

# Development of a sport psychological inventory investigating mental skills in equestrian sports

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# Abstract

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The aim of the present study was to develop a sport psychological inventory which is meant to help riders (and their coaches) to test their pre-competitive mental skills. The inventory was developed in two steps. The first version of the inventory was based on various studies and interviews with riders. This version included 49 items divided into five potential factors: self-confidence, goal-setting, arousal control, visualization and routines. The questions could be answered on a 4-point Likert scale (1=never, 2=seldom, 3=often, 4=always). Additionally, six general questions about gender, age, discipline, level, riding experience and possession of horses were included. 297 riders of different disciplines and levels participated on the first study. After having conducted a principal component analysis (PCA), the inventory was divided into the five factors which have been suggested previously. For the second version of the inventory, seven items were deleted because of their poor internal consistency. The second version included 44 items. 371 riders participated. After having analyzed the reliability of the five factors using Cronbach's Alpha coefficient, four of the factors (self-confidence, visualization, goal-setting and arousal control) showed good reliabilities from .67 to .88. The factor 'routine' showed a poor reliability of .45. Due to these results, this factor was removed. The final version of the inventory includes 32 items.

Furthermore, the results of both studies were combined and analyzed using a one-way multivariate analysis of variance (MANOVA). 668 riders participated on this study. The aim of the study was to investigate the differences between level and discipline regarding the four factors. No statistically significant difference was found:  $F(4, 668) = 1.22, p = .08$ ; Wilks' Lambda = .85; partial eta squared = .04. Regarding the results separately, the researchers

found that riders in higher levels show better mental skill scores. This confirmed previous studies finding that elite riders show more mental skills than non-elite riders.

# Kurzfassung

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In der vorliegenden Studie wurde ein sportpsychologischer Fragebogen entwickelt, der Reitern und deren Trainern helfen soll, ihre mentalen Fähigkeiten vor einem Turnier zu überprüfen. Die Entwicklung fand in zwei Schritten statt. Die erste Version des Fragebogens wurde basierend auf Studien und Interviews mit Reitern entwickelt. Diese Version enthielt 49 Fragen, die in fünf potenzielle Faktoren untergliedert wurden: Selbstvertrauen, Zielsetzung, Erregungskontrolle, Visualisierung und Rituale/Routine. Diese Fragen konnten auf einer Vierpunkte-Likert-Skala (1=nie, 2=selten, 3=häufig, 4=immer) beantwortet werden. Hinzu kamen sechs Fragen über Geschlecht, Alter, Disziplin, Leistungsklasse, Reiterfahrung und Pferdebesitz. An der ersten Studie nahmen 297 Reiter unterschiedlicher Disziplinen und Leistungsklassen teil. Nach Durchführung einer Komponenten-Analyse wurde der Fragebogen in die bereits vorher vermuteten fünf Faktoren aufgeteilt. Sieben Fragen fielen aufgrund ihrer schlechten internen Beständigkeit bei der zweiten Version des Fragebogens weg. Der zweite Fragebogen enthielt 44 Fragen und wurde von 371 Reitern ausgefüllt. Nach einer Analyse der Reliabilität der fünf Faktoren mit Hilfe des Cronbach Alpha Koeffizienten zeigten vier der Faktoren (Selbstvertrauen, Visualisierung, Zielsetzung und Erregungskontrolle) eine gute Reliabilität von .67 bis .88. Der Faktor Routine zeigte hingegen eine schlechte Reliabilität von .45. Aufgrund der Ergebnisse wurde dieser Faktor aus dem Fragebogen genommen. Die finale Version des Fragebogens enthält 32 Fragen.

Desweiteren wurden die Ergebnisse der beiden Studien zusammengefasst und mit Hilfe einer Einweg multivariaten Analyse (MANOVA) ausgewertet. An dieser Studie nahmen insgesamt 668 Reiter teil. Ziel war es, die Unterschiede zwischen den Leistungsklassen und Disziplinen in Bezug auf die vier Faktoren zu untersuchen. Es wurde keine statistisch

signifikante Differenz gefunden:  $F(4, 668) = 1.22$ ,  $p = .08$ ; Wilks' Lambda = .85; partial eta squared = .04. Bei getrennter Betrachtung konnte jedoch festgestellt werden, dass Reiter in höheren Leistungsklassen auch bessere mentale Fähigkeiten vorweisen konnten. Dies bestätigte wiederum vorherige Studien, in denen festgestellt wurde, dass Elite-Reiter häufig bessere mentale Fähigkeiten aufweisen können als Amateurreiter.

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# 1 Introduction

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“To become successful, the athlete needs to be committed, dedicated, motivated, mentally tough, and able to pursue achievement goals in a rational way. All these attributes may be developed or improved by using psychological skills” (Bertollo, Saltarelli & Robazza, 2009; p. 245).

Many sport psychological studies over the last decades have been investigating cognitive and emotional factors related with athletic performance and success in order to identify personality traits of skilled athletes and mental strategies they use to be able to perform successfully (Bertollo, Saltarelli & Robazza, 2009). However, there have not been many studies about equestrian athletes.

Equestrian sport is quite different from all other sports because of the horse as an animal partner in sport (Wolframm & Micklewright, 2009). The horse-rider dyad requires a specific communication. Horses do not communicate verbally but physically. They are very sensitive animals which are able to detect every little change in the mood of the rider. Horses are able to sense muscular tension, stress or, in good cases, self-confidence of the rider. Due to this, it is necessary that the rider is able to stay calm and relaxed to not influence the horse in a negative way. Since the horse is a herd and flight animal, it is determined to react, if the herd leader, the rider, signals a danger. In order to be able to perform successfully, it is obvious that the rider has to be able to apply certain mental skills such as relaxation techniques, self-talk, goal-setting or visualization. Studies of Wolframm and Micklewright (2009, 2010a, 2010b, 2011) found that elite riders use mental skills more often than non-elite riders. Concluding, elite riders are likely to be more successful because of a good horse-rider

communication. Regarding this thought, this study was developed. The aims of the study were twofold. The primary aim was to develop an inventory measuring pre-competitive mental skills of equestrian athletes. The secondary aim of the study aimed to investigate differences in the use of pre-competitive mental skills between equestrian athletes at different level and discipline.

## 2 Literature review

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### 2.1 Deficiencies in athletes prior to or during competitive performance

#### 2.1.1 General pre-competitive affects

For many athletes performing, at a competition quite often entails a number of unpleasant and unwanted cognitive or emotional experiences, such as change of mood, anxiety, stress, muscular tension, lack of self-confidence or self-handicapping. Although negative affect can even be observed at the elite level, non-elite athletes are more commonly affected. A number of research studies and theoretical models have sought to explain the interaction and effects of anxiety, stress and confidence in sport (Fazey, 1987; Hardy, 1990, Hardy & Parfitt, 1991; Jerome & Williams, 2000; Lazarus, 2000). Therefore this topic has become one of the most popular sport psychological research topics. Other researchers have found that many athletes are not successful in their performance because they are unable to concentrate during a competitive event (Orlick & Partington, 1988). Many aspects which are not controllable for the athlete can result in a deficiency like stress or competitive anxiety. Especially if the competition is seen by public visitors, this might cause certain expectancy in the elite or even sub-elite athlete (Wolframm, 2011). According to Patmore (1979; 1986) top performances vary only slightly in technical quality. He thinks that an elite athlete is certainly able to produce a world-class performance because of his natural status. A competitive event should hence be regarded as a test if the athlete is able to perform the way he wants at precisely the time when he wants to. In an early study, Orlick and Partington (1988, p.129) investigated factors related to Olympic success. They stated: "Of the three major readiness factors rated by the athletes – mental, physical, technical – mental readiness provided the

only statistically significant link with final Olympic ranking.” This has led to the conclusion that a large percentage of athletes were not able to perform properly because they could not hold their concentration and focus facing the distraction (Orlick & Partington, 1988). Considering these factors, it might be possible to differentiate successful from less successful athletes (Jones, Hanton & Swain, 1994; Jones & Swain, 1995). However, Mahoney, Gabriel and Perkins (1987) have found that individual athletes report more problems with performance anxiety and self-confidence compared to team sport athletes in their study about psychological skills and exceptional athletic performance.

### 2.1.2 Anxiety, arousal and stress

In literature of sport science terms like “anxiety”, “arousal” and “stress” are frequently used since they refer to negative emotional factors which have an implicit or explicit threat to an athlete’s mental and physical health (Wolframm, 2011). Also Woodman and Hardy (2001) comment that the theoretical relationship between anxiety and sporting performance is known as one of the most commonly debated and researched areas in sport psychology. They mention additionally that performance anxiety is always seen as an unpleasant emotion which determines sport performances in a negative way (Woodman & Hardy, 2001). Performance anxiety is regarded to be multidimensional (Martens, Vealey & Burton, 1990; Smith, Smoll & Wiechman, 1998). Therefore, it consists of a cognitive component (worries about performance, negative judgement of oneself and the situation) and a physiological component (somatic symptoms like sweating, butterflies in the stomach, increased muscular tension). Morris et al. (1981, p.541) defined cognitive anxiety as “negative expectations and cognitive concerns about oneself, the situation at hand, and potential consequences.” Somatic or physiological anxiety was explained as “the perception of one’s physiological arousal.” Despite numerous studies took aim at investigating the

relationship between anxiety and performance in different sports, findings remain inconsistent (Woodman & Hardy, 2003). Even under high levels of arousal and cognitive anxiety, performers will still be able to perform as long as they are self-confident (Wolframm & Micklewright, 2010a). Therefore, it is important to handle the term of pre-competitive anxiety needs which are applied with care because arousal does not necessarily have negative impacts on an athlete.

As already mentioned, also arousal is a common problem of athletes before or during a competition. However, Schachter (1964) stated that “precisely the same state of physiological arousal could be labeled ‘joy’ or ‘fury’ or any of a great diversity of emotional labels, depending on the cognitive aspects of the situation” (p. 53). Hence, the difference between arousal and anxiety is that arousal usually refers to the intensity of symptoms regardless of their direction. In contrast, anxiety is always associated with negative impact. Therefore, many researchers had problems to define whether aspects of arousal or anxiety influence each other. Parfitt, Jones and Hardy (1990, p.44) describe it as following: “... a sudden increase in physiological arousal (somatic anxiety) can be a source of worry, while conversely, worrying about a threatening event may cause an increase in physiological anxiety.” Arousal is also referred to the neutral physiological and psychological stimulation before or during a stressful event however regardless of the cognitive evaluation of the event (Lazarus & Folkmann, 1984). Concluding, it can be said that the possessing of relevant coping skills and self-confidence is necessary to deal with stress and the development of anxiety (Lazarus, 1991).

### 2.1.3 Lack of self-confidence

Researchers have found that confident athletes are able to cope better with symptoms of anxiety (e.g. Jones, Hanton & Swain, 1994; Jones & Swain, 1995). However, lack of self-confidence is a problem that occurs quite commonly in athletes. A self-confident person can be described as somebody who is able to apply enough coping skills to handle a difficult situation. However, Hardy, Jones and Gould (2001) suggest that self-confidence does not depend on the amount of skills someone possesses but of the “performers’ perception of their ability to succeed in a given situation at a given time.” Summarized, self-confidence or self-efficacy is “one’s belief that a certain level of performance can be attained” (Hardy, Jones and Gould, 2001). Also other researchers found that self-confidence is an important factor which influences the athletic performance (e.g. Jones & Hanton, 2001; Vealey, 2001). Hardy et al. (2001) argue that “performance accomplishments are thought to elicit the most powerful effects on self-efficacy since they are based upon personal mastery experience.” The model of sport confidence by Vealey and his colleagues (1998) identified different sources of confidence such as mastery, demonstration of ability, physical/mental preparation, physical self-presentation, social support, vicarious experience, coach’s leadership, environmental comfort and situational favorableness. Based on these sources, self-confidence tends to be unstable, especially at Olympic level (Gould et al., 1999). In a more recent study by Hays and colleagues (2007), athletes identified these sources of sport confidence. These could be categorized into nine global dimensions such as preparation, performance accomplishments, coaching, social support, innate factors, experience, competitive advantage, trust and self-awareness. The results showed that successful world class athletes generate confidence mainly from preparation, performance accomplishments and coaching. These sources of confidence were also influenced by gender (Hays et al.,

2007). Concluding, self-confidence is an important factor regarding sports performances however it depends on several sources and can, but not necessarily must be influenced by skills.

