

Ola Sydow Rasmussen

Validation of the Mental Skills Test – football (MST-f) questionnaire

An exploratory factor analysis

Master thesis in Sport Sciences
Department of Coaching and Sports Psychology
Norwegian School of Sport Sciences, 2019

Summary

The focus on and use of organized sports psychology programs within Norwegian football is growing and this project will hopefully be a valuable addition to create even further interest for the discipline. To be able to develop effective programs, there is a need for precise assessment tools so that change in skills can be monitored. This thesis examines the precision and validity of one of these assessment tools, namely the Mental Skills Test-Questionnaire (MST) developed by Pensgaard & Hollingen, (2004). MST exists in a general version and also more sport-specific versions, and it was a football version of the MST (MST-f) that was used here.

By using exploratory factor analysis, the thesis revealed that the original 6-factor structure of the MST-f -Questionnaire was not supported, but rather a 3-factor solutions, indicating a possible higher order structure. More research is needed involving a larger sample to determine if this new factor solution is more precise than the original structure.

Contents

Summary.....	2
Acknowledgements	5
1. Introduction.....	6
2. Theoretical perspectives.....	8
2.1 Psychological characteristics of elite athletes.....	8
2.2 Theoretical constructs of the questionnaire	9
2.2.1 Construct 1: Match preparation	9
2.2.2 Construct 2: Imagery.....	11
2.2.3 Construct 3: Self-talk and self-confidence.....	12
2.2.4 Construct 4: Energy management	16
2.2.5 Construct 5: Concentration	17
2.2.6 Construct 6: Goal Setting & Motivation	18
3. Methods	19
3.1 Recruitment and procedure	20
3.2 Population	20
3.3 Measuring instrument	20
3.4 Pilot test	21
3.5 Ethics	21
4. Results	22
4.1 Exploratory Factor Analysis.....	22
4.1.1 Principal Component Analysis or Factor Analysis.....	22
4.1.2 Choosing a Factor Extraction Method.....	22
4.1.3 Number of factors retained	23
4.1.4 Choosing factor rotation	25
4.1.5 Sample size	26
4.2 Deciding item removal and final factor structure	26
5. Discussion.....	28
6. Conclusion, future research and implications	31
7. Limitations.....	32
Reference list	33
Appendices.....	40

Appendix A: Mental ferdighetstest – Fotball (A. Pensgaard & Hollingen, 2004)	40
Appendix B: the English version of the MST	44
Appendix C: Approval from NSD	46
Appendix D: Participation request	47
Appendix E: Table 2	48
Appendix F: Table 3	49
Appendix G: Table 4.....	50
Appendix H: Figure 1	51
Appendix I: Table 5.....	52

Acknowledgements

This thesis has been completed with the help of a number of people. Firstly, I would like to thank Tor Oskar Thomassen for showing me the MST-Questionnaire a couple of years ago and giving me the inspiration to work with this wonderful tool on both Bachelor- and Master-level.

Thank you to all the football clubs that chose to participate and thank you to all friends that assisted the recruitment to the project.

I would like to thank my brother for helping me through SPSS-related breakdowns.

Thanks also to Heidi Ekle-Ramsdal and Peder Lindsetmo for the work you did on your own master theses! They were of enormous help in writing mine!

And last, but not least, the biggest thank you of all goes to Anne Marte Pensgaard! Thank you for taking time to answer my endless e-mails without showing a single sign of frustration! This thesis would not be completed without you!

1. Introduction

The biggest question in football today, with “wonderkids” like Martin Ødegaard, Kristoffer Ajer and Sander Berge, is what makes some players great and others average. Martin Ødegaard played in the Norwegian top division at 15 years of age, and still managed to be an influential player against seasoned veterans. Could this happen because of innate talent, or is it a result of better quality of training from an earlier age? Many would analyze these players’ skill sets in the usual technical/physical/tactical-paradigm. They are better, faster, stronger and smarter than their peers, but does that describe the whole picture? One of the most difficult questions in football is to answer what separates the very best players and the second best.

Football coaches describing this phenomenon almost always point to mental factors to why someone did not make it. Empty phrases like “he did not have what it takes”, “he could not handle the pressure”, “it got to his head” etc. flourish when debating the critical turning points of young footballers in the transition from youth to senior football. Talents are always gifted technically, and sometimes they are also gifted physically, so that is rarely the reason why they did not make it. Every coach can “see” why, with the empty phrases exemplified above, but it is regarded as something permanent, unchangeable, untrainable. How can football coaches sit idly by watching as mentally untrained young players work thousands of hours towards their own downfall?

This thesis tries to define and measure a set of critical mental attributes that are essential for every top-level footballer. The empty phrases are not empty, but they are not close to being constructive enough. A top-level coach would never say to a player “you do not score enough goals” without giving him instructions, a training program and individual feedback with video or otherwise. Mental skills are rarely regarded as trainable skills, and that is a big problem in football. The main problem is a lack of understanding of mental training. Some mental skills that are regarded as critical in the thesis are goal setting & motivation, self-confidence, self-talk, visualization, concentration, energy management and match preparation.

To be able to ascertain whether mental skills play a big role in football, it is essential to have precise instruments. In this case the psychometric properties of the Mental Skills Test - football (MST-f), created by Anne Marte Pensgaard and Even Hollingen, will be examined and validated

based on the answers of 253 athletes. Most of the participants are football players ranging from professionals, to semi-professionals and amateurs, with and without national team experience.

Through a search on Google Scholar and PubMed, little evidence of such a systematic mapping of mental skills on a national scale exists. The thesis will present theoretical evidence/support of previous research done on each of the mental skills included in the test, underlining why these specific skills might be critical, and then focus on the precision and validity of the research instrument, which tries to combine several mental skills into one questionnaire.

It is my hope that this validation will help the growing interest in mental skills training in football by providing a precise and valid instrument to use. In my Bachelor thesis I used the same measurement. The results were encouraging and inspired me to continue this line of research and even try to improve the measurement, using a broader sample as a base. As already pointed out, there is clearly a need for a sound and validated measurement to tap into the level of mental skills among athletes. To be able to do this, the need for a precise instrument is paramount.

The research problem: Will an exploratory factor analysis alter the proposed six-factor solution of the MST-f-Questionnaire (Pensgaard & Hollingen, 2004), and change the number of items retained?

2. Theoretical perspectives

Competitive sports environments are often compared to the military, when it comes to psychological demands (Fletcher & Fletcher, 2005; Meland, 2016). The commonality is often the topic of stress. This comes from the fact that competitive sports events at the highest level is a very extreme environment. Paulus et al. (2012) defines an extreme environment as “an external context that exposes individuals to demanding psychological and/or physical conditions, and which may have profound effects on cognitive and behavioral performance” (p. 2). This comparison will not be discussed further, but it gives a clear picture of what demands are placed on elite athletes.

2.1 Psychological characteristics of elite athletes

Retrospective research on successful athletes tends to almost exclusively highlight the importance of psychological factors (MacNamara, Button, & Collins, 2010). Through research, some “success factors” have been defined as beneficial for achieving sporting excellence: high level of commitment, long- and short-term goals, focus and pre- and in-competition plans (Orlick & Partington, 1988). In addition to these, Gould, Dieffenbach, and Moffett (2002) have reported that successful athletes are more committed and focused, and they also spend more time preparing mentally than less successful athletes. These findings are heavily supported by Durand-Bush and Salmela (2002) who also add self-confidence and motivation.

To achieve sporting excellence requires thousands of hours of deliberate practice, so the emphasis on commitment and motivation is not surprising (Bailey & Morley, 2006; Miller et al., 2018; Ward, Hodges, Williams, & Phillipaerts, 2008). Determination and persistence (Bloom & Sosniak, 1985; Renzulli, 1986), motivation (Singer & Orbach, 1999; Ward et al., 2008) and autonomy (Schoon, 2000) are regarded as critical if an athlete is to attain excellence in any field.

MacNamara et al. (2010) provides more evidence of the mentioned psychological factors in their retrospective investigation of successful athletes. Kreiner-Phillips and Orlick (1993) highlights that the mental strategies that can be taught through sports must be learned to be able to achieve excellence (Orlick & Partington, 1988). These mental strategies include, among others, goal setting, imagery, planning and performance evaluation. Research also highlights these strategies' importance when overcoming the obstacles of sports, e.g. learning a new skill (Rogers, 2006;

Waskiewicz & Zajac, 2001), dealing with difficult times and competing in big tournaments (Collins & MacNamara, 2012).

Some of the psychological characteristics of elite athletes in the examples named above lays the foundation for the MST-f-Questionnaire (Pensgaard & Hollingen, 2004). The next chapters will give insight into the meanings of the theoretical constructs of the questionnaire, and present the items in each construct.

2.2 Theoretical constructs of the questionnaire

2.2.1 Construct 1: Match preparation

All items from construct 1: match preparation

1. *I have clear tasks during a match*
2. *I have back-up plans in case my routines during a game gets interrupted*
3. *I follow my pre-performance routines as closely as possible, because I know this will give me the best possibilities to perform well*
4. *I am as prepared for competition as my strongest opponents*
5. *I perform well because I can rely on my match plan*
6. *I evaluate every match to learn from them, and to use this experience in future matches*
7. *I am skilled at getting in the right mindset to feel secure and confident before each match*

The theory around the topic of match preparation is varied. As we can see from the items in the questionnaire, they vary from having clear and concise tasks (either defined by the coach or the athlete), to pre-performance routines which may either be technical or even superstitious in many cases, and perception of control. The preparation can be related to both imagery and arousal control.

Perceived control in match preparation can be explained by the agent-means connections conceptualized by Ellen A. Skinner (1995, 1996). These connections give expectations that the self (agent) has the means to produce a response. These connections also give capacity beliefs, for example “4. *I am as prepared for competition as my strongest opponents*”. This example does not include any control on the outcome of competition, but it gives the athlete the belief that

he or she has done anything possible to be prepared for competition against the strongest possible opponent (i.e. training, skills etc..).

In chapter 2.1.3 the topic of self-efficacy will be discussed further, but in this context the importance of task and role efficacy (Item 1 and 5) is clear. The interdependent nature of football gives the relation between how an athlete's individual skills fit together with the team's overall performance (Bray, Brawley, & Carron, 2002). In football all there are numerous formal positions and variations within these positions (e.g. holding midfielder or box-to-box midfielder), each with specific tasks in the team context often prescribed by the coach (i.e. defensive and attacking responsibilities etc..). A football player will then most certainly show lower levels of task and role efficacy if they are played out of position, but this will of course be mediated by training to prepare for a eventual new role (Bray & Brawley, 2002). Regarding Item 1 and 5 then, it is dependent on mainly two factors: 1) How clear are the tasks prescribed by the coach, and 2) how does the athlete on his own explore and create tasks for himself or herself, related to their own skills (self-efficacy).

The level of superstitions in sport is generally high, although it varies between sports (Bleak & Frederick, 1998; Buhrmann, Brown, & Zaugg, 1982). Superstitions in sport can be defined as *“actions which are repetitive, formal, sequential, distinct from technical performance, and which the athletes believe to be powerful in controlling luck or other external factors”* (Womack, 1992, p. 191). In item 3 the word routine is used, but there is a fine line between routine and ritual, where ritual drifts more into superstition and routine can be more defined by the team. The true effectiveness of rituals is unclear, but athletes' beliefs in this phenomenon is strong (Bleak & Frederick, 1998). It gives a sense of confidence in each athlete's preparation and a sense of control that everything is “done right”. Failure to execute these routines and rituals can lead to loss of control and higher stress levels, therefore the important of back up plans (Item 2) is clear (Bleak & Frederick, 1998).

2.2.2 Construct 2: Imagery

All items from construct 2: Imagery

1. *I often use imagery by seeing myself performing*
2. *I often visualize myself reaching my goals*
3. *When I visualize, I use all senses (sight, hearing, smell, movement and touch)*
4. *I often visualize how I could solve different tasks during training*
5. *I use imagery to prepare for trainings and matches*
6. *When I visualize, the image is strong and clear*
7. *I am good at visualizing*

Visualization is regarded as the use of the senses to create or recreate an experience in your own mind. To imagine performing an action can be quite similar to physically performing it (Suinn, 1994). The mind retrieves and recreates stimuli from the memory to create a meaningful image, and through this process, footballers can recreate past experiences and make them feel real and detailed (Kizildag & Tiryaki, 2012; Levy, Perry, Nicholls, Larkin, & Davies, 2015; Ridderinkhof & Brass, 2015; Weinberg, 2008).

Suinn (1994) defines imagery as a mental practice that emphasizes the attempt of realistically capturing all of the sensory-proprioceptive-emotional aspects of a task and the environment. It goes beyond just imagining something, and forces the athlete to relive or experience something as though it is really happening. The technique integrates all that is happening within and without to create an environment where physical rehearsal can take place.

