

Rebecca Karlsson

Mental Skills in Norwegian Elite Swimmers

A cross-sectional study to investigate the sport specific mental skills of national elite swimmers and differences across gender and age

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Forord

Skrivningen av denne masteroppgaven går nå mot slutten. Det er både en lettelse og vemodig at studietiden nå snart er over. Arbeidet med denne oppgaven har vært utrolig lærerikt og jeg setter stor pris på å ha fått muligheten til å fordype meg i et tema jeg brenner for.

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Summary

Mental skills are important for athletes' success. The goal of mental training in elite sport is to develop mental skills needed to achieve high level performance outcomes (Vealey, 2007). To reach a high level in any sport, a basic principle is that the physical training needs to be sport specific. This principle of specificity is also applicable for mental skills training. The best way to facilitate for high level performance in a sport is to incorporate the mental skills training with the physical training (Vealey, 2007), surely this is a reason to find out which mental skills that are important in the specific sport and for the individual athlete. The aims of this study were to provide an overview of Norwegian elite swimmers' mental skills and to further suggest sport specific mental skills for swimming. Also, based on the conflicting findings in literature, we sought to identify if there were any differences in mental skills scores between gender (males/females) and age (senior/junior) in elite swimmers. To investigate this a cross-sectional study design was applied in form of a questionnaire, a translated version of the Ottawa Mental Skills Assessment Tool (OMSAT-3*; Durand-Bush et al., 2001) was used. This questionnaire had 48 items on 12 mental skill subscales, divided in to three broader psychological concepts (Foundation skills; goal setting, self-confidence, and commitment, Psychosomatic skills; relaxation, activation, stress reactions, and fear control, Cognitive skills; competition planning, imagery, mental practice, focusing, and refocusing). To further elaborate on mental skills in swimming, the differences between gender (female/male) and age (senior/junior) within the elite swimming population was analyzed. The results showed that Norwegian elite swimmers scored highest in the foundation skills: goal setting, self-confidence, and commitment. The results indicated differences between females and males in several of the mental skill subscales (self-confidence, activation, relaxation, stress reactions, imagery and focusing), no differences were found between senior and junior swimmers on the mental skill subscales. Results from multiple regression analyses indicated that selected mental skills (mental practice, focusing, activation, relaxation, and competition planning) contributed to the variance in the foundation skill scores. Swimming coaches should consider gender differences in mental training for elite swimmers. The results from the multiple regression analysis imply that mental practice, focusing, activation, relaxation and competition planning are important factors for the foundation skills scores in elite swimmers. This master thesis is written as a research article, including an extended introduction and method part. Firstly, the extended introduction and method is presented followed by the research article. The article will be

submitted to The Journal of Applied Sport Psychology (JASP) for publication. The JASP guidelines are followed in the article.

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Theoretical Framework for The Research Article

Introduction to Mental Training

For many years, mental skills training in sports has been an important part of developing high level performers (Williamon, 2004). Mental skills training can be defined as “The systematic and consistent practice of mental or psychological skills for the purpose of enhancing performance, increasing enjoyment, or achieving greater sport and physical activity self-satisfaction” (Weinberg & Gould, 2019, p. 262). In mental skills training there are many definitions that are used interchangeably (Birrer et al., 2010). To clarify and better understand terms and concepts, the mental training framework by Vealey (2007) is outlined. The framework suggests that mental training is ingrained within several broader concepts. Two factors influence the mental training processes. These are the physical training and the social cultural context. How the physical training is planned and conducted by coaches will affect the implementation of mental training. The framework highlights that mental training needs to be integrated with the physical training in order to provide the most benefit for an athlete’s enhancement. It is important for coaches and mental training consultants to understand the social-cultural context in which the mental training occurs. This is because this will influence the athletes’ conceptions of mental training and their participation. Further, Vealey (2007) suggests that the mental training process starts with the coach or consultant’s philosophical approach (e.g., educational vs. clinical, or program-centered vs. athletes-centered,), and this determines the model used for mental training interventions. Mental training models (e.g., cognitive-behavioral, self-regulatory, and sport-specific mental skills models) are the background for more specific use of mental techniques. Mental techniques can be defined as “specific procedures used to achieve mental training goals” (Behnke et al., 2019, p. 505), and the most used mental techniques in interventions are goal setting, imagery, self-talk, and relaxation (Vealey, 2007). These mental techniques are used to develop mental skills. Mental skills can be defined as “the learned ability to carry out a specific training task” (Behnke et al., 2019, p. 505), and mental skills are for example self-confidence, arousal regulation, and focusing (Birrer et al., 2012). Furthermore, mental practice is often used interchangeably with mental training, however mental practice refers to the cognitive processes of mental training and can be considered a mental skill. Following, a more thorough outline of mental practice will be presented because it brings out the essence of mental processes and how it can be applied in relation to performance.

Mental practice can be described as “repeating a task in your mind without any movement of the body” (Ungerleider, 2005, p. 8). Ungerleider (2005) presents four possible explanations behind why mental practice works. The first is the *Symbolic learning theory*. Here, creating an image becomes a part of a coding system that helps athletes to understand movements. Everything we do in our life is coded into our minds and nervous system. When athletes mentally rehearse something, they code these movements and make their bodies remember it. Mental practice will therefore make the movement more automatic (Ungerleider, 2005). For example, the block-start dive in swimming is an isolated part of the swimming race. The swimmer can here break the dive into several components and mentally rehearse each of them, the starter blowing the whistle once; getting on the block, one foot on the front of the block, one foot placed at the back of the block, lowering the body to grab the block, adjusting head, neck, and back position. The starter says, “take your marks” followed by the start signal from the timing system, pushing off with the feet, stretching out the head, neck, and body, stretching the arms into a streamline and tight body position before diving into the water. Rehearsing this sequence can help the swimmer encode these movements which could enhance their dive and make the swimmer better at knowing when to engage the different body parts. The second theory is the *Psychoneuromuscular theory*. This occurs during mental practice, and here the body perform small muscle contractions similar to those involved in the athletes’ sport. Therefore, this makes the mental practice quite specific towards the athlete’s sport. For a swimmer mentally practicing a 50 m freestyle, the muscle contractions would be similar of that in the 50 m freestyle race, such as the continuous flutter kicks with the feet and legs, the rotation and tightening of the core muscles, the arms in the pull and recovery phases of the arm stroke. The third theory is *Bio-informational theory* which is “the connection between imagery and anxiety” and is explained by “if we imagine how we might respond to a certain event, we can better prepare for it” (Ungerleider, 2005, p. 7). For example, a swimmer might feel anxious before a race or for a particular part of the race (e.g., a flip turn). Imaging this race or a phase of the race while feeling anxious will prepare the swimmer for the actual situation. The fourth and last theory is *Dual coding theory* which states that athletes receive information by verbal communication and motor execution. When learning something new, the athlete should first be explained how to do it, and then shown how to do it. For example, when the swimmer is learning a new drill or is developing the technique, the coach might explain how this is done and then show how it should be executed. This connection between communication and execution can

enhance learning for the swimmer (Ungerleider, 2005). Further, these mental processes are likely a part of all athletes' performances in an unstructured or subconscious way. Structuring the way of thinking and controlling these processes requires a great amount of mental training, starting with the mental foundation skills.

Foundation Skills

In the literature, it is suggested that some mental skills are fundamental to achieve success in sport. According to Vealey (2007) these skills are basic building blocks necessary for the athletes' success and presents the foundation skills as "achievement drive, self-awareness, productive thinking, and self-confidence" (p. 289). Durand-Bush et al. (2001) suggest that foundation skills are "essential for consistent high-level performance in sport" (p. 5), and propose goal setting, self-confidence, and commitment as foundation skills in the Ottawa Mental Skills Assessment Tool (OMSAT-3*; Durand-Bush et al., 2001). *Self-confidence* appears to be a very important mental skill for elite athletes. It is defined as "the belief that one has the internal resources, particularly abilities, to achieve success" (Vealey, 2007, p. 290). Elite athletes have stated that self-confidence is one of the most important mental skills for high level performance (Durand-Bush & Salmela, 2002). *Achievement drive* is defined as a "urgent, compelling desire to apply effort and persistence to overcome obstacles to accomplish something of worth or importance" (Vealey, 2007, p. 288). This is similar to *commitment* which Durand-bush et al. (2001) defines as "one's intensity and dedication toward achieving desired goals" (p. 5). *Goal setting* is defined as a mental technique by Vealey (2007), and as a mental skill by Durand-Bush et al. (2001). The latter study did not differentiate between mental techniques and skills and defined all as mental skills which were divided into three broader conceptual components; foundation skills, psychosomatic skills, and cognitive skills (Durand-Bush et al., 2001). Goal setting was defined as "the process by which individuals establish objectives or goals that provide them with a direction and the motivation to achieve an end result" (Durand-Bush et al., 2001, p. 5). Goal setting is highlighted as a key technique for athletes' achievements in sports (Gould, 2015). *Productive thinking* is "the ability to manage thoughts to effectively prepare for and respond to life events in a way that facilitates personal success and well-being" (Vealey, 2007, p. 289). According to Vealey (2007), successful athletes have greater productive thinking than lower-level athletes and are more focused towards the relevant tasks for their performance. *Self-awareness* is "the ability to engage in

introspection and retrospection to understand one's thoughts, feelings, and behaviors" (Vealey, 2007, p. 289). Self-awareness and other self- skills (e.g., self-monitoring and self-evaluation) are important for effective self-regulation in sport (Vealey, 2007). These foundation skills are considered to be basic skills needed to develop other mental skills (Durand-Bush et al., 2001).

Mental training and the learned mental skills are necessary for high level performance throughout the athletic career (Pierce, 2017). Throughout the athletic career these mental skills can also be beneficial in other life domains (e.g., work, and education) and is transferred into life skills (Pierce, 2017). The process of gaining life skills from sport is affected by psychological processes (e.g., self-confidence, and perceptions of support) and the context in which these life skills are applied might facilitate or hinder the use of these life skills (Pierce, 2017). Hardcastle et al. (2015) found that several mental techniques and skills (e.g., goal setting, stress management, and self-confidence) were useful for athletes in other life domains (e.g., homework, and academic study) throughout their athletic career. This highlights the importance of mental skills training in sport and that it can be particularly beneficial for elite athletes who combine education and work together with their sport, or after their athletic career (de Subijana et al., 2022). The development of foundation skills and other mental techniques or skills requires systematic planning and implementation by coaches and athletes throughout the career, how this can be done will further be outlined.

Periodization of Mental Skills Training

The physical training in sport is usually periodized. Commonly, physical training is divided into cycles (Holliday et al., 2008). For example, a macrocycle is the long-term plan and can last from several months up to years (an Olympic cycle four years). The macrocycle is usually divided into mesocycles which can last from several weeks up to months. The main goal of a mesocycle is to "peak" performance for a competition. A mesocycle is typically divided into microcycles which lasts for weeks. Commonly used microcycles are preparatory, competitive, peaking, and recovery cycles (Holliday et al., 2008). The main goals of the physical training are: (1) to develop sport specific fitness (e.g., strength, endurance, speed, and flexibility), and (2) to refine specific motor abilities and techniques to perform at the highest level of proficiency during the competition phase (Blumenstein & Orbach, 2020). Holliday et al. (2008), suggests that mental training should follow the same type of periodization as physical training. This means to begin learning the mental training techniques and how to perform them

in a non-sport-specific environment, for thereafter during the mesocycle to make the mental training more sport specific, in order to peak the performance (Holliday et al., 2008). Blumenstein and Orbach (2020) suggest that to achieve the first goal of physical preparation, the mental training should focus on goal setting, motivational aspects, and recovery processes. To achieve the second goal, the mental training should focus on mental techniques such as relaxation, imagery, self-talk, and concentration (Blumenstein & Orbach, 2020). Most athletes and coaches have reported that mental skills are important to perform well at a high level (Vealy, 2007). However, most coaches and athletes do not plan the mental training into their daily physical training, but rather use mental techniques and mental skills in competitions (Blumenstein & Orbach, 2020). Blumenstein and Orbach (2020) suggest that this can be explained by the lack of knowledge from coaches, sport psychologists, and athletes on mental skills training and how it can be incorporated into the physical training plan. Vealey (2007) highlights mental skills as more “easily taught, learned, and remembered if they are developed along with physical skills” (p. 292), and emphasizes the importance of consultants and coaches understanding of the sport specific requirements to best integrate mental training with physical training for athletes. Further, to implement mental training with the physical training it has to be suitable for the individual athlete’s physical training and personal needs to be effective.