## 2.2 Mental skills

### 2.2.1 General definition

Since there are many deficiencies which occur in athletes before or during a competition, it is necessary that these athletes are able to cope with them. If an athlete is coping well, he or she shows a good performance even under pressure or in stressful situations. Usually, it is thought that elite athletes are able to cope better with such situations but studies found that also among elite athletes the ability to cope varies from individual to individual (Gould, Finch & Jackson, 1993). Lazarus and Folkman (1984) define coping as “the cognitive and behavioural efforts of an individual to manage the internal and external demands encountered during a competitive situation.” Coping is also to be seen as “negotiator” between the stressful event and a person’s mental and physical health (Folkman, Lazarus, Gruen & De Longis, 1986). Since stress is seen to have damaging potential regarding one’s psyche and body, Anthony and Liberman (1986) suggest that good coping strategies like psychological skills may help to prevent this damaging process. There are different coping styles which depend on the cognitive, behavioural or affective functions. These include problem-focused, emotion-focused, avoidance and appraisal-reappraisal coping styles (Endler & Parker, 1990; Lazarus & Folkman, 1984) which can be differentiated by the mental skills that are used. Problem-focused coping includes strategies which may manage or change the stressing factor. Problem-focused skills can be gathering of information, goal-setting, time management and problem solving. To reduce emotional responses to stress,

emotion-focused coping is applied. These are skills like meditation, relaxation and breathing techniques and cognitive strategies which changes someone's opinion of the stressor. Avoidance styles are used to mentally or physically get away from the stressor. Contrarily, appraisal-reappraisal skills are strategies to appraise and reappraise a situation to know if coping skills were successful. Research has found that approach-coping strategies like confrontation, problem solving or positive reappraisal were used when the situation was within control of the athlete. When the athlete had the feeling to lose control over the situation, he adopted distancing and escape-avoidance strategies (Carver, Scheier & Weintraub, 1989; Folkman & Lazarus, 1985; Scheier, Weintraub & Carver, 1986).

Gould and his colleagues also found that elite athletes tend to combine different strategies in their coping process. The applied mental skills are thought to be influenced by personality components like emotionality (Bolger, 1990) and environmental factors (Mattlin, Wethington & Kessler, 1990). Aldwin (1994) thought that the environment plays an important role in choosing the coping styles because it is dependent on the controllability of the environment.

Skinner, Edge, Altman and Sherwood (2003) differentiated between two concepts of control: the concept of perceived control and the experience of control. This was meant to give clarity about the definition of subjective control. They defined perceived control as "an individual's interpretation of the resources they have to deal with a situation". Consequently, perceived control means the use of task-orientated and problem-focused coping strategies. Perceived control also prevents the use of avoidance coping strategies. Different studies on coping showed that athletes usually use a mixture of coping strategies to be able to perform in stressful situations (Compas, 1987; Folkman & Lazarus, 1985; Gaudreau & Blondin, 2004). Despite of various research studies, it has not yet been possible

to connect coping strategies to real performance results such as scores or goals (Gaudreau & Blondin, 2004). Dale (2000) investigated the distractions which have been occurring during competitive performances of decathletes. These athletes reported two strategies to keep task-orientated: First of all, they remind themselves that they will compete against themselves if they compare themselves to the performance of others. Then, they kept in mind how much they have been training when they started to doubt their own preparation. Some research was carried out on the investigation of real performance indicators such as goals or scores and the appliance of coping techniques, however, only weak significant relations could be found (Finch, 1994; Haney & Long, 1995). The most important to keep in mind is the fact that perfect performance is always depending on the physiological and technical strengths of an athlete. There will not be a coping skill which is able to compensate a lack of skill or talent. Nevertheless, the right coping strategies might help an athlete to give his very best in any moment. Athletes who are not able to cope properly with the situation, will never be able to recall the prepared skills and techniques and will never meet their expectations (Bertollo, Saltarelli & Robazza, 2008; Cerin, Szabo, Hunt & Williams, 2000

### 2.2.2 How mental skills help to improve performance

Already over 85 years ago, Griffith (1925) has studied experienced and successful athletes to find out about their psychological skills which they apply in order to help less experienced or less successful athletes using coping techniques. However, the most important question is how mental skills help to improve performance. Krane and Williams (2006) studied the psychological characteristics of successful performers and concluded that these athletes use a broad amount of cognitive and behavioural skills to perform at their very best level. These skills were imagery, well-developed competitive plans, goal setting, well-learned coping skills, thought control, arousal management, emotional control, attention control and

refocusing. To be successful an athlete needs to be committed, dedicated, motivated, mentally tough and able to pursue achievement goals in a rational way. These are the attributes which might be improved or developed by using mental skills (Krane & Williams, 2006). Because of this, sport psychologists have developed many mental training programs for team and individual sports (see Dosil, 2006).

Mental skills training (MST) includes many different techniques which have figured out to be efficient strategies to improve athletic performance and perception in different sports. MST usually include techniques like mental imagery, goal setting and variations of self-talk which were applied by athletes either as single technique or as an MST package (Blakeslee & Goff, 2007). Shamrock and Bull (1996) found that basketball players were able to improve free-throw consistency when using mental imagery. In water polo (Hatzigeorgiadis, Theodorakis & Zourbanos, 2004) and dart throwing (Van Raalte & Brewer, 1995) self-talk was also improving performance. American football linebackers reported that goal setting was helpful for correct positioning, successful tackling and halting the opposition's progress (Ward & Carnes, 2002). The running performance of endurance athletes seemed to have improved through a MST package consisting of relaxation, imagery, self-talk and goal setting (Patrick & Hrycaiko, 1998). Additionally, MST packages have shown to improve the success in sport when combining with regular physical training (Patrick & Hrycaiko, 1998; Thelwell & Greenlees, 2001; Thelwell & Maynard, 2003). Furthermore, researchers found that MST is effective with both elite and novice athletes with intellectual disabilities (Gorely, Jobling & Lewis, 2002; Gregg et al., 2004). Dugdale and Eklund (2002) found that a cue word helped the participants of an Australian Rules Football match to not focus on the surrounding environment and possible distractions. Also Hatzigeorgiadis and colleagues (2004) found that positive self-statements decreased the amount of interfering thoughts. Therefore, self-

talk in any form is seen as beneficial to neutralize negative and task-irrelevant thoughts and might be even more beneficial in combination with relaxation techniques and mental imagery. Furthermore, task-relevant thoughts make the appliance of goal setting techniques possible. Goal setting is defined as “a psychological method of enhancing one’s perception of control and increasing intrinsic motivation” (Blakeslee & Goff, 2007). Thus, goal setting can benefit performance because it regards to immediate plans of actions (short-term goals) and sets challenging performance targets (long-term goals) which motivate the athlete and allow him to assess the personal progress (Locke & Latham, 1985). Burton (1989) made it clear that it is very important to keep a balance between outcome (i.e. personal achievement), performance (i.e. comparison with others), and process goals (i.e. how to get there). Barron and Harackiewicz (2001) supported this multiple-goal theory when showing that both mastery and performance goals were efficient for a successful learning task. Mahoney, Gabriel and Perkins (1987) showed that elite athletes compared to non-elites reported a more moderate level of performance anxiety, were able to concentrate better, were more self-confident, applied imagery and were more motivated in performing well. However, the measurement of sport psychological skills and the effect on the performance are quite hard to measure. Maybe it is even more complicated in sport psychology than in any other area of psychology because of the combination of psychological and physiological components which lead to peak performance (Mahoney & Epstein, 1981). As already mentioned, an athlete who is mentally tough but not physically in form or has no talent at all will never be able to perform at his very best.

### 2.2.3 Self-talk

It has been proven that many athletes apply self-talk as a psychological technique during training and competition (Van Raalte, Brewer, Rivera & Petitpas, 1994; Van Raalte, Cornelius,

Brewer & Hatten, 2000). Self-talk can be either positive (e.g. 'I can do this') or negative (e.g. 'I will never be able to manage this'). Van Raalte et al. (1994) found that among junior tennis players negative self-talk occurs twice as frequently as positive self-talk. However, positive self-talk is seen as an encouragement of athletes. If an athlete is able to apply only positive self-talk, it can be an effective coping strategy which helps to overcome anxiety, increase self-confidence and improve technique (Cox, 2007).

According to Hardy, Gammage and Hall (2001), self-talk is defined as "overt or covert personal dialogue in which the athlete interprets feelings, perceptions and convictions and gives himself instructions and reinforcement." Self-talk has been shown to be very efficient in regulating cognition and organizing an athlete's thoughts. Landin (1994) suggested that "self-talk increases attentional focus, as concentrating on the desired thought leads to desired action" (Johnson, Hrycaiko & Hallas, 2004). Furthermore, Nideffer (1993) proposed that self-talk can be helpful to redirect attentional focus and give certain cues according to the situation.

There are three primary categories in self-talk: task-specific statements relating to technique (e.g. 'Left leg back to change canter'), encouragement and effort (e.g. 'You can do it') and mood words which avoid an increase of arousal (e.g. 'Calm down') (Cox, 2007). Zinsser et al. (2006) summarized the reasons to apply self-talk. Building and developing self-efficacy through stimulating thoughts and feelings, which lead to the belief that a person is able to fulfill the task efficiently and effectively. Self-talk can also be helpful to learn new skills and techniques. If mood words are used effectively, self-talk can either create a desired mood or change an undesired one. Self-talk can furthermore help to control efforts and to stay attentional focused and concentrated. Affirmation statements can be used during training and competition. These statements confirm the athlete that he possesses all necessary skills,

abilities, positive attitudes and belief in a successful performance. Affirmation statements in a goalkeeper in football can be “Nothing gets by me”, for example (Cox, 2007).

Mahoney and Avenier (1977) investigated the differences of Olympic qualifiers and non-qualifiers for men’s gymnastics in 1976. The qualified athletes showed higher levels of anxiety management, were able to forget mistakes earlier and go on with their tasks, used more positive than negative self-talk and applied mental imagery. Contrarily, successful athletes were actually more anxious before the competition than the not successful gymnasts. However, this changed during competition. Unsuccessful athletes nearly panicked because of negative self-talk and the mental imagery of failure or catastrophes. The successful gymnasts, on the other hand, interpreted their anxiety as “facilitative arousal” and qualified for the Olympics.

#### 2.2.4 Relaxation techniques

Some athletes only suffer from low levels of arousal, whereas others experience high levels of anxiety and tension. All strategies to increase arousal cause even more anxiety and tension in these athletes. As already mentioned, anxiety during a competition leads to a decrease of performance which results in an even higher anxiety and therefore an anxiety/stress spiral. Relaxation is the only way out of this spiral because anxiety and tension needs to be reduced (Cox, 2007). Two of these relaxation techniques are progressive muscle relaxation and deep breathing. Important for using these techniques is a mental device, a passive attitude, a decreased muscle tone and a quiet environment. Davis, Eshelman and McKay (1995) explain that there are two types of breathing used: chest breathing and abdominal breathing. Chest breathing is associated with emotional distress and is often irregular and rapid. Contrarily, abdominal breathing is associated with relaxation and is often

deep, regular and slow. “The process of deeply inhaling and exhaling in a slow rhythmic fashion is very relaxing through deep breathing” (Cox, 2007). It can be practiced everywhere and at any time. Most effectively is practicing while sitting or lying in a comfortable position. Jacobson (1929; 1938) outlined all modern progressive relaxation techniques. For the relaxation procedure he suggests a sitting posture in a comfortable chair. The environment should be quiet and arms and legs should not be crossed to avoid unnecessary stimulation. To be able to relax within a few minutes when it is necessary, he recommends a daily training of one hour. He recommends to tense and to relax specific muscle groups in a predetermined order. “Relaxation begins with the muscles of the left arm and proceeds to those of the right arm, left and right legs, abdomen, back, and chest and shoulders, concluding with the neck and face muscles” (Cox, 2007). The training procedure will last for several months. However, this is a very long procedure, therefore, abbreviated versions exist. Carlson and Hoyle (1993) showed that abbreviated muscle relaxation training procedures help to decrease anxiety, tension and stress. Also the beginning with the left arm of Jacobson’s technique is not always necessary. Research has shown that progressive muscle relaxation is effective to increase the relaxation response. Furthermore, studies showed that progressive muscle relaxation is improving performance even more when it is combined with other cognitive or arousal control interventions (Cox, 2007).

