = .349, *p* = .040) mean scared ski (r = .480, *p* = .005) max scared pause (r = .592, *p* = .001) mean scared pause (r = .443, *p* = .010). And also, mean scared ski correlates positively with mean surprised ski (r = .487, *p* = .005). Mean surprised pause correlated with mean scared ski(r = .444, *p* = .011) and mean scared pause (r = .502, *p* = .003). Mean scared pause with max surprise pause (r = .369, *p* = .045).

As expected, we find a number of correlation within the different measures of the same emotion like mean surprised pause and max surprised ski correlates (r = .44, *p* = .008). Max scared pause correlated with mean scared pause (r = .65, *p* = < .001). Max happy ski correlated with mean happy ski (r = .51, *p* = .004) and max happy pause (r = .39, *p* = .031). Max speed ski correlated with mean speed ski (r = .94, *p* = < .001). Mean surprise pause correlates with mean surprised ski (r = .64, *p* = < .001). Mean surprised pause with max surprised pause (r = .53, *p* = .002). Mean happy pause correlates with max happy pause (r = .39, *p* = .024). Mean surprised ski correlates with max surprise ski (r = .66, *p* = < .001). Mean scared ski correlated with max scared pause(r = .42, *p* = .017), mean scared pause (r = .68, *p* = <.001). Max scared ski correlated positively with mean scared ski (r = .53, *p* = .002), max scared pause (r = .65, *p* = < .001), mean scared pause (r = .47, *p* = .006).

We note that mean surprised pause and not happiness correlated with both max speed ski (r = .48, *p* = .003) and mean speed ski (r = .42, *p* = .012). A negative correlation between gender and mean speed ski (r = -.35, = *p* = .050). We also see that people tend to be less surprised with age as mean surprised pause correlated negatively with age (r = .43, *p* = .012). And we also see that women report more fear than men as max scared ski correlated with gender (r = .48, *p* = .005), this holds true even after removing outliers (r = .47, *p* = .009). *Lastly*, max speed of skiing correlated positively with mean surprised pause (r = .48, *p* = .003).

Table 4

Pearson Correlation Matrix of Verbal Measures Relation to Visual Measures

Variable	Trait Happy	Trait Interest	Trait Fear	Situational Happy	Situational Interest	Situational Fear
Max Speed Ski	-.08	.00	.17	-.21	-.13	.14
Mean Speed Ski	-.10	-.02	.10	-.13	-.11	-.01
Max Happy Ski (out)	.05	-.05	.21	.06	.15	.12
Mean Happy Ski	.29	-.04	-.07	.30	.39*	-.17
Max Happy Pause (out)	.24	.12	.26	.26	.38*	-.05
Mean Happy Pause	.16	.16	.00	.32	.48**	-.09
Max Surprised Ski	.29	.42*	.47**	-.02	.24	.20
Mean Surprised Ski	.05	.11	.20	-.01	.14	.07
Max Surprised Pause (out)	.05	-.05	.17	-.17	-.15	.17
Mean Surprised Pause	-.01	.04	.27	-.15	-.03	.04
Max Scared Ski	.36*	.35*	.11	.17	.02	.08
Mean Scared Ski (out)	.33	.06	.24	.00	.08	-.01
Max Scared Pause	.32	.19	.26	.08	.03	.02
Mean Scared Pause (out)	.29	.06	.21	.11	.14	-.09

Note. * = p< .05; ** =p< .01; *** =p< .001 (2-tailed).

In table 4, a correlation is seen between Mean happy ski and the situational measurement of interest (r = .39, *p* = .026). Further, those who are surprised report that they are interested (r = .42, *p* = .013) and fearful (r = .47, *p* = .005) persons. Those who also report that the overall situation was interesting was either having a Max happy pause (r = .38, *p* = .035) Mean happy pause (r = .48, *p* = .006) or mean happy skiing (r = .39, *p* = .026). Those who report that they have happiness and interest as traits correlate significantly with Max fear ski (r= .36, *p* = .035) and (r = .35, *p* = .043) respectively.

The following three tables regress the overall feelings of the three emotions, interest, pleasure and fear with an episodic report as predictors.

Table 5

Regressing Overall Interest on Feelometers Interest, Gender and Age. Episodic Report as Predictors for Overall State Reports.