The Elite Athlete – Personality and Individualization

Research suggests that elite athletes acquire more developed mental skills than sub-elite athletes (Fallby et al., 2006), and are better at coping and arousal regulation, have higher self-confidence, and use goal setting and imagery more effectively (e.g., Sotoodeh, 2012; Durand-Bush et al., 2001). These findings indicate that possessing these skills will increase the chances of reaching the elite level in sport. It can be argued that elite athletes have practiced these skills to a greater extent, and therefore, have more developed mental skills. Also, personality and individual differences might influence the elite athletes’ development of mental skills. Fallby et al. (2006) found that elite athletes who perceived the world to be controllable, manageable, and meaningful had more developed mental skills. The study argued that athletes who had an internal focus of control, (i.e., they perceived actions as in their own control), had more developed mental skills than athletes with an external focus of control, (i.e., they perceived actions to be a result of luck, or in the control of others) (Fallby et al., 2006). A widely known model is the Big five model by McCrae and Costa (1987). This model describes five personality

traits (i.e., neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness) and has been acknowledged by sport psychologists and is used in research on athletes' personalities. For example, Kaiseler et al. (2019) found that different personality traits affected dispositional coping and coping effectiveness among athletes. This shows that personality traits or characteristics could influence the acquisition of mental skills in elite athletes. Further, when examining individual differences, gender should be considered a factor that can influence the development of mental skills. Taking self-confidence as an example, as it is established as an important mental skill for high level performance (Vealey, 2007), research in sports has shown that male athletes score higher than female athletes on self-confidence (Woodman & Hardy, 2003). Females rely more on the social support and physical preparedness, and males more on comparison and competition to facilitate for self-confidence (Plakona, 2014). Suggesting that the context in which training or competitions take place might affect self-confidence in genders differently. Considering swimming as a gender-neutral sport, where females and males train and compete together, coaches have to facilitate for the development of self-confidence for both genders. Further, research have been conducted on gender differences in other mental skills such as imagery (Campos et al., 2014), coping with anxiety during competition (Hammermeister & Burton, 2004), activation (Sotoodeh et al., 2012), and relaxation (Katsikas et al., 2009), however findings are conflicting. Another individual difference in sport is the age of the athlete. As mentioned, research have established that elite athletes' have more developed mental skills than sub-elite athletes (Fallby et al., 2006). Athletes defined as elite athletes perform at a higher level than sub-elite athletes based on results. Within the elite population in Norwegian swimming, the athletes can be separated by age, and are divided into junior and senior athletes. The individual differences in mental skills and age within an elite population have not been established in swimming, and to our knowledge only one other study have investigated this (Jooste et al, 2014). Henriksen et al. (2019) found that consultants often used the same mental techniques with youth athletes (13-18 years) and senior athletes. Considering, the individual differences within an elite population, age might influence the development of mental skills in athletes. Knowledge on the influence of age on mental skill development can be interesting to swimming coaches because junior and senior athletes often train together.

It is important to appraise individual differences when working with athletes and implementing mental skills training. Quantitative research may suggest guidelines on the

mental skills important for the individual athlete, however the most important thing to consider is the individual athlete's strengths, weaknesses, and needs.

Swimming and Mental Skills Requirements

The goal in competitive swimming is to travel the given distance (50-1500 m) in the shortest possible time (Barbosa et al., 2010). Since swimming is executed in water, the forces that are directly impacting the swimmer is gravity, buoyancy, water resistance, and propulsion (Barbosa et al., 2010). The velocity the swimmer is capable of reaching depends on how much propulsion the swimmer is able to produce and how well the swimmer minimizes the water resistance (Toussaint & Beek, 1992). This depends on the swimmer's power production and swimming technique. Since swimming is a low-impact sport, it is common for elite athletes to train up to 25-30 hours per week in the water. Elite swimmers often wake up at 5 am for their first practice of the day. This practice often includes a dry-land warmup (30 min), a swimming session (90-120 min), and is often followed by strength training (60 min). In the evening, the swimmers have another dry-land warmup and swimming session, maybe followed by stretching (30 min). This regime requires well-structured plans for transportation, meals, sleep, social life and for some work or school. These swimmers need to be able to handle stress and responsibilities because of the demands inherent in their sport (Lane et al., 2004). As a results, teaching and encouraging swimmers to use mental techniques and skills might help them to better cope with the stress and responsibilities and in turn improve their performance in training and competitions (Lane et al., 2004). The swimming races in competitions are continuous single-stage races performed without a break, similarly to other endurance sports like for example rowing and running (Rich et al., 2021). The race time in swimming is between 22 seconds and 15 minutes depending on the event (50 m – 1500 m). This limits the use of mental skills during the race itself because of the relatively short durations. Pre competition planning is therefore essential to the swimmer's performance. The race plan needs to be perfected before diving into the water, especially since there is no communication or feedback from coaches or support team during the race. Rich et al. (2021) suggested that for rowers', imagery and self-talk were key mental skills for their performance. Since swimming competitions are much like rowing competitions in nature, it can be assumed that these skills also would be beneficial for elite swimmers. Imagery can be a useful mental skill for swimmers in their pre competition routines to mentally rehearse the race. During the race, self-talk can be used by the swimmer to

regulate the arousal level. More specifically, cue words or trigger words can be used. This is also something that can be planned by the swimmers during their pre competition planning. Self-talk was not included in the OMSAT-3*, and therefore not included in the present research article. However, it should be considered as a valuable skill to elite level swimmers. Self-talk can be defined as an “internal dialogue in which individuals interpret feelings and perceptions, regulate and change evaluations and cognitions, and give themselves instruction and reinforcement” (Wilson & Richards, 2011, p. 343). In high pressure situations, it is important for athletes to be able to control their negative internal dialogue because these thoughts can lead to negative emotions subsequent to performance (Wilson & Richards, 2011). Research has shown that self-talk affects the athlete’s performance (Hamilton et al., 2007). Motivational self-talk has shown to give athletes increased self-confidence (Hatzigeorgiadis et al., 2009), and self-talk can also influence the athletes’ acquisition of skills and self-regulation (Hamilton et al., 2007). Nedergaard et al. (2021) found that athletes’ use of self-talk could indicate their sport skill level. The study indicated that instructional self-talk was used by beginners, whereas motivational self-talk was more frequently used by elite athletes (Nedergaard et al., 2021). Hamilton (2007) found in endurance athletes that both positive and negative assisted self-talk could affect the performance positively and concluded that it was the athletes’ reaction to the assisted self-talk that affected their performance.

Mental Training in Norwegian Swimming

The Norwegian Swimming Federation (NSF) has a developmental ladder based on the physical demands of the sport (NSFs Utviklingstrapp, 2019). It gives detailed information on how to train at different levels and ages. This is made for Norwegian swimming clubs and coaches to give them a guideline on how to plan and implement training at each level. The developmental ladder does not provide any specific guidelines on how to do or use mental training, but it underlines the importance of autonomy (NSFs Utviklingstrapp, 2019, p. 7) which could make the athletes more independent and increase intrinsic motivation (Ryan & Deci, 2000). The NSF emphasizes the importance of mental skills training for elite athletes in a document called “Training philosophy in swimming – road towards medals in the Olympic games 2020-2024” (NSF, 2016, p. 7). In this document, especially two important mental skills for swimmers are highlighted, motivation and confidence. The NSF states in this document that mental training should be done in collaboration with the coach and at every practice. However,

it does not give any specific information about how this mental training should be performed or structured.

The Present Study

To our knowledge, there are no overviews of mental skills in Norwegian swimming, and we are not aware of mental training interventions organized among Norwegian swimmers. This cross-sectional study on the mental skills in Norwegian elite swimmers is a steppingstone into doing mental training interventions in Norwegian and international elite level swimming. Further, providing an overview of the most important mental skills in swimming will encourage athletes and coaches to implement more sport specific mental skills training in everyday training. It can also encourage coaches to consider individual differences such as gender and age when implementing mental skills training with elite swimmers. The study can give NSF and similar sport organizations valuable information about mental skills in swimming and help further develop coaches' education courses. The aims of this study were to provide an overview of Norwegian elite swimmers' mental skills and to further suggest sport specific mental skills for swimming. Also, based on the conflicting findings in literature, we sought to identify if there were any differences in mental skills scores between gender (males/females) and age (senior/junior) in elite swimmers.

Extended Method for Research Article

Philosophy of Research

The purpose, collecting the data, analyzing the data, and interpreting the results in research are based on the philosophical perspective of the researcher, also called paradigms (Moon, 2014). My philosophical perspectives are shaped by my beliefs and past experiences. My experiences from the past as an elite swimmer, and now as a swimming coach is the underlying interest for conducting this study. I did not do structured mental skills training as an elite swimmer and now that I have studied coaching and psychology in combination with coaching swimmers, I reflect upon my experiences and have an interest in finding out more on today's elite swimmers' mental skills and share this knowledge. The philosophical perspective of a researcher is based on ontological and epistemological positions (Moon, 2014). First, considering ontology which can be explained with the question "What is reality?", can be viewed as a specter with the realist on one end, and the relativist on the other end (Moon, 2014). Realist ontology argues that one reality exists, and that this reality can be measured, studied, and understood with the right design and tools. Relativist ontology argues that reality exists in the mind and that this reality is created by the individual. My ontological position is closer to the realistic ontology than the relativist. This is explained by Moon (2014) as a structural realist, "accepts that, although one true reality can be identified, the structures (e.g., definitions, measurements, technologies, norms) around how that reality is defined can change, at which point the nature of reality also changes" (p. 1170). Secondly, epistemology can be explained with the question "How can I know reality?", and is commonly divided into objectivism, constructivism, and subjectivism. Further, considering the specter, objectivist epistemology is on the realistic side of the specter and subjectivist epistemology is on the relativist side. In the middle of objectivist and subjectivist, is the constructivist. Constructivism assumes that humans construct knowledge, and the research generates contextual understandings of a topic. I place myself in the middle of objectivist and constructivist epistemology. Furthermore, from the ontological and epistemological positioning, my philosophical perspective or paradigm is somewhere between positivism and constructivism (Moon, 2014). I believe that knowledge about reality can be obtained through objective methodology, however I believe that some human constructs and contexts cannot be studied in depth with objective methods only. Based on this I have chosen a quantitative research method to find answers to the present study aims, the quantitative method and the cross-sectional study design allowed for the data collection and

analyses in the present study. Furthermore, the interpretation of these results provide knowledge on the aims of this study.

Literature Search

The search for literature was done through Google Scholar and SPORTDiscuss. Search words included “mental training”, “mental skills training”, “PST in swimming”, “gender and differences in mental skills”, “age and differences in mental skills”, “mental skills training and elite athletes”, and “OMSAT-3*”. The articles were selected based on their relevance to the present study aims, and articles including the keywords elite athletes, endurance sports, mental techniques/skills, and OMSAT-3* were used in this extended introduction or the attached article. Further, articles not including these keywords were read and included if considered relevant to the aims of this study.

Research Design

The present study is an observational study. In observational studies, the researcher is observing without intervening, distinct from intervention and experimental studies (Bird, 2019). Commonly used observational study designs are cross-sectional, longitudinal, and case-controlled designs. This study used a cross-sectional study design, which is a one-time measurement of exposure over a short period of time (Setia, 2016). Cross sectional study designs “are usually conducted to estimate the prevalence of outcome of interest for a given population” (Levin, 2006, p. 24). The study design offers some strengths and weaknesses. Strengths of cross-sectional study designs; they are less time consuming, cheaper to conduct compared to other designs (e.g., longitudinal), many outcomes can be assessed when there is a large number of participants, and the measurements are taken at one point in time which avoids losing participants in potential follow-ups (Bird, 2019; Levin, 2006). Further, they can be a steppingstone into further investigations through for example longitudinal studies (Bird, 2019). The cross-sectional study design also provides weaknesses; it is not possible to make causal inference from associations between variables and because of the one-time measurement it is possible that the situation would be different if another timeframe was chosen (Bird, 2019; Levin, 2006). The cross-sectional study design was chosen in this study because of the primary aim to map the mental skills in elite swimmers in Norway. This design allowed for the collection of data from many participants. Cross-sectional study designs are often used in studies where

the aim is to describe a population (Levin, 2006), suggesting that this was a proper method for the aims of this study.

The present study used a questionnaire to collect data, which is the most commonly used method in cross-sectional studies (Mann, 2003). Questionnaires can be used to “provide descriptive information, data for the determination between factors and data for comparing groups” (Bird, 2019, p. 93). This study used the Ottawa Mental Skills Assessment Tool (OMSAT-3*; Durand-Bush et al., 2001) questionnaire to map the mental skills of elite swimmers. The OMSAT-3* was predominantly developed for coaches or consultants working with athletes to design individualized mental skills training programs. Further, it states that it was “devised to help researchers empirically investigate the effectiveness of intervention programs and to generate typology of mental skills profiles of athletes from various skill levels, sports and populations” (Durand-Bush, 2001, p. 4), which is why it was chosen for the present study aims. Another reason why the OMSAT-3* was considered fit for the aims of the study was the large number of mental skills assessed (12 mental skills). Other preexisting surveys (e.g., The Competitive State Anxiety Inventory (CSAI2), The Trait-State Confidence Inventory (TSCI), and The Athletic Coping Skills Inventory-28 (ACSI) used in swimming aimed to assess one mental skill, technique or construct not fitted for a mapping of several mental skills (Smith, 2002). Furthermore, in terms of items on each subscale (four), the scores will be less representative of the participants mental skills than questionnaires with more items on a scale. Considering the aims of the study, the participants score on each subscale can still provide enough information for an overview of mental skills.

The OMSAT-3* included 48 items (12 mental skills subscales with four items on each), grouped together into three broader psychological concepts (foundation skills, psychosomatic skills, and cognitive skills). Each of the broader psychological concepts had underlying mental skill subscales; foundation skills (goal setting, self-confidence, and commitment), psychosomatic skills (stress reactions, activation, relaxation, and fear control), and cognitive skills (mental practice, imagery, focusing, refocusing, and competition planning). The questions were to be answered on a seven-point Likert-scale. The Likert scale ranged from 1 (strongly disagree) to 7 (strongly agree) with 4 being do not agree/do not disagree. Likert scales are widely used in questionnaires on physical activity research and is convenient because it is easy for the researcher to interpret the results and to compare scores between participants (Bird, 2019). However, Likert-scales limits the research to numerical data which can be difficult to

transfer into real-world behavior or practice (Bird, 2019). For example, with the OMSAT-3* it is difficult to determine the specific causes and consequences of the participants self-confidence score or the intensity and direction of the stress reaction score which limits the interpretation of the results (Smith, 2002).