#### 2.2.5 Mental imagery

Another psychological skill to improve performance is mental imagery. A lot of successful athletes use imagery and visualization, but not all are able to describe verbally how it works (Cox, 2007). Vealey and Greenleaf (2001, p.248) defined imagery as “the using of all the senses to re-create or create an experience in mind.” Therefore, it can be said that imagery

can be created in one's mind without any external stimuli, the image may involve one or all senses and the image is created by the memories which are stored in the sensory register, the working memory or the long-term memory. According to Block (1981), imagery is one of the most important topics in cognitive science. There are two general theories: Firstly, the athlete scans an image which has been formed in his brain by using his mind's eye. The athlete using this form is called "pictorialist". Secondly, so-called "descriptionists" do not think that there is anything like a mental image. They describe a physical scene in their mind but are not really seeing an internal image. However, the graphic and detailed nature of the language makes it seem like that (Cox, 2007). Therefore, imagery is meant to be the language of the brain. "In a real sense, the brain cannot tell the difference between an actual physical event and the vivid imagery of the same event" (Fisher, 1986). Thus, imagery is very useful for repetition, elaboration, intensification and preservation of important athletic sequences and skills (Cox, 2007).

#### 2.2.6 Goal setting

Goal setting is a psychological skill which can be easily combined with other skills. Blakeslee and Goff (2007) defined goal setting as a "psychological method of enhancing one's perception of control and increasing intrinsic motivation." The benefit is that goal setting is also is an immediate plan of action (short-term goals) and sets challenges in performance (long-term goals) which are motivating and assessing an athlete's progress (Locke & Latham, 1985). For realistic goals it is important that these goals are SMART (specific, measurable, achievable, realistic and time-bound). To achieve realistic goals, Burton (1989) suggests a balance between outcome (e.g. personal achievement), performance (e.g. comparison with others) and process goals (e.g. how to get there). Barron and Harackiewicz (2001) supported

the idea of a multiple-goal theory. This means that athletes use a combination of both mastery goals and performance goals which was beneficial for success in learning task.

### 2.2.7 Routines

To achieve control over aspects of athletic performance, mental plans or routine are important (Orlick, 1986). These routines can be applied for almost every aspect of athletic performance. Tennis players might have pre-competitional routines, a routine between points, after the game and a plan to refocus in case of disruptions. Included in these routines are thoughts, actions, images and feelings which are helpful for the athlete to perform at his very best. Mental plans or routines provide a certain sense of control within the athlete and may also increase self-confidence. This confidence can be achieved because the athlete knows that these actions, thoughts and feelings will help him to perform at his best abilities and do not allow distractions, negative thoughts, images or feelings (Orlick, 1986).

### 2.3 Horse-rider interaction

In contrast to all other sports, equestrian sport is different because the performance also depends on the partnership between horse and rider (Wolframm and Micklewright, 2010b). In equestrian sports, “performance does not merely depend on human ability and skills but equally on that of the equine partner, and, most importantly the quality of the interaction between horse and rider” (Mc Greevy, 2002; 2007). Riders often find that their horse seems to feel and react on the rider’s mood state which usually leads to a change in performance (Pretty, 2001; Tenenbaum, Lloyd, Pretty & Hanin, 2002). Therefore, it is especially important for riders to control their emotional responses to not confuse their horses and to be able to compete at the demanded level. At an advanced level, riders usually are able to apply more advanced mental skills to make sure that a good horse-rider communication is possible. This

effective communication is absolutely necessary to execute complicated exercises in dressage or difficult jumps in show-jumping.

Regarding self-confidence, it has been shown that a good confidence in the rider will also influence the horse. Riders who are less insecure and do not doubt are used to be much quicker in their reactions to their horses and therefore, the given aids are even more precise (Wolframm & Micklewright, 2010b). Horses are trained through classical and instrumental conditioning (McGreevy & Boakes, 2006; Murphy & Arkins, 2007) to be able to understand the rider's aids regarding change of tempo or direction. Thus, the more precise and immediate the cues which are given by the rider, the stronger will be the learned reaction of the horse. Meyers et al. (1999) also found that more successful riders are able to concentrate better. Therefore, advanced riders may be able to react much quicker to the cues given by the horse. This usually leads to improved performance and harmony and there will be less misunderstanding in the horse-rider communication. This is the reason why it is absolutely necessary that also novice riders are supported by sport psychologists to be able to concentrate on the specific task and respond quicker and more precisely to the horse. Especially advanced riders have usually been performing together with their equine partner for several years, going through different levels in training and competition (Wolframm & Micklewright, 2010b). Bandura (1997) found that these riders are likely to have moments of perceived mastery in frequent time periods. These moments of perceived mastery will have increased the rider's level of task-specific self-confidence.

The problem is that these highly effective horse-rider interactions are not as easy to establish because humans and horses are used to quite different modes of social interactions. Horses have still many of the natural instincts and behaviours of their wild ancestors, though they have been domesticated, trained and bred for carrying humans or

doing other work centuries ago (Christensen, Zharkikh, Ladewig & Yasinetskaya, 2002; Waring, 2003). The horse remains a herd and prey animal which will always react with flight when the herd leader communicates a danger, due to the natural instincts of a flight animal which needs to secure its survival in the wild (McGreevy, 2004). These social behaviours are essential to ensure survival which has been found by Dierendock and Goodwin (2005) when they studied equine group dynamics and functioning outlines of the horse's social nature. The researchers also found that horses usually communicate non-verbal using body language because vocal communication would attract predators when used in dangerous situations. In contrast, humans mainly communicate verbally. McGreevy (2004) mentioned that horses are prey animals which initially flee as soon as they notice a threat. Brandt (2004, p.305) said wisely: "Horses, in general, have highly sensitive bodies because their bodies are their vehicle for communication. Because horses rely on their bodies to transmit and receive information, they are highly skilled at reading (and using) body language." This is the reason why horses detect and react immediately to the change of the rider's body position, muscular tonus, respiration and even heart rate.

Considering all this, it is most important that the rider is seen as the leader of this horse-rider dyad. If the rider fears or indicates danger, the horse will react accordingly. Due to their ability of reading and sensing body language and sensitivity to touch, horses are thought to feel the emotional state of the rider (Williams, 1999). Even if the rider is able to control the horse's desire to flee, the following performance will be influenced by the tension of the horse which might lead to faults in show-jumping or a loss of marks in dressage. Regarding this close relationship between horse and rider, it is obvious that both of them will be influenced by the other's mood or emotional state. Thus, it is most important for the

equestrian athlete to be able to control his mind and body but also be able to deal with the horse's character traits.

## 2.4 Mental skills in riders

As already shown in the previous chapter, there is a special interaction between rider and horse which is also responsible for the quality of performance. Regarding their interaction, horse and rider usually have different motives. The rider usually takes part in a competition to achieve some kind of goal, whereas the horse responds to certain stimuli which it has been trained via negative and positive reinforcement (McGreevy, 2007). Therefore, relevant coping techniques depend on the rider's feeling about his or her horse. Approach or avoidance coping styles may depend on the controllability of the situation, the environment and the horse. A rider who feels able to fully control his or her horse, would probably choose approach or task-orientated coping techniques, also if he or she thinks that the environment (e.g. the decision of a judge) is not within his control. Considering all this, researches concerning the rider's psychological state during competition are quite different to all other sports. This is probably the reason why there has not been much research yet about mental skills in riders yet.

However, Blakeslee and Goff (2007) have done a research about the effect of a mental skills training package on equestrians. During this study, they applied the mental skills training (MST) package to 17 competitive collegiate, eight of them received the MST and nine were used as controls. The MST package included relaxation techniques, imagery, goal setting and self-talk, all strategies which improve performance and perceptions through cognitive-somatic techniques. Also the goal orientation of the riders has been assessed in regard to the relationship with performance change over time. The findings did not rule out MST as a

possible performance improving technique however more research needs to be done to examine the effect of the MST on equestrians. Nevertheless, compared to other athletes who do not perform with an animal partner (e.g. professional tennis players, competitive rock climbers, Olympic weight lifters), Meyers, Bourgeois, LeUnes and Murray (1999) found that riders reported a higher psychological skills response measured by the Psychological Skills Inventory for Sport (PSIS; Mahoney, Gabriel & Perkins, 1987). Riders also used more mental skills than the other athletes. Regarding mental skills among elite and sub-elite riders, Meyers et al. (1999) found that “the more successful athletes possessed higher anxiety management and concentration skills than less successful peers” (p.405).

Recent studies of Wolframm and Micklewright (2009; 2010a; 2010b) confirm the findings of Meyers et al. (1999). The researchers also found differences in the psychological skills between elite and non-elite riders. In a study on the pre-competitive mood states of advanced and novice equestrian dressage riders it was hypothesized that the more experienced riders had more facilitative pre-competitive mood states (Wolframm and Micklewright, 2010b), lower somatic arousal and higher self-confidence scores than their less experienced peers (Wolframm and Micklewright, 2009). Concluding these results, the ability to control the symptoms of arousal in riding is similar to other sports. An elite rider who is able to control symptoms of arousal and/or anxiety might therefore have a greater coping capacity which is also dependent on experience and superior skills. This might result in an increase of self-confidence and therefore in interpretations of arousal which are improving performance (Wolframm & Micklewright, 2009). Also Beauchamp and Whinton (2005) found that levels of self-confidence are closely connected to the perception of the ability of the horse to perform. The study of Wolframm and Micklewright (2010b) on the

interaction of arousal, equine temperament and performance showed that “the intensity of pre-competitive cognitive and somatic arousal influences equestrian performance.”

A recent study by Wolframm and Micklewright (unpublished PhP thesis, 2011) investigated the perception of mental strategies in elite and non-elite riders. Findings showed that advanced and intermediate level riders use mental preparation techniques. A second study using semi-structured interviews investigated the skills which are used to control pre-competitive anxiety. The researchers found that elite riders are using a combination of goal-setting, cognitive restructuring, positive self-talk, focusing skills, mental imagery, pre-competitive preparation and relaxation skills to be able to deal with the stressful situation. Non-elite riders showed dependence on others and less use of mental skills.

In conclusion, it has been shown through various researches that mental skills also improve equestrian performance. However, the interaction of horse and rider should be taken into account. This means that a rider who is good in applying psychological skills but is unable to communicate precisely with his horse, will not be as successful.

## 2.5 Why is an inventory necessary?

To measure all these skills mentioned previously, there have been various researchers who have developed sport-specific questionnaires across different competitive standards and sports (e.g. Thomas, Murphy & Hardy, 1999). Psychological inventories which are based on the athlete’s self-report are important instruments to assess the cognitive and affective state of the athlete (Vealey & Garner-Holman, 1998). Traditional forms of the sport psychological assessment assumed that personality states of traits determine an individual’s pattern of behavior (Tkachku, Leslie-Toogood & Martin, 2003). Some instruments for assessment and consultation of sport psychologists are for example the “16 Personality Factor

Questionnaire" (Cattell, 1949), the "State-Trait Anxiety-Inventory" (Spielberger, Gorsuch & Lushene, 1970) or the "Profile of Mood States" (McNair, Lorr & Droppleman, 1971). However, these measures have been questioned because of their clinical focus, absence of athlete norms, questionable psychometric properties and inconsistencies in findings (Ford & Summers, 1992; LeUnes & Nation, 1989; Tkachuck et al., 2003). Therefore, many sport psychologists have changed to the use of inventories which assess sport-related behaviours instead of personality dimensions which might be linked to those behaviours (Hardy, Roberts, Thomas & Murphy, 2010). One of these inventories is, for example, the "Psychological Skills Inventory for Sport" (PSIS; Mahoney, Gabriel & Perkins, 1987) which assesses five broad themes: anxiety measurement, concentration, self-confidence, mental preparation, and team emphasis. Hardy et al. (2010) have refined the Test of Performance Strategies (TOPS) using confirmatory analysis. "The TOPS was designed to measure a comprehensive range of psychological skills and techniques, and their strategic use by athletes both in competition and at practice" (Hardy et al., 2010). The TOPS is divided into eight mental skills which were based on exploratory factor analyses: goal setting, relaxation, activation, imagery, self-talk, attentional control, emotional control and automaticity. Smith, Schutz, Smoll and Ptacek (1995) developed and validated a multidimensional measure of sport-specific psychological skills, the so called "Athletic Coping Skills Inventory-28" (ACSI-28). The researchers used confirmatory factor analysis as a basis for a new form of the ACSI. The ACSI-28 includes seven sport-specific categories: coping with adversity, peaking under pressure, goal setting/mental preparation, concentration, freedom of worry, confidence and achievement motivation, and coachability. The sum of the scales is the Personal Coping Resource score which is supposed to reflect a multifaceted psychological skills construct.

Since psychological skills are an important determinant of sports performance, it is important to measure these skills. By measuring it, sport psychologists are able to consult athletes how to apply and improve these skills in order to improve performance (Smith et al., 1995). Furthermore, mental skills are important outcome variables in performance enhancement intervention programs. So it is necessary to be able to assess these skills as a means of evaluating program efficacy (Smith, 1980; 1989b). Because of these reasons, “there is a need for psychometrically sound measures of sport-related coping skills” (Smith et al., 1995).