Variable	Corr	B	SE	beta	p
FMI1	.24*	.03	.09	.05	.79
FMI2	.24*	.08	.09	.16	.39
FMI3	.29*	.00	.10	.00	1.00
FMI4	.41***	.10	.09	.19	.27
FMI5	.35**	.09	.08	.16	.29
FMI6	.25*	.02	.06	.06	.70
FMI7	.37**	.08	.06	.18	.23
Gender	.02	-.02	.29	-.01	.95
Age	-.06	-.01	.02	-.08	.51

Note. Corr = zero order correlations; B = unstandardized regression coefficient; SE = Standard Error: beta =standardized regression coefficient; Gender Male = 0
* = p< .05; ** =p< .01; *** =p< .001(one tailed)

This model was marginally significant with an adjusted R^2 = .14, F (9,49) = 2,051, p = .053. The author note that all the interest factors correlate, but the regressions does not show any unique effects from the seven predictor variables.

Table 6

Regressing Overall Pleasure on Feelometers Pleasure Gender and Age.

Variable	Corr	B	SE	beta	P
FMP1	.35**	.10	.06	.24	.07
FMP2	.36**	.07	.07	.16	.30
FMP3	.41***	.01	.07	.03	.85
FMP4	.56***	.15	.08	.26	.06
FMP5	.56***	.19	.07	.35	.01
FMP6	.30**	-.06	.06	-.15	.31
FMP7	.48***	.10	.07	.21	.15
Gender	.03	.32	.25	.13	.20
Age	-.04	-.03	.02	-.15	.13

Note. Corr = zero order correlations; B = unstandardized regression coefficient; SE = Standard Error: beta =standardized regression coefficient; Gender Male = 0
* = p< .05; ** =p< .01; *** =p< .001(one tailed)

This regression was significant with an adjusted R^2 = .49, F (9,50) = 7.20, p = < .01. Regressions show that the fifth Feelometer for pleasure (FMP5), significantly predicts overall pleasure (B = ..56, p = .01). FMP5 is measured right after the middle of the decent. Also, marginally significant in predicting an overall pleasurable feeling is FPM 4. (B = .56, p = .06) in the middle of the decent. All the pleasure factors correlate significantly.

Table 7

Regressing Overall Fear on Feelometers Fear, Gender and Age.

	Corr	B	SE	beta	p
FMF1	.67***	.20	.07	.37	.01
FMF2	.71***	.07	.09	.12	.41
FMF3	.72***	.24	.08	.34	.00
FMF4	.48***	-.17	.09	-.22	.06
FMF5	.56***	.24	.12	.24	.04
FMF6	.51***	.25	.09	.25	.01
FMF7	.13	-.09	.12	-.06	.46
Gender	.39***	.04	.28	.01	.90
Age	-.11	.01	.02	.05	.51

Note. Corr = zero order correlations; B = unstandardized regression coefficient; SE = Standard Error: beta =standardized regression coefficient; Gender Male = 0
* = p< .05; ** =p< .01; *** =p< .001(one tailed)

This regression was significant with an adjusted R^2 = .68, F (9,51) = 15.05, p = < .01. Nearly all the he Feelometer measurement of Fear are significantly predicting reported situational fear; at the start of the decent (FMF1) (B = .20, p = .01), before the middle of the decent (FMF3) (B = .24, p = .004). At the middle of the decent (FMF4) (B = .48, p = .060), after the middle (FMF5) (B = .56, p = .045), and at the last part of the decent (FMF6) (B = .51, p = .012). Nearly all the measurements of fear correlates.

Discussion

Our study suggest that fear is closely related to interest. Interest is also co-occurring with surprise, which also is present as you ski fast. There is little support that happiness correlates with anything suggesting that the engaging part of the skiing experience is the factor of interest. This study thereby suggest that the fear which lead to the feeling of interest factor is the reason for the high participation in this sport in accordance to challenge skill ratio (Delle Fave, 2011). Or, one may also, as this study not have done, use the biological findings of dopamine and opioid replacement. For those further interested in this mechanism, is advised to read Barbano and Cador (2007).

In this study, we wanted to explore the emotional experience of skiing. We measured trait emotions before the trip and state emotions immediately afterwards. In addition we filmed the participants face. This film was later run through a software that coded their facial expressions. We also wanted to see what part of the trip that colored the overall judgment. Therefore, in the report immediately afterward we divided the decent into seven episodes and asked the participants to rate their emotions, section by section. Through regression analysis we could then single out the section with highest impact.