The subscale fear control was considered not relevant in swimming based on the wording in three out of the four questions and was therefore not included in the multiple regression analysis of the study (e.g., “I find it difficult to train because of the fear involved in my sport”). The questions were included in the survey, and participants’ scores are presented. The participants had the second highest score on this subscale out of all the mental skills which we questioned. It seems that the questions were directed towards extreme sport athletes (e.g., alpine skiing, motor sport, and skydiving) where the notion of fear is present, and the consequences of failing can be fatal. However, one of the questions on the subscale was considered relevant, “I am afraid to lose”, but since three out of four items were irrelevant, the subscale was not included in the statistical analyses (Worthington & Withtaker, 2006).

The OMSAT-3* did not include self-talk, and since the OMSAT-3* did not differentiate between technique and skills, this could have been added to the scale as a mental skill. Knowing this is one of the most used mental techniques in sport psychology interventions (Vealey, 2007), and considering the use of it in other endurance sports (Rich et al., 2021), it would be interesting to investigate this in relation to swimmers in a future study.

The original OMSAT-3* was translated into Norwegian by six people (two professors, two master students, and two previous master students) from The Norwegian School of Sport Sciences (NIH). The six translated versions of the OMSAT-3* were compared and compiled into one Norwegian version. This version was then back translated to English for a validity check. The final version was then transferred into SurveyXact (SurveyXact by Ramboll) (Appendix 3).

Recruitment and Distribution of the survey

The inclusion criteria for the present study were swimmers aged 16 years or older qualified for the Norwegian Championship 2021. The survey was distributed to 322 swimmers through email. The Norwegian Swimming Federation (NSF) distributed a link to the survey through email and posted information on their website about the project including a link to the

survey. The email was sent from the NSF membership system and the receiver could not identify other recipients of the email.

Variables

Two independent samples t-tests were performed, one for each of the independent variables. The independent variables (age and gender) and dependent variables (mental skills) were used to find out if there were differences between gender (female/male) and age (senior/junior) on athletes' mental skills scores. Three multiple regression analyses were performed, one for each of the foundation skills (goal setting, self-confidence, and commitment). In the multiple regression analysis, the independent variables were the foundation skills, and the dependent variables were selected mental skills (i.e., goal setting; mental practice, focusing, and competition planning, self-confidence; activation, relaxation, and stress reactions, and commitment; competition planning, mental practice, and imagery).

The dependent variables used in the multiple regression were selected based on the belief that these could explain some of the variance in the foundation skills score.

Population and Sample

The study population was Norwegian elite swimmers above the age of 16 years old, qualified for the Norwegian Championship 2021. This population consisted of 322 swimmers. Out of the 322 swimmers who received the email, 184 started the survey in SurveyXact, a reminder was sent by email to all 322 swimmers after two weeks, and 118 fully completed the survey.

Reliability, Validity, and Generalizing

Validity is whether an instrument measures what it sets out to measure and reliability is the ability of the measure to produce the same results under the same conditions. (Field, 2013, p. 12). This study used a preexisting and validated questionnaire, (OMSAT-3*; Durand-Bush et al., 2001). There are several types of validity (e.g., content validity, criterion validity, construct validity (convergent and discriminant validity), and face validity) (Bird, 2019). Considering the translated version of the OMSAT-3* used in this study, it was important to ensure that the content was sustained through translation. Content validity is whether the questionnaire measures what it is intended to measure (Field, 2013). The OMSAT-3* had

several subscales, and it was important to ensure that the items translated for one subscale still represented the mental skill intended. This was enhanced by recruiting translators working with or studying sport psychology. Additionally, it was important to not translate the questions directly but to interpret the meaning so that the participants could understand the content of the questions (Bird, 2019). The internal validity is whether the results from the study can be relied upon based on the design and how the study was carried out (Mann, 2003). The internal validity was ensured by firstly including a sample size that could represent the population. Secondly, reducing the possibility of humanly mistakes by using SurveyXact (SurveyXact by Ramboll) and ensuring that information and the questions were easy to understand for the participants. Thirdly, by calculating effect sizes and using the standard level of significance ($p = .05$). External validity, or generalization to the wider population is possible if the random sample size is assumed to be representative of the population of interest (O'Donoghue, 2012). The sample size in this study was considered large enough to represent the population of Norwegian elite swimmers above the age of 16 years.

Reliability was assessed through Cronbach's alpha. Cronbach's alpha estimates internal consistency and indicates the average correlation among the items in each of the subscales. It is recommended that the Cronbach's alpha level is at a minimum of .7, but the value is dependent on the number of items on each scale and with few items (less than 10) the score can be lower (Pallant, 2013). In this study there were four items per scale and the internal consistency was between .60-.79. Therefore, the subscales with scores below .7 were included due to the small number of items.

Statistical Analyses

The Statistical Package for Social Sciences (SPSS) version 24.0 (IBM Corp. Armonk, NY, USA) was used to perform all statistical analyses. The statistical analyses performed were Pearson correlation coefficient, independent samples t-tests and multiple regressions. Pearson correlations were performed to explore associations between the mental skill variables. Independent samples t-tests were performed to compare scores for gender and all mental skills variables, and age and all mental skill variables. Before conducting the analyses, some general assumptions were checked according to Pallant (2013).

Pearson correlation and independent samples t-test

Assumptions of Pearson correlation and independent samples t-test.

- Level of measurement

The data was at the ordinal level (categorical answers from the Likert scale), usually this means that non-parametric tests should be applied. However, literature and previous studies suggest that parametric tests can be used with categorical data (Pallant, 2013) and this is commonly used in other studies with mental skill assessment tools (e.g., Durand-Bush, 2001; Nicholls et al., 2010; Sotoodeh et al., 2012). Both parametric (t-test) and non-parametric (Mann-Whitney U) were performed for comparison, and the results were quite similar. Therefore, using parametric tests gave a wider range of possible methods for statistical analyses (e.g., multiple regression).

- Random sampling and independence of observations

Random sampling from the population studied was fulfilled because there was no one in the population that were specifically selected to participate, and they voluntarily answered the questionnaire (Pallant, 2013). The observations were independent in the way that the survey link was distributed to the individual participants, and they could participate in the study at a time that suited them (not influenced by others in for example a classroom). However, some participants might respond to the survey together, and thereby influence each other's answers.

- Normal distribution, homogeneity of variance, and effect size

The data was tested for normality and confirmed by the Shapiro-Wilk test. Levene's test for equality was not significant for any of the mental skills variables for gender and age, and the assumption of homogeneity of variance was confirmed. The effect size was calculated using Cohen's d. This indicates the relative magnitude of the differences between the means (Pallant, 2013).

- Missing data

Missing data was handled by the exclude cases pairwise option in SPSS. Meaning that the cases were only excluded if the required data was missing (Pallant, 2013; Worthington & Withttaker, 2006). The required data was set to answering three or more questions for one subscale. The case was deleted from the subscale if only two or less questions were answered but was still included in the analysis for the other subscales.

Standard multiple regression

Standard multiple regression was conducted between the foundation skills (goal setting, self-confidence, and commitment) and selected mental skills from the OMSAT-3*(competition planning, mental practice, focusing, activation, relaxation, stress reactions, and imagery).

Assumptions of multiple regression:

- Sample size

The sample size needs to be large enough so that the results can be generalized to other samples. The required sample size can be calculated by taking into account the number of independent variables, the formula is $N > 50 + 8m$ (N = sample size, m = number of independent variables) (Pallant, 2013). When applying this formula to the present study, it was suggested that 74 participants were needed to use multiple regression analyses. Since there were 118 participants in the present study there were enough cases to use multiple regression and generalize results.

- Multicollinearity and singularity

Multicollinearity and singularity refer to the relationship between the independent variables and should not occur when using multiple regression. Multicollinearity is when the independent variables have a very large correlation ($r = .9$ and above) (Pallant, 2013). The correlation between goal setting, self-confidence, and commitment were below this, meaning that multicollinearity was not present. Singularity is when the independent variable is a combination of other independent variables. The independent variables were not a combination of other independent variables in this study and every item belonged only to one subscale, meaning that singularity was not present.

- Outliers

Since multiple regression is sensitive to outliers (very high or very low scores) the data was checked by looking at the residual plots where no outliers were identified (residual values outside $-3.3 - 3.3$) (Pallant, 2013).

- Normality, linearity, homoscedasticity, and independence of residuals

These were obtained from the residuals scatterplot which was generated as a part of the multiple regression analysis. The difference between predicted and obtained dependent variables score is the residuals (Pallant, 2013). The residuals were normally distributed (normality) and had a linear relationship (linearity) in predicting the dependent variable scores.

The scatterplot for the multiple regression showed that the prerequisite of homoscedasticity was satisfied. All assumptions for multiple regression in this study were fulfilled.

Ethical Considerations

Before starting the research project, an application was sent to and approved by The Norwegian Center for Research Data (reference number: 313761; Appendix 1). In consultation with the Ethical Committee at the Norwegian School of Sport Sciences it was decided that the project did not need approval from the Ethical Committee in accordance with their guidelines.

Recruitment

The NSF sent a link to the survey by email to each potential participant, and it was posted on the NSF's own website. A message from an organization is considered an appropriate way of recruiting participants (Bird, 2019). The email was sent to swimmers above the age of 16 years qualified for the Norwegian championships, this email could not be replied. It was sent to the personal email address (registered in medley.no), and the receiver could not see or identify other recipients of the email. The project description, participant information sheet and a link to the survey was also posted on the NSF's website (svomming.no). The inclusion criteria were clearly stated on the website, but it could be the case that participants not eligible for participation did complete the survey. This cannot be guaranteed, but it was considered unlikely that people not portraying to the inclusion criteria would complete the survey.

Informed consent

Informed consent was retrieved from all participants. The participant information sheet (Appendix 2) included the purpose of the study, why they were asked to participate, what it required to participate, their right to withdraw consent and the contact information of the master student and project leader. Since the survey was conducted online, participants had to click "yes" to confirm that they had been given and read the participant information sheet, and to click "yes" in order to give their voluntary consent to participate. Both questions had to be confirmed with "yes" before a participant would get access to the questionnaire. If someone clicked "no", they were redirected out of the survey to ensure that people not wanting to participate were not forced to continue to the survey questions.

Risks in participating

Research designs should aim to minimize the potential risks for participants and the benefits should always try to be maximized and outweigh the potential risks (Bird, 2019). The risk of psychological stress was considered in this study. The risk of triggering preexisting conditions was not considered as high as there were no questions directed towards conditions or mental health. The risk of increasing stress or anxiety was considered as quite low, but some could feel that they had to score high on some scales, or that they would want to elaborate on some questions. There was no time pressure involved when completing the questionnaire and participants could leave the survey and come back later. This could decrease the risk of feeling stressed about completing the questionnaire in one session or within a certain time period. The risk of participants feeling less confident, or embarrassment was also considered as low, because they did not receive a final score and were not able to compare themselves to others. Surely, there was a risk of participants not understanding a question or a concept which could lead them to feeling less confident or embarrassed, but this was minimized by explaining how the questions should be answered and by using “lay language” understandable to the participant group (Bird, 2019).

Confidentiality and data protection

Participants answered the questionnaire anonymously and the only personal information collected was their age, gender and if they participated in the junior, senior or both sections at the Norwegian Championships. When participants completed or partially completed the survey, it was saved in SurveyXact, where only the research group had access to the account. The results were thereafter transferred into Excel and SPSS by the researcher. The research group were the only people having access to the dataset and the SPSS file. Participants could not be identified in the dataset. The data will be kept by the research group until June 2023, and thereafter it will be deleted.

Potential method biases

The respondent

The present study has potential biases which should be considered when interpreting the results (Podsakoff et al., 2003). *Social desirability* can lead to the tendency of participants to present themselves favorably to attain acceptable behaviors. This can lead to questions being

answered in the direction participants think is the more favorable direction. This can further affect the mean and the relationship between the mental skill variables (Podsakoff et al., 2003). *Acquiescence biases* is when the respondent answers in a direction (strongly agree/strongly disagree) regardless of the question content (Friborg et al, 2006). The OMSAT-3* includes subscales that were to be answered in a negative direction to correct for potential acquiescence bias. The participants' *mood states* in general (affectivity) or affected by recent events can influence their response to questions (Podsakoff et al., 2003). Survey questions cannot account for participants' mood states, but it emphasizes the limitations of a one-time measurement.