Regarding all this, the need of psychological skills inventories is quite obvious. However, all of these inventories and questionnaires are developed for usual team or individual sport. In none of them is the component of an equine partner is considered. Therefore, it is absolutely necessary to develop an inventory which is exactly adapted to the specific needs of equestrian sport. The interaction between horse and rider needs to be considered when regarding the rider’s psychological skills and the performance outcome.

# 3 Methodology

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## 3.1 Study 1

### 3.1.1 Development of initial version

In order to design the initial version of the inventory for competitive riders, it was necessary to define the type of mental skills and strategies which are important while competing. For this reason, the questions are based on certain interviews of riders. First of all, the findings of Hardy et al. (2010) were important for the development of the initial inventory. While refining the Test of Performance Strategies (TOPS) using confirmatory factor analysis, the researchers have found nine factors which are important for athletes performing at a competition: self-talk, emotional control, automaticity, goal setting, imagery, activation, relaxation, negative thinking and distractibility. Also the study of Kleinert et al. (2009), who developed a German short version of the Psychological Skills Inventory for junior athletes, was taken into account while developing the questions. Furthermore, the questions were based on semi-structured interviews which were part of the unpublished PHD thesis of Wolframm (2011) focusing on psychological traits in equestrian sports. Based on these findings, the initial version of the inventory was developed including 49 items divided into five potential factors: self-confidence, arousal/anxiety control, goal setting, visualization and routines. All items were scored on a 4-point Likert scale (1=never, 2=seldom, 3=often, 4=always). A "neutral" response category was deliberately not included in order to avoid participants from choosing the neutral option whenever they were uncertain about a certain response and thereby potentially rendering the inventory invalid. Additionally, six general questions about age, gender, discipline, level, riding experience and possession of own

horses were asked. All together, the initial inventory included 49 questions. The initial version can be found in the annex I.

### 3.1.2 Data collection

The developed initial inventory was uploaded to an online questionnaire website. The link was published through various social networks, forums and the German equine magazine 'Reiter Revue'. Within a period of four weeks, 297 riders (male: N=28, female: N=269) of different age (M=24.69, SD=7.4), discipline (dressage: N=115, show jumping: N=113, eventing: N=48, leisure: N=13, western riding: N=6, vaulting: N=2) and level (German 'Leistungsklasse' 0: N=22, 6: N= 47, 5: N=79, 4: N=84, 3: N=38, 2: N=25, 1: N=2) filled in the questionnaire. The participants had a mean riding experience of M=16.16 (SD=7.09) years. N=225 riders owned on average M=2.68 (SD=6.756) horses. Since the participants were of different age, level, discipline etc., the questionnaire covered a broad sector of equestrian sports.

### 3.1.3 Data processing and analysis

The collected data was processed using the program SPSS 16.0 (Statistical Package for Social Scientists). Firstly, all negative worded items were reversed. This was necessary to make sure that the highest possible score is also the most positive one. Therefore questions like "When I make a mistake during the dressage test or the show jumping course, it is hard for me to concentrate on the rest of the test/course" were reversed. Factor analysis is usually carried out as a data reduction technique. First of all, there was an assessment of the suitability of the data for the factor analysis. This assessment checks the data on sample size and the strength of the relationship among the items. This was followed by a factor extraction, which determines the smallest number of factors that may be used to best present the

interrelations among the set of variables (Pallant, 2007). The extraction method used was a Principal Component Analysis (PCA). Subsequently, factor rotation (Varimax with Kaiser Normalisation) and interpretation was conducted to determine which factors belong together. Following completion of the factor analysis, reliability of the extracted factors was tested using Cronbach alpha coefficient. Regarding these findings, seven items were deleted because it was not possible to classify them into one of the components. One item (“I have certain routines before I ride in the arena or parcours.”) was moved from the component arousal control to routines because it matched better to this component

## 3.2 Study 2

### 3.2.1 Development of the second and the final version

Based on the findings of the first study, the second version of the inventory for competitive riders was developed. Having defined five factors in study 1, the second inventory also included also five factors: self-confidence, goal-setting, arousal control, visualization and routines. After having developed the second version of the inventory, the items were mixed again to avoid that participants would identify related components. Also the final inventory had a 4-point Likert scale from “1=never” to “4=always”. The second version can be found in the annex II. According to the findings of the second study, the second version has been adapted to develop the final version which can also be found in annex III.

### 3.2.2 Data collection

The second version of the inventory was uploaded to an online questionnaire website. The created link was spread through several social networks, emails, forums and the website of the German equine magazine ‘Reiter Revue’. Within four weeks, N=371 riders (male: N=32,

female: N=339) of different age ( $M=27.22$ ,  $SD=9.4$ ) have completed the inventory. The riders were of different disciplines (dressage: N=179, show jumping: N=128, eventing: N=38, leisure: N=17, western riding: N=8, vaulting: N=1) and levels (German 'Leistungsklasse' 0: N=38, 6: N= 64, 5: N=96, 4: N=96, 3: N=47, 2: N=27, 1: N=3). The participants had a mean riding experience of  $M=17.72$  ( $SD=8.1$ ) years and owned  $M=1.98$  ( $SD=2.1$ ) horses. Because of this broad profile of the participants, the second questionnaire covered a wide part of the equestrian sports sector.

### 3.2.3 Data processing and analysis

The collected data was processed using the program SPSS 16.0. Firstly, all negative worded items were reversed as explained in 4.1.3. Then the reliability of the data was checked calculating the Cronbach's alpha coefficient. One component was deleted because of its low Cronbach's alpha coefficient. However, one item was moved to another component. This one was checked on reliability again. Finally, four components were built: self-confidence, arousal control, visualization and goal-setting.

## 3.3 Study 3

### 3.3.1 Data collection

In order to determine psychological components of riders, the collected data of the first and second study were combined and analyzed considering the previously defined four factors. Therefore, N=668 riders (male: N=60, female: N=608, mean age of 26.1,  $SD=8.7$ ) participated on this study. These riders were of different disciplines (dressage: N=294, show jumping: N=241, eventing: N=86, leisure: N=30, western riding: N=14, vaulting: N=3) and level (German 'Leistungsklasse' 0: N=60, 6: N= 111, 5: N=175, 4: N=180, 3: N=85, 2: N=52, 1: N=5).

The participants had a mean riding experience of  $M=17.0$  ( $SD=7.7$ ) years and owned on average  $M=2.3$  ( $SD=4.5$ ) horses. This broad range of participants covers the equestrian sports sector quite well because of its diversity.

### 3.3.2 Data processing and analysis

The collected data were processed using the program SPSS 16.0. Since there was more than one independent variable a one-way multivariate analysis of variance (MANOVA) was conducted. The MANOVA was done one-way. Included in MANOVA were descriptive statistics, Box's Test of Equality of Covariance Matrices, Levene's Test of Equality of Error Variances, multivariate tests including Wilks' Lambda, a Test of Between-Subjects Effects and the Effect size. Furthermore the group means were compared by calculating Estimated Marginal Means. Statistical significance was  $p < 0.05$ .

# 4 Results

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## 4.1 Study 1

The 43 items (excluding the six general items) of the inventory for competitive riders were subjected to principal component analysis (PCA) using SPSS version 16.0. Prior to performing PCA, the suitability of data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of .3 and above. The Kaiser-Meyer-Okin value was 0.794, exceeding the recommended value of .6 and Bartlett's Test of Sphericity reached statistical significance, supporting the factorability of the correlation matrix.

Principal components analysis revealed the presence of 12 components with eigenvalues exceeding 1. An inspection of the screeplot revealed a clear break after the sixth component. Using Catell's scree test, it was decided to retain six components for further investigation.

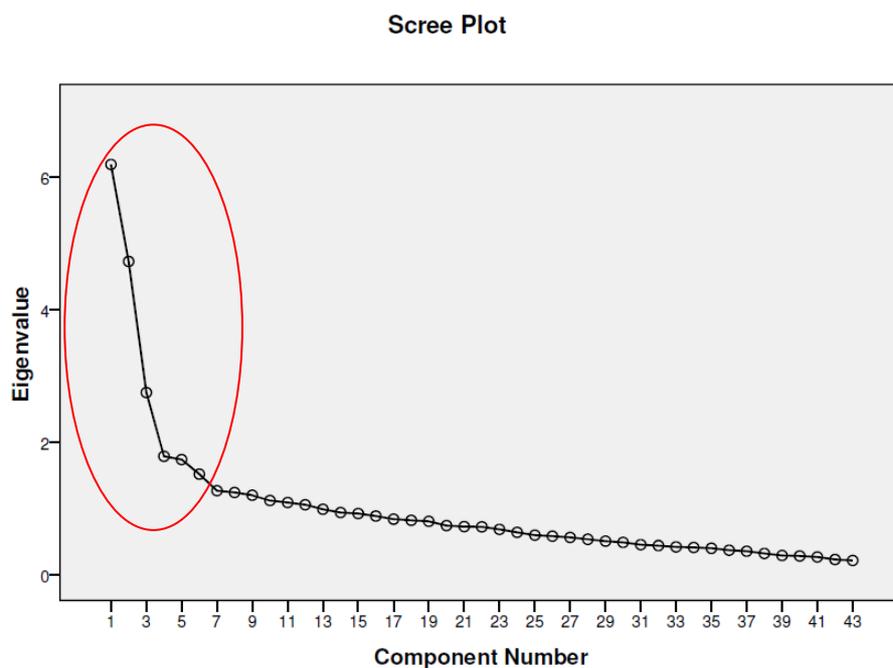


Figure 1: The Screeplot shows a break in the eigenvalue at the sixth component. Therefore, only six components of 12 proposed have been chosen.

The six-component solution explained a total of 43.4% of the variance, with Component 1 contributing 11.1% and Component 6 contributing 4.2%.

Table 1: Total Variance Explained, Extraction Method: Principal Component Analysis

Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
<b>1</b>	4.757	11.063	11.063
<b>2</b>	4.020	9.349	20.412
<b>3</b>	3.050	7.092	27.505
<b>4</b>	3.021	7.025	34.530
<b>5</b>	2.019	4.695	39.226
<b>6</b>	1.813	4.217	43.442

To aid in the interpretation of these six components, Oblimin rotation was performed. The rotated solution revealed the presence of simple structure, with five of six components showing a number of strong loadings and almost all variables loading substantially on only five components. The interpretation of the five components was consistent with the previous research on the inventory for competitive riders. The five components were named as the following: self-confidence, arousal/anxiety control, goal-setting, visualization and routines. Seven items were deleted because of their low level of correlation. The according table can be found in annex VI.

Four of these factors showed a good internal consistency with a Cronbach Alpha coefficient reported from .70 to .83. Factor five and six showed a moderate or poor internal consistency

of .53 and .24 respectively. Due to this, the researchers decided to use only five factors for the second study.

Table 2: Reliability statistics calculating Cronbach's alpha. The sixth component has been deleted because of its bad internal consistency.

<b>Component</b>	<b>Cronbach's Alpha</b>	<b>N of items</b>
<b>1: Self-confidence</b>	.829	11
<b>2: Goal-setting</b>	.792	8
<b>3: Arousal control</b>	.697	9
<b>4: Visualization</b>	.763	6
<b>5: Routines</b>	.534	4
<b>6: Not defined component</b>	.235	4

## 4.2 Study 2

Based on the findings of the first study, the five components were checked again on reliability using the Cronbach's alpha coefficient. Four of these factors (self-confidence, goal-setting, visualization and arousal control) showed a good internal consistency with a Cronbach Alpha coefficient reported from .67 to .88. Factor five (routines) showed a poor internal consistency of .45.

Table 3: Reliability statistics calculating Cronbach's alpha. The fifth component has been deleted because of its bad internal consistency.

<b>Component</b>	<b>Cronbach's Alpha</b>	<b>N of items</b>
<b>1: Self-confidence</b>	.876	11
<b>2: Goal-setting</b>	.807	8
<b>3: Arousal control</b>	.712	9

<b>4: Visualization</b>	.674	5
<b>5: Routines</b>	.452	4

Due to poor internal reliability of factor 5, it was decided to remove said factor altogether. However, one of the items contained in factor 5 (“routines”), namely “I have certain routines before I ride in the arena or show-jumping course.” also loaded on factor 3 (“arousal control”). Therefore, this item was moved to factor 3 with internal reliability confirming an even higher internal consistency with a Cronbach’s alpha coefficient of .71. Considering these findings, the final version of the inventory contains 32 items. The first six questions are general questions about gender, age, discipline, level, riding experience and possession of horses. Factor 1 (“self-confidence”) contains 11 items, factor 2 (“goal-setting”) contains 8 items, factor 3 (“arousal control”) contains 9 items and factor 4 (“visualization”) contains 5 items. The final version of the inventory can be found in annex III and a table showing the items divided by factors in annex IV. In annex V, a scoring key for the final inventory can be found.