2.2.3 Construct 3: Self-talk and self-confidence

All items from construct 3: Self talk and self-confidence

1. *I have confidence in my own abilities as an athlete*
2. *I have confidence in myself in most situations*
3. *I believe in myself, and expect that I will reach my goals*
4. *I am good at reminding myself of my qualities and strengths*
5. *I have mostly positive thoughts during matches*
6. *My self-confidence is not affected by the strength of my opponents*
7. *I see difficult situations as challenges*

Deborah Feltz defines self-confidence (SC), self-efficacy (SE), perceived ability and perceived competence (PC) as components related to a certain level of performance (Feltz, 2007). In this she regards SC as an umbrella term containing SE, PC or ability, sport confidence and movement confidence. All these terms are essential to understand if one is to grasp the complexity of SC. She regards SC as “the perceived ability to accomplish a certain level of performance” (Feltz, 2007, p. 279). High levels of SC (or lack thereof) are very often regarded as a facilitator or debilitator for competitive anxiety (Hanton & Connaughton, 2002; Hanton, O’Brien, & Mellalieu, 2003; Jones, 1995; Jones & Hanton, 2001; Ntoumanis & Jones, 1998). SC is regarded as one of the most important variables related to sports performance (Robazza & Bortoli, 2007). Athletes with a higher level of SC have better coping and emotion management abilities (Besharat & Pourbohloul, 2011). SC is shown to moderate competitive anger symptoms (Hanton & Connaughton, 2002; Hanton et al., 2003), facilitates coping resources for encountering anxiety (Hanton & Connaughton, 2002; Jones & Hanton, 2001; Robazza & Bortoli, 2007) and the ability to regain control of stressful scenarios in competition settings. SC also determines lower levels of competitive anxiety and is shown to correlate with better performance (Craft, Magyar, Becker, & Feltz, 2003).

As mentioned in Deborah Feltz’ (2007) definition of SC, an important component is SE. SE is often accredited to Albert Bandura’s work (Bandura, 1997). His research has been the inspiration for a lot of later research on the topic of sport-specific confidence. In his own words, “Perceived self-efficacy refers to beliefs in one’s capabilities to organize and execute the courses of action

required to produce given attainments” (Bandura, 1997, p. 3). This quote assumes that an athlete’s SE beliefs have a greater effect on their motivation, emotions and actions than what is objectively true. SE beliefs are immensely important in choice of behaviors, effort expenditure, perseverance in pursuit of goals, resilience to setbacks and problems, stress level and affect, and also in our ways of thinking about ourselves and others (Bandura, Freeman, & Lightsey, 1999).

Sport confidence is defined as “*the belief or degree of certainty individuals possess about their ability to be successful in sport*” (Vealey, 1986, p. 222). Vealey coins the term “competitive orientation” to define what constitutes success in relation to sport confidence. The competitive orientation should reflect an athlete’s belief that attainment of a certain type of goal demonstrates competence and success (Vealey, 1986). On this rationale, the main goals upon which competitive orientation is based on are winning and performing well. It is without a doubt possible for an athlete to pursue both of these at these goals simultaneously. Athletes usually strive to perform well and win at the same time.

A term related to SC is perceived competence. This refers to an athlete’s perception of how much ability they have in their own domain (e.g. football). This differs from SC with the definition that SC focuses on people’s beliefs about what they can do with the skills that they have (Knight, Harwood, & Gould, 2017).

The importance of high levels of SC in sports development and high-level performance is thoroughly researched and documented (George, 1994; Hatzigeorgiadis, Zourbanos, Mpoumpaki, & Theodorakis, 2009; Martin & Gill, 1995; Miller, 1993; Rodrigo, Lusiardo, & Pereira, 1990; Treasure, Monson, & Lox, 1996; Weiss, Wiese, & Klint, 1989; Woodman & Hardy, 2003). Reviewing Bandura’s SE theory, one can understand the relationship between high SC and increased levels of performance more clearly (Bandura, 1997). This theory states that young athletes’ behavior, thinking, and emotional responses are influenced by their level of SC. Levels of SC or EC influence the motivation of the choices young athletes make, how much effort they expend, the persistence they show in the face of adversity and the resilience in how they rebound from failure. Athletes high in SC and PC tend to engage in more productive attributional patterns, by attributing their success to internal and controllable factors, and their failures to uncontrollable and changeable factors (Chase, 2001; Vealey, 1986; Vealey & Campbell, 1988).

Although high levels of SC are regarded as one of the most facilitating psychological attribute for increasing sports performance (Beaumont, Maynard, & Butt, 2015; Hays, Thomas, Maynard, & Bawden, 2009; Vealey, Garner-Holman, Hayashi, & Giacobbi, 1998), there are also studies discussing the problem of “over-confidence”(Hofseth, Toering, Jordet, & Ivarsson, 2017; Johnson & Fowler, 2011). Over-confidence occurs when the perceived competence of an athlete is higher than the actual skill level (reported by experts e.g. coaches). Specifically, in soccer, Hofseth et. al. (2017) researched the detrimental relationship between over-confidence and future performance. There is a tendency that many youth soccer players overestimate their skills (Kontos, 2004). This study demonstrates that to be successful in sports, it is essential to have a realistic and accurate evaluation of one’s skill level. The rationale of Johnson and Fowler (2011) relies heavily on Vealey (1986) and her conceptualization of sport confidence.

The concept of self-talk as a beneficial concept for humans comes mainly from the domain of cognitive-behavioral therapy. The idea of changing individuals’ thoughts, interpretations and behaviors have led to various methods of psychological treatment (Hatzigeorgiadis, Zourbanos, Galanis, & Theodorakis, 2011). Self-instructional training is the dominant method of therapy deriving from this theory (Meichenbaum, 1977). Meichenbaum (1977) suggested that statements addressed to oneself can regulate behavioral performance. This has been supported by Rokke and Rehm (2001) who claim that self-instructional training helps the learning of new skills and enhancing performance. It can then be defined as a form of self-management (Rokke & Rehm, 2001).

Albert Ellis (1996) describes an ABC of self-talk from an emotive behavior therapy perspective, but it is highly transferrable to the world of sports. In every situation requiring self-talk there is an activating event (A). An activating event can be player needing to make a crucial decision to lunge in for a tackle, or having to execute the winning penalty kick in a cup final. Activating events will lead to cognitive consequences (C). Negative consequences include emotions (e. g. anxiety) and disruptive behaviors (e. g. poor concentration, bad execution). Beneficial consequences would include positive emotions (e. g. challenge, excitement) and helpful behaviors (e. g. better concentration, anticipation). The last point comes in between A and C. The B stands for the athlete’s beliefs. An athlete’s beliefs are what determine the interpretation of the activating event, and the interpretation determines the following emotions and behavior to a

much greater extent than the activating event itself. The basic principle of self-talk is that an athlete cannot control what happens, but she can control how she responds to uncontrollable events.

The empirical research on self-talk categorizes into two broad dimensions, where the cues are described as either instructional or motivational. Motivational self-talk techniques aim to psych up the athlete (e.g., “let’s go”), maximize effort (e.g., “Let’s give it everything we got”), build confidence (e.g., “I can do this”) and create positive moods (e.g., “I feel ready”) (Mallett & Hanrahan, 1997; Van Raalte, Brewer, Lewis, & Linder, 1995). Instructional self-talk techniques provide instructions to technical aspects of the game (e.g., “follow through on the pass”), strategy (e.g., “attack”), or kinesthetic attributes of a skill (e.g., “explosive”) (Rushall, Hall, Roux, Sasseville, & Rushall, 1988; Ziegler, 1987).

There is robust evidence that self-talk can have a facilitating effect on performance, and the choice of self-talk cues is essential (Hatzigeorgiadis, Theodorakis, & Zourbanos, 2004; Theodorakis, Hatzigeorgiadis, & Chroni, 2008; Theodorakis, Weinberg, Natsis, Douma, & Kazakas, 2000). Theodorakis et al. (2008) investigated the functions of self-talk (“*i.e. the mechanisms through which self-talk facilitates performance*” (Theodorakis et al., 2008, p. 349)). They identified five relevant dimensions, and suggests that self-talk can facilitate performance by enhancing attentional focus, increasing confidence, regulating effort, controlling cognitive and emotional reactions and triggering automatic execution.

2.2.4 Construct 4: Energy management

All items from construct 4: energy management

1. *I don't become stressed in a negative way during a match*
 2. *I quickly recognize if my arousal level has grown too high*
 3. *High levels of stress don't negatively affect my performance*
 4. *I know if my arousal level is too low or too high*
 5. *If you ask my coach, he/she will say that I am good at regulating my arousal level*
 6. *Compared to my strongest opponents, I control my arousal level well*
 7. *I know what situations that affects my arousal negatively, and I know how to handle it*
-

Energy management refers to an athlete's ability to adjust his or hers mental arousal before, during and after a performance. Early research on the concept of arousal and motor performance were dominated by two main theories. The two main hypotheses were drive theory (Hull, 1943; Spence, 1951) and the inverted-U hypothesis (Yerkes & Dodson, 1908). Drive theory was discarded on lack of ability to support its predictions and anecdotal evidence suggests that it should be rejected, because excessive arousal or anxiety can lead to disrupted performance (Landers, 1980; Martens, 1971).

The inverted U-hypothesis suggests that increases in arousal are positively related to improved performance until an optimal level is reached, until further increases will lead to negative performance (Duffy, 1941, 1957, 1962; Klavora, 1979; Landers, 1980; Martens, 1974; Oxendine, 1970; Singer, 1982).

"In actuality, the inverted-U hypothesis is not an explanation for the arousal-performance relationship; it merely posits that this relationship is curvilinear without explaining what internal state or process produces it" (Landers, 1980, p. 78). This quote explains the ambiguity that exists relating to whether the hypothesis is correlational or causal (Neiss, 1988).

Recent research and anecdotal evidence is more nuanced in the way they look at arousal. There is no longer a prevailing view that there is a gold standard for arousal, rather that it is highly individual. Arousal and anxiety can both be either destructive or beneficial for performance (Horn & Smith, 2018).

2.2.5 Construct 5: Concentration

All items from construct 5: concentration

1. *I rarely lose concentration when I'm performing*
 2. *I regain correct focus quickly if I get distracted*
 3. *My concentration skill is very good compared to my opponents*
 4. *I maintain a high level of concentration during the entire match*
 5. *If you ask my coach, he/she will say that I am good at staying concentrated during training*
 6. *I am rarely distracted by negative thoughts*
 7. *I am good at regaining focus when situations change unpredictably*
-

Factors relating to concentration are critical to achieve success in sports, in the sense of being able to focus on the task at hand, blocking external distractions and to be able to regain concentration and control after unpredictable events (Abernethy, Wood, & Parks, 1999; Gray, 2004; Krane & Williams, 2006; Moran, 2016). The feeling of complete immersion in an activity, which has been defined in sports psychology as “flow” is what this sports-specific concentration is related to (Csikszentmihalyi, 1997; Eteke et al., 2018; Jackson & Csikszentmihalyi, 1999).

To concentrate or to be attentive is the process of the consciousness' direction towards the information available to the senses. The consciousness is constantly being bombarded by different stimuli, both internally and externally. For a footballer, it is essential to be able to master the different directional techniques of concentration (Weiss, Reber, & Owen, 2008). Concentration has been defined to exist along two different dimensions; width (wide or narrow) and direction (internal or external). The width refers to how many different stimuli or information is relevant in a given moment. A footballer taking a free kick needs to focus on the contact with the ball to be able to place it where he needs to. This example would be a narrow width of attention. The situation will be extremely different in open play, with teammates and opponents moving in potentially unpredictable patterns, and the image can change in the split of a second. This needs a wide width of attention, to be able to perceive all the relevant cues that lead to the correct action. The direction of attention refers to a player's ability to listen to internal and external cues. This leads to a choice of strategy.

Reading the paragraph above, it is clear that the ability to master both dimensions is essential, and to be able to change between the continuum of both at any given moment to be able to perform at a high level.

2.2.6 Construct 6: Goal Setting & Motivation

All items from construct 6: goal setting & motivation

1. *I am good at motivating myself*
2. *I know what it takes to reach my goals and I am willing to do what is needed to reach them*
3. *I evaluate every match and practice based on my own development goals*
4. *I strongly want to succeed in football*
5. *Setting clear goals for each exercise helps me perform better in training*
6. *I prioritize football more than anything else, so I can become as good as possible*
7. *I know in what areas I have to improve in order to reach my goals, and I am determined to prioritize the training of these skills*

In sports psychology, and psychology in general, motivation is one of the most debated and researched topics (Ford, 1992; Pardee, 1990; Wiersma, 1992). Roberts, Treasure and Conroy defines motivational processes as “the psychological constructs that *energize, direct and regulate* achievement behavior (Roberts, Treasure, & Conroy, 2007, p. 3). They place motivation theories as being on a continuum ranging from deterministic to mechanistic to organismic to cognitive. The more recent theories on motivation as defined and researched by Albert Bandura, Edward L. Deci, Richard M. Ryan, Carol S. Dweck, and John G. Nicholls show a more organismic and social-cognitive trend. Here the human is an active participant in decision making and in planning achievement behavior (Bandura, 1986; Deci & Ryan, 1985; Dweck & Leggett, 1988; Nicholls, 1984).