Scale and Item characteristics

Items presented to participants might also affect the results of the present study. The wording of items should be as clear and specific as possible. The construct of mental skills in the present study included several terms and constructs which might be complex or unfamiliar to the respondent. *Item complexity* was considered in the present study. Terms that were considered as either complex, abstract or had a double meaning were reworded and translated to ensure that respondents had similar perceptions of the meaning of the items. The *scale format* was consistent throughout the questionnaire in the present study with a seven-point Likert scale (1 strongly disagree/7 strongly agree) for all OMSAT-3* items (Durand-Bush et al., 2001). This can lead to respondents' answering questions without processing the content of the questions (Podsakoff et al., 2003). Subscales that were to be answered in a negative direction could engage the respondent to not answer the questions automatically, but it could also lead to participants answering in the opposite direction in which they intended. Further, the *scale length* was considered because this could also lead to answering questions without processing the content, especially at the end of the questionnaire. In addition, it could lead to participants not completing the questionnaire because of fatigue. The OMSAT-3* included 48 items, 66 participants did not complete the whole questionnaire and was not included in the study. This could indicate that the questionnaire was too long or took too much time to complete. The OMSAT-3* had *mixed items* from the different subscales throughout the questionnaire. This can lead to a decrease in reliability because it is difficult to see the similarity between items belonging to the same subscale. However, this can also lead to more accurate scores because the respondent cannot choose to score high on subscales perceived as more important to them

(Podsakoff et al., 2003). The internal reliability (Cronbachs' alpha) was tested, and all items were considered reliable in the present study.

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Mental Skills in Norwegian Elite Swimmers

Rebecca Karlsson¹, Gro Jordalen^{1*} & Bjørn Harald Olstad²

¹Department of Sport and Social Sciences, Norwegian School of Sport Sciences, Oslo,
Norway

²Department of Sport and Physical Performance, Norwegian School of Sport Sciences,
Oslo, Norway.

***Corresponding author:** Gro Jordalen (gro.jordalen@nih.no), Department of Sport
and Social Sciences, Norwegian School of Sport Sciences, Oslo, Norway.

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Abstract

The purpose of this study was to investigate Norwegian elite swimmers score on mental skills, and to better understand the relationship between mental skills, gender (female/male) and age (junior/senior). The translated version of the Ottawa Mental Skills Assessment Tool (OMSAT-3*) was administered to Norwegian elite swimmers above the age of 16 who participated at the Norwegian Championship 2021. Participants in the study were 118 elite swimmers (63 males and, 55 females). Independent sample *t*-tests showed differences between genders on six mental skills (self-confidence, $p < .001$; activation, $p = .028$; relaxation, $p < .001$; focusing, $p = .001$; imagery, $p = .022$; stress reactions, $p < .001$) with males scoring higher on all. No difference was found between age for any variable. Multiple regression analysis used foundation skills (goal setting, self-confidence, and commitment) and selected mental skills (competition planning, mental practice, focusing, activation, relaxation, stress reactions, and imagery). The results showed that mental practice and focusing contributed to the variance in the goal setting score with 36.8% and 27.6%, respectively. Activation and relaxation contributed to the variance in the self-confidence score with 51.8% and 19.8%, respectively, and competition planning contributed 21% to the variance in the commitment score. These findings suggest that swimming coaches should differentiate mental training for male and female swimmers. The results from the regression analysis implies that mental practice, focusing, activation, relaxation and competition planning are important factors for the foundation skills scores among national elite swimmers.

Key words: psychological skills, swimming, OMSAT-3*, gender, age

Lay summary: This study investigated mental skills in Norwegian elite swimmers and found that elite swimmers scored highest on goal setting, self-confidence, and commitment.

Additionally, gender differences were found in six mental skills (self-confidence, activation,

relaxation, focusing, imagery, and stress reactions). Furthermore, the present study identified sport specific mental skills for swimming.

Implications for practice:

- Coaches implementing mental training with Norwegian elite swimmers should consider the gender and age of the elite swimmer to individualize the process of developing mental skills.
- Mental training interventions in swimming should focus on sport specific mental techniques and skills such as self-confidence, activation, relaxation, and competition planning.

Mental Skills in Norwegian Elite Swimmers

Psychological Skills Training in Elite Sports

In professional sports there is a thin line between winning and losing. In the 2021 Olympic Games the average time difference between the first and fourth place finisher in all the swimming events were 0.8% for men and 1.3% for women (FINA, 2021). To close this gap, swimmers train every day to excel and peak their performance. Mental skills training (MST) is for many swimmers an important part of their training regime. MST can be defined as “The systematic and consistent practice of mental or psychological skills for the purpose of enhancing performance, increasing enjoyment, or achieving greater sport and physical activity self-satisfaction” (Weinberg & Gould, 2019, p. 262). Research on elite athletes in various sports have shown positive effects of MST programs, for example in basketball (Vakil et al., 2020), golf (Ashbrook et al., 2018), soccer (Zadkhosh et al., 2019), running (Hill et al., 2020), volleyball (Heydari et al., 2018), tennis (Dohme et al., 2020), and swimming (Sheard & Golby, 2006). Researchers in the field of MST use many different expressions like “mental skills”, “psychological skills”, “mental strategies”, “psychological strategies” and “mental techniques” almost interchangeably (Birrer & Morgan, 2010). Behnke et al. (2019) differentiated between the term *mental skill* and *mental technique* and defined them as “a mental skill is the learned ability to carry out a specific training task (e.g., coping with stress or increased self-confidence), whereas mental techniques are specific procedures used to achieve mental training goals (e.g., imagery or self-talk)” (p. 505). Four basic mental techniques that are predominantly used in sport psychology intervention studies are imagery (e.g., Smith et al., 2007; Post et al., 2012), goal setting (e.g., Mellalieu et al., 2006), self-talk (e.g., Hatzigeorgiadis et al.; 2009, Hamilton et al., 2007), and relaxation (e.g., Pelka et al., 2017). The studies mentioned above all found enhanced performance after the intervention. These mental training techniques have shown to improve mental skills such as self-confidence, arousal control, stress management, self-awareness, and attention control (Williams et al., 2015), suggesting that mental training

techniques lead to improved mental skills which in turn can lead to improved sport performance (Weinberg, 2008). The present study will predominantly use the term mental skills for all terms presented in the Ottawa Mental Skills Assessment Tool (OMSAT-3*; Durand-Bush et al., 2001). To further define the terms and categorize mental skills in the present study, we divided them into three broader psychological concepts, as suggested in OMSAT-3*: foundation skills, psychosomatic skills, and cognitive skills (Durand-Bush et al., 2001, p. 3).

Foundation Skills

Foundation skills consist of goal setting, self-confidence, and commitment (Durand-Bush, et al., 2001, p. 3). Durand-Bush et al. (2001) defines foundations skills as “fundamental and essential for consistent high-level performance in sport; they are considered to be building blocks for the development of other mental skills.” (p. 5). Durand-Bush et al. (2001) found that athletes scored highest on the foundation skills in the OMSAT-3*. The definition of a goal can be “attaining a specific level of proficiency in a task, usually within a specific time limit” (Locke & Latham, 2002, p. 705). Goal setting is one of the most used mental technique in sports research (Vealey, 2007). It is important for athletes’ performance because it directs their focus towards the task at hand, it can increase athletes’ effort and persistence, and facilitate the development of relevant learning strategies (Weinberg & Butt, 2014). Commonly there are three types of goals that are discussed in sport science: outcome, performance, and process goals (Weinberg & Butt, 2014). Previous studies suggest that goal setting is very effective in enhancing performance and behavior when using a combination of outcome, performance, and process goals (Sheard & Golby, 2006). This multiple goal strategy gives athletes the opportunity to for example focus on process and performance goals, if he or she does not reach the outcome goal.

Self-confidence is “the belief that one has the internal resources, particularly abilities to achieve success” (Vealey, 2007, p. 290). Elite athletes have pointed out that the development

and maintenance of confidence is one of the most important parts of their mental skills training (Durand-Bush & Slamela, 2002). Self-confidence can influence athletes' anxiety during competitions. Hanton et al. (2004) found that when self-confidence was absent, anxiety increased and was perceived as outside the performers control which led to a decrease in performance. When high self-confidence was present there was an increase in positive perceptions of control and facilitative interpretations. Athletes in the study reported the use of cognitive confidence management strategies including mental rehearsal, thought stopping, and positive self-talk, to lower their anxiety during competitions. The study highlighted the importance of self-confidence for elite athletes to protect against negative thoughts and feelings during competitions (Hanton et al., 2004).

Commitment in sport refers to the motivational force behind persistence (Scanlan et al., 1993). Elite athletes often start training at an early age and devote much time to their sport throughout life. Ericsson (1996) argued that athletes in their respective sport or activity need at least 10000 hours of "deliberate practice" to succeed at the elite level. Halldorsson et al. (2012) found that elite level athletes scored higher on commitment than lower-level athletes. Furthermore, the study found that the elite level athletes had a stronger desire to be successful in their sport, enjoyed the sport more and scored higher on intrinsic motivation than lower-level athletes. Intrinsic motivation can be described as engaging in an activity for the pleasure and satisfaction derived from the activity itself (Ryan & Deci, 2000). Intrinsically motivated individuals are more likely to participate and work hard when external rewards are not available, they experience lower levels of performance-related anxiety, and show greater levels of skill learning relative to those with a more extrinsic motivational orientation (Hollembek & Amarose, 2005).

Psychosomatic Skills

Psychosomatic skills consist of stress reactions, fear control, activation, and relaxation (Durand-Bush, et al., 2001, p. 3). Psychosomatic skills as defined by Durand-Bush et al. (2001) “brings about variations in psychological arousal as well as mental and physical intensity and can be used for their regulation” (p. 5). Stress is defined as “an ongoing process that involves individuals transacting with their environments, making appraisals of the situations they find themselves in, and endeavoring to cope with any issues that may arise” (Hanton et al., 2005, p. 1129). Being able to handle stress is important for athletes when performing at a high level, and the main source of stress is competition (Hanton et al., 2015). More specifically, athletes need to cope with fear of failure, frustration, injury, and external stressors like the crowd watching (Bhadauriya & Tripathi, 2018). These stress reactions are common for athletes in all sports, and literature shows that imagery, self-talk, attention control, and relaxation can help athletes to cope with stress reactions (Hanton et al., 2015). Further, these techniques have also shown to be effective for athletes` fear control (Brymer & Schweitzer, 2013). “Fear refers to a feeling state in which there is both a subject and an object” (Brymer & Schweitzer, 2013, p. 479). In sports, this notion of fear is typically linked to extreme sports, where failing can have fatal outcomes. To control the fear, athletes need to have a great focus on the task at hand, slow down, and clear their minds of distracting elements (Brymer & Schweitzer, 2013).

Arousal is the degree of activation in the body, and the level of arousal likely impacts performance preparation and quality (Williamon, 2004). Relaxation and activation techniques can be used to control level of arousal, which can be both physical and mental. Both can be used to either reach a deep sleep, sustained level of relaxation or a momentary, less profound state. The depth to which one relaxes will depend on the time and focus devoted to the exercise (Williamon, 2004). The relaxation technique can be a great tool to decrease stress levels and anxiety. Relaxation can for example be an effective technique in recovery processes, lower the

activation between competitions, reduce pain if an athlete has an injury, and improve sleep (Ungerleider, 2005). Contrary, activation is used to increase bodily arousal and can be used to reach optimal arousal if the athlete is under aroused. This is called the zone of optimal functioning (Hanton et al., 2015).

Cognitive Skills

Cognitive skills consist of imagery, mental practice, focusing, refocusing and competition planning (Durand-Bush et al., 2001). Cognitive skills are “dependent upon cognitive processes and activities that include sensation, perception, learning, memory, thinking and reasoning” (Durand-Bush et al., 2001, p. 5). Imagery can be described as an exercise that uses all the senses to create an experience in the mind (Ungerleider, 2005). Imagery can be used to improve motor skills, performance, motivation, confidence, and arousal control (Post et al., 2012). Research shows that imagery is most effective when used in combination with physical training (Weinberg & Gould, 2019). The use and effectiveness of imagery can differ between sports. In closed sports, such as golf, there are few other factors that will disrupt the execution of a skill, compared to open sports, like soccer, where the opponent will play an unpredictable role. It is commonly said that imagery in closed sports is easier than in open sports (Weinberg et al., 2003). Post et al. (2012) suggests that swimming is a continuous task which is different from only being a closed sports because the movements are repeated over a longer time period, and there is no recognizable start and end. The study found that imagery improved the swimmer’s performance.

Mental practice can be described as “repeating a task in your mind without any movement of the body” (Ungerleider, 2005, p. 8). Mental practice and imagery are used interchangeably (Simonsmeier et al., 2021), though are differentiated by definition:

Mental practice does not necessarily involve imagery but can also refer to other types of mental processes or mental preparation including self-talk and relaxation. Different from

mental practice, imagery is a specific mental process that can be mentally practiced and that includes the creation and re-creation of an experience of any kind not limited to motor performance. (p. 186)

Durand-Bush et al. (2001) elaborated on the difference between imagery and mental practice, stating “it is noteworthy that imagery and mental practice comprised two different scales in the OMSAT-3* because research has shown that although these two constructs are related, they should be differentiated” (p. 3). In OMSAT-3*, examples of mental practice subscale questions were “I mentally practice my sport on a daily basis” and “I mentally practice for critical situations in competition”.

Being able to focus and refocus during a game or competition in sports are important factors for peak performance (Williams et al., 2015). Rymal et al. (2021) suggests that “effective concentration involves two main components; the ability to attend to the correct things at the correct moment and the ability to attend to the information in the correct way” (p. 455). A model commonly used when referring to attention control is the 2x2 model (Nideffer, 1976); it suggests that people have four dimensions of attention. The first component is the direction of the athlete’s attention, it is described as either internal (within oneself) or external (outside oneself). The other component is the width of the attention focus, it is thought of being either broad or narrow. The demand of concentration varies between sports. The information that a soccer player must focus on is likely different for a swimmer, therefore, it is important to train attention control to effectively concentrate for the specific task (Rymal et al., 2021). Focus and refocus can be trained even though there seem to be some level of focus innate for each athlete (Williams et al., 2015).