### 4.3 Study 3

A one-way between groups multivariate analysis of variance was performed to investigate the difference in psychological skills between disciplines and level considering the four previously defined factors: self-confidence, arousal control, goal-setting and visualization. Therefore, these four factors were used as dependant variables. The independent variables were level and discipline. There was no statistically significant difference between the discipline (dressage, show-jumping, eventing, leisure, western, vaulting) and the level regarding those four factors as dependant variables,  $F(4, 668) = 1.22, p = .08$ ; Wilks’ Lambda

= .85; partial eta squared = .04. When the results for the dependant variables were considered separately, the only difference to reach statistical significance, using Bonferroni adjusted alpha level of .026, was visualization,  $F(1, 668) = 1.54, p = .05$ .

Table 4: Tests of Between-Subjects Effects

<b>Discipline*Level</b>	<b>Dependant Variable</b>	<b>F</b>	<b>Sig.</b>
	<b>Goal-setting</b>	1.16	.28
	<b>Arousal control</b>	.92	.57
	<b>Visualization</b>	1.54	.05
	<b>Self-confidence</b>	1.05	.40

An inspection of the mean scores indicated that goal-setting skills were slightly higher in eventing (M=25.7), skills of arousal control were higher in leisure riders (M=24.2), skills of visualization were highest in western riders (M=11.3) and self-confidence was slightly higher in show-jumpers (M=33.7). Riders of the German 'Leistungsklasse' 3 showed a higher ability in goal-setting (M=24.4), arousal control was much higher in riders of the level 1 (highest level) (M=27.3), visualization was slightly higher in riders of level 6 (M=11.1) and self-confidence was higher in riders of level 2 (M=34.4). Combining the independent variables level and discipline, the most interesting findings were that riders at the highest level regardless of the discipline had the highest goal-setting, arousal control and self-confidence scores. This cannot be said for the visualization scores.

Factor “goal-setting”:

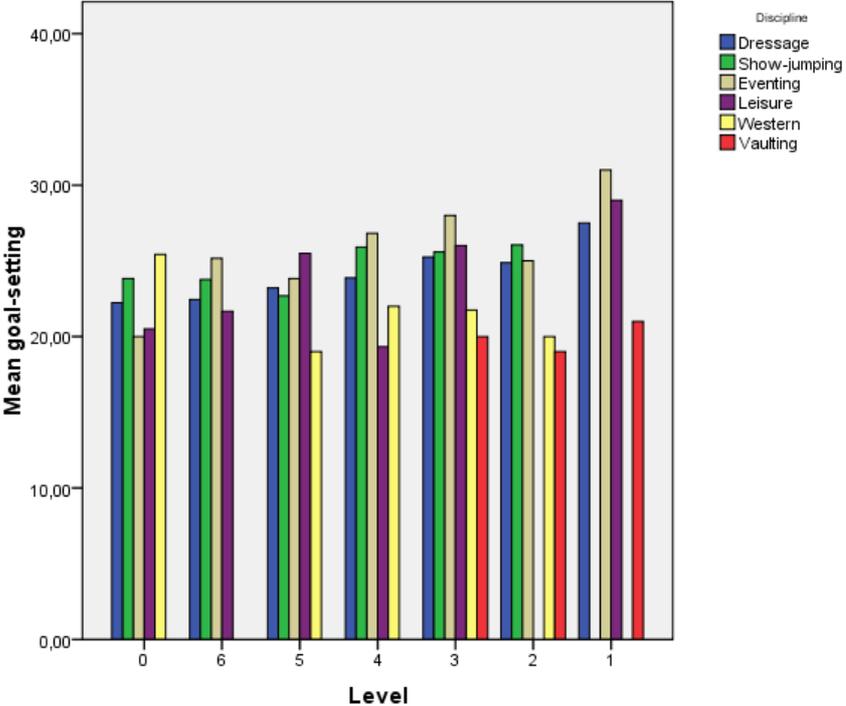


Figure 2: This bar chart shows the increase of the goal-setting skills with the increasing level divided by disciplines.

Factor “arousal control”:

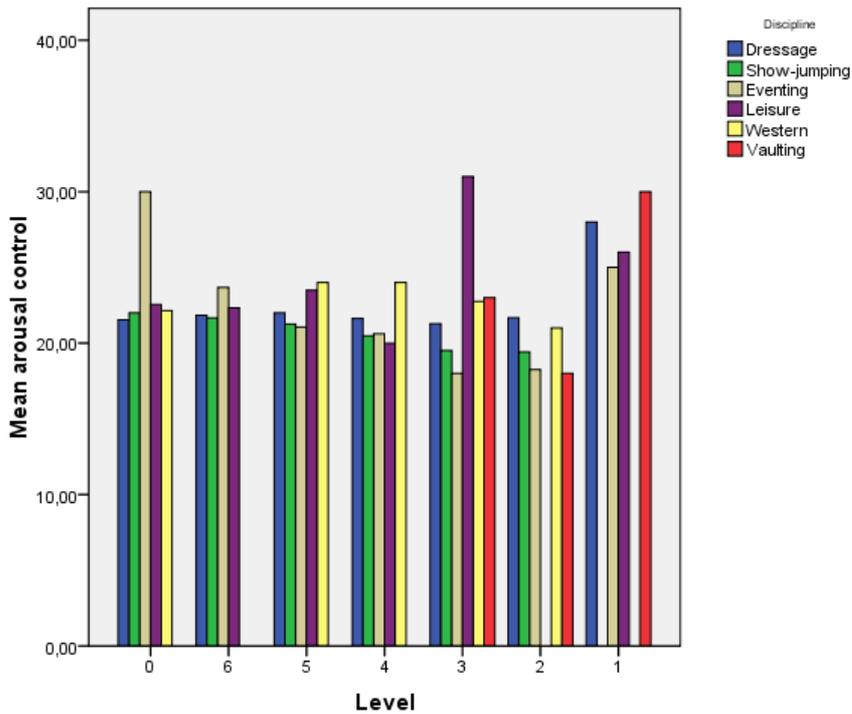


Figure 3: This bar chart shows higher arousal control techniques in eventing, leisure riding and vaulting regardless of the level.

Factor “visualization:

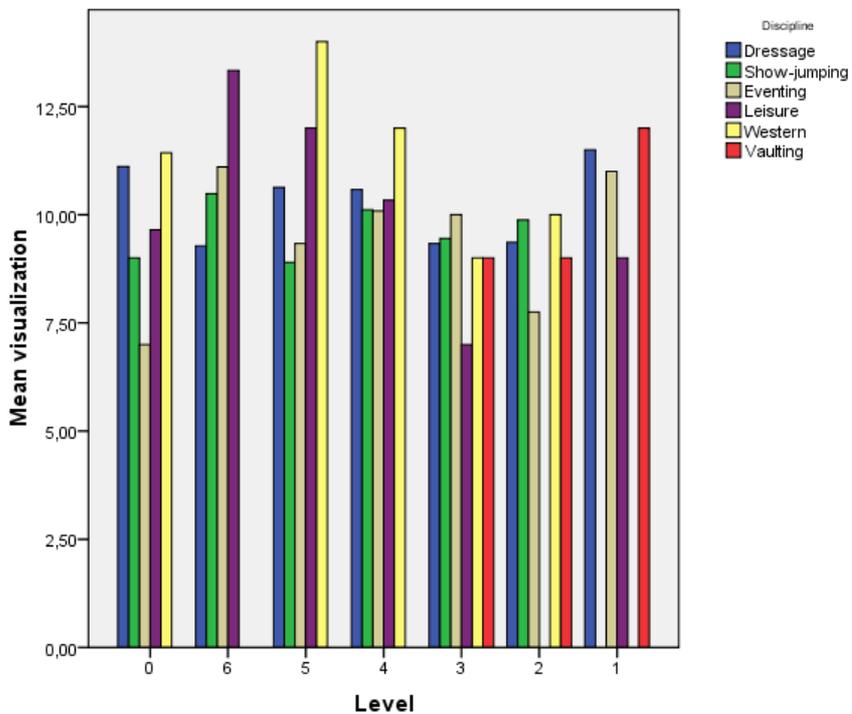


Figure 4: This bar chart shows also no increasing of visualization skills with the increasing level.

Factor “self-confidence”:

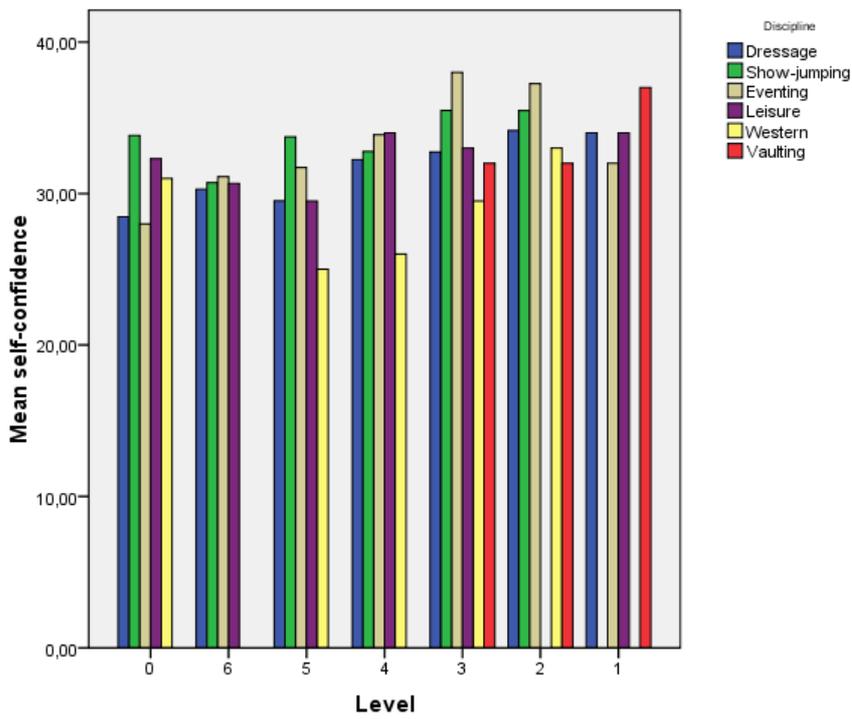


Figure 5: This bar chart shows an increasing level of self-confidence regarding the level. A table containing all means of the previous charts can be found in annex VII.

# 5 Discussion

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## 5.1 Study 1 & 2

The current study was conducted in order to develop a sport psychological inventory which allows riders to test their mental skills before competition. It was necessary to develop an inventory which is adapted to the needs of riders especially relating to the component horse. The developed inventory helps riders to determine which mental skills they already have and which they need to work on before a competition. During training riders are able use the inventory and score their abilities in order to improve their mental skills before competition. All existing sport psychological inventories focus on team and individual sports and none of them considers the horse as an animal partner. According to Wolframm and Micklewright (2010b), equestrian sport is different compared to all other sports because of the partnership and interaction between horse and rider. The horse is a very sensitive animal which is able to detect any form of arousal, tension or stress in its rider. Therefore, the horse is likely to be influenced by different aspects relating to moods, emotions and behavior of the rider, which will, in turn, also influence performance (Pretty, 2001; Tenenbaum, Lloyd, Pretty & Hanin, 2002).

The final version of the inventory included 32 items divided into four factors: self-confidence, arousal control, visualization and goal setting. Various studies found that these four factors are the most important in equestrian sports. Especially in riding it is very important to be able to control cognitive and physical experiences at competitions such as anxiety, arousal, stress or muscular tension. Mental skills can go a long way towards to helping a rider deal with pre-competitive anxiety and improve performance. However, many

riders (and their coaches) show little awareness of their levels of mental skills. Helping riders gain a better understanding of how they set competitive goals is likely to have a considerable effect on horse-rider communication and competitive performance. Oxendine (1984) suggested that low levels of arousal are quite an advantage especially in sports which require a fine motor control. The rider might not be able to transmit an aid correctly or release the aid as quickly as possible if he is affected by an increase of muscular tension, respiratory rate or heart rate. Even if the rider seems not to be anxious but feels an increased level of physiological arousal, he might hold on to the reins too tightly, block the horse with his seat or his increased muscular tension will hinder a relaxation of maybe relevant muscle groups. The horse will maybe not be able to react properly to the given aids because they are not as precisely as the horse has learned them. Summarizing, the importance of staying calm and focused but also alert and positive in training and competition are fundamental strategies which an equestrian athlete needs to have to be able to communicate effectively with his equine partner (Meyers et al, 1997). Arousal control should therefore be considered a vital aspect in any mental skills repertoire. The item "arousal control" should therefore help riders gain a better understanding of how they react during stressful competitive situations and, more importantly, of how this may affect the communication with their horse.