The theory behind goal setting as a performance indicator is accredited to Edwin Locke and Gary Latham in modern times (Locke & Latham, 1994), although they are clearly influenced by Thomas Ryan (Ryan, 1970) and Kurt Lewin (Lewin, Dembo, Festinger, & Sears, 1944). Locke

and Latham have taken it further, and uses it as a research are to show how goal setting effects performance (Locke & Latham, 1990).

Locke initially hypothesized that higher levels of intended achievement would contribute to higher levels of performance, as well as higher standards of performance and specific goals would lead to better performance (Locke, 1966).

Locke and Latham (Locke & Latham, 1994) give goals two main attributes – content and intensity. The content refers to what is being done and what result is expected or sought. The intensity of the goal relates to the level of importance it has to the individual. Goal content is more directing in nature, and it regulates energy expenditure because different goals require different amounts of effort. The intensity of goals can influence the direction and level of effort. Important goals are more likely to be accepted, and will evoke more persistent striving to reach them.

The predominant motivation theory in sports psychology is the achievement goal theory, where achievement is defined as “*the attainment of a personally or socially valued achievement goal that has meaning for the person in a physical activity context*” (Roberts et al., 2007, pp. 3-4). This theory relates strongly to the last chapter about goal setting, in the sense that it is the goals that creates the motivation and the subjectively assessed success or failure of the goal is crucial to sustain and feed motivation (Maehr & Nicholls, 1980; Spink & Roberts, 1980).

The acceptance of goals is paramount in every area of performance, but especially in sports. In most cases acceptance relies on the perceived difficulty related to perceived ability of an individual or a group.

3. Methods

The purpose of this study was to examine the factor structure and validate the effectiveness of the MST -f-questionnaire (Pensgaard & Hollingen, 2005), among a sample of Norwegian high performance athletes (n=8) and soldiers (n=8), but mainly football players (n=237). The data from the questionnaire were collected and protected by SurveyXact. The study contained no collection of sensitive data of any sort and was anonymous. Approval was granted by NSD (Norwegian centre for research data) (Appendix C).

3.1 Recruitment and procedure

Initially, recruitment was done by direct contact to club leaders in the chosen divisions by e-mail. A hyperlink was provided in the e-mail, with a description of the study, for the leaders to re-distribute to their respective players (Appendix D). In order to expand the sample size to improve statistical power, we decided to add completed questionnaires from elite athletes collected in previous research done by Anne Marte Pensgaard to expand the basis for validation.

The MST-f questionnaire was distributed as an on-line questionnaire (SurveyExact) directly to the clubs, who distributed it to the players. Through this there was minimal direct contact between the researcher and the subjects. The questionnaire did not contain sensitive information, and consent was regarded as given if the subjects finished the questionnaire. It was communicated to the clubs that they were not allowed to regard this as mandatory for any player. If the clubs suggested to the players that it is mandatory, a personal consent would not be valid.

3.2 Population

The selection body consisted of professional, semi-professional and amateur male footballers in first team squads ranging through the top four levels of the Norwegian football division system, as well as top tier female football players and representatives from cross country skiing and the Norwegian Air Defence. The only criterion was that the clubs regard their respective players as first team members, regardless of contractual obligations. Age was not a criterion for exclusion, unless in the unlikely situation that players under the age of 16 are permanent members of a first team squad. The expected age range was between 16 and 40 years old.

In total 253 individuals (football, $n = 237$; 182 male and 55 female; cross country skiing, $n = 8$; Norwegian Air Defence, $n=8$) answered one or more statements of the questionnaire. 203 participants completed the full questionnaire. Incomplete questionnaires ($n=50$) were treated as dropouts and removed from the analysis.

3.3 Measuring instrument

The MST-f questionnaire consisted of 42 items divided into six categories. The six categories were *Match Preparation*, *Visualization*, *Self-talk and Self-confidence*, *Energy Management*, *Concentration and Goal setting and Motivation*. Seven items were related to each category where the participants answered using a 10-point LIKERT scale. The anchor statements were 1=completely agree, and 10=strongly disagree. In this case, the lower the score, the higher the

proficiency of the athlete. The maximum score for each factor was 7 and the lowest score was 70.

3.4 Pilot test

A pilot test was conducted beforehand on a similar demographic (both male and female football players between 18-30 years old), to test the comprehensibility of the items of the questionnaire and the ease of overall administration of the questionnaire. The pilot was conducted in the same manner as the full study, using SurveyXact online questionnaire.

The pilot questionnaire was completed by 7 individuals (6 males, 1 female; age 21-30 years). All participants played at a local level (county). The choice of a county-level team was made for practical reasons. They were asked to mainly provide feedback on the level of difficulty in completing the online questionnaire but were also encouraged to provide feedback on the comprehensibility of the statements of the questionnaire.

The feedback was exclusively positive in regard to the completion of the questionnaire. Some questions were asked about some of the statements in the questionnaire; mainly the questions related to “If you ask my coach...” (Statements 28 and 29), and “I have clear tasks during a match” (Statement 1). It was, however, decided to keep the original statements in the full study.

3.5 Ethics

There were no particular ethical dilemmas related to this study, as far as we could see. Consent was given through the voluntary participation of every individual. The questionnaire did not have the potential to reveal any sensitive information about the individual. Data was anonymous to the extent that the only revealing information was the division a player belonged to this season. No info of club affiliation was requested or processed; hence data could not be traced back to the individual player.

All the questions in the questionnaire were directly related to each individual role as a footballer, or athlete, and not how they are as persons. The questionnaire was related to their sport performances and was not concerned with their “daily lives”.

Since the majority of the data was collected without the direct presence of the researcher, it is unlikely that the information was forced or influenced in any degree. It was collected in their own time at their own pace, and by their own volition.

4. Results

The Statistical Package for the Social Sciences (IBM SPSS Statistics 25) was used for all statistical analyses. The purpose was to examine the factor structure of MST-f questionnaire (Pensgaard & Hollingen, 2004). The factor analysis should provide a clear factor structure and highlight the strengths and weaknesses of the MST-f questionnaire (Pensgaard & Hollingen, 2004).

4.1 Exploratory Factor Analysis

Factor analysis is used to reduce a set of variables into fewer variables (Field, 2009). It attempts to measure latent variables; variables that cannot be measured directly. In this case we have the six aforementioned theoretical concepts that needs to be measured indirectly using a set of questionnaire items. Using these six concepts, we try measure the total prowess of each athlete in the mental dimension. The choice of an exploratory factor analysis (EFA), instead of a confirmatory factor analysis (CFA), was made on the basis of scale development and evaluation, as this dissertation in broad terms aims to do. EFA is regarded as more appropriate than CFA for this purpose (Hurley et al., 1997; Morris, 2001; Osborne, Costello, & Kellow, 2008; Tinsley & Tinsley, 1987).

4.1.1 Principal Component Analysis or Factor Analysis

As Principal Component Analysis (PCA) is regarded as only a data reduction method, and it does not take the latent variables into account when computing (Osborne et al., 2008). Because of this shortcoming, the use of PCA is not recommended in psychological research (Bentler & Kano, 1990; Floyd & Widaman, 1995; Ford, MacCallum, & Tait, 1986; Gorsuch, 1990). With any dataset, researchers usually have a general idea or assumption on how variables relate to one another. Factor Analysis (FA), on the other hand, aims to reveal these latent variables that cause the covariance between items. Because FA also discriminates between shared and unique variance, it is highly preferable in this case, and is therefore the chosen method of analysis.

4.1.2 Choosing a Factor Extraction Method

SPSS provides six different methods of factor extraction: unweighted least squares, generalized least squares, maximum likelihood, principal axis factoring, alpha factoring and image factoring. Fabrigar, Wegener, MacCallum, and Strahan (1999) suggests using principal axis factoring (PAF) when the assumption of normality is severely violated, as it is in this case (Kolmogorov-

Smirnov, $p < 0,000$ on all items). Because of this significant non-normality, PFA will be the chosen method of factor extraction.

4.1.3 Number of factors retained

In the literature, there are several ways to estimate the number of factors that should be retained during FA. Three ways to analyze how many factors to retain are using Kaiser’s criterion (Kaiser, 1960), parallel analysis (J. L. Horn, 1965), and the scree test (Cattell, 1966). In this regard, each test will have to follow a few set criteria made by the author. Firstly, each factor needs to contain at least five items to be regarded as relevant. Secondly, five items from each theoretically defined construct needs to load on the same factor. And lastly, it needs to be a theoretically sound model.

The default in SPSS is to base the extraction on eigenvalues greater than 1 (Kaiser, 1960). Eigenvalues represent the amount of variation explained by a factor and that an eigenvalue of 1 represents a substantial amount of variation (Field, 2009). Velicer and Jackson (1990) argues that this is a highly inaccurate criterion. Related to this, Field (2009) also argues that with sample sizes below 250 ($n=203$) and with average communalities greater than or equal to 0.6 ($h^2=0.641$) Kaiser’s criterion is not very accurate.

Table 1 shows the proposed factor-solution computed by SPSS, based on Kaiser’s criterion. The table shows that the difference between factor 3 and factor 4 is greater than the difference between factor 4 through 8. This gives an indication that some of the factors might be trivial and should not be retained.

Table 1: Factor-solution computed by SPSS using Kaiser (1960).

Initial factor-solution				
Factor	Initial Eigenvalues			Rotation Sums of Squared Loadings ^a
	Total	% of Variance	Cumulative %	Total
1	14.017	33.375	33.375	8.324
2	3.997	9.516	42.890	2.694
3	3.340	7.953	50.844	2.970
4	1.773	4.222	55.065	4.652
5	1.623	3.863	58.929	7.783
6	1.374	3.272	62.200	6.586
7	1.107	2.637	64.837	4.221
8	1.094	2.604	67.441	6.160

Extraction Method: Principal Axis Factoring.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Table 2 (Appendix E) gives another image on how each of the items load on the different factors. The significance of a factor loading will depend on sample size (Field, 2009). Stevens (2012) produced a table where a factor loading that exceeds 0.364 can be regarded as significant for a sample size of 200. This value of 0.364 has created the baseline for inclusion in the output. Five items do not load on any of the factors (5.2, 3.5, 4.7, 6.1, 2.2), and we have one that loads on two factors (5.3). Osborne et al. (2008) argues that Kaiser's criterion tends to retain too many factors, as seems to be the case here, where only three factors contain more than five items. Although factors 4 and 5 contains exclusively items from the same theoretical construct (the second number indicates which initial theoretical construct each item belongs to; i.e. 1.1 indicates that the item belongs to the match preparation-construct.), which is interesting, the total image of this factor-solution seems to contain too many inconsistencies and trivial factors.

Other evidence suggesting SPSS, through default settings, may have retained too many factors, is shown through an Eigenvalue Monte Carlo-simulation, more commonly known as a parallel analysis (Appendix F). The parallel analysis attempts to recreate and develop new data, using the algorithm of Castellán (1992), based on the raw data. This is also called the permutation approach, where "The permutation approach is testing whether the test statistic for a particular eigenvalue is larger than one would expect assuming a purely random fitness measure, and not necessarily whether an eigenvalue is statistically different from zero" (Reynolds, Childers, & Pajewski, 2010, p. 1078). Table 3 shows that only five factors are retained performing a parallel analysis. The significance of these are indicated when the percentile value exceeds the raw data eigenvalue (Buja & Eyuboglu, 1992). In this case at the sixth factor.

Table 4 (Appendix G) shows the factor loadings of the parallel analysis, and although the problem of trivial factors now is gone (more than five items within each factor), the model is not perfect. There are still many theoretical inconsistencies not explained by this model. Factors 1, 2 and 3 shows some consistencies within the same theoretical constructs (five or more items from the same construct within a factor). Another reason for concern is the number of cross-loadings (9 items) and one with non-significant loading. This also suggests that the model is not entirely satisfactory.

With Kaiser's criterion and parallel analysis being regarded as unsatisfactory, the remain test is the scree test. The scree test involves plotting a graph of each eigenvalue on the Y-axis against

the factor with which it is associated on the X-axis (Cattell, 1966; Field, 2009). The graph then generated is called a scree plot (Appendix H). In this graph it is easy to see each factors' individual importance. Cattell (1966) argues that the cut-off point for selecting factors should be at the point of inflexion of the curve shown in the graph (where the angle changes dramatically). All factors on the left side of the red line, which indicates the point of inflexion will be retained.