Competition planning is an important part of peak performance in sport. The primary aim of a pre-competition routine is to help the athlete reach an optimal state in order to perform at their best (Collins et al, 2011). Pre-competition routines or plans help athletes establish a

consistent method of performance and control their arousal level. It takes time and experience to develop optimal competition plans, and in addition requires evaluation and refinement by both coaches and athletes (Collins et al., 2011).

Mental Skills Requirements in Swimming

Few studies have investigated the effects of PST in swimming. Sheard and Golby (2006) found that a 45-minute program per week for seven weeks improved national level swimmers' times in the 200 m for three separate swimming strokes. In addition, the swimmers improved their positive psychological profiles. Pavlidou and Dogains (2008) did a nine-week PST program with young swimmers (11-16 years). The swimmers significantly increased their performance and confidence during the period. Both studies included several mental techniques like goal setting, relaxation, self-talk and imagery. Birrer and Morgan (2010) did a review on PST in what they called high intensity sports (HIS), and referred to typical HIS as rowing, swimming, 800 and 1500m track running, track cycling, and flat-water canoeing. They argued that to "achieve outstanding performance, PST should be adapted to the psychological and physiological demands of each discipline" (p. 78). This means that when athletes do PST it should be sport specific. Based on the research on psychological requirements in sports, Birrer and Morgan (2010) suggested a list to identify the psychological demands in a specific sport:

Duration, intensity, and continuity of the impact; complexity and variability of the action; movement pattern and movement complexity and cooperation between the athlete and all members of the party, training scope, training intensity, training years, psychosocial development, and injury and death risk. (p. 80)

Considering these requirements, the psychological demands of swimming will be outlined. Swimming requires long hours of practice to attain proficiency and rigorous training to attain the needed strength and endurance. It also requires intense training and competing from an early age. Race duration is usually between 22-30 seconds to 15-17 minutes and the

intensity and continuity of the impact is very high throughout the whole race (Sheard & Golby, 2006). Swimming is a cyclic sport, where the movement patterns are repeated. The movement patterns in the four competitive strokes (butterfly, backstroke, breaststroke, and freestyle) are different from each other, and are technically demanding. Although swimming requires highly optimized movement patterns, the task complexity and variability can be considered as low. Pool competitions always occur under the same conditions; the distances are always the same (50 – 1500 m) and the only variability are the tactical decisions. Due to high training volumes and high intensities, the risk of overtraining injuries can be considered as high. Further, the risk of a serious injury or death can be viewed as low because there is no impact from other competitors or objective risks. (Birrer & Morgan, 2010). Birrer and Morgan (2010), presented a list of the most important psychological skills for HIS like swimming:

- (1) self-skills, personal development and life skills (to fulfill the normal developmental tasks and to cope with high training demands)
- (2) arousal-regulation skills (to regulate stress and pressure)
- (3) volitional skills (to overcome pain and fatigue due to specific performance demands)
- (4) motivational skills
- (5) recovery skills (to cope with high training and performance demands and minimize the injury and overtraining risk. (p. 81)

Further, to our knowledge no other review than Birrer and Morgan (2010) have outlined the mental skills requirements in swimming. As well as being sport specific, PST should also be specific to the individual athletes (Birrer & Morgan, 2010). In attempts to further identify athletes' mental skills profiles, previous studies have investigated differences in mental skills between genders, but the findings are conflicting (Kruger & Pienaar, 2014; Newland et al., 2013; Woodman & Hardy, 2003; Katsikas et al., 2009 and Sotoodeh et al, 2012). Differences in age (e.g., senior/junior) in an elite population has been investigated and no differences were

found in cricket athletes (Jooste et al., 2013). To our knowledge, there are no studies on differences in age (senior/junior) on swimming or endurance sports.

Therefore, the aims of this study were to provide an overview of Norwegian elite swimmers' mental skills and to further suggest sport specific mental skills for swimming. Also, based on the conflicting findings in literature, we sought to identify if there were any differences in mental skills scores between gender (males/females) and age (senior/junior) in elite swimmers.

Method

Participants

Following the approval by the Norwegian Center for Research Data (reference number: 313761, Appendix 1), competitive swimmers that participated in the Norwegian championship in 2021 and was older than 16 years were invited to participate in this study (Appendix 2). Out of 322 invited swimmers, 118 consented to participate, age 18.4 ± 2.6 (55 females, age 17.6 ± 2.2 , 13 senior and 42 junior, and 63 males, age 18.8 ± 2.9 , 22 senior and 41 junior). The swimmers had competed between 4-18 years ± 2.7 years. In Norwegian swimming the age groups are divided into senior and junior. Senior age is 18 years and above for females and 19 years and above for males. Prior to giving consent, participants were informed about the purpose of the study and their right to withdraw their consent without any apparent reason. They were informed about their anonymity in the project and that all personal data will be deleted at the end of the project.

Design

A cross sectional study design was used to obtain an overview of mental skills and psychological skill training in elite swimmers in Norway. Due to the nature of the present study this method was chosen to give an overview of the current state, the cross-sectional design also offered the benefit of collecting little quantitative data from many participants (Setia, 2016).

Existing research has demonstrated that cross sectional designs can be effective in measuring mental skills and psychological skills training in sports (e.g., Nicholls et al., 2010, Sotoodeh et al., 2012). Furthermore, there are many psychological inventories and tests used in competitive swimming, often answered with likert-scales. These psychometric tests often require a quantitative approach to analyze the data and the results require thorough interpretation (Smith et al., 2002). Cross-sectional designs are used for population-based surveys and to assess the prevalence of the outcome of interest, for the population (Levin, 2006). These studies are usually conducted either before planning a cohort study or a baseline measure in a cohort study (before interventions). Since it is a one-time measurement of exposure and outcome, one cannot derive causal associations from cross-sectional analysis (Setia, 2016)

Measures

The OMSAT-3* (Durand-Bush et al., 2001) was used to assess the swimmers' mental skills and included 48 items and 12 mental skills scales grouped together under the following three broader conceptual components: (a) foundation skills (goal setting, self-confidence, commitment); (b) psychosomatic skills (stress reactions, fear control, relaxation, activation); and (c) cognitive skills (imagery, mental practice, focusing, refocusing and competition planning). The 12 mental skills were assessed with four questions on each skill, and questions were answered on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). Some items (focusing, fear control, refocusing and stress reactions) were to be answered in a negative direction to correct for potential acquiescence bias which is the tendency for participants to respond positively to items regardless of item content (Friborg et al., 2006), these are reversed in the results. Fear control was removed from the analysis because we considered it not relevant for swimmers, as these questions are more towards extreme sport athletes as previously explained.

Data Collection

At the Coaching and Leadership Conference on August 26-28, 2021, the study outline was presented to inform swimming coaches in Norway about the upcoming study and to encourage their swimmers to participate. OMSAT-3* was translated to Norwegian with the help of two master students at the Norwegian School of Sport Sciences (NIH), one former sport psychology student, two professors from NIH and one outside institution translator (naive translator). Seven translated versions of the OMSAT-3* were synthesized into one Norwegian version by the authors of the present study. Further, the version was back translated to English for ensuring the validity by the authors (Beaton et al., 2000, p. 3188-3190). The Norwegian version of the OMSAT-3* was then prepared in SurveyXact ([SurveyXact](#) by Ramboll). SurveyXact was used to administer and collect the data. The Norwegian Swimming Federation (NSF) distributed the link to the survey to 382 swimmers (184 women and 198 men) through email and the survey was open for participants between 1.10.2021 – 3.11.2021.

Statistical Analyses

The Statistical Package for Social Sciences (SPSS) version 24.0 (IBM Corp. Armonk, NY, USA) was used to perform all statistical analyses. Data were tested for normality and confirmed with the Shapiro Wilk tests. A descriptive analysis (mean and one standard deviation) was conducted for all mental skills variables. The Pearson's correlation coefficient was used to indicate relationships between the 12 mental skill variables. The threshold values representing small, moderate, large, very large and extremely large correlations were defined as 0.1, 0.3, 0.5, 0.7, and 0.9, respectively (Hopkins et al., 2009). Internal consistency was tested for all mental skill variables using Cronbach's alpha (α). Independent samples t-tests were performed to compare scores for gender and all mental skills variables, and age and all mental skill variables. Participants who answered two or less of the four questions belonging to a mental skill variable were excluded based on the general rule that there should be at least three

items for one latent factor (Worthington & Whittaker, 2006). Effect sizes were calculated using Cohens'd. Values representing small, medium, large effect sizes were defined as 0.2, 0.5, and 0.8, respectively (Pallant, 2013, p. 218). Standard multiple regression was conducted between the foundation skills (goal setting, self-confidence, and commitment) and selected mental skills from the OMSAT-3* (competition planning, mental practice, focusing, activation, relaxation, stress reactions, and imagery) to find which mental skills that contributed to the variance in the foundation skills scores. The significance level was set at $p < 0.05$.

Results

Mean Scores and Standard Deviations for all Mental Skill Variables

In Table 1 the total mean scores for all mental skills variables from OMSAT-3* is presented. The highest mean scores were on the foundation skills: goal setting ($M = 5.38$, $SD = 0.92$), self-confidence ($M = 5.13$, $SD = 1.08$) and commitment ($M = 4.82$, $SD = 1.24$). The lowest mean score was on mental practice ($M = 3.69$, $SD = 1.17$).

Table 1.

*Descriptive statistics for all Mental skills scores from the OMSAT-3**

Variables	<i>M</i>	<i>SD</i>
Goal setting	5.38	0.92
Self-confidence	5.13	1.08
Commitment	4.82	1.24
Stress reactions	4.42	1.34
Fear control	5.34	1.14
Activation	4.46	1.05
Relaxation	4.60	1.21
Imagery	4.63	1.26
Mental practice	3.69	1.17
Focusing	4.38	1.13
Refocusing	3.94	1.17

Variables	<i>M</i>	<i>SD</i>
Competition planning	4.76	1.25

The Relationship between all Mental Skill Variables

The relationship between all mental skills variables is presented in Table 2. The results showed a large significant correlation ($r = 0.62, p < .01$) between self-confidence and activation. Self-confidence and activation had significant correlations with all mental skill variables ($p < .01$). Goal setting had large significant correlations with commitment ($r = 0.54, p < .01$), self-confidence ($r = 0.52, p < .01$) and mental practice ($r = 0.50, p < .01$). The results showed a large correlation between imagery and mental practice ($r = 0.52, p < .01$). There were also large significant correlations between relaxation and stress reactions ($r = 0.59, p < .01$) and activation and focusing ($r = 0.50, p < .01$). Internal consistency (Cronbach's alpha) ranged between .60 - .79 for all variables.

Table 2.*Correlations between all Mental Skill Variables*

	1	2	3	4	5	6	7	8	9	10	11
1	0.67										
2	.52**	0.74									
3	.12	.42**	0.77								
4	.44*	.62**	.33**	0.62							
5	.54**	.42**	-.04	.24**	0.73						
6	.40**	.41**	.31**	.41**	.23*	0.79					
7	.31**	.31**	.07	.31**	.29**	.36**	0.74				
8	.50**	.37**	.23*	.46**	.24*	.52**	.43**	0.60			
9	.13	.43**	.59**	.44**	-.02	.24*	.03	.01	0.70		
10	.43**	.48**	.31**	.50**	.14	.35**	.25**	.37	.44**	0.69	
11	.08	.27**	.27**	.38**	-.07	.16	.11	-.02	.39**	.45	0.65

Note: 1. Goal setting; 2. Self-confidence; 3. Relaxation; 4. Activation; 5. Commitment; 6. Imagery; 7. Competition planning; 8. Mental practice; 9. Stress reactions; 10. Focusing; 11. Refocusing. **Correlation is significant at the 0.01 level. *Correlation is significant at the 0.05 level.

Numbers in **bold** indicate internal consistency.

Differences between Gender for Mental Skills Variables

Table 3 shows that there were significant differences between females and males for self-confidence; $t(116) = -3.95, p < .001$, relaxation; $t(116) = -5.42, p < .001$, activation; $t(113) = -2.23, p = .028$, imagery; $t(114) = -2.31, p = .022$, fear control; $t(115) = -2.15, p = .034$, stress reactions; $t(116) = -5.07, p < .001$ and focusing $t(116) = -3.37, p = .001$.

Table 3.

Differences between Gender in Mental Skills Variables

Variables	Females		Males		<i>t</i> (<i>df</i>)	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Goal setting	5.25	0.92	5.48	0.91	-1.37 (116)	.174	0.25
Self confidence	4.73	1.05	5.47	0.99	-3.95 (116)	<.001	0.73
Relaxation	4.02	1.15	5.11	1.04	-5.42 (116)	<.001	1.00
Activation	4.23	0.98	4.66	1.07	-2.23 (113)	.028	0.42
Commitment	4.65	1.26	4.96	1.22	-1.33 (116)	.186	0.25
Imagery	4.34	1.24	4.88	1.23	-2.31 (114)	.022	0.43
Competition planning	4.86	1.23	4.68	1.28	0.78 (115)	.437	0.15
Mental practice	3.61	1.09	3.76	1.24	-0.66 (113)	.512	0.12
Stress reactions	3.81	1.21	4.94	1.22	-5.07 (116)	<.001	0.94
Focusing	4.02	1.07	4.69	1.09	-3.37 (116)	.001	0.62
Refocusing	3.89	1.23	3.98	1.11	-0.40 (115)	.687	0.08

Table 4 shows that there were no significant differences between Norwegian junior and senior swimmers for mental skills on the OMSAT-3*.