The study found that there is a positive relationship between the trait of being scared and the trait of interest. Further, we found that the situational happiness is also reported as interesting. We find as expected that trait and state correlates in both happiness (parasignificant) and fear. If you are a jumpy person, then you might be more afraid than your peers skiing down that mountain. However, the correlation between fear and interest attracts attention and suggest that these two phenomena are tightly linked. Fear is also related to gender, meaning that the girls supposedly are more afraid, than their male counterparts.

We see a corresponding pattern in the online measures as the facial analysis strongly binds surprise with fear. This can be seen in light of classical flow theory (Csikszentmihalyi & LeFevre, 1989) where skiers seek challenge that tightly match their skills. Thus, fear might be interest's negative counterpart. Therefore, when you push yourself to far the emotions shift valence from interest to fear. However, it is interesting to see that interest and fear does not correlate with happiness, suggesting that happiness is a different phenomenon. This also seems logical in a functionalist perspective since the function of surprise is to gather information under novel and possibly important stimuli (Oatly, 1987). Skiing is of nature filled of rapid changes. Since the speed is high, and the light of the snow conditions often are challenging, you may experience many unexpected moves. This also fits under Fredrickson (1998) thought action paradigm where interest is the emotion where you are developing your skills.

Skiers do also report situational interest when they at the same time have happy facial expression. This is particularly when you have a pause in skiing. This is often seen on the recordings of the skiers where when the skiers turn stop and turn around to look at their tracks, they often smile. This suggest that happiness in skiing is related to have successfully mastered a challenge, such as skiing down a steep trail or just have completed a laborious feat of skiing.

Those who show the most surprised facial expression are the ones with most prominent traits of fear and interest. In addition, those who have had the most scared facial expression are

those who are the happy people and the interested people. However, it is important to note that the max scores are very short and that there is more information in the mean scores. The acquisition of such a number could therefore be coincidental.

When it comes to predicting reported situational interest, we see that although interest does correlate with itself, there is not one significant interesting part of the decent that predict whether you should find the total experience interesting.

However, when it comes to happiness the part right after you made it half way down the mountain seems to predict the overall happiness for that trip. What is interesting is that we do not see any peak-end as suggested by Khaneman (2000). What seems to be the joyful part of the trip was the middle of the decent. The end does not predict the overall report, and the predicting part does not stand out with peaking levels.

Fear on the other hand, predicts over all fear along the whole decent except on two occasions. The first one is rather peculiarly right after you left the top. This might be because some of the tension is released, as it is better to get going than to stand worrying on top.

Limitations and suggestions for further studies.

The limitations of this study is the small N. Data gathering in this study is a time and energy-demanding factor. Moreover, since this project started up recently, and as of our knowledge some of the methods is the first of its kind, there has been a large development, and some of the data collected at early stages had to be abandoned. Recording facial expressions in a real world setting also provides us with some uncertainties. There was no possibility to wear goggles under the decent in order to successfully get an analysis. Wind and sharp light may therefore distort the facial expressions, making it angrier. Further research is needed to verify facial recorded emotions as valid. The limited number of basic emotions that can be extracted

from facial expressions also makes it hard to compare other “not included” basic emotions such as interest.

Conclusion

Skiing is both interesting and scary with occasional happy situations. Also, guys ski faster than girls and they are less afraid. Interest shows itself as the expression of fear, which is also closely related to surprise. The end of the trip does not make the trip the most positive, but rather the midst of the ride down the mountain. Interest is not found in any particular point of the trip but there seems to be a lot of fear during the whole trip, which was correlated with interest. Therefore, fear and interest seems to be the feelings you seek when you go skiing. The trip may therefore not fun because it is hedonic (søholt, 2008), which means an absence of problems. Rather, there are many scary moments which supports the notion of eudemonia (Vittersø et al., 2010). Face Reader served as a very practical tool, giving the study of emotions a whole new perspective. With this study, we have followed the development of emotions 25 times a second and have with reasonable success uncovered the main emotions of fear, interest and surprise in skiers. The driving force of skiing seems to be the elements of fear and surprise, while the pleasure in skiing is when you turn to look back to where you came from.

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