Based on the scree plot, it was decided to retain three factors. Table 5 (Appendix I) shows the factor loadings using the same criteria of exclusion (>0.364). Using the set criteria of the thesis, each factor contains more than five items, and at least five items from all theoretical constructs are included in the same factor. The importance of clusters of related items are imperative if one is to create a theoretical framework.

The purpose of factor extraction is that the solution has to be logical, both statistically, visually and theoretically (Osborne et. al., 2008). In this case, a three-factor solution is sound in all three dimensions. In table 5, it is apparent that Self-Talk & Self-Confidence, Energy Management and Concentration is loading towards the same factor, which can be labelled *intrinsic orientations*. Match Preparation and Goal Setting & Motivation can be labelled *intrinsic strategies*, and Imagery can be labelled *intrinsic techniques*.

4.1.4 Choosing factor rotation

Factor rotation discriminates between factors by rotating the factor axes such that variables are loaded maximally to only one factor (Field, 2009). There are two types of factor rotation: *orthogonal rotation* and *oblique rotation*. Orthogonal rotation means rotating factors while making sure that they remain uncorrelated. Oblique rotation, on the other hand, allows correlation between factors. In the social sciences, it is highly improbable to find any factors that do not correlate on any level (Field, 2009), therefore the use of oblique rotations is preferred to avoid loss of value of data (which is a danger with orthogonal rotations) (Osborne et. al., 2008). The choice between different oblique rotations seems to have little importance (Fabrigar et al., 1999). All the data presented above was computed using a *direct oblimin rotation* with the default delta (0).

4.1.5 Sample size

To ascertain whether the data was of adequate size for a factor analysis, there were vaguely conflicting evidence. Field (2009) argues that for a sample size of 100-200, communalities should be over the value of 0.5. In our case ($n=203$), there were five communality values below 0.5 (items 2.2 (.334), 4.2 (.486), 2.3 (.455), 4.3 (.408), 2.4 (.360)). The average value was comforting (.641). Osborne et. al. (2008) sets the minimum value at 0.4. In this case only two communalities fall below that line (2.2 and 2.4).

For an alternative value on the sample size adequacy, a Kaiser-Meyer-Olkin measure (KMO) was made on the data, and was found to be very adequate, $KMO = .906$. Field (2009) regards values exceeding 0.9 as superb. Bartlett's test of sphericity $\chi^2(861) = 5704.258, p < .001$, also indicates that correlations between items were sufficiently large for PAF. The average communality value (.641), the KMO-measure (.906) and Bartlett's test of sphericity ($p < .001$) gives us confidence that the sample size is adequate for PCA.

4.2 Deciding item removal and final factor structure

For the factor structure to be regarded as satisfactory, it needed to be as "clean" as possible. This meant that each item could only significantly load ($> .364$) on one single factor (Field, 2009). Looking at Table 5, this was not the case. Eight items (marked in bold) were regarded as not satisfactory, by either loading significantly on two factors, or not on any of the factors.

The removal of eight items (1.1, 2.2, 2.5, 3.1, 3.3, 4.2, 6.1 & 6.5) provided a structure where all items loaded significantly on at least one factor, while two items loaded on two factors (2.6, 4.7). These were subsequently removed, and this left only one item cross-loading (4.4). Item 4.4 was removed, and table 6 shows the final factor structure with the retained items. In total, eleven items were removed, leaving 31 items.

Table 6: Factor loadings after item removal

Items	Pattern Matrix ^a		
	Factor		
	1	2	3
4.1 I don't become stressed in a negative way during a match	.824		
5.6 I am rarely distracted by negative thoughts	.792		
3.5 I have mostly positive thoughts during matches	.771		
5.1 I rarely lose concentration when I'm performing	.770		
5.7 I am good at regaining focus when situations change unpredictably	.735		
5.2 I regain correct focus quickly if I get distracted	.733		
3.6 My self-confidence is not affected by the strength of my opponents	.728		
3.2 I have confidence in myself in most situations	.691		
4.6 Compared to my strongest opponents, I control my arousal level well	.687		
5.4 I maintain a high level of concentration during the entire match	.651		
3.7 I see difficult situations as challenges	.650		
1.7 I am skilled at getting in the right mindset to feel secure and confident before each match	.588		
5.3 My concentration skill is very good compared to my opponents	.558		
5.5 If you ask my coach, he/she will say that I am good at staying concentrated during training	.530		
4.5 If you ask my coach, he/she will say that I am good at regulating my arousal level	.509		
3.4 I am good at reminding myself of my qualities and strengths	.500		
4.3 High levels of stress don't negatively affect my performance	.374		
6.4 I strongly want to succeed in football		.804	
6.2 I know what it takes to reach my goals and I am willing to do what is needed to reach them		.801	
6.7 I know in what areas I have to improve in order to reach my goals, and I am determined to prioritize the training of these skills		.739	
1.3 I follow my pre-performance routines as closely as possible, because I know this will give me the best possibilities to perform well		.737	
6.3 I evaluate every match and practice based on my own development goals		.700	
1.6 I evaluate every match to learn from them, and to use this experience in future matches		.646	
1.4 I am as prepared for competition as my strongest opponents		.603	
1.5 I perform well because I can rely on my match plan		.578	
6.6 I prioritize football more than anything else, so I can become as good as possible		.510	
2.1 I often use imagery by seeing myself performing		.462	
2.3 When I visualize, I use all senses (sight, hearing, smell, movement and touch)			.735
1.2 I have back-up plans in case my routines during a game gets interrupted			.686
2.4 I often visualize how I could solve different tasks during training			.609
2.7 I am good at visualizing			.590

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 7 iterations.

5. Discussion

In this thesis, the main aim was to explore the adequacy of the factor structure of the MST-f suggested by the authors (Pensgaard & Hollingen, 2004), and to also examine the precision of each item.

Therefore, to that end, the most important points of discussion in this thesis is based around the statistical choices made, how has the factor analysis suggested possible changes of the MST-f - questionnaire and is the new version of the questionnaire more adequate to use or should it be tested further.

In factor analysis, the choice of how many factors to retain is based on several criteria. This thesis explored three different techniques, namely Kaiser's criterion (Kaiser, 1960), parallel analysis (Horn, 1965), and the scree test (Cattell, 1966). Kaiser's criterion (Kaiser, 1960) uses an absolute eigenvalue of 1 as the only criterion for how many factors should be retained. Parallel analysis (Horn, 1965) expands the real data by generating a set number of "fake" data to explore the significance of each factor. The significance of these are indicated when the percentile value exceeds the raw data eigenvalue (Buja & Eyuboglu, 1992).

The last test, the scree test (Cattell, 1966), is more visual, where you look at the graphed eigenvalues. The most prominent point of inflexion, the point where the line changes angle drastically, is where one should start excluding factors as insignificant. This technique ended up being the chosen method on factor rotation, as it seemingly includes the most relevant factors, namely the factors with both the highest eigenvalues but also with the biggest difference in eigenvalue.

The choice was also supported after factor rotation, as it was the only solution that created a satisfactory matrix of items, based on the criteria of item loading ($> .364$), numbers of items per factor and numbers of items from each theoretical construct within each factor.

Although the analysis and the results produced were satisfactory, the main point of concern was the sample size. The techniques used for exploring whether the sample size was satisfactory for factor analysis, was both by using the average value of communalities (Field, 2009) and the Kaiser-Meyer-Olkin measure, together with Bartlett's test of sphericity. All these supported the notion that the sample size was adequate, although Comrey & Lee (1992) classifies a sample size

of 200 as in the middle of poor (n = 100) and good (n= 300). Regardless of this, the tests made (KMO, Bartlett's test of sphericity and the average communalities) gave confidence in the sample size, but it is still a point of concern regarding the reliability of the results. It is clear that the sample size is adequate to say something about the validity of the MST-f-questionnaire, but one cannot exclude the possibility that a larger sample size would have led to different results and different statistical choices. A larger sample size is therefore highly recommended for further analysis.

None of the analytical tools for factor rotation agreed with the proposed solution of six factors. The chosen three-factor solution (Table 5) differs in this regard, but it still seems to capture the same range of psychological characteristics proposed by Pensgaard & Hollingen (2004) and presented in Chapter 2. Factor analysis identifies latent factors within a group of items, but it does not provide us with an interpretation of the meaning of these identified themes.

The factor solution seems to couple different psychological characteristics together, where factor 1 includes self-talk & self-confidence, energy management and concentration. This factor was then named *intrinsic orientations*, because of the partially permanent, "innate" and spontaneous nature of these characteristics. Factor 2 includes match preparation together with goal setting & motivation, which can be explained as *intrinsic strategies*, because of the habitual and strategic nature of these strategies. Factor 3 encompasses only imagery and was named *intrinsic techniques* because of the trainability of this psychological technique. To ascertain whether this division into three factors has value, it is essential to increase the sample size to at least 300+ participants (Comrey & Lee, 1992).

The analysis proposed the exclusion of eleven items. But only one of the three statements mentioned in the pilot as problematic were excluded ("*1.1 I have clear tasks during a match*"). It seems rather random why the given statements were either loading on two factors or on no factor, based on the theory on each subject. This can be also be attributed to the small sample size.

An interesting point is that six statements (more than half) belonged to two theoretical constructs; imagery and energy management. One speculation could be the lack of the participants' understanding of these two concepts, which use a slightly more academic

terminology and requires more practice and a higher level of self-awareness than others. Removing three items from factor three (intrinsic strategies) also creates problems, regarding the relevance of this factor, as each factor should include at least five statements.

These results indicate there is a difference between the initial proposed factor solution and the factor solution provided through the factor analysis. Because of the small sample size, the significance of the difference is still highly uncertain. It can be argued that the length of the questionnaire (42 statements), can be one main issue when talking about the accuracy of the measurement of each statement. The questionnaire is also very diverse in the topics that it tries to measure. On one hand, when every sixth question is related to the same theoretical construct, the variation alone can delay boredom among the participants. However, on the other hand, the sheer length of the questionnaire might do the opposite. When the sample size is not good enough and with the magnitude of the questionnaire, it is hard to argue about the accuracy of each measurement. It could be highly beneficial to provide the questionnaire in six different parts on different occasions to get a more accurate view on each separate theoretical construct. This would discern whether there is a sufficient amount of statements to measure the true value of each skill and prevent boredom. The factor analysis arguably indicates that there might be too many statements in one questionnaire, more than indicating that each statements lack value. Six questionnaires of 7-10 statements might be more accurate than one questionnaire with 40+ statements. This notion is supported by studies that indicate that the quality of the response gets lower in the last part of a long questionnaire (Galesic & Bosnjak, 2009; Herzog & Bachman, 1981).

Comparable mental skills tests in sports exist, and some are shorter than the MST-f-Questionnaire (Pensgaard & Hollingen, 2004), for example the Mental Skills Questionnaire (MSQ) by Bull, Albison and Shambrook (1996). Although this questionnaire is divided into seven factors (imagery, mental preparation, self-confidence, anxiety and worry management, concentration ability, relaxation ability and motivation), it only contains 28 items, with four items related to each factor. A contrast to this is the Psychological Characteristics of Developing Excellence Questionnaire (PCDEQ) (MacNamara & Collins, 2010a, 2010b, 2011) which contains 59 items. In the development and validation of the PCDEQ there were 363 participants, which is well above recommended numbers stated by Andy Field (2009) ($n > 200$). The results indicated,

incidentally, a six-factor solution. These two questionnaires raise more questions regarding the results of this thesis. Both questionnaires indicate that it is highly possible to create valid mental skills tests with more than six theoretical constructs or factors, and that it is possible to have 25+ items in a questionnaire without compromising the validity to a high degree. To compare the three questionnaires (MST-f, MSQ and PCDEQ), they all propose six or more factors, but only two of the tests (MSQ and PCDEQ) have significant results. To obtain six significant factors, the accuracy of each item is essential. One speculation can be that the issue with the MST-f-Questionnaire is not the proposed factor structure, but the accuracy of its items. With that in mind, as mentioned above, the suggestion to provide the MST-f-Questionnaire as six separate questionnaires can be more effective. In this way, with a large enough sample size, one can look more closely into each individual item.

6. Conclusion, future research and implications

In the current study two questions were asked: a) will a factor analysis alter the factor structure of the MST-f-questionnaire (Pensgaard & Hollingen, 2004), and b) will a factor analysis change the number of items retained?

In both cases the answer is inconclusive. The factor analysis indicates both a change in the factor structure, and that the removal of some statements might be beneficial. But with such a small sample size, it can only be regarded as indications. There is a clear need for further studies of the complete questionnaire on a larger population, to say more about the factor structure. To ascertain the value of each statement it might be beneficial to divide the questionnaire into six separate questionnaires.

The factor analysis proposed a three-factor solution which is interesting, and worth further investigation. The current study has provided insight into how different theoretical constructs interact and are separated. Although inconclusive, it has shed light on potential challenges regarding the current factor structure of the MST-f-questionnaire (Pensgaard & Hollingen, 2004).