Table 4.

Differences between Age for Mental Skills Variables

Variables	Junior		Senior		<i>t</i> (<i>df</i>)	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Goal setting	5.32	.90	5.50	0.96	-0.92 (116)	.359	0.19
Self confidence	5.12	1.04	5.14	1.20	-0.07 (116)	.948	0.01
Relaxation	4.59	1.23	4.64	1.18	-2.22 (116)	.825	0.05
Activation	4.47	1.01	4.44	1.16	0.17 (113)	.868	0.03
Commitment	4.74	1.22	5.01	1.29	-1.08 (116)	.283	0.22
Imagery	4.60	1.32	4.72	1.10	-0.47 (114)	.642	0.09
Competition planning	4.83	1.21	4.60	1.36	0.92 (115)	.361	0.19
Mental practice	3.66	1.18	3.76	1.16	-0.42 (113)	.675	0.09
Stress reactions	4.50	1.27	4.21	1.48	1.06 (116)	.291	0.21
Focusing	4.43	1.11	4.27	1.18	0.68 (116)	.498	0.14
Refocusing	4.01	1.17	3.76	1.16	1.09 (115)	.277	0.22

Standard Multiple Regression for Foundation Skills

Table 5 shows the standard multiple regression for foundation skills. Competition planning, mental practice and focusing explained 33.0% of the variance in the goal setting score ($R^2 = .330$). The psychosomatic skills activation, relaxation and stress reactions explained 44.0% of the variance in the self-confidence score ($R^2 = .444$). Competition planning, mental practice and imagery explained 10.6% of the variance in the commitment score ($R^2 = .106$). Mental practice had the strongest contribution to explain goal setting with 36.8% ($p < .001$), Activation had the highest contribution to explain self-confidence with 51.8% ($p < .001$) and competition planning explained 21% of the variance in commitment ($p = 0.041$).

Table 5.

Standard Multiple Regression for Foundation Skills

Variables	<i>r</i>	R^2	β	<i>t</i>	<i>p</i>
Goal setting	.574	.330			
Competition planning			.082	0.94	.349
Mental practice			.368	4.07	<.001
Focusing			.276	3.28	.001
Self confidence	.666	.444			
Activation			.518	6.55	<.001
Relaxation			.198	2.25	.027
Stress reactions			.089	0.97	.337
Commitment	.326	.106			
Competition planning			.210	2.07	.041
Mental practice			.093	0.84	.405
Imagery			.104	0.97	.333

Discussion

The aims of this study were to provide an overview of Norwegian elite swimmers' mental skills and to further suggest sport specific mental skills for swimming. Also, based on the conflicting findings in literature, we sought to identify if there were any differences in mental skills scores between gender (males/females) and age (senior/junior) in elite swimmers. The present study found that elite swimmers scored highest on the foundation skills (goal setting, self-confidence, and commitment). The results showed that there were differences in mental skills between genders, with males scoring higher than females on six subscales (self-confidence, relaxation, activation, imagery, stress reactions and focusing). There were no differences found in mental skills between senior and junior swimmers. The relationship among selected mental skill subscales is presented in 4.3. Practical implications and future directions on sport specific mental skills for swimming is presented in 4.4.

Gender Differences in Mental Skills Scores

The results from the present study showed that males scored higher than females in self-confidence, relaxation, activation, imagery, stress reactions and focusing. Research on self-confidence in sports has shown that male athletes score higher on self-confidence than female athletes (Woodman & Hardy, 2003), this matches the findings in the present study. Plakona et al., (2014) presents three factors influencing the difference in self-confidence between genders "the nature of the task, availability of accurate and clear information, and social context" (p. 52). Further, males feel higher self confidence in tasks that involve competition while females enhance more self-confidence when they can focus on their own goals. To females, effective communication can influence their self-confidence positively, and compared to males' social acceptance is more important to females' self-confidence (Plakona et al., 2014). Sport is competitive in nature and thus might be favorable for males' development of self-confidence. Therefore, these three factors should be considered when working with swimmers, to enhance

females' self-confidence. Especially in swimming where males and females train together, the environment must enhance the development of self-confidence for both genders.

There was a significant difference in relaxation and activation scores between males and females in the present study. These results agree with previous studies on differences in relaxation (Katsikas et al., 2009) and activation (Sotoodeh et al., 2012) between genders, where males used these two mental skills more effectively than female athletes. These arousal regulation techniques have shown to be effective for elite athletes during competitions to stay calm, focused, and ready (Durand-Bush & Slamela, 2002), mental skills training in swimming should facilitate for the development of arousal regulation techniques for female swimmers.

The results in the present study revealed that females scored higher on stress reactions related to performance and competition than males. On the contrary, Hammermeister and Burton (2004) found that there were no differences in competitive state anxiety between genders, but there were differences in coping styles with females using more emotion focused coping and males using more problem focused coping (Hammermeister & Burton, 2004). High levels of stress or anxiety in competition can affect the performance negatively, but it does not necessarily have to. Hanton et al. (2015) states that it is how the athlete perceives the stress that will determine how it affects the performance. If an athlete experiences the competition related anxiety as beneficial to the performance, the athlete will likely demonstrate better overall performance, implying that individual attributes play an important role in interpretation of competition anxiety symptoms (Hanton et al., 2015). Considering present study results, a higher score on this subscale does not necessarily have to be debilitating to performance, and the individual interpretation of stress can determine how it affects performance.

The results from the present study showed that males scored higher than females on imagery. This suggests that males found it easier to create, change and feel mental images than females based on the survey questions. Several studies have assessed gender differences in

imagery, but the results are inconsistent (e.g., Campos, 2014; Katsikas et al., 2009). Campos (2014) suggests that the reason for this is the “wide array of types of imagery” (p. 107), the study found that males and females scored differently on different imagery scales. To further investigate the differences in imagery between genders in elite swimming, a survey including specific types of imagery (e.g., The Object-Spatial Imagery and Verbal Questionnaire (OSIVQ), and The Vividness of Visual Imagery Questionnaire-2 (VVIQ-2)) would be necessary (Campos, 2014).

The results indicate that males in the present study found it easier to stay focused during training and competition than females. To our knowledge there are few other studies on elite athletes and gender differences in focusing. Lum et al., (2002) found differences across gender and sports type (static and dynamic) in college athletes and visual orienting (e.g., vigilance, alerting, automatic orienting), and suggested that the skill of focusing effectively should be considered in the specific sports because of the different attentional requirements. Based on present study results, an elaboration on focusing and attentional control in swimming could specify reasons for the difference in score between genders.

Considering the differences between genders and their score on mental skills, previous research has shown that males tend to score higher than females when responding to self-assessments even though the level might be the same (Beyer, 2002). This should be considered when interpreting the results of the present study.

Differences between Junior and Senior Swimmers in Mental Skills Scores

No significant differences between junior and senior swimmers were found in the OMSAT-3* scores. This might be due to the small age difference between juniors and seniors, and the overweight of junior swimmers in the study (83 juniors, 35 seniors). There are some previous studies on the difference between junior and senior athletes and their mental skills, but to our knowledge none with swimming. One study on cricket which included junior and senior

academy, and first-class senior provincial players, found no difference in mental skills between the three groups (Jooste et al., 2013). Further, the study indicated that regardless of the players level of participation they scored high on the skills of motivation, self-confidence, concentration ability, imagery, coachability, and peaking under pressure (Jooste et al., 2013). Similarly, the present study showed no difference in mental skills between juniors and seniors indicating that these skills were already developed before competing at the Norwegian Championship level. Henriksen et al. (2019) found in their study on successful and less successful interventions with youth and senior athletes that sport psychologists often used many of the same mental techniques with youth athletes (13-18 years) and senior athletes. In successful interventions with youth athletes the focus was more towards helping them handle several life domains (e.g., school, sport, family and social life), and teach relevant mental skills but also life skills. In working with senior athletes, the practitioners used less mental training theory and focused more on the athletes' individual needs. They taught the senior athletes' mental skills if needed but focused more on helping the athletes with existential and motivational issues involved in elite athletic career. (Henriksen et al., 2019). In the present study the swimmers might also have practiced the same type of mental skills since they were youth and therefore there was no difference. If the OMSAT-3* had included questions on motivation, life skills and additional self-regulatory skills it could potentially have revealed a difference between juniors and seniors on these variables.

Relationship between Foundation Skills and Selected Mental Skills

The swimmers scored highest on the foundation skills (goal setting, self-confidence, and commitment). This is in accordance with Durand-Bush et al. (2001) which investigated 345 athletes from 35 different sport disciplines, both individual and team sports, where athletes scored highest on goal setting, commitment, and self-confidence subscales. Further, the

discussion will focus on the results from the multiple regression analyses assessing the relationship between the foundation skills and selected mental skills.

Goalsetting

Goal setting is a cognitive process and goals are formed by using internal comparisons and standards (Weinberg & Butt, 2014), which is why the cognitive skills of mental practice, focusing and competition planning were used in the regression analysis. The swimmers scored highest on goal setting in the present study. Mental practice and focusing both contributed to the variance in the goal setting score with 36.8% and 27.6% respectively, competition planning made no significant contribution. Mental practice was the mental skill where the swimmers scored the lowest, but still it made a significant contribution to the goal setting score. It might be the case that the swimmers who perform mental practice as a part of their training routine have high goals and wants to conduct mental practice to enhance their performance. Their mental training might also be a part of the goals that they have. Goal setting influence performance by helping athletes directing their attention to the task at hand (Weinberg & Butt, 2014), and training goals can keep the athlete focused and motivated to persist in the sport. Focus contributed substantially to the goal setting score. This might be because focus is needed to set future goals and to do the work in order to reach these goals. Swimmers in the present study can benefit from goal setting to remain focused during training and competition. Interestingly, competition planning did not contribute to the variance in the goal setting score. Considering competition planning is directed specifically towards the competition setting this might not fall under goal setting as such. Goal setting in the OMSAT-3* focused more on daily goals and how it affects the athlete's effort in training.

Self-confidence

The competition settings in sport can often create physical and mental stress for the athletes and arousal regulation techniques may be helpful to manage their feeling of stress and

in turn influence their self-confidence and performance positively (Vealey, 2007). Considering, we chose to include the psychosomatic skills (activation, relaxation and stress reactions) in the multiple regression analysis. The results from the multiple regression showed that activation had a 51.8% contribution to the variance in the self-confidence score. Relaxation contributed 19.8% and stress control had no significant contribution. This indicates that swimmers who regulate their arousal with activation might have higher self confidence in competition settings. Since relaxation also contributed to the self-confidence score, it can be assumed that being able to both “psych up” and “psych down” will affect the swimmers feeling of self-confidence. The literature on arousal and self-confidence shows that being able to have the optimal arousal level will positively affect self-confidence and performance (Hanton et al., 2015). Athletes have stated that self-confidence is one of the most important factors for high level performance, and that it has a central role in being able to cope with stress and pressure of competitions (Durand-Bush & Slamela, 2002). This is consistent with the results in the present study where Norwegian swimmers in general scored high on self-confidence in the OMSAT-3*. Further, PST that uses relaxation and activation could help swimmers regulate their arousal in a better way and therefore increase their self-confidence. Stress reactions did not contribute to the variance in the self-confidence score. This could mean that the feeling of stress did not influence self-confidence. It is rather the way of handling the stress (activation and relaxation) that has an impact on the feeling of self-confidence.

Commitment

Commitment as a more stable foundation skill coincides with persistence in an activity and desire to reach a certain goal (Durand-Bush et al., 2001), therefore competition planning, mental practice and imagery were included in the regression analysis as these were considered cognitive skills likely used regularly. Competition planning explained 21% of the variance in the commitment score, mental practice and imagery had no significant contribution. Most

athletes want to facilitate for the best possible performance and plan their pre-competition routines. These routines must be perfected throughout the career from competitions and experiences. Having performance routines lead to consistent thoughts and behaviors during the performance and will lead to a more consistent performance (Collins et al., 2011). The results from the present study indicate that when the swimmers engage in the process of developing competition plans it can make them feel more committed to their swimming performance. This is consistent with previous findings from Durand-Bush and Salmela (2002) with Olympic level athletes who emphasized the importance of competition planning and evaluation throughout their whole career for their achievements. Mental practice and imagery did not contribute to the variance in the commitment score. There can be several reasons for this. One can be the general focus in swimming. To elite swimmers, competing is important and most likely a part of the swimmers' priorities. Competition planning is a specific part of this process. Mental practice and imagery might not have been a structured part of the swimmers training or preparation for a competition in the same way as competition planning and therefore not as important to the feeling of commitment. With that in mind, mental practice and imagery is likely involved in the competition planning in a more informal or unstructured way (Durand-Bush & Salmela, 2002). Looking at the swimmers score on mental practice from the OMSAT-3*, they had a lower score on this compared to the other mental skills, indicating that this is not a structured part of the swimmers training.