Due to the reason that riders who are able to control symptoms of arousal and therefore have greater coping capacity, these riders will also report an increase of self-confidence. This higher level of self-confidence will then lead to an improvement of performance (Wolframm & Micklewright, 2009). Beauchamp and Whinton (2005) also found that the level of self-confidence is related to the perception of the ability of the horse to perform. Advanced riders who have gone with one horse through all levels are likely to have moments of

perceived mastery in frequent time periods (Bandura, 1997). Especially these moments of perceived mastery will increase task-specific self-confidence of the rider. Furthermore, it has been shown that a good level of self-confidence of the rider will also influence the horse. The rider will be less uncertain and will not hesitate. Thus, he will be able to react much quicker to the horse and therefore the given aids are more precise (Wolframm & Micklewright, 2010b). Due to this, it is obvious why it is necessary to test the level of self-confidence before a competition and in training to be able to work on it and therefore increase performance.

The use of visualization showed to be advantageous in combination with relaxation techniques. Weinberg, Seabourne and Jackson (1981) proved that the combination of relaxation techniques and visualization work together to lower anxiety, promote task-relevant cognition and possibly enhance motor-skill performance which benefits equestrian athletes as already mentioned. Therefore, it is also necessary to test riders on their visualization abilities and, if it is required, work on these abilities.

Goal-setting is known as a method to enhance one's perception of control and increase intrinsic motivation. This motivation is known to go hand in hand with a plan of action when athletes set themselves short- and long-term goals. These goals allow them to assess their progress (Locke & Latham, 1985). This can also be seen in equestrian athletes. By setting specific goals, they might see their individual progress which is in most cases very motivating. A motivated rider will also be self-confident which can also be noticed by the horse. Therefore, it is important to test if a rider is setting goals to improve the motivation and thus performance.

The inventory is also useful for coaches to measure the mental skills of the athletes and to be able to concentrate even more on the skills which are not scored as high as the others. Mental skills are also quite important when thinking of accidents which might happen during riding. Considering the horse's sensitivity towards the rider and its size, strength and own mind (Brandt, 2004), equestrian sport can be seen as one of the most dangerous sports because of severe injuries which might occur especially in the discipline of eventing (Silver, 2002). Sorli (2005) found recently that there are three times more hospital admissions due to equestrian injuries than due to motorcycling accidents. Pounder (1984) and Paix (1999) identified equestrian sport as the one with the highest mortality rate of one per one million population. Regarding this, riding a horse can be seen as a higher risk than automobile racing, motorcycling, skiing and playing rugby (Buckley, 1993; Macnab & Cadman, 1996).

## 5.2 Study 3

Study 3 was conducted in order to investigate the difference between mental skills in riders regarding level and discipline. There was no statistically significant difference between the discipline (dressage, show-jumping, eventing, leisure, western, vaulting) and the level regarding those four factors. However, some findings confirmed that riders of higher levels usually show higher scores in mental skills as well. Especially in eventing and dressage, riders of higher levels showed increasing goal-setting skills. A recent study investigating the effect of mental strategies training on state anxiety components and competitive performance by Wolframm & Micklewright (2011) suggested that non-elite riders report a positive effect on their dressage performance at competition when using mental strategies training. This might be because of the improved communication and interaction between horse and rider.

In arousal control, eventers, vaulters and leisure riders showed the highest scores regardless the riding level. This might be because vaulting and eventing are the most dangerous disciplines in riding. Therefore, a higher concentration and arousal control is necessary to avoid severe accidents. The higher risk of accidents in these disciplines is not depending on the level because the risk exists in low levels as well as in high levels. However, leisure riders usually do not have any competitive pressure. Therefore, they might be more relaxed when riding. Stressful moments will not influence them as much as competitive riders because performance and success are not as important. Due to this, leisure riders of all levels might be able to stay calm in all situations and therefore, their arousal control skills are quite high. Show-jumpers and eventers showed the highest level of self-confidence which was increasing with the riding level. Huge inconsistencies could be seen in visualization. Here, the highest score was in western riders of level 5, a lower level. This might be because visualization is a quite difficult technique. A lot of riders might use visualization without even noticing it. Therefore, it might be hard to measure because only five items in the inventory are considering visualization.

However, it is not possible to adapt this to all equestrian athletes. In this study only five riders of the highest level were participating. Therefore, the study is not representative with all equestrian athletes in the German equine sector. It is absolutely necessary to do further research with more participants of all levels to confirm the finding that riders of higher levels have higher scores in mental skills.

Also studies on mental skills in other sports confirmed that elite athletes usually have more mental skills than non-elite athletes. This was found in a research of Gould, Dieffenbach and Moffett (2002) while investigating Olympic champions. The athletes who performed almost perfectly had high scores on measures of confidence, freedom from worry, goal setting,

mental preparation and concentration. Also Williams and Krane (2001) found a lot of mental skills such as self-regulation of arousal, high confidence, concentration and focus or an “in control but not forcing it” attitude, positive imagery, self-talk, high determination and commitment, goal setting, thought control and preparation routines in highly successful athletes. Summarizing these research results, it is possible to say that elite or successful athletes show more psychological skills than less successful athletes.

Already Wolframm and Micklewright (2009; 2010a; 2010b) suggested that there is a difference in psychological skills between elite and non-elite riders. Additionally, there has been research on mental skills in riders done by Blakeslee and Goff (2007). The researchers investigated the effect of a mental skills training (MST) package on equestrians. They applied the MST package to 17 competitive collegiates, eight of them received the MST package and nine were controls. The MST package included relaxation techniques, imagery, goal-setting and self-talk. However, the findings did not rule out the MST as a possible performance improving technique, therefore further research was suggested. Using the new inventory developed especially for riders, it might be much easier to investigate topics like this. Since there has not been done a lot of research on mental skills in equestrians, the inventory might help to do more of these investigations.

## 6 Conclusion

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In two steps, a sport psychological inventory was developed which can help riders to test their mental skills before a competition. The final inventory includes 32 items which are divided into four factors: self-confidence, goal-setting, visualization and arousal control. Additionally, general questions about gender, age, discipline, level and riding experience can be asked when it is necessary in the study. The items are scored on a 4-point Likert scale from “1=never” to “4=always”. When all negative worded items are reversed in the analysis, the higher the score, the higher are the mental skills of the athlete. The inventory is aimed to help riders gain a better insight into their own use of mental skills prior to competition. It can also be used by coaches to be able to determine the mental skills of the athlete and to work on the skills which are not high scored. Furthermore, the inventory allows researchers to study the mental skills of riders regarding level, discipline, gender and age.

A first study using this inventory, showed interesting findings. In general it can be said that riders of a higher level are able to apply more mental skills compared to riders of lower levels. However, due to the small amount of elite riders participating in the study, the results are not representative for all equestrian athletes. Therefore, further studies need to be done in order to investigate the mental skills of riders before a competition regarding also level and discipline.

Summarizing, the mental skills inventory for equestrian sports (MSI-ES) was developed to help riders and their coaches to work on mental skills or researchers to investigate the mental skills in equestrian athletes. Many sport psychological inventories exist but none of them is considering an animal partner. Therefore, it was necessary to develop an inventory

which is adapted to the needs of equestrian athletes. Seeing that equestrian sports primarily depend on horse-rider interaction, the inventory also measures how the interaction between horse and rider may influence or determine the use of mental skills. An increased awareness of mental skills and their effect of equestrian performance should go a long way towards improving both competitive performance and horse-rider safety.

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# 8 Annex

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## Annex I: First version of the inventory for riders

### Fragebogen zur mentalen Wettkampfvorbereitung bei Reitern

1. Ich bin [ ] Jahre alt.
2. Ich bin  
[ ] männlich [ ] weiblich
3. Meine bevorzugte Disziplin ist  
[ ] Dressur  
[ ] Springen  
[ ] Vielseitigkeit  
[ ] Freizeit  
[ ] Western  
[ ] Voltigieren
4. Leistungsklasse  
[ ] 0  
[ ] 6  
[ ] 5  
[ ] 4  
[ ] 3  
[ ] 2  
[ ] 1
5. Ich habe [ ] Jahre Reiterfahrung.
6. Ich habe ein eigenes Pferd.  
[ ] ja  
[ ] eins  
[ ] mehrere (Bitte angeben wie viele [ ])  
[ ] nein
7. Wenn beim Abreiten auf einem Turnier etwas nicht so klappt, wie ich es möchte, schimpfe ich mit meinem Pferd.

nie selten häufig immer

8. Ich habe Angst, dass mir beim Abreiten oder in der Prüfung etwas Schlimmes und/oder Peinliches passieren könnte.

nie selten häufig immer

9. Wenn es beim Abreiten nicht so läuft, wie ich es mir vorstelle, kann ich nur schwierig zu meiner gewohnten Form zurückfinden.

nie selten häufig immer

10. Wenn ich fühle, dass ich vor einem Turnierstart aufgeregter bin, interpretiere ich das als Zeichen, dass mein Körper bereit ist.

nie selten häufig immer

11. Ich habe Angst, auf einem Turnier zu versagen.

nie selten häufig immer

12. Wenn ich aufgeregter bin, versuche ich mich zu beruhigen, indem ich tief ein- und ausatme.

nie selten häufig immer

13. Beim Abreiten und/oder in der Prüfung suche ich mir etwas ganz Bestimmtes (Rhythmus, Hilfengebung, Sitz etc.), auf das ich mich konzentriere.

nie selten häufig immer

14. Ich versuche, meine reiterlichen Ziele zu erreichen.

nie selten häufig immer

15. Vor der Prüfung stelle ich mir ganz genau vor, wie ich die Prüfung/den Parcours reiten möchte.

nie selten häufig immer

16. Auch wenn ich alleine auf einem Turnier bin, höre ich beim Abreiten und/oder in der Prüfung die Stimme von meiner Trainerin/meinem Trainer in meinem Kopf, die/der mir Anweisungen gibt.
- nie selten häufig immer
17. Mein Ziel bei einem Turnierstart ist es, besser zu werden bzw. meine Leistung zu verbessern.
- nie selten häufig immer
18. Ich lasse mich schnell von anderen Reitern/Pferden ablenken.
- nie selten häufig immer
19. Wenn ich merke, dass ich angespannt bin, kreise ich mit den Schultern, um locker zu werden.
- nie selten häufig immer
20. Sobald ich nervös werde, verspannt sich mein Pferd oder wird ungehorsam.
- nie selten häufig immer
21. Beim Abreiten und/oder in der Prüfung versuche ich, mich nur auf mein Pferd zu konzentrieren.
- nie selten häufig immer
22. Wenn ich aufgeregt bin, versuche ich bewusst meine Muskeln zu entspannen.
- nie selten häufig immer
23. Auf dem Weg zum Turnier male ich mir aus, wie mein Pferd laufen wird.
- nie selten häufig immer
24. Vor einem Turnier denke ich ganz bewusst darüber nach, was ich erreichen möchte.
- nie selten häufig immer

25. Vor einem Turnier bin ich davon überzeugt, dass mein Pferd es kann und ich daher auch.

nie    selten    häufig    immer

26. Wenn ich in einer Prüfung oder im Parcours erst einmal einen Fehler mache, fällt es mir schwer, mich auf den Rest der Prüfung/des Parcours zu konzentrieren.

nie    selten    häufig    immer

27. Vor einem Turnier versuche ich, mir die Turnierumgebung genau auszumalen.

nie    selten    häufig    immer

28. Ich vertraue in mein Können als Reiter.

nie    selten    häufig    immer

29. Ich überlege mir vor einem Turnier ganz konkret, was erreichen möchte.

nie    selten    häufig    immer

30. Vor einem Turnier male ich mir aus, wie ich auf dem Siegereppchen stehe/eine Schleife bekomme.

nie    selten    häufig    immer

31. Ich rede mir beim Abreiten und/oder in der Prüfung gedanklich gut zu.

nie    selten    häufig    immer

32. Vor einem Turnier gehe ich in Gedanken noch einmal meinen schönsten Reiterfolg durch.

nie    selten    häufig    immer

33. Ich versuche, beim Abreiten und/oder in der Prüfung die Umwelt komplett auszublenden.

nie    selten    häufig    immer

34. Wenn ich ein bestimmtes reiterliches Ziel vor Augen habe, mache ich mir bewusst, welche einzelnen Schritte ich gehen muss, um dieses zu erreichen.