7. Limitations

The main limitation of the current study was the lack of access to enough subjects. Of a total of 135 clubs contacted, only 203 completed questionnaires were obtained. The total number of attempted recruited athletes were around 2700, which provides a completion rate of under 10%. Limited by both time and economical resources, further attempts of recruiting and completion were not made.

Reference list

- Abernethy, B., Wood, J., & Parks, S. (1999). Can the anticipatory skills of experts be learned by novices? *Research quarterly for exercise and sport*, 70(3), 313-318.
- Bailey, R., & Morley, D. (2006). Towards a model of talent development in physical education. *Sport, education and society*, 11(3), 211-230.
- Bandura, A. (1986). Social foundation of thought and action: A social cognitive theory. 1986. *Englewoods Cliffs: NJ: Prentice Hall Google Scholar*.
- Bandura, A. (1997). *Self-Efficacy: The Exercise of Control*. New York, NY: Freeman.
- Bandura, A., Freeman, W., & Lightsey, R. (1999). Self-efficacy: The exercise of control. In: Springer.
- Beaumont, C., Maynard, I. W., & Butt, J. (2015). Effective ways to develop and maintain robust sport-confidence: Strategies advocated by sport psychology consultants. *Journal of Applied Sport Psychology*, 27(3), 301-318.
- Bentler, P. M., & Kano, Y. (1990). On the equivalence of factors and components. *Multivariate Behavioral Research*, 25(1), 67-74.
- Besharat, M. A., & Pourbohloul, S. (2011). Moderating effects of self-confidence and sport self-efficacy on the relationship between competitive anxiety and sport performance. *Psychology*, 2(7), 760.
- Bleak, J. L., & Frederick, C. M. (1998). Superstitious behavior in sport: Levels of effectiveness and determinants of use in three collegiate sports. *Journal of Sport Behavior*, 21(1), 1.
- Bloom, B. S., & Sosniak, L. A. (1985). *Developing talent in young people*: Ballantine Books.
- Bray, S. R., & Brawley, L. R. (2002). Role efficacy, role clarity, and role performance effectiveness. *Small Group Research*, 33(2), 233-253.
- Bray, S. R., Brawley, L. R., & Carron, A. V. (2002). Efficacy for interdependent role functions: Evidence from the sport domain. *Small Group Research*, 33(6), 644-666.
- Buhrmann, H., Brown, B., & Zaugg, M. (1982). Superstitious beliefs and behavior: A comparison of male and female basketball players. *Journal of Sport Behavior*, 5(4), 175.
- Buja, A., & Eyuboglu, N. (1992). Remarks on parallel analysis. *Multivariate Behavioral Research*, 27(4), 509-540.
- Bull, S. J., Albinson, J. G., & Shambrook, C. J. (1996). *The mental game plan: Getting psyched for sport*. Sports Dynamics.
- Castellan, N. J. (1992). Shuffling arrays: Appearances may be deceiving. *Behavior Research Methods, Instruments, & Computers*, 24(1), 72-77. doi:10.3758/bf03203474
- Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral Research*, 1(2), 245-276.
- Chase, M. A. (2001). Children's self-efficacy, motivational intentions, and attributions in physical education and sport. *Research quarterly for exercise and sport*, 72(1), 47-54.
- Collins, D., & MacNamara, Á. (2012). The rocky road to the top. *Sports medicine*, 42(11), 907-914.
- Comrey, A., & Lee, H. (1992). Interpretation and application of factor analytic results. *Comrey AL, Lee HB. A first course in factor analysis*, 2, 1992.
- Craft, L. L., Magyar, T. M., Becker, B. J., & Feltz, D. L. (2003). The relationship between the Competitive State Anxiety Inventory-2 and sport performance: A meta-analysis. *Journal of sport and exercise psychology*, 25(1), 44-65.
- Csikszentmihalyi, M. (1997). Flow and the psychology of discovery and invention. *HarperPerennial, New York*, 39.

- Deci, E., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*: Springer Science & Business Media.
- Duffy, E. (1941). The conceptual categories of psychology; a suggestion for revision. *Psychological review*, 48(3), 177.
- Duffy, E. (1957). The psychological significance of the concept of "arousal" or "activation.". *Psychological review*, 64(5), 265.
- Duffy, E. (1962). *Activation and behavior*. New York: Wiley.
- Durand-Bush, N., & Salmela, J. H. (2002). The development and maintenance of expert athletic performance: Perceptions of world and Olympic champions. *Journal of Applied Sport Psychology*, 14(3), 154-171.
- Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological review*, 95(2), 256.
- Ellis, A. (1996). *Better, deeper, and more enduring brief therapy: The rational emotive behavior therapy approach*. New York: Brunner/Mazel.
- Eteke, C., Havlucu, H., Kırbaç, N. İ., Onbaşı, M. C., Coşkun, A., Eskenazi, T., . . . Akgün, B. (2018). Flow From Motion: A Deep Learning Approach. *arXiv preprint arXiv:1803.09689*.
- Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological methods*, 4(3), 272.
- Feltz, D. L. (2007). Self-confidence and sports performance. *studies*, 33(41), 50-66.
- Field, A. (2009). *Discovering Statistics Using SPSS*, Third Edition. In: sage publications.
- Fletcher, D., & Fletcher, J. (2005). A meta-model of stress, emotions and performance: Conceptual foundations, theoretical framework, and research directions. *Journal of Sports Sciences*, 23(2), 157-158.
- Floyd, F. J., & Widaman, K. F. (1995). Factor analysis in the development and refinement of clinical assessment instruments. *Psychological assessment*, 7(3), 286.
- Ford, J. K., MacCallum, R. C., & Tait, M. (1986). The application of exploratory factor analysis in applied psychology: A critical review and analysis. *Personnel psychology*, 39(2), 291-314.
- Ford, M. E. (1992). *Motivating humans: Goals, emotions, and personal agency beliefs*: Sage.
- Galesic, M., & Bosnjak, M. (2009). Effects of questionnaire length on participation and indicators of response quality in a web survey. *Public opinion quarterly*, 73(2), 349-360.
- George, T. R. (1994). Self-confidence and baseball performance: A causal examination of self-efficacy theory. *Journal of sport and exercise psychology*, 16(4), 381-399.
- Gorsuch, R. L. (1990). Common factor analysis versus component analysis: Some well and little known facts. *Multivariate Behavioral Research*, 25(1), 33-39.
- Gould, D., Dieffenbach, K., & Moffett, A. (2002). Psychological characteristics and their development in Olympic champions. *Journal of Applied Sport Psychology*, 14(3), 172-204.
- Gray, R. (2004). Attending to the execution of a complex sensorimotor skill: expertise differences, choking, and slumps. *Journal of Experimental Psychology: Applied*, 10(1), 42.
- Hanton, S., & Connaughton, D. (2002). Perceived control of anxiety and its relationship to self-confidence and performance. *Research quarterly for exercise and sport*, 73(1), 87-97.

- Hanton, S., O'Brien, M., & Mellalieu, S. D. (2003). Individual differences, perceived control and competitive trait anxiety. *Journal of Sport Behaviour*, 26(1), 39-55.
- Hatzigeorgiadis, A., Theodorakis, Y., & Zourbanos, N. (2004). Self-talk in the swimming pool: The effects of self-talk on thought content and performance on water-polo tasks. *Journal of Applied Sport Psychology*, 16(2), 138-150.
- Hatzigeorgiadis, A., Zourbanos, N., Galanis, E., & Theodorakis, Y. (2011). Self-talk and sports performance: A meta-analysis. *Perspectives on Psychological Science*, 6(4), 348-356.
- Hatzigeorgiadis, A., Zourbanos, N., Mpoumpaki, S., & Theodorakis, Y. (2009). Mechanisms underlying the self-talk–performance relationship: The effects of motivational self-talk on self-confidence and anxiety. *Psychology of Sport and Exercise*, 10(1), 186-192.
- Hays, K., Thomas, O., Maynard, I., & Bawden, M. (2009). The role of confidence in world-class sport performance. *Journal of sports sciences*, 27(11), 1185-1199.
- Herzog, A. R., & Bachman, J. G. (1981). Effects of questionnaire length on response quality. *Public opinion quarterly*, 45(4), 549-559.
- Hofseth, E., Toering, T., Jordet, G., & Ivarsson, A. (2017). Self-evaluation of skills and performance level in youth elite soccer: Are positive self-evaluations always positive? *Sport, Exercise, and Performance Psychology*, 6(4), 370.
- Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika*, 30(2), 179-185.
- Horn, T., & Smith, A. (2018). *Advances in Sport and Exercise Psychology, 4E: Human Kinetics*.
- Hull, C. (1943). Principles of behavior.
- Hurley, A. E., Scandura, T. A., Schriesheim, C. A., Brannick, M. T., Seers, A., Vandenberg, R. J., & Williams, L. J. (1997). Exploratory and confirmatory factor analysis: Guidelines, issues, and alternatives. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior*, 18(6), 667-683.
- Jackson, S. A., & Csikszentmihalyi, M. (1999). *Flow in sports: Human Kinetics*.
- Johnson, D. D., & Fowler, J. H. (2011). The evolution of overconfidence. *Nature*, 477(7364), 317.
- Jones, G. (1995). More than just a game: Research developments and issues in competitive anxiety in sport. *British journal of psychology*, 86(4), 449-478.
- Jones, G., & Hanton, S. (2001). Pre-competitive feeling states and directional anxiety interpretations. *Journal of sports sciences*, 19(6), 385-395.
- Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and psychological measurement*, 20(1), 141-151.
- Kizildag, E., & Tiryaki, M. Ş. (2012). Imagery use of athletes in individual and team sports that require open and closed skill. *Perceptual and motor skills*, 114(3), 748-756.
- Klavora, P. (1979). Customary arousal for peak athletic performance. In P. Klavora. & J. V. Daniel. (Eds.), *Coach, athlete, and the sport psychologist*. Champaign, IL: Human Kinetics Publishers.
- Knight, C. J., Harwood, C. G., & Gould, D. (2017). *Sport psychology for young athletes: Routledge*.
- Kontos, A. P. (2004). Perceived risk, risk taking, estimation of ability and injury among adolescent sport participants. *Journal of pediatric psychology*, 29(6), 447-455.

- Krane, V., & Williams, J. (2006). Psychological characteristics of peak performance. *Applied sport psychology: Personal growth to peak performance*, 5, 207-227.
- Kreiner-Phillips, K., & Orlick, T. (1993). Winning after winning: The psychology of ongoing excellence. *The Sport Psychologist*, 7(1), 31-48.
- Landers, D. M. (1980). The arousal-performance relationship revisited. *Research quarterly for exercise and sport*, 51(1), 77-90.
- Levy, A. R., Perry, J., Nicholls, A. R., Larkin, D., & Davies, J. (2015). Sources of sport confidence, imagery type and performance among competitive athletes: the mediating role of sports confidence. *The Journal of sports medicine and physical fitness*, 55(7-8), 835-844.
- Lewin, K., Dembo, T., Festinger, L., & Sears, P. S. (1944). Level of aspiration.
- Locke, E., & Latham, G. (1994). Goal-setting theory. *Organizational Behavior 1: Essential Theories of Motivation and Leadership*, 159-183.
- Locke, E. A. (1966). The relationship of intentions to level of performance. *Journal of Applied Psychology*, 50(1), 60.
- Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting & task performance*: Prentice-Hall, Inc.
- MacNamara, Á., Button, A., & Collins, D. (2010a). The role of psychological characteristics in facilitating the pathway to elite performance part 1: Identifying mental skills and behaviors. *The Sport Psychologist*, 24(1), 52-73.
- MacNamara, Á., Button, A., & Collins, D. (2010). The role of psychological characteristics in facilitating the pathway to elite performance part 2: Examining environmental and stage-related differences in skills and behaviors. *The sport psychologist*, 24(1), 74-96.
- MacNamara, A., & Collins, D. J. (2011). Development and initial validation of the Psychological Characteristics of Developing Excellence Questionnaire. *Journal of Sports Sciences*, 29(12), 1273-1286. doi:10.1080/02640414.2011.589468
- Maehr, M., & Nicholls, J. (1980). Culture and achievement motivation: A second look. *N. Warren (Ed.), Studies in cross cultural psychology*, 221-267.
- Mallett, C. J., & Hanrahan, S. J. (1997). Race modeling: An effective cognitive strategy for the 100 m sprinter? *The Sport Psychologist*, 11(1), 72-85.
- Martens, R. (1971). Anxiety and motor behavior: A review. *Journal of Motor Behavior*, 3(2), 151-179.
- Martens, R. (1974). Arousal and motor performance. In J. H. Wilmore. (Ed.), *Exercise and sport science reviews* (Vol. 2). New York: Academic Press.
- Martin, J. J., & Gill, D. L. (1995). The relationships of competitive orientations and self-efficacy to goal importance, thoughts, and performance in high school distance runners. *Journal of Applied Sport Psychology*, 7(1), 50-62.
- Meichenbaum, D. (1977). Cognitive behaviour modification. *Cognitive Behaviour Therapy*, 6(4), 185-192.
- Meland, A. (2016). Mindfulness in High Performance Environments.
- Miller, M. (1993). Efficacy strength and performance in competitive swimmers of different skill levels. *International Journal of Sport Psychology*.
- Miller, S. D., Chow, D., Wampold, B. E., Hubble, M. A., Del Re, A., Maeschalck, C., & Bargmann, S. (2018). To be or not to be (an expert)? Revisiting the role of deliberate practice in improving performance. *High Ability Studies*, 1-11.