Practical Implications and Future Directions of Sport Specific PST in Swimming

Birrer and Morgan (2010) argued that “in attempting to achieve outstanding performance, PST should be adapted to the psychological and physiological demands of each discipline” (p. 78). The present study has presented Norwegian elite swimmers results from the OMSAT-3*. Furthermore, by implementing the sport specific PST for HIS as suggested by Birrer and Morgan (2010) (self-skills, arousal regulation skills, volitional skills, motivational

skills, and recovery skills), together with the findings of the present study it can be suggested that mental skills specific to swimming can be used in PST and interventions with elite swimmers. Birrer and Morgan (2010) highlight self-skills, personal development skills and life skills as important psychological skills in HIS. In the present study, self-confidence has been underlined as important to the Norwegian elite level swimmers. The OMSAT-3* did not include specific personal development or life skills, but with swimming having high training demands elite level swimmers will likely excel including such mental skills in their PST. Future interventions should look at the importance of such skills in elite level swimmers. Arousal skills were also suggested as important mental skills for athletes in HIS (Birrer & Morgan, 2010). Swimmers should focus on developing activation and relaxation techniques to perform at their best. Present study results suggest this could also increase their feeling of self confidence in competition settings. Further, it should be considered whether males and females need to practice activation and relaxation differently, since present study findings revealed gender differences on these mental skill scores. Motivational and volitional skills are not directly targeted in the OMSAT-3*, and the present study have not included motivation because of the scope of this paper. However, commitment can be indirectly linked to motivation because they both enhance persistence. The willingness to keep going in a sport even when it gets tough, or it requires sacrifices are basic drives that are important in a sport like swimming. Furthermore, present study results suggest that swimmers should consider using competition planning to enhance the feeling of commitment in swimming. Recovery skills are mentioned by Birrer and Morgan (2010) as important to athletes in HIS. When referring to recovery training, physical recovery often overshadows mental recovery, even though mental stress is often present and especially when injured (Trainor et al., 2020). In swimming, the risk of getting overuse injuries is large, and being able to cope with potential injuries with mental recovery skills is relevant. Relaxation can influence athletes' recovery from injury and help fasten the recovery process

(Birrer & Morgan, 2010). Considering the present study findings relaxation can be an important mental skill in swimming for several reasons (e.g., arousal regulation) and should be implemented in swimmers PST.

Limitations

The cross-sectional study design offers some weaknesses because it is a one-time measurement of exposure and outcome, therefore interpreting associations should be done carefully. Reasons for present study findings can therefore not be stated but this overview can rather be a steppingstone into doing mental skill interventions with swimmers. The present study used self-reporting, and participants were to answer questions on a Likert-scale. Converting numbers into real world behaviors will not give definite answers and the need for interventions is necessary for validity. The data was treated as continuous data because we wanted to further analyze the data with standard multiple regression. This could give different results than using non-parametric tests in the preliminary analyzes. Since there were many participants (118), and the data was normally distributed we considered this method as reliable. The population was elite swimmers which could mean that the findings might differ for lower level, age-group or open water swimmers. There were also an uneven distribution of juniors (83) and seniors (35) which could have affected the scores.

Conclusion

The present study found that Norwegian elite swimmers scored highest on the foundation skills (goal setting, self-confidence, and commitment). There were differences between genders in the mental skills' self-confidence, relaxation, activation, imagery, stress reactions and focusing. Future studies should consider this difference when doing interventions. There were no observed differences between juniors and seniors on the mental skills. Future interventions on this population should aim at having an even distribution of age (senior/junior) and include motivation, life skills and self-skills. Mental practice, focusing, activation,

relaxation and competition planning contributed to the variance in the foundation skills scores, furthermore, finding mental skills that facilitate the development and maintenance of foundation skills can be interesting for future research in swimming. Future mental training interventions in swimming should focus on sport specific mental techniques and skills such as self-confidence, activation, relaxation, and competition planning.

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Disclosure statement

The authors report there are no competing interests to declare.

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Appendices

Appendix 1: Approval from Norwegian Center for Research Data

Appendix 2: Participant Information Sheet

Appendix 3: Translated Version of The OMSAT-3*

Appendix 1: Approval from Norwegian Center for Research Data

2022-06-23 13:06

Meldeskjema for behandling av personopplysninger

[Meldeskjema](#) / [Kartlegging av mental trening og mentale ferdigheter i norsk elitesvø...](#) / Vurdering

Vurdering

Referansenummer

313761

Prosjekttittel

Kartlegging av mental trening og mentale ferdigheter i norsk elitesvømming

Behandlingsansvarlig institusjon

Norges idrettshøgskole / Institutt for idrett og samfunnsvitenskap

Prosjektansvarlig

Gro Jordalen

Student

Rebecca Karlsson

Prosjektperiode

06.09.2021 - 31.05.2023

[Meldeskjema](#) 

Dato	Type
15.07.2021	Standard

Kommentar

Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet med vedlegg den 15.07.2021. Behandlingen kan starte.

TYPE OPPLYSNINGER OG VARIGHET

Prosjektet vil behandle alminnelige kategorier av personopplysninger frem til 31.05.2023.

SLETTING

Vi anbefaler at du ikke lover sletting av alle data ved prosjektslutt dersom anonymiserte data kan være nyttig til fremtidig forskning.

LOVLIG GRUNNLAG

Prosjektet vil innhente samtykke fra de registrerte til behandlingen av personopplysninger. Vår vurdering er at prosjektet legger opp til et samtykke i samsvar med kravene i art. 4 og 7, ved at det er en frivillig, spesifikk, informert og utvetydig bekreftelse som kan dokumenteres, og som den registrerte kan trekke tilbake.

Lovlig grunnlag for behandlingen vil dermed være den registrertes samtykke, jf. personvernforordningen art. 6 nr. 1 bokstav a.

PERSONVERNPRINSIPPER

NSD vurderer at den planlagte behandlingen av personopplysninger vil følge prinsippene i personvernforordningen om:

- lovlighet, rettfærdighet og åpenhet (art. 5.1 a), ved at de registrerte får tilfredsstillende informasjon om og samtykker til behandlingen
- formålsbegrensning (art. 5.1 b), ved at personopplysninger samles inn for spesifikke, uttrykkelig angitte og berettigede formål, og ikke behandles til nye, uforenlige formål
- dataminimering (art. 5.1 c), ved at det kun behandles opplysninger som er adekvate, relevante og nødvendige for formålet med prosjektet
- lagringsbegrensning (art. 5.1 e), ved at personopplysningene ikke lagres lengre enn nødvendig for å oppfylle formålet

DE REGISTRERTES RETTIGHETER

Så lenge de registrerte kan identifiseres i datamaterialet vil de ha følgende rettigheter: innsyn (art. 15), retting (art. 16), sletting (art. 17), begrensning (art. 18), og dataportabilitet (art. 20).

NSD vurderer at informasjonen om behandlingen som de registrerte vil motta oppfyller lovens krav til form og innhold, jf. art. 12.1 og art. 13.

Vi minner om at hvis en registrert tar kontakt om sine rettigheter, har behandlingsansvarlig institusjon plikt til å svare innen en måned.

FØLG DIN INSTITUSJONS RETNINGSLINJER

NSD legger til grunn at behandlingen oppfyller kravene i personvernforordningen om riktighet (art. 5.1 d), integritet og konfidensialitet (art. 5.1 f) og sikkerhet (art. 32).

For å forsikre dere om at kravene oppfylles, må dere følge interne retningslinjer og/eller rådføre dere med behandlingsansvarlig institusjon.

MELD VESENTLIGE ENDRINGER

Dersom det skjer vesentlige endringer i behandlingen av personopplysninger, kan det være nødvendig å melde dette til NSD ved å oppdatere meldeskjemaet. Før du melder inn en endring, oppfordrer vi deg til å lese om hvilke type endringer det er nødvendig å melde: <https://www.nsd.no/personverntjenester/fyll-ut-meldeskjema-for-personopplysninger/melde-endringer-i-meldeskjema>
Du må vente på svar fra NSD før endringen gjennomføres.

OPPFØLGING AV PROSJEKTET

NSD vil følge opp ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet.

Lykke til med prosjektet!

Appendix 2: Participant Information Sheet

Kartlegging av mentale ferdigheter og mental trening i Norsk svømming.

Utøver

Dette er et spørsmål til deg om å delta i et forskningsprosjekt, hvor formålet er å kartlegge norske elitesvømmere sine mentale ferdigheter, og treneres vektlegging av og kunnskap om mental trening. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Formålet med prosjektet er å kartlegge mentale ferdigheter hos svømmere på NM junior- og/eller senior nivå (16 år og eldre), og treneres vektlegging av og kunnskap om mental trening for utøvere på dette nivået. Disse utøverne har ofte et ønske om å utvikle seg og konkurrere blant de beste utøverne i Norge og internasjonalt. For å være en eliteutøver stilles det en rekke krav til både fysiske og mentale ferdigheter. Flere av verdens beste utøvere benytter seg av mental trening for å prestere bedre både i trening og konkurranse. Det er derfor viktig å få mer kunnskap om mentale ferdigheter hos noen av Norges beste svømmere.

Trenere kan spille en stor rolle i hvordan de tilrettelegger til rette for utøveres mentale trening. Treneres vektlegging av og kunnskap om mental trening er derfor viktig å studere i samsvar med utøvernes mentale ferdigheter.

I dette masterprosjektet ønsker jeg å finne svar på følgende problemstillinger:

1. I hvilken grad bruker norske eliteutøvere innen svømming mentale ferdigheter i trening og konkurranse?
2. I hvilken grad har trenere for norske eliteutøvere innen svømming kunnskap om mental trening, og hvordan vektlegger de dette i arbeidet med sine utøvere?

Hvem er ansvarlig for forskningsprosjektet?

Dette er forskningsprosjektet til masterstudent Rebecca Karlsson. Gro Jordalen (Institutt for idrett og samfunnsvitenskap) og Bjørn Harald Olstad (Institutt for fysisk prestasjonsevne) er veiledere og prosjektledere. Ansvarlig for studien er Norges idrettshøgskole (NIH). Prosjektet gjennomføres i samarbeid med Norges svømmeforbund (NSF).

Hvorfor får du spørsmål om å delta?

Alle svømmere over 16 år i Norge med individuelle krav til NM junior og/eller senior blir spurt om å delta i forskningsprosjektet. Det er kun utøvere som fortsatt trener og konkurrerer aktivt som kan delta. Du som svømmer kan gi oss verdifull informasjon som kan ha stor betydning for andre utøvere, trenere, støtteapparat og NSF, samt et internasjonalt vitenskapelig miljø.

Hva innebærer det for deg å delta?

Du deltar i dette forskningsprosjektet ved å besvare et nettbasert spørreskjema. Dette vil ta ca.15 minutter. Spørreskjemaet inneholder spørsmål om mentale ferdigheter (f.eks indre dialog, målsetting, stress-mestring, fokus/refokusering).

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen

negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan oppbevares og brukes dine opplysninger

Vi vil bare bruke opplysningene om deg til formålene vi har beskrevet i dette informasjonsskrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. Det er kun forskningsgruppen ved Norges idrettshøgskole som vil få tilgang til innsamlede data. Data vil bli lagret i henhold til NIHs retningslinjer for sikker oppbevaring av forskningsdata på et eget sikkert område frem til prosjektets slutt. Alle data behandles anonymt.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Opplysningene dine og alle data vil slettes når forskningsprosjektet avsluttes i 30. juni 2023.

Dine rettigheter

Så lenge du kan identifiseres i datamaterialet, har du rett til: innsyn i hvilke personopplysninger som er registrert om deg, og å få utlevert en kopi av opplysningene, å få rettet personopplysninger om deg, å få slettet personopplysninger om deg, og å sende klage til Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?

Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra Norges idrettshøgskole har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne mer informasjon?

Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med: NIH ved prosjektleder og veileder: Gro Jordalen, tlf: 23 26 23 51 eller epost: gro.jordalen@nih.no NIH ved masterstudent: Rebecca Karlsson, tlf: 45 28 60 89 eller epost: rebeccak@nih.no Personvernombud ved NIH, epost: personvernombud@nih.no Hvis du har spørsmål knyttet til NSD sin vurdering av prosjektet, kan du ta kontakt med: NSD – Norsk senter for forskningsdata AS på tlf: 55 58 21 17 eller epost: personverntjenester@nsd.no

Med vennlig hilsen

Rebecca Karlsson (masterstudent)
Gro Jordalen (Ph.D., prosjektansvarlig)

Appendix 3: Translated Version of The OMSAT-3*

Jeg har mottatt og forstått informasjon om prosjektet «Kartlegging av mentale ferdigheter og mental trening i Norsk elite svømming».

Jeg har fått anledning til å stille spørsmål om denne spørreundersøkelsen, og

- (1) Jeg samtykker til å delta
- (2) Jeg samtykker ikke til å delta

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet, 30.juni 2023.

- (1) Jeg samtykker
- (2) Jeg samtykker ikke

Skriv inn ditt fødselsår (ÅÅÅÅ):

Kjønn:

- (1) Kvinne
- (2) Mann
- (3) Hen
- (4) Vet ikke/ønsker ikke å svare

Hvor mange år har du vært aktiv svømmer? (dvs. deltatt på stevner).

Hvilken konkurranse har du deltatt på i år (2021)?