nie    selten    häufig    immer

[ ]   [ ]   [ ]   [ ]

35. Wenn ich Angst habe, rede ich mit meinem Pferd.

nie    selten    häufig    immer

[ ]   [ ]   [ ]   [ ]

36. Sobald ich aufgeregt werde, merke ich, dass ich nicht mehr gut reite.

nie    selten    häufig    immer

[ ]   [ ]   [ ]   [ ]

37. Wenn ich aufgeregt bin, stelle ich mir vor, was alles schief gehen könnte.

nie    selten    häufig    immer

[ ]   [ ]   [ ]   [ ]

38. Ich habe bestimmte Rituale, bevor ich in die Prüfung reite. (z.B. Pferd loben, Augen zu machen, durchatmen etc.)

nie    selten    häufig    immer

[ ]   [ ]   [ ]   [ ]

39. Am Anfang der Turniersaison stelle ich einen Plan auf, welche Ziele ich erreichen möchte.

nie    selten    häufig    immer

[ ]   [ ]   [ ]   [ ]

40. Ich habe auf dem Turnier einen Glücksbringer dabei.

nie    selten    häufig    immer

[ ]   [ ]   [ ]   [ ]

41. Ich reite auf dieselbe Weise auf dem Turnier ab.

nie    selten    häufig    immer

[ ]   [ ]   [ ]   [ ]

42. Wenn ich beim Abreiten und/oder in der Prüfung einen Fehler mache, oder etwas nicht klappt, werde ich böse mit mir selbst und sage mir selbst negative Dinge (z.B. „Du kannst es einfach nicht.“)

nie    selten    häufig    immer

[ ]   [ ]   [ ]   [ ]

43. Wenn ich mir für ein Turnier ein Ziel gesetzt habe, überlege ich mir wie ich dieses Ziel am besten erreichen kann.

nie    selten    häufig    immer

44. Vor einem Turnier liste ich in Gedanken meine bisherigen Erfolge auf.

nie    selten    häufig    immer

45. Wenn ich nervös bin, schließe ich die Augen und versuche zu mir zurück zu finden.

nie    selten    häufig    immer

46. Ich mache mein Pferd auf dem Turnier in derselben Reihenfolge fertig.

nie    selten    häufig    immer

47. Wenn sich mein Pferd erschreckt oder zur Seite springt, lasse ich mich dadurch aus der Ruhe bringen.

nie    selten    häufig    immer

48. Wenn ich eine Übung reite, die mir schwerfällt, oder ein schwieriges Hindernis anreite, gebe ich mir spezifische Anweisungen, worauf ich achten muss.

nie    selten    häufig    immer

49. Wenn ich eine Lektion/Aufgabe/ein Hindernis schwierig finde, gehe ich sie/es in Gedanken mehrmals durch.

nie    selten    häufig    immer

## Annex II: Second version of the inventory for riders

### Fragebogen zur mentalen Wettkampfvorbereitung bei Reitern

1. Ich bin [ ] Jahre alt.
2. Ich bin  
[ ] männlich [ ] weiblich
3. Meine bevorzugte Disziplin ist  
[ ] Dressur  
[ ] Springen  
[ ] Vielseitigkeit  
[ ] Freizeit  
[ ] Western  
[ ] Voltigieren
4. Leistungsklasse  
[ ] 0  
[ ] 6  
[ ] 5  
[ ] 4  
[ ] 3  
[ ] 2  
[ ] 1
5. Ich habe [ ] Jahre Reiterfahrung.
6. Ich habe ein eigenes Pferd.  
[ ] ja  
[ ] eins  
[ ] mehrere (Bitte angeben wie viele [ ])  
[ ] nein
7. Wenn beim Abreiten auf einem Turnier etwas nicht so klappt, wie ich es möchte,  
schimpfe ich mit meinem Pferd.  
nie    selten    häufig    immer  
[ ]    [ ]    [ ]    [ ]

8. Ich habe Angst, dass mir beim Abreiten oder in der Prüfung etwas Schlimmes und/oder Peinliches passieren könnte.
- nie   selten   häufig   immer  
[ ]   [ ]   [ ]   [ ]
9. Wenn es beim Abreiten nicht so läuft, wie ich es mir vorstelle, kann ich nur schwierig zu meiner gewohnten Form zurückfinden.
- nie   selten   häufig   immer  
[ ]   [ ]   [ ]   [ ]
10. Ich habe Angst, auf einem Turnier zu versagen.
- nie   selten   häufig   immer  
[ ]   [ ]   [ ]   [ ]
11. Wenn ich aufgeregt bin, versuche ich mich zu beruhigen, indem ich tief ein- und ausatme.
- nie   selten   häufig   immer  
[ ]   [ ]   [ ]   [ ]
12. Beim Abreiten und/oder in der Prüfung suche ich mir etwas ganz Bestimmtes (Rhythmus, Hilfengebung, Sitz etc.), auf das ich mich konzentriere.
- nie   selten   häufig   immer  
[ ]   [ ]   [ ]   [ ]
13. Ich versuche, meine reiterlichen Ziele zu erreichen.
- nie   selten   häufig   immer  
[ ]   [ ]   [ ]   [ ]
14. Vor der Prüfung stelle ich mir ganz genau vor, wie ich die Prüfung/den Parcours reiten möchte.
- nie   selten   häufig   immer  
[ ]   [ ]   [ ]   [ ]
15. Auch wenn ich alleine auf einem Turnier bin, höre ich beim Abreiten und/oder in der Prüfung die Stimme von meiner Trainerin/meinem Trainer in meinem Kopf, die/der mir Anweisungen gibt.
- nie   selten   häufig   immer  
[ ]   [ ]   [ ]   [ ]

16. Mein Ziel bei einem Turnierstart ist es, besser zu werden bzw. meine Leistung zu verbessern.

nie    selten    häufig    immer

17. Ich lasse mich schnell von anderen Reitern/Pferden ablenken.

nie    selten    häufig    immer

18. Wenn ich merke, dass ich angespannt bin, kreise ich mit den Schultern, um locker zu werden.

nie    selten    häufig    immer

19. Sobald ich nervös werde, verspannt sich mein Pferd oder wird ungehorsam.

nie    selten    häufig    immer

20. Wenn ich aufgeregt bin, versuche ich bewusst meine Muskeln zu entspannen.

nie    selten    häufig    immer

21. Auf dem Weg zum Turnier male ich mir aus, wie mein Pferd laufen wird.

nie    selten    häufig    immer

22. Vor einem Turnier denke ich ganz bewusst darüber nach, was ich erreichen möchte.

nie    selten    häufig    immer

23. Wenn ich in einer Prüfung oder im Parcours erst einmal einen Fehler mache, fällt es mir schwer, mich auf den Rest der Prüfung/des Parcours zu konzentrieren.

nie    selten    häufig    immer

24. Vor einem Turnier versuche ich, mir die Turnierumgebung genau auszumalen.

nie    selten    häufig    immer

25. Ich vertraue in mein Können als Reiter.

nie    selten    häufig    immer

26. Ich überlege mir vor einem Turnier ganz konkret, was erreichen möchte.

nie selten häufig immer

27. Vor einem Turnier male ich mir aus, wie ich auf dem Siegereppchen stehe/eine Schleife bekomme.

nie selten häufig immer

28. Vor einem Turnier gehe ich in Gedanken noch einmal meinen schönsten Reiterfolg durch.

nie selten häufig immer

29. Wenn ich ein bestimmtes reiterliches Ziel vor Augen habe, mache ich mir bewusst, welche einzelnen Schritte ich gehen muss, um dieses zu erreichen.

nie selten häufig immer

30. Wenn ich Angst habe, rede ich mit meinem Pferd.

nie selten häufig immer

31. Sobald ich aufgeregt werde, merke ich, dass ich nicht mehr gut reite.

nie selten häufig immer

32. Wenn ich aufgeregt bin, stelle ich mir vor, was alles schief gehen könnte.

nie selten häufig immer

33. Ich habe bestimmte Rituale, bevor ich in die Prüfung reite. (z.B. Pferd loben, Augen zu machen, durchatmen etc.)

nie selten häufig immer

34. Am Anfang der Turniersaison stelle ich einen Plan auf, welche Ziele ich erreichen möchte.

nie selten häufig immer

35. Ich reite auf dieselbe Weise auf dem Turnier ab.

nie selten häufig immer

36. Wenn ich beim Abreiten und/oder in der Prüfung einen Fehler mache, oder etwas nicht klappt, werde ich böse mit mir selbst und sage mir selbst negative Dinge (z.B. „Du kannst es einfach nicht.“)

nie selten häufig immer

37. Wenn ich mir für ein Turnier ein Ziel gesetzt habe, überlege ich mir wie ich dieses Ziel am besten erreichen kann.

nie selten häufig immer

38. Vor einem Turnier liste ich in Gedanken meine bisherigen Erfolge auf.

nie selten häufig immer

39. Wenn ich nervös bin, schließe ich die Augen und versuche zu mir zurück zu finden.

nie selten häufig immer

40. Ich mache mein Pferd auf dem Turnier in derselben Reihenfolge fertig.

nie selten häufig immer

41. Wenn sich mein Pferd erschreckt oder zur Seite springt, lasse ich mich dadurch aus der Ruhe bringen.

nie selten häufig immer

42. Wenn ich eine Übung reite, die mir schwerfällt, oder ein schwieriges Hindernis anreite, gebe ich mir spezifische Anweisungen, worauf ich achten muss.

nie selten häufig immer

43. Wenn ich eine Lektion/Aufgabe/ein Hindernis schwierig finde, gehe ich sie/es in Gedanken mehrmals durch.

nie selten häufig immer  
[ ] [ ] [ ] [ ]

### Annex III: Final version of the inventory for riders

<b>Fragebogen zu mentalen Fertigkeiten im Reitsport</b>					
	Name:				
	<p><i>Auf den nächsten Seiten befinden sich 34 Aussagen von Reitern, die deren Gedanken, Empfindungen und Gefühle vor oder während eines Turniers beschreiben. Bitte lesen Sie jede Aussage durch und markieren Sie, inwieweit diese Aussage auf Sie selbst zutrifft.</i></p> <p><i>Es gibt hierbei keine richtigen oder falschen Antworten. Bitte halten Sie sich nicht zu lange bei einer Aussage auf, und versuchen Sie so ehrlich wie möglich zu sein.</i></p>	<i>nie</i>	<i>selten</i>	<i>häufig</i>	<i>immer</i>
1	Ich habe Angst, dass mir beim Abreiten oder in der Prüfung etwas Schlimmes und/oder Peinliches passieren könnte.	(1)	(2)	(3)	(4)
2	Wenn es beim Abreiten nicht so läuft, wie ich es mir vorstelle, kann ich nur schwierig zu meiner gewohnten Form zurückfinden.	(1)	(2)	(3)	(4)
3	Ich habe Angst, auf einem Turnier zu versagen.	(1)	(2)	(3)	(4)
4	Wenn ich aufgeregt bin, versuche ich mich zu beruhigen, indem ich tief ein- und ausatme.	(1)	(2)	(3)	(4)
5	Ich versuche, meine reiterlichen Ziele zu erreichen.	(1)	(2)	(3)	(4)
6	Vor der Prüfung stelle ich mir ganz genau vor, wie ich die Prüfung/den Parcours reiten möchte.	(1)	(2)	(3)	(4)
7	Auch wenn ich alleine auf einem Turnier bin, höre ich beim Abreiten und/oder in der Prüfung die Stimme von meiner Trainerin/meinem Trainer in meinem Kopf, die/der mir Anweisungen gibt.	(1)	(2)	(3)	(4)