- Moran, A. P. (2016). *The psychology of concentration in sport performers: A cognitive analysis*: Psychology Press.
- Morris, S. B. (2001). Sample size required for adverse impact analysis. *Applied HRM Research*, 6(1-2), 13-32.
- Neiss, R. (1988). Reconceptualizing arousal: psychobiological states in motor performance. *Psychological bulletin*, 103(3), 345.
- Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. *Psychological review*, 91(3), 328.
- Ntoumanis, N., & Jones, G. (1998). Interpretation of competitive trait anxiety symptoms as a function of locus of control beliefs. *International Journal of Sport Psychology*, 29, 99-114.
- Orlick, T., & Partington, J. (1988). Mental links to excellence. *The Sport Psychologist*, 2(2), 105-130.
- Osborne, J. W., Costello, A. B., & Kellow, J. T. (2008). Best practices in exploratory factor analysis. *Best practices in quantitative methods*, 86-99.
- Oxendine, J. B. (1970). Emotional arousal and motor performance. *Quest*, 13(1), 23-32.
- Pardee, R. L. (1990). Motivation Theories of Maslow, Herzberg, McGregor & McClelland. A Literature Review of Selected Theories Dealing with Job Satisfaction and Motivation.
- Paulus, M. P., Flagan, T., Simmons, A. N., Gillis, K., Kotturi, S., Thom, N., . . . Swain, J. L. (2012). Subjecting elite athletes to inspiratory breathing load reveals behavioral and neural signatures of optimal performers in extreme environments. *PloS one*, 7(1), e29394.
- Pensgaard, A. M., & Hollingen, E. (2004). *Mental ferdighetstest - Fotball*. Norwegian School of Sports Sciences. Oslo.
- Pensgaard, A. M., & Hollingen, E. (2005). *Mental ferdighetstest - fotball*. Idrettens Mentale Treningslære.
- Renzulli, J. S. (1986). The three-ring conception of giftedness: A developmental model for creative productivity. In R. J. Sternberg & J. Davidson (Eds.), *Conceptions of Giftedness* (pp. 53-92). New York: Cambridge University Press.
- Reynolds, R. J., Childers, D. K., & Pajewski, N. M. (2010). The distribution and hypothesis testing of eigenvalues from the canonical analysis of the gamma matrix of quadratic and correlational selection gradients. *Evolution: International Journal of Organic Evolution*, 64(4), 1076-1085.
- Ridderinkhof, K. R., & Brass, M. (2015). How Kinesthetic Motor Imagery works: a predictive-processing theory of visualization in sports and motor expertise. *Journal of Physiology-Paris*, 109(1-3), 53-63.
- Robazza, C., & Bortoli, L. (2007). Perceived impact of anger and anxiety on sporting performance in rugby players. *Psychology of Sport and Exercise*, 8(6), 875-896.
- Roberts, G. C., Treasure, D. C., & Conroy, D. E. (2007). Understanding the dynamics of motivation in sport and physical activity: An achievement goal interpretation.
- Rodrigo, G., Lusiardo, M., & Pereira, G. (1990). Relationship between anxiety and performance in soccer players. *International Journal of Sport Psychology*.
- Rogers, R. G. (2006). Mental practice and acquisition of motor skills: examples from sports training and surgical education. *Obstetrics and Gynecology Clinics*, 33(2), 297-304.
- Rokke, P. D., & Rehm, L. R. (2001). Self-management therapies. In K. S. Dobson (Ed.), *Handbook of cognitive-behavioral therapies* (pp. 173-210). New York: Guilford Press.

- Rushall, B. S., Hall, M., Roux, L., Sasseville, J., & Rushall, A. C. (1988). Effects of three types of thought content instructions on skiing performance. *The Sport Psychologist*, 2(4), 283-297.
- Ryan, T. A. (1970). *Intentional behavior: An approach to human motivation*.
- Schoon, I. (2000). Towards a dynamic-interactive model of talent development: A Life-Span Perspective. In K. A. Heller, F. J. Mönks, R. Sternberg, & R. Subotnik (Eds.), *International Handbook of Giftedness and Talent*. Oxford: Pergamon Press.
- Singer, & Orbach. (1999). Persistence, excellence, and fulfilment. In R. Lidor & M. Bar-Eli (Eds.), *Sport psychology: linking theory and practice* (pp. 167-191). Morgantown: Bookcrafters.
- Singer, R. N. (1982). Thought processes and emotions in sport. *The Physician and sportsmedicine*, 10(7), 75-88.
- Skinner, E. A. (1995). *Perceived control, motivation, & coping* (Vol. 8): Sage.
- Skinner, E. A. (1996). A guide to constructs of control. *Journal of personality and social psychology*, 71(3), 549.
- Spence, K. W. (1951). Theoretical interpretations of learning In S. S. Stevens (Ed.), *Handbook of experimental psychology*. New York: Wiley
- Spink, K. S., & Roberts, G. C. (1980). Ambiguity of outcome and causal attributions. *Journal of sport psychology*, 2(3), 237-244.
- Stevens, J. P. (2012). *Applied multivariate statistics for the social sciences*: Routledge.
- Suinn, R. M. (1994). Visualization in sports. *Imagery in sports and physical performance*, 23-42.
- Theodorakis, Y., Hatzigeorgiadis, A., & Chroni, S. (2008). Self-talk: It works, but how? Development and preliminary validation of the functions of self-talk questionnaire. *Measurement in Physical education and exercise Science*, 12(1), 10-30.
- Theodorakis, Y., Weinberg, R., Natsis, P., Douma, I., & Kazakas, P. (2000). The effects of motivational versus instructional self-talk on improving motor performance. *The Sport Psychologist*, 14(3), 253-271.
- Tinsley, H. E., & Tinsley, D. J. (1987). Uses of factor analysis in counseling psychology research. *Journal of counseling psychology*, 34(4), 414.
- Treasure, D. C., Monson, J., & Lox, C. L. (1996). Relationship between self-efficacy, wrestling performance, and affect prior to competition. *The Sport Psychologist*, 10(1), 73-83.
- Van Raalte, J. L., Brewer, B. W., Lewis, B. P., & Linder, D. E. (1995). Cork! The effects of positive and negative self-talk on dart throwing performance. *Journal of Sport Behavior*, 18(1), 50.
- Vealey, R. S. (1986). Conceptualization of sport-confidence and competitive orientation: Preliminary investigation and instrument development. *Journal of sport psychology*, 8(3), 221-246.
- Vealey, R. S., & Campbell, J. L. (1988). Achievement goals of adolescent figure skaters: Impact on self-confidence, anxiety, and performance. *Journal of Adolescent Research*, 3(2), 227-243.
- Vealey, R. S., Garner-Holman, M., Hayashi, S. W., & Giacobbi, P. (1998). Sources of sport-confidence: Conceptualization and instrument development. *Journal of sport and exercise psychology*, 20(1), 54-80.
- Velicer, W. F., & Jackson, D. N. (1990). Component analysis versus common factor analysis: Some further observations. *Multivariate Behavioral Research*, 25(1), 97-114.

- Ward, P., Hodges, N. J., Williams, J. M., & Phillippaerts, R. (2008). Deliberate practice and expert performance: defining the path to excellence. In J. M. Williams & N. J. Hodges (Eds.), *Skill acquisition in sport: research, theory and practice* (pp. 231-258). London: Routledge.
- Waskiewicz, Z., & Zajac, A. (2001). The imagery and motor skills acquisition. *Biology of Sport*, 18(1), 71-83.
- Weinberg, R. (2008). Does imagery work? Effects on performance and mental skills. *Journal of Imagery Research in Sport and Physical Activity*, 3(1).
- Weiss, M. R., Wiese, D. M., & Klint, K. A. (1989). Head over heels with success: The relationship between self-efficacy and performance in competitive youth gymnastics. *Journal of sport and exercise psychology*, 11(4), 444-451.
- Weiss, S. M., Reber, A. S., & Owen, D. R. (2008). The locus of focus: The effect of switching from a preferred to a non-preferred focus of attention. *Journal of sports sciences*, 26(10), 1049-1057.
- Wiersma, U. J. (1992). The effects of extrinsic rewards in intrinsic motivation: A meta-analysis. *Journal of Occupational and Organizational Psychology*, 65(2), 101-114.
- Womack, M. (1992). Why athletes need ritual: A study of magic among professional athletes. In S. Hoffman (Ed.), *Sport and religion* (pp. 191-202). Champaign, IL: Human Kinetics.
- Woodman, T., & Hardy, L. (2003). The relative impact of cognitive anxiety and self-confidence upon sport performance: A meta-analysis. *Journal of sports sciences*, 21(6), 443-457.
- Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of comparative neurology*, 18(5), 459-482.
- Ziegler, S. G. (1987). Effects of stimulus cueing on the acquisition of groundstrokes by beginning tennis players. *Journal of applied behavior analysis*, 20(4), 405-411.

Appendices

Appendix A: Mental ferdighetstest – Fotball (A. Pensgaard & Hollingen, 2004)

Mental ferdighets test - fotball

© 2004 Rettigheter: Anne Marte Pensgaard & Even Hollingen
Revidert januar 2005.

Hvor godt utviklet er dine mentale ferdigheter?

Vurder deg selv ut fra denne skalaen [Enig 1 2 3 4 5 6 7 8 9 10 Uenig]

Sett en ring rundt et tall for hvert spørsmål nedover

1. Min kampplan består av klare arbeidsoppgaver

1 2 3 4 5 6 7 8 9 10

2. Jeg bruker ofte visualisering hvor jeg ser meg selv gjøre gode prestasjoner

1 2 3 4 5 6 7 8 9 10

3. Jeg har stor tro på meg selv som fotballspiller

1 2 3 4 5 6 7 8 9 10

4. Jeg blir sjelden negativt stresset under en kamp

1 2 3 4 5 6 7 8 9 10

5. Jeg er god til å konsentrere meg selv om det er mye forstyrrelser rundt meg

1 2 3 4 5 6 7 8 9 10

6. Jeg er flink til å motivere meg selv

1 2 3 4 5 6 7 8 9 10

7. Jeg har utviklet reserveplaner dersom rutinene jeg ønsker å følge under kampen ikke er gjennomførbare

1 2 3 4 5 6 7 8 9 10

8. Jeg visualiserer ofte at jeg oppnår målene jeg setter meg

1 2 3 4 5 6 7 8 9 10

9. Jeg har god selvtillit i de fleste situasjoner

1 2 3 4 5 6 7 8 9 10

10. Jeg kjenner raskt når spenningsnivået (stressnivået) blir for høyt

1 2 3 4 5 6 7 8 9 10

11. Selv om jeg blir distraheret/forstyrret kan jeg raskt gjenvinne ønsket konsentrasjon

1 2 3 4 5 6 7 8 9 10

12. Jeg vet hva som kreves for å nå mine mål, og jeg er villig til å satse det som trengs for å klare dette

1 2 3 4 5 6 7 8 9 10

13. Rutinene frem til kampstart følger jeg i den grad jeg kan, fordi jeg vet at dette gir meg de beste forutsetninger for å gjøre gode prestasjoner