- (1) NM junior langbane
- (2) NM senior langbane
- (3) Begge
- (4) Var kvalifisert, men deltok ikke på NM langbane
- (5) Har NM krav nå (jr og/eller sr), men tok det etter årets langbane NM

Hvilke mentale ferdigheter synes du er viktigst i svømming? (Velg 3)

- (1) Målsetting
- (2) Selvtillit
- (3) Spenningsregulering
- (4) Stressmestring
- (5) Motivasjon
- (6) Fokus
- (7) Visualisering
- (8) Konkurransen planlegging
- (9) Positiv indre dialog

De neste påstandene skal du besvare ved å markere på en skala fra Svært uenig til Svært enig hvor enig du er i påstanden. Tenk på dine siste prestasjoner i svømming, både på trening og i konkurranse. Vennligst marker det svaret som passer best for deg. Svar gjerne det som faller deg først inn, det er ingen riktige eller gale svar.

	Svært uenig	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig	Svært enig	Vet ikke
1) Jeg setter meg daglige treningsmål.	(1) <input type="radio"/>	(2) <input type="radio"/>	(3) <input type="radio"/>	(4) <input type="radio"/>	(5) <input type="radio"/>	(6) <input type="radio"/>	(7) <input type="radio"/>	(0) <input type="radio"/>
2) Jeg har troen på at jeg kan lykkes i svømming uavhengig av hvilke utfordringer jeg møter på veien.	(1) <input type="radio"/>	(2) <input type="radio"/>	(3) <input type="radio"/>	(4) <input type="radio"/>	(5) <input type="radio"/>	(6) <input type="radio"/>	(7) <input type="radio"/>	(0) <input type="radio"/>

3) Jeg synes det er lett å slappe av. (1) (2) (3) (4) (5) (6) (7) (0)

4) Det er flere ting i min idrett som er potensielt farlig og gjør meg redd. (1) (2) (3) (4) (5) (6) (7) (0)

5) Jeg klarer å øke energinivået mitt når jeg er sliten på trening. (1) (2) (3) (4) (5) (6) (7) (0)

6) Jeg opplever prestasjonsproblemer fordi jeg er for nervøs. (1) (2) (3) (4) (5) (6) (7) (0)

De neste påstandene skal du besvare ved å markere på en skala fra Svært uenig til Svært enig hvor enig du er i påstanden. Tenk på dine siste prestasjoner i svømming, både på trening og i konkurranse. Vennligst marker det svaret som passer best for deg. Svar gjerne det som faller deg først inn, det er ingen riktige eller gale svar.

Svært uenig Uenig Litt uenig Verken enig eller uenig Litt enig Enig Svært enig Vet ikke

7) Jeg er bestemt på å aldri gi opp i (1) (2) (3) (4) (5) (6) (7) (0)

idretten min.

8) Jeg mister fokus under viktige konkurranser. (1) (2) (3) (4) (5) (6) (7) (0)

9) Jeg synes det er enkelt å lage mentale bilder. (1) (2) (3) (4) (5) (6) (7) (0)

10) Jeg setter meg vanskelige, men oppnåelige mål. (1) (2) (3) (4) (5) (6) (7) (0)

11) Jeg planlegger ritualer jeg skal gjøre før en konkurranse. (1) (2) (3) (4) (5) (6) (7) (0)

12) Jeg oppfører meg selvsikkert, selv i vanskelige situasjoner i idretten min. (1) (2) (3) (4) (5) (6) (7) (0)

De neste påstandene skal du besvare ved å markere på en skala fra Svært uenig til Svært enig hvor enig du er i påstanden. Tenk på dine siste prestasjoner i svømming, både på trening og i konkurranse. Vennligst marker det svaret som passer best for deg. Svar gjerne det som faller deg først inn, det er ingen riktige eller gale svar.

Svært uenig Uenig Litt uenig Verken enig eller uenig Litt enig Enig Svært enig Vet ikke

13) Jeg gjør mental trening til daglig i idretten min. (1) (2) (3) (4) (5) (6) (7) (0)

14) Kroppen min blir unødvendig anspent i konkurranse. (1) (2) (3) (4) (5) (6) (7) (0)

15) Jeg mister fokus på den daglige treningen. (1) (2) (3) (4) (5) (6) (7) (0)

16) Jeg er redd for å tape. (1) (2) (3) (4) (5) (6) (7) (0)

17) Jeg er forpliktet til å bli en enestående utøver. (1) (2) (3) (4) (5) (6) (7) (0)

18) Jeg har klare mentale bilder i hodet. (1) (2) (3) (4) (5) (6) (7) (0)

De neste påstandene skal du besvare ved å markere på en skala fra Svært uenig til Svært enig hvor enig du er i påstanden. Tenk på dine siste prestasjoner i svømming, både på trening og i

konkurransen. Vennligst marker det svaret som passer best for deg. Svar gjerne det som faller deg først inn, det er ingen riktige eller gale svar.

	Svært uenig	Uenig	Litt uenig	Verken enig eller uenig	Litt enig	Enig	Svært enig	Vet ikke
19) Jeg kan bevisst redusere spenningen i musklene mine.	(1) <input type="radio"/>	(2) <input type="radio"/>	(3) <input type="radio"/>	(4) <input type="radio"/>	(5) <input type="radio"/>	(6) <input type="radio"/>	(7) <input type="radio"/>	(0) <input type="radio"/>
20) Jeg klarer å øke energinivået mitt når jeg er for avslappet i en konkurranse.	(1) <input type="radio"/>	(2) <input type="radio"/>	(3) <input type="radio"/>	(4) <input type="radio"/>	(5) <input type="radio"/>	(6) <input type="radio"/>	(7) <input type="radio"/>	(0) <input type="radio"/>
21) Jeg tenker på maksimal prestasjon når jeg trener mentalt.	(1) <input type="radio"/>	(2) <input type="radio"/>	(3) <input type="radio"/>	(4) <input type="radio"/>	(5) <input type="radio"/>	(6) <input type="radio"/>	(7) <input type="radio"/>	(0) <input type="radio"/>
22) En feil fører ofte til nye feil i konkurranse.	(1) <input type="radio"/>	(2) <input type="radio"/>	(3) <input type="radio"/>	(4) <input type="radio"/>	(5) <input type="radio"/>	(6) <input type="radio"/>	(7) <input type="radio"/>	(0) <input type="radio"/>
23) Jeg setter meg mål for å forbedre de daglige aspektene ved prestasjonen min.	(1) <input type="radio"/>	(2) <input type="radio"/>	(3) <input type="radio"/>	(4) <input type="radio"/>	(5) <input type="radio"/>	(6) <input type="radio"/>	(7) <input type="radio"/>	(0) <input type="radio"/>

24) Jeg synes det er vanskelig å trene på grunn av frykt involvert i idretten min. (1) (2) (3) (4) (5) (6) (7) (0)

De neste påstandene skal du besvare ved å markere på en skala fra Svært uenig til Svært enig hvor enig du er i påstanden. Tenk på dine siste prestasjoner i svømming, både på trening og i konkurranse. Vennligst marker det svaret som passer best for deg. Svar gjerne det som faller deg først inn, det er ingen riktige eller gale svar.

Svært uenig Uenig Litt uenig Verken enig eller uenig Litt enig Enig Svært enig Vet ikke

25) Jeg planlegger hva jeg skal tenke på under en konkurranse. (1) (2) (3) (4) (5) (6) (7) (0)

26) Jeg kan føle bevegelsene når jeg visualiserer. (1) (2) (3) (4) (5) (6) (7) (0)

27) Jeg synes det er vanskelig å refokusere når jeg blir skuffet over egen prestasjon. (1) (2) (3) (4) (5) (6) (7) (0)

28) Jeg tror jeg har den personlige kapasiteten som trengs for å nå mine mål. (1) (2) (3) (4) (5) (6) (7) (0)

29) Jeg synes det er lett å raskt kunne slappe av. (1) (2) (3) (4) (5) (6) (7) (0)

30) Jeg er villig til å ofre det meste for å utvikle meg i min idrett. (1) (2) (3) (4) (5) (6) (7) (0)

De neste påstandene skal du besvare ved å markere på en skala fra Svært uenig til Svært enig hvor enig du er i påstanden. Tenk på dine siste prestasjoner i svømming, både på trening og i konkurranse. Vennligst marker det svaret som passer best for deg. Svar gjerne det som faller deg først inn, det er ingen riktige eller gale svar.

Svært uenig Uenig Litt uenig Verken enig eller uenig Litt enig Enig Svært enig Vet ikke

31) Jeg synes det er vanskelig å konsentrere meg i enkelte treningssituasjoner. (1) (2) (3) (4) (5) (6) (7) (0)

32) Jeg opplever (1) (2) (3) (4) (5) (6) (7) (0)

at et stort publikum gjør meg nervøs i konkurranser.

33) Jeg synes det er lett å endre mentale bilder i hodet mitt. (1) (2) (3) (4) (5) (6) (7) (0)

34) Jeg synes det er vanskelig å refokusere etter en uventet hendelse i en konkurranse. (1) (2) (3) (4) (5) (6) (7) (0)

35) Jeg planlegger min mentale trening. (1) (2) (3) (4) (5) (6) (7) (0)

36) Jeg presterer bedre på trening enn jeg gjør i konkurranse. (1) (2) (3) (4) (5) (6) (7) (0)

De neste påstandene skal du besvare ved å markere på en skala fra Svært uenig til Svært enig hvor enig du er i påstanden. Tenk på dine siste prestasjoner i svømming, både på trening og i konkurranse. Vennligst marker det svaret som passer best for deg. Svar gjerne det som faller deg først inn, det er ingen riktige eller gale svar.

Svært Uenig Litt Verken Litt enig Enig Svært Vet ikke enig

uenig

uenig

eller
uenig

enig

37) Jeg kan enkelt aktivere meg selv til et optimalt nivå hvor prestasjonen min er på sitt beste.

(1)

(2)

(3)

(4)

(5)

(6)

(7)

(0)

38) Jeg har vanskeligheter med å finne effektive strategier for å holde fokus under en hel konkurranse.

(1)

(2)

(3)

(4)

(5)

(6)

(7)

(0)

39) Jeg føler meg mer forpliktet til å forbedre meg i idretten min enn noe annet i livet.

(1)

(2)

(3)

(4)

(5)

(6)

(7)

(0)

40) Jeg planlegger hva jeg skal gjøre under en konkurranse.

(1)

(2)

(3)

(4)

(5)

(6)

(7)

(0)

41) Mine mål pusher meg til å trene hardere.

(1)

(2)

(3)

(4)

(5)

(6)

(7)

(0)

42) Jeg kan slappe av på en

(1)

(2)

(3)

(4)

(5)

(6)

(7)

(0)

effektiv måte i avgjørende situasjoner i en konkurranse.

De neste påstandene skal du besvare ved å markere på en skala fra Svært uenig til Svært enig hvor enig du er i påstanden. Tenk på dine siste prestasjoner i svømming, både på trening og i konkurranse. Vennligst marker det svaret som passer best for deg. Svar gjerne det som faller deg først inn, det er ingen riktige eller gale svar.

Svært uenig Uenig Litt uenig Verken enig eller uenig Litt enig Enig Svært enig Vet ikke

43) Jeg synes det er vanskelig å ta kontroll over ting for å redusere min egen frykt på trening.

(1) (2) (3) (4) (5) (6) (7) (0)

44) Jeg dweler ved feil jeg gjør på trening.

(1) (2) (3) (4) (5) (6) (7) (0)

45) Jeg trener mentalt på at uforutsette ting kan skje under en konkurranse.

(1) (2) (3) (4) (5) (6) (7) (0)

46) Jeg kan enkelt regulere

(1) (2) (3) (4) (5) (6) (7) (0)

meg selv før en konkurranse hvis jeg føler meg nedenfor.

47) Jeg har en plan som inkluderer stikkord som jeg sier til meg selv under konkurranser. (1) (2) (3) (4) (5) (6) (7) (0)

48) Jeg er selvsikker i de fleste situasjonene rundt min prestasjon. (1) (2) (3) (4) (5) (6) (7) (0)

De neste påstandene skal du besvare ved å markere på en skala fra Svært uenig til Svært enig hvor enig du er i påstanden. Tenk på dine siste prestasjoner i svømming, både på trening og i konkurranse. Vennligst marker det svaret som passer best for deg. Svar gjerne det som faller deg først inn, det er ingen riktige eller gale svar.

Svært uenig Uenig Litt uenig Verken enig eller uenig Litt enig Enig Svært enig Vet ikke

49) Jeg synes filming er et bra verktøy for å utvikle meg teknisk. (1) (2) (3) (4) (5) (6) (7) (0)

50) Min trener og jeg benytter filming på trening og konkurranse for å utvikle min teknikk og evaluere fremgang. (1) (2) (3) (4) (5) (6) (7) (0)

51) Jeg ser på video av bedre utøvere enn meg selv for å få inspirasjon og tekniske tips. (1) (2) (3) (4) (5) (6) (7) (0)

52) Jeg føler at det er lettere å endre teknikken min når jeg ser meg selv på video enn når jeg får tilbakemelding fra trener. (1) (2) (3) (4) (5) (6) (7) (0)

Du har gitt ett verdifullt bidrag, tusen takk!
Du kan avslutte besvarelsen din ved å klikke "Neste".

Ha en fin dag!

Med vennlig hilsen
Rebecca Karlsson (masterstudent)
Gro Jordalen (Ph.D., prosjektansvarlig)