1 2 3 4 5 6 7 8 9 10

14. Når jeg visualiserer bruker jeg alle sanser (ser, hører, lukter, smaker og kjenner bevegelsene)

1 2 3 4 5 6 7 8 9 10

15. Jeg har stor tro på meg selv, og forventer at jeg skal lykkes med det jeg setter meg som mål

1 2 3 4 5 6 7 8 9 10

16. For mye stress fører sjelden til svake prestasjoner

1 2 3 4 5 6 7 8 9 10

17. Min konsentrasjonsevne er svært god sammenlignet med de beste idrettsutøverne jeg konkurrerer mot

1 2 3 4 5 6 7 8 9 10

18. Jeg evaluerer både kamper og treninger etter mål jeg har satt meg

1 2 3 4 5 6 7 8 9 10

19. Mine kampforberedelser er like gode som de beste fotballspillerne jeg spiller mot

1 2 3 4 5 6 7 8 9 10

20. Jeg visualiserer ofte hvordan jeg skal løse forskjellige arbeidsoppgaver under trening

1 2 3 4 5 6 7 8 9 10

21. Jeg er flink til å finne positive sider ved meg selv, og minne meg selv på dette

1 2 3 4 5 6 7 8 9 10

22. Jeg vet hva jeg skal gjøre dersom jeg har for lavt eller for høyt spenningsnivå

1 2 3 4 5 6 7 8 9 10

23. Jeg har ingen problem med å holde god konsentrasjon under hele kampen

1 2 3 4 5 6 7 8 9 10

24. Jeg ønsker sterkt å lykkes i fotball

1 2 3 4 5 6 7 8 9 10

25. En av grunnene til at jeg presterer jevnt godt er at kamprutinene mine er gode

1 2 3 4 5 6 7 8 9 10

26. Jeg bruker visualisering som en del av forberedelsene til trening og kamp

1 2 3 4 5 6 7 8 9 10

27. Under kampen tenker jeg stort sett positivt

1 2 3 4 5 6 7 8 9 10

28. Spor du treneren min vil han/hun si at jeg er god til å regulere spenningsnivået i ønsket retning

1 2 3 4 5 6 7 8 9 10

29. Spor du treneren min vil han/hun si at jeg er flink til å holde konsentrasjonen gjennom treningsøkten

1 2 3 4 5 6 7 8 9 10

30. Det å sette seg klare mål for hver treningsøkt hjelper meg til å gjennomføre gode treninger

1 2 3 4 5 6 7 8 9 10

31. Jeg evaluerer hver kamp for å trekke lærdom av dette og å bruke disse erfaringene videre

1 2 3 4 5 6 7 8 9 10

32. Når jeg visualiserer opplever jeg dette sterkt og klart

1 2 3 4 5 6 7 8 9 10

33. Min selvtillit blir sjelden påvirket av andre spillere

1 2 3 4 5 6 7 8 9 10

34. Sammenlignet med de beste i fotball som jeg spiller mot, har jeg god kontroll over spenningsnivået

1 2 3 4 5 6 7 8 9 10

35. Jeg lar meg sjelden forstyrre av negative tanker

1 2 3 4 5 6 7 8 9 10

36. Jeg er villig til å sette fotballen foran alt for å bli best mulig

1 2 3 4 5 6 7 8 9 10

37. Jeg er flink til å få frem følelsene som gjør meg sikker og bestemt for kampen

1 2 3 4 5 6 7 8 9 10

38. Jeg er flink til å visualisere

1 2 3 4 5 6 7 8 9 10

39. Jeg tar vanskelige situasjoner som en utfordring

1 2 3 4 5 6 7 8 9 10

40. Jeg vet hvilke situasjoner som kan påvirke spenningsnivået i en negativ retning, og jeg vet hva jeg skal gjøre i slike situasjoner

1 2 3 4 5 6 7 8 9 10

41. Jeg er flink til å skifte konsentrasjonsfelt ettersom situasjonene forandrer seg

1 2 3 4 5 6 7 8 9 10

42. Jeg vet hva jeg må utvikle meg ytterligere på for å nå mine mål, og jeg er innstilt på å prioritere trening av disse egenskapene.

1 2 3 4 5 6 7 8 9 10

SCORING FOTBALL ALDER: _____ KJØNN: _____

Før inn scoringene i tabellene, tallene i tabellen viser til spørsmålet med samme nummer. Tall 1 tilsvarer altså spørsmål nr. 1.

SCORINGS SYSTEM

Kampforberedelser	Visualisering	Indre dialog & Selvtillit	Spenningsregulering	Konsentrasjon	Målsetting & motivasjon
1.	2.	3.	4.	5.	6.
7.	8.	9.	10.	11.	12.
13.	14.	15.	16.	17.	18.
19.	20.	21.	22.	23.	24.
25.	26.	27.	28.	29.	30.
31.	32.	33.	34.	35.	36.
37.	38.	39.	40.	41.	42.
Sum:					

Summer hver enkelt kolonne. Det beste resultatet vil være 7, allikevel vil en sum på 25 eller lavere vise at du behersker den enkelte ferdighet godt. Har du en score på over 25 bør du vurdere om du skal prioritere trening av den/disse ferdighetene. Begynner du å trene enkelte mentale ferdigheter har dette ofte en positiv påvirkning av andre ferdigheter. Begynner du f. eks å mestre stress fører dette ofte til bedret konsentrasjonsevne.

Målsetting & motivasjon

Motivasjonskolonnen viser hvor god du er til å motivere deg selv, i hvilken grad du bruker mål under trening og kamp, og hvor mye du er villig til å satse for å gjøre det godt i fotball. Har du en score på 25 eller høyere og ambisjoner om å gjøre det bra i fotball bør du se nærmere på hva du kan gjøre for å øke din motivasjon. Om du har en høyere score er dette selvsagt ikke negativt i seg selv. Det er helt greit å ikke ha ambisjoner om å få gode resultater i idrett. Vi tror imidlertid at mange skuffelser kan unngås dersom en har et bevisst forhold til hva som kreves av trening og innsats for å nå sine mål.

Konsentrasjon

Det å kunne opprettholde konsentrasjon over tid, kunne raskt komme tilbake til ønsket konsentrasjon om en blir forstyrret, og mestre de spesifikke konsentrasjonskravene den enkelte idrett stiller er en sentral egenskap å trene om en vil gjøre det godt

i idrett. Har du en score på over 25 bør du vurdere om du skal prioritere opptrening av denne ferdigheten.

Indre dialog & Selvtillit

Skal en lykkes i fotball kreves det god selvtillit. En svak selvtillit vil sannsynligvis påvirke det meste du foretar deg i idretten på en lite gunstig måte

Spenningsregulering

Regulering av spenningsnivået i ønsket retning er en svært sentral ferdighet å mestre innenfor konkurranseidretten. Du må kjenne deg selv i forhold til hvilke situasjoner du opplever stress, hvordan dette føles og hva du kan gjøre for å mestre dette.

Visualisering

Det er svært få toppidrettsutøvere som ikke bruker visualisering som en del av den daglige treningen og under forberedelsene til konkurranse/kamp. Skal visualiseringen ha best mulig effekt må du bruke alle følelser; hørsel, lukt, smak, kroppslige følelser og syn

Kampforberedelser

Kampforberedelser er en slags samlesekk av mentale ferdigheter som du mestrer. Det å ha et bevisst forhold til hva en skal gjøre i de forskjellige forberedelsesfasene til kamp og hva en skal gjøre i kampen, vil legge forholde til rette for gode prestasjoner.

Appendix B: the English version of the MST

1. I have clear tasks during a match
2. I often use imagery by seeing myself performing
3. I have confidence in my own abilities as an athlete
4. I don't become stressed in a negative way during a match
5. I rarely lose concentration when I'm performing
6. I am good at motivating myself
7. I have back-up plans in case my routines during a game gets interrupted
8. I often visualize myself reaching my goals
9. I have confidence in myself in most situations
10. I quickly recognize if my arousal level has grown too high
11. I regain correct focus quickly if I get distracted
12. I know what it takes to reach my goals and I am willing to do what is needed to reach them
13. I follow my pre-performance routines as closely as possible, because I know this will give me the best possibilities to perform well
14. When I visualize, I use all senses (sight, hearing, smell, movement and touch)
15. I believe in myself, and expect that I will reach my goals
16. High levels of stress don't negatively affect my performance
17. My concentration skill is very good compared to my opponents
18. I evaluate every match and practice based on my own development goals
19. I am as prepared for competition as my strongest opponents
20. I often visualize how I could solve different tasks during training
21. I am good at reminding myself of my qualities and strengths
22. I know if my arousal level is too low or too high

23. I maintain a high level of concentration during the entire match
24. I strongly want to succeed in football
25. I perform well because I can rely on my match plan
26. I use imagery to prepare for trainings and matches
27. I have mostly positive thoughts during matches
28. If you ask my coach, he/she will say that I am good at regulating my arousal level
29. If you ask my coach, he/she will say that I am good at staying concentrated during training
30. Setting clear goals for each exercise helps me perform better in training
31. I evaluate every match to learn from them, and to use this experience in future matches
32. When I visualize, the image is strong and clear
33. My self-confidence is not affected by the strength of my opponents
34. Compared to my strongest opponents, I control my arousal level well
35. I am rarely distracted by negative thoughts
36. I prioritize football more than anything else, so I can become as good as possible
37. I am skilled at getting in the right mindset to feel secure and confident before each match
38. I am good at visualizing
39. I see difficult situations as challenges
40. I know what situations that affects my arousal negatively, and I know how to handle it
41. I am good at regaining focus when situations change unpredictably
42. I know in what areas I have to improve in order to reach my goals, and I am determined to prioritize the training of these skills

Appendix C: Approval from NSD



Anne Marte Pensgaard
Postboks 4014 Ullevål stadion
0806 OSLO

Vår dato: 23.08.2018

Vår ref: 60954 / 3 / BGH

Deres dato:

Deres ref:

Vurdering fra NSD - Norsk senter for forskningsdata AS – anonym behandling av personopplysninger

NSD viser til meldeskjema mottatt 30.05.2018 for prosjektet:

60954	<i>Measurement of mental skill level in Norwegian footballers</i>
Behandlingsansvarlig	<i>Norges idrettshøgskole, ved institusjonens øverste leder</i>
Daglig ansvarlig	<i>Anne Marte Pensgaard</i>
Student	<i>Ola Sydow Rasmussen</i>

Vi forstår det slik at studenten ikke skal samle inn direkte eller indirekte opplysninger som kan identifisere enkeltpersoner. I tillegg skal studenten bruke en anonym spørreskjemaløyperandør i forbindelse med spørreundersøkelsen. Prosjektet trenger derfor ikke en vurdering fra NSD.

Hva må du gjøre dersom du likevel skal behandle personopplysninger?

Dersom prosjektopplegget endres og det likevel blir aktuelt å behandle personopplysninger, må du sende inn nytt meldeskjema.

Vi avslutter oppfølging av prosjektet

Siden prosjektet ikke behandler personopplysninger avslutter vi all oppfølging av prosjektet.

Se våre [nettsider](#) eller ta kontakt dersom du har spørsmål. Vi ønsker lykke til med prosjektet!

Vennlig hilsen


Marianne Høgetveit Myhren


Belinda Gloppen Helle

Kontaktperson: Belinda Gloppen Helle tlf: 55 58 28 74 / belinda.helle@nsd.no

Kopi: Ola Sydow Rasmussen, olarasm@gmail.com

Dokumentet er elektronisk produsert og godkjent ved NSDs rutiner for elektronisk godkjenning.

NSD – Norsk senter for forskningsdata AS Harald Hårfagres gate 29 Tel: +47-55 58 21 17 nsd@nsd.no Org.nr. 985 321 884
NSD – Norwegian Centre for Research Data NO-5007 Bergen, NORWAY Faks: +47-55 58 96 50 www.nsd.no

Appendix D: Participation request

Som deltager i Norges fire høyeste divisjoner for menn, eller Toppserien for kvinner, inviteres dere til å delta i en historisk kartlegging av norske fotballspillere.

For første gang vil det kartlegges mentale ferdigheter hos norske fotballspillere, og målet er å finne et referansepunkt for hva som kreves for å spille på det øverste nivået i Norge.

Kartleggingen blir gjennomført gjennom en nettbasert spørreundersøkelse som tar 5-10 minutter for hver enkelt spiller.

Alt dere trenger å gjøre er å viderefordre linken nedenfor til spillerne gjennom en lukket Facebook-gruppe, Messenger, SMS, E-mail etc.. Undersøkelsen er anonym.

<https://www.survey-xact.dk/LinkCollector?key=C9LN7U6CC612>

Håper dere ønsker å bidra til at bevisstheten rundt mentaltrening øker, og at forskningen på dette feltet i norsk sammenheng videreutvikles gjennom å delta i dette mastergradsprosjektet.

Gjerne bekreft at denne mailen er mottatt og om dere ønsker/ikke ønsker å delta.

Hvis denne mailen ikke lenger er tilknyttet klubben, så håper jeg at dere kan videresende den til riktig mottaker.

Mvh

Ola Sydow Rasmussen

v/ Norges Idrettshøgskole

Appendix E: Table 2

Table 2: Factor loadings using Kaiser's criterion

	Pattern Matrix ^a							
	Factor							
	1	2	3	4	5	6	7	8
5.7 I am good at regaining focus when situations change unpredictably	.565							
5.5 If you ask my coach, he/she will say that I am good at staying concentrated during training	.563							
5.4 I maintain a high level of concentration during the entire match	.540							
1.7 I am skilled at getting in the right mindset to feel secure and confident before each match	.539							
5.1 I rarely lose concentration when I'm performing	.451							
3.7 I see difficult situations as challenges	.440							
4.6 Compared to my strongest opponents, I control my arousal level well	.429							
4.5 If you ask my coach, he/she will say that I am good at regulating my arousal level	.407							
5.2 I regain correct focus quickly if I get distracted								
3.5 I have mostly positive thoughts during matches								
3.6 My self-confidence is not affected by the strength of my opponents		-.562						
5.6 I am rarely distracted by negative thoughts		-.548						
2.3 When I visualize, I use all senses (sight, hearing, smell, movement and touch)			.594					
1.2 I have back-up plans in case my routines during a game gets interrupted			.552					
5.3 My concentration skill is very good compared to my opponents	.395		.417					
4.4 I know if my arousal level is too low or too high			.379					
4.7 I know what situations that affects my arousal negatively, and I know how to handle it								
6.6 I prioritize football more than anything else, so I can become as good as possible				.788				
6.2 I know what it takes to reach my goals and I am willing to do what is needed to reach them				.635				
6.4 I strongly want to succeed in football				.613				
6.7 I know in what areas I have to improve in order to reach my goals, and I am determined to prioritize the training of these skills				.518				
3.1 I have confidence in my own abilities as an athlete					.796			
3.2 I have confidence in myself in most situations					.750			
3.4 I am good at reminding myself of my qualities and strengths					.635			
3.3 I believe in myself, and expect that I will reach my goals					.621			
6.1 I am good at motivating myself								
2.7 I am good at visualizing						-.778		
2.6 When I visualize, the image is strong and clear						-.777		
2.5 I use imagery to prepare for trainings and matches						-.775		
2.1 I often use imagery by seeing myself performing						-.678		
6.5 Setting clear goals for each exercise helps me perform better in training						-.535		
1.6 I evaluate every match to learn from them, and to use this experience in future matches						-.417		
2.4 I often visualize how I could solve different tasks during training						-.407		
6.3 I evaluate every match and practice based on my own development goals						-.386		
2.2 I often visualize myself reaching my goals								
4.1 I don't become stressed in a negative way during a match							.644	
4.3 High levels of stress don't negatively affect my performance							.555	
1.3 I follow my pre-performance routines as closely as possible, because I know this will give me the best possibilities to perform well								.588
1.5 I perform well because I can rely on my match plan								.563
4.2 I quickly recognize if my arousal level has grown too high								.529
1.1 I have clear tasks during a match								.370
1.4 I am as prepared for competition as my strongest opponents								.368

Extraction Method: Principal Axis Factoring.

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 26 iterations.

Appendix F: Table 3

Table 3: Parallel analysis (Monte Carlo-simulation) with permuted data (n=1000)

Factor	Raw data (eigenvalue)	Means (0.5)	Percentile (0.05)
1	13.70	1.22	1.33
2	3.67	1.10	1.18
3	2.99	1.01	1.10
4	1.43	0.93	1.01
5	1.22	0.86	0.95
6	0.97	0.80	0.87
7	0.71	0.74	0.80
8	0.67	0.69	0.75

Appendix G: Table 4

Table 4: Factor loadings of the MST using parallel analysis (Monte Carlo-simulation)

	Pattern Matrix ^a				
	Factor				
	1	2	3	4	5
5.6 I am rarely distracted by negative thoughts	.801				
3.6 My self-confidence is not affected by the strength of my opponents	.651				
4.1 I don't become stressed in a negative way during a match	.650				
4.6 Compared to my strongest opponents, I control my arousal level well	.582				
4.4 I know if my arousal level is too low or too high	.547				
4.3 High levels of stress don't negatively affect my performance	.529				
5.3 My concentration skill is very good compared to my opponents	.523				
3.5 I have mostly positive thoughts during matches	.515				
4.7 I know what situations that affects my arousal negatively, and I know how to handle it	.479				
5.2 I regain correct focus quickly if I get distracted	.425			-.368	
6.2 I know what it takes to reach my goals and I am willing to do what is needed to reach them		.818			
6.4 I strongly want to succeed in football		.781			
6.7 I know in what areas I have to improve in order to reach my goals, and I am determined to prioritize the training of these skills		.666			
6.6 I prioritize football more than anything else, so I can become as good as possible		.655			
6.3 I evaluate every match and practice based on my own development goals		.529	.415		
1.3 I follow my pre-performance routines as closely as possible, because I know this will give me the best possibilities to perform well		.520			-.414
1.5 I perform well because I can rely on my match plan		.493			
1.4 I am as prepared for competition as my strongest opponents		.478			
1.6 I evaluate every match to learn from them, and to use this experience in future matches		.391			
2.7 I am good at visualizing			.842		
2.6 When I visualize, the image is strong and clear			.809		
2.5 I use imagery to prepare for trainings and matches			.730		
2.1 I often use imagery by seeing myself performing			.556	-.486	
2.3 When I visualize, I use all senses (sight, hearing, smell, movement and touch)			.461		
2.4 I often visualize how I could solve different tasks during training			.442		
6.5 Setting clear goals for each exercise helps me perform better in training			.412		
1.2 I have back-up plans in case my routines during a game gets interrupted	.383		.408		
2.2 I often visualize myself reaching my goals					
3.1 I have confidence in my own abilities as an athlete					-.713
3.2 I have confidence in myself in most situations	.371				-.673
3.3 I believe in myself, and expect that I will reach my goals		.372			-.589
5.1 I rarely lose concentration when I'm performing					-.498
6.1 I am good at motivating myself					-.435
3.4 I am good at reminding myself of my qualities and strengths					-.407
1.1 I have clear tasks during a match					-.387
5.4 I maintain a high level of concentration during the entire match					-.387
5.5 If you ask my coach, he/she will say that I am good at staying concentrated during training					-.526
4.2 I quickly recognize if my arousal level has grown too high					-.504
5.7 I am good at regaining focus when situations change unpredictably	.455				-.493
1.7 I am skilled at getting in the right mindset to feel secure and confident before each match	.375				-.428
4.5 If you ask my coach, he/she will say that I am good at regulating my arousal level					-.403
3.7 I see difficult situations as challenges					-.389

Extraction Method: Principal Axis Factoring.

Rotation Method: Oblimin with Kaiser Normalization.

Appendix H: Figure 1

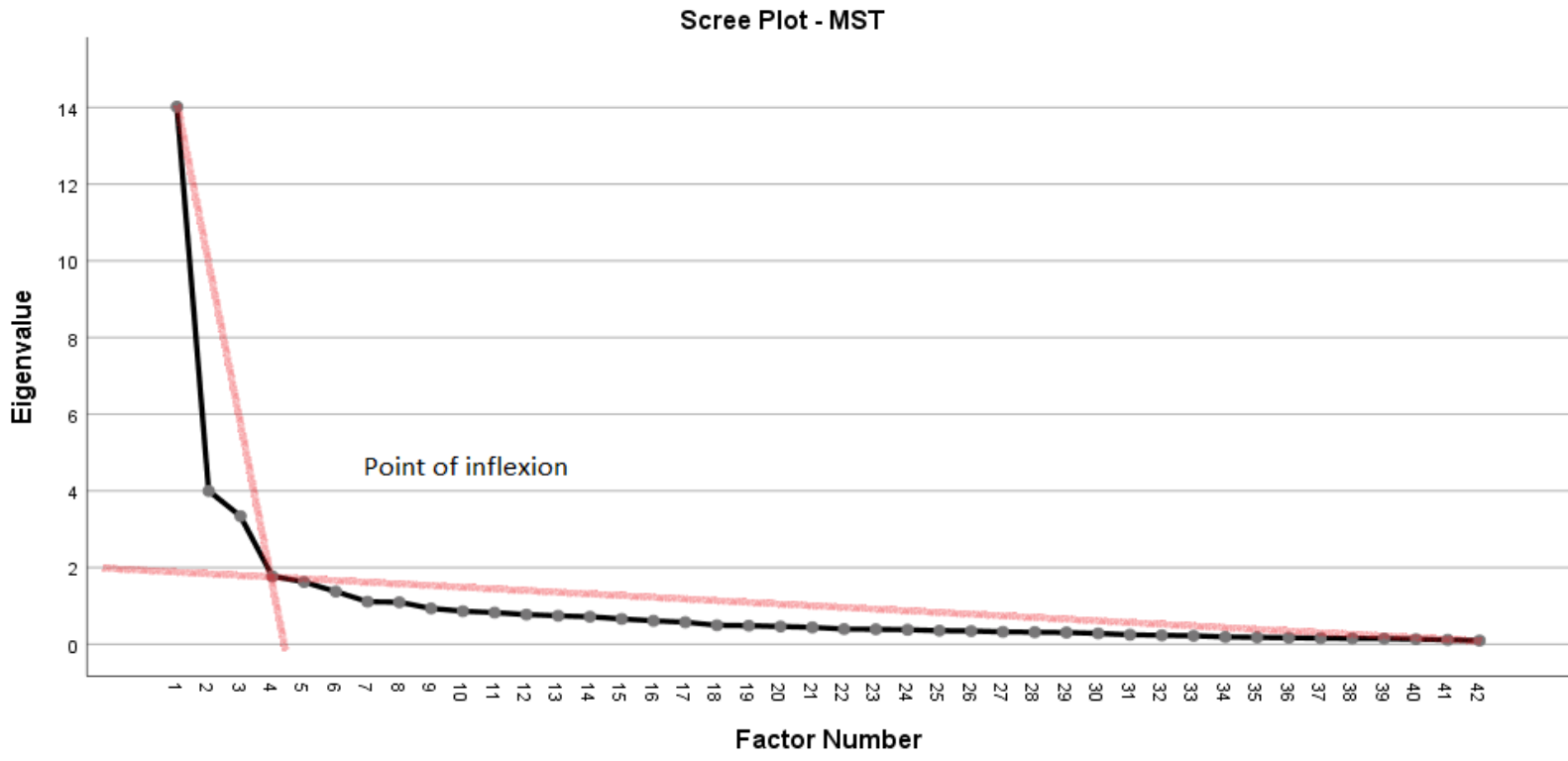


Figure 1: Scree plot with point of inflexion

Appendix I: Table 5

Table 5: Factor loadings of the scree test (Cattell, 1966)

Items	Pattern Matrix ^a		
	1	2	3
5.6 I am rarely distracted by negative thoughts	.803		
4.1 I don't become stressed in a negative way during a match	.780		
3.5 I have mostly positive thoughts during matches	.734		
3.6 My self-confidence is not affected by the strength of my opponents	.718		
5.7 I am good at regaining focus when situations change unpredictably	.696		
5.1 I rarely lose concentration when I'm performing	.686		
5.2 I regain correct focus quickly if I get distracted	.682		
4.6 Compared to my strongest opponents, I control my arousal level well	.660		
3.2 I have confidence in myself in most situations	.641		
5.4 I maintain a high level of concentration during the entire match	.587		
3.7 I see difficult situations as challenges	.572		
5.3 My concentration skill is very good compared to my opponents	.569		
1.7 I am skilled at getting in the right mindset to feel secure and confident before each match	.565		
4.4 I know if my arousal level is too low or too high	.537		
4.7 I know what situations that affects my arousal negatively, and I know how to handle it	.528		
3.1 I have confidence in my own abilities as an athlete	.508	.428	
3.4 I am good at reminding myself of my qualities and strengths	.480		
4.5 If you ask my coach, he/she will say that I am good at regulating my arousal level	.473		
5.5 If you ask my coach, he/she will say that I am good at staying concentrated during training	.434		
4.3 High levels of stress don't negatively affect my performance	.420		
6.4 I strongly want to succeed in football		.818	
6.2 I know what it takes to reach my goals and I am willing to do what is needed to reach them		.799	
1.3 I follow my pre-performance routines as closely as possible, because I know this will give me the best possibilities to perform w		.747	
6.7 I know in what areas I have to improve in order to reach my goals, and I am determined to prioritize the training of these skills		.711	
6.3 I evaluate every match and practice based on my own development goals		.665	
1.6 I evaluate every match to learn from them, and to use this experience in future matches		.604	
1.4 I am as prepared for competition as my strongest opponents		.551	
6.1 I am good at motivating myself	.365	.531	
3.3 I believe in myself, and expect that I will reach my goals	.405	.522	
2.1 I often use imagery by seeing myself performing		.516	
1.5 I perform well because I can rely on my match plan		.510	
1.1 I have clear tasks during a match	.431	.458	
6.5 Setting clear goals for each exercise helps me perform better in training		.449	.406
6.6 I prioritize football more than anything else, so I can become as good as possible		.389	
4.2 I quickly recognize if my arousal level has grown too high			
2.2 I often visualize myself reaching my goals			
2.6 When I visualize, the image is strong and clear			.694
2.7 I am good at visualizing			.639
2.5 I use imagery to prepare for trainings and matches		.427	.554
1.2 I have back-up plans in case my routines during a game gets interrupted			.540
2.3 When I visualize, I use all senses (sight, hearing, smell, movement and touch)			.489
2.4 I often visualize how I could solve different tasks during training			.473
Eigenvalues	14.02	3.40	3.33
% of variance	33.78	9.52	8.00
α	.94	.91	.82