8	Mein Ziel bei einem Turnierstart ist es, besser zu werden bzw. meine Leistung zu verbessern.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	Ich lasse mich schnell von anderen Reitern/Pferden ablenken.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	Wenn ich merke, dass ich angespannt bin, kreise ich mit den Schultern, um locker zu werden.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11	Sobald ich nervös werde, verspannt sich mein Pferd oder wird ungehorsam.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	Wenn ich aufgeregt bin, versuche ich bewusst meine Muskeln zu entspannen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	Auf dem Weg zum Turnier male ich mir aus, wie mein Pferd laufen wird.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	Vor einem Turnier denke ich ganz bewusst darüber nach, was ich erreichen möchte.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	Wenn ich in einer Prüfung oder im Parcours erst einmal einen Fehler mache, fällt es mir schwer, mich auf den Rest der Prüfung/des Parcours zu konzentrieren.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	Vor einem Turnier versuche ich, mir die Turnierumgebung genau auszumalen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17	Ich vertraue in mein Können als Reiter.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	Ich überlege mir vor einem Turnier ganz konkret, was erreichen möchte.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19	Vor einem Turnier male ich mir aus, wie ich auf dem Siegereppchen stehe/eine Schleife bekomme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	Vor einem Turnier gehe ich in Gedanken noch einmal meinen schönsten Reiterfolg durch.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21	Wenn ich ein bestimmtes reiterliches Ziel vor Augen habe, mache ich mir bewusst, welche einzelnen Schritte ich gehen muss, um dieses zu erreichen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22	Wenn ich Angst habe, rede ich mit meinem Pferd.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23	Sobald ich aufgeregt werde, merke ich, dass ich nicht mehr gut reite.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	Wenn ich aufgeregt bin, stelle ich mir vor, was alles schief gehen könnte.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25	Ich habe bestimmte Rituale, bevor ich in die Prüfung reite. (z.B. Pferd loben, Augen zu machen, durchatmen etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26	Am Anfang der Turniersaison stelle ich einen Plan auf, welche Ziele ich erreichen möchte.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27	Wenn ich beim Abreiten und/oder in der Prüfung einen Fehler mache, oder etwas nicht klappt, werde ich böse mit mir selbst und sage mir selbst negative Dinge (z.B. „Du kannst es einfach nicht.“)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28	Wenn ich mir für ein Turnier ein Ziel gesetzt habe, überlege ich mir wie ich dieses Ziel am besten erreichen kann.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29	Vor einem Turnier liste ich in Gedanken meine bisherigen Erfolge auf.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

30	Wenn ich nervös bin, schließe ich die Augen und versuche zu mir zurück zu finden.	1	2	3	4
31	Wenn sich mein Pferd erschreckt oder zur Seite springt, lasse ich mich dadurch aus der Ruhe bringen.	1	2	3	4
32	Wenn ich eine Übung reite, die mir schwerfällt, oder ein schwieriges Hindernis anreite, gebe ich mir spezifische Anweisungen, worauf ich achten muss.	1	2	3	4

## Annex IV: Table of items per factor

Factor	Item
<b>Self-confidence</b>	Wenn ich aufgeregt bin, stelle ich mir vor, was alles schief gehen könnte.
	Ich habe Angst, dass mir beim Abreiten oder in der Prüfung etwas Schlimmes und/oder Peinliches passieren könnte.
	Wenn es beim Abreiten nicht so läuft, wie ich es mir vorstelle, kann ich nur schwierig zu meiner gewohnten Form zurückfinden.
	Ich lasse mich schnell von anderen Reitern/Pferden ablenken.
	Ich habe Angst, auf einem Turnier zu versagen.
	Sobald ich aufgeregt werde, merke ich, dass ich nicht mehr gut reite.
	Ich vertraue in mein Können als Reiter.
	Wenn ich in einer Prüfung oder im Parcours erst einmal einen Fehler mache, fällt es mir schwer, mich auf den Rest der Prüfung/des Parcours zu konzentrieren.
	Wenn ich beim Abreiten und/oder in der Prüfung einen Fehler mache, oder etwas nicht klappt, werde ich böse mit mir selbst und sage mir selbst negative Dinge (z.B. „Du kannst es einfach nicht.“)
	Wenn sich mein Pferd erschreckt oder zur Seite springt, lasse ich mich dadurch aus der Ruhe bringen.
	Sobald ich nervös werde, verspannt sich mein Pferd oder wird ungehorsam.
<b>Goal-setting</b>	Ich überlege mir vor einem Turnier ganz konkret, was erreichen möchte.
	Wenn ich mir für ein Turnier ein Ziel gesetzt habe, überlege ich mir wie ich dieses Ziel am Besten erreichen kann.
	Vor einem Turnier denke ich ganz bewusst darüber nach, was ich erreichen möchte.
	Wenn ich ein bestimmtes reiterliches Ziel vor Augen habe, mache ich mir bewusst, welche einzelnen Schritte ich gehen muss, um dieses zu erreichen.
	Am Anfang der Turniersaison stelle ich einen Plan auf, welche Ziele ich erreichen möchte.
	Ich versuche, meine reiterlichen Ziele zu erreichen.
	Vor der Prüfung stelle ich mir ganz genau vor, wie ich die Prüfung/den Parcours reiten möchte.
	Mein Ziel bei einem Turnierstart ist es, besser zu werden bzw. meine Leistung zu verbessern.
<b>Arousal control</b>	Wenn ich aufgeregt bin, versuche ich bewusst meine Muskeln zu entspannen.

	Wenn ich nervös bin, schließe ich die Augen und versuche zu mir zurück zu finden.
	Wenn ich aufgeregt bin, versuche ich mich zu beruhigen, indem ich tief ein- und ausatme.
	Wenn ich merke, dass ich angespannt bin, kreise ich mit den Schultern, um locker zu werden.
	Auch wenn ich alleine auf einem Turnier bin, höre ich beim Abreiten und/oder in der Prüfung die Stimme von meiner Trainerin/meinem Trainer in meinem Kopf, die/der mir Anweisungen gibt.
	Ich habe bestimmte Rituale, bevor ich in die Prüfung reite. (z.B. Pferd loben, Augen zu machen, durchatmen etc.)
	Wenn ich eine Übung reite, die mir schwerfällt, oder ein schwieriges Hindernis anreite, gebe ich mir spezifische Anweisungen, worauf ich achten muss.
	Wenn ich Angst habe, rede ich mit meinem Pferd.
<b>Visualization</b>	Vor einem Turnier gehe ich in Gedanken noch einmal meinen schönsten Reiterfolg durch.
	Vor einem Turnier liste ich in Gedanken meine bisherigen Erfolge auf.
	Vor einem Turnier male ich mir aus, wie ich auf dem Siegereppchen stehe/eine Schleife bekomme.
	Auf dem Weg zum Turnier male ich mir aus, wie mein Pferd laufen wird.
	Vor einem Turnier versuche ich, mir die Turnierumgebung genau auszumalen.

## Annex V: Scoring key of the final inventory

Punkteschlüssel für den Fragebogen:

Der **Faktor Selbstvertrauen** enthält folgende Fragen:

24, 1, 2, 9, 3, 23, 17, 15, 27, 31, 11

Die Ergebnisse der Fragen 24, 1, 2, 9, 3, 23, 15, 27, 31, 11 müssen umgekehrt werden, da diese eine negative Bedeutung haben. Das heißt: 4=1, 1=4, 2=3, 3=2.

Die maximal erreichbare Höchstpunktzahl ist 44. Minimal können 11 Punkte erreicht werden.

Der **Faktor Zielsetzung** enthält folgende Fragen:

18, 28, 14, 21, 26, 5, 6, 8

Die maximal erreichbare Punktzahl ist 32. Mindestens können 8 Punkte erreicht werden.

Der **Faktor Erregungskontrolle** enthält folgende Fragen:

12, 30, 4, 10, 7, 25, 32, 22

Maximal können 32 Punkte erreicht werden, minimal 8 Punkte.

Der **Faktor Visualisierung** enthält folgende Fragen:

20, 29, 19, 13, 16

Hier können maximal 20 Punkte und mindestens 5 Punkte erreicht werden.

Annex VI: Table of *Rotated Component Matrix*, Rotation method: *Varimax with Kaiser Normalization*. *Red items* have been deleted in the follow-up study.

Item	Component					
	1	2	3	4	5	6
37	.692					
8	.665					
18	.650					
9	.647					
11	.628					
36	.612					
28	<i>-.586</i>					.392
26	.574					
42	.516					
47	.488					
20	.466					
7						.334
29		.772				
43		.725				
24		.674		.373		
34		.626				
39		.604				
14		.524				
15		.482				
17		.448				.307
22			.703			

45			.654			
12			.635			
19			.604			
16		.312	.406			
38			.383		.301	
48			.374			.316
35			.365			
13			.359			
32				.734		
44				.710		
30				.629		
23		.391		.572		
31				.438		
27				.438		
41					.809	
46					.771	
49		.302			.422	
10						
21						.582
33						.528
25						.427
40						-.414

Annex VII: Table of the multivariate analysis of variance between the independent factors discipline and level and the dependent factors (goal-setting, visualization, self-confidence, arousal control)

**3. MeinebevorzugteDisziplinist \* InwelcherLeistungsklassestartenSie**

Dependent Variable	MeinebevorzugteDisziplinist	InwelcherLeistungsklassestartenSie	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Zielsetzung	Dressur	0	22,231	,816	20,627	23,834
		6	22,440	,589	21,284	23,596
		5	23,211	,478	22,273	24,148
		4	23,875	,491	22,912	24,838
		3	25,167	,642	23,905	26,428
		2	24,880	,833	23,245	26,515
		1	27,500	2,944	21,719	33,281
	Springen	0	23,833	1,700	20,496	27,171
		6	23,769	,667	22,460	25,078
		5	22,692	,471	21,767	23,618
		4	25,900	,498	24,923	26,877
		3	25,581	,748	24,112	27,049
		2	26,059	1,010	24,076	28,042
		1	a	.	.	.
	Vielseitigkeit	0	20,000	4,163	11,825	28,175
		6	25,158	,955	23,282	27,033
		5	23,833	,981	21,906	25,760
		4	26,824	,714	25,421	28,226
		3	28,000	1,862	24,344	31,656
		2	25,000	1,472	22,110	27,890
		1	31,000	4,163	22,825	39,175
	Freizeit	0	20,500	,931	18,672	22,328
		6	21,667	2,404	16,947	26,387
		5	25,500	2,944	19,719	31,281
		4	19,333	2,404	14,613	24,053

		3		26,000	4,163	17,825	34,175
		2	a				
		1		29,000	4,163	20,825	37,175
	Western	0		25,429	1,574	22,339	28,518
		6	a				
		5		19,000	4,163	10,825	27,175
		4		22,000	4,163	13,825	30,175
		3		21,750	2,082	17,662	25,838
		2		20,000	4,163	11,825	28,175
		1	a				
	Voltigieren	0	a				
		6	a				
		5	a				
		4	a				
		3		20,000	4,163	11,825	28,175
		2		19,000	4,163	10,825	27,175
		1		21,000	4,163	12,825	29,175
Erregungskontrolle	Dressur	0		21,538	,884	19,802	23,275
		6		21,840	,638	20,588	23,092
		5		22,000	,517	20,984	23,016
		4		21,625	,531	20,582	22,668
		3		21,333	,696	19,967	22,700
		2		21,680	,902	19,909	23,451
		1		28,000	3,188	21,739	34,261
	Springen	0		22,000	1,841	18,385	25,615
		6		21,667	,722	20,249	23,084
		5		21,256	,511	20,254	22,259
		4		20,471	,539	19,413	21,530
		3		19,516	,810	17,926	21,106
		2		19,412	1,094	17,264	21,559
		1	a				
	Vielseitigkeit	0		30,000	4,509	21,146	38,854
		6		23,684	1,034	21,653	25,715
		5		21,056	1,063	18,969	23,142

		4	20,618	,773	19,099	22,136
		3	18,000	2,016	14,040	21,960
		2	18,250	1,594	15,120	21,380
		1	25,000	4,509	16,146	33,854
	Freizeit	0	22,550	1,008	20,570	24,530
		6	22,333	2,603	17,222	27,445
		5	23,500	3,188	17,239	29,761
		4	20,000	2,603	14,888	25,112
		3	31,000	4,509	22,146	39,854
		2	a	.	.	.
		1	26,000	4,509	17,146	34,854
	Western	0	22,143	1,704	18,796	25,489
		6	a	.	.	.
		5	24,000	4,509	15,146	32,854
		4	24,000	4,509	15,146	32,854
		3	22,750	2,254	18,323	27,177
		2	21,000	4,509	12,146	29,854
		1	a	.	.	.
	Voltigieren	0	a	.	.	.
		6	a	.	.	.
		5	a	.	.	.
		4	a	.	.	.
		3	23,000	4,509	14,146	31,854
		2	18,000	4,509	9,146	26,854
		1	30,000	4,509	21,146	38,854
Visualisierung	Dressur	0	11,115	,582	9,972	12,259
		6	9,280	,420	8,455	10,105
		5	10,632	,341	9,963	11,301
		4	10,583	,350	9,896	11,271
		3	9,333	,458	8,433	10,233
		2	9,360	,594	8,194	10,526
		1	11,500	2,100	7,376	15,624
	Springen	0	9,000	1,212	6,619	11,381
		6	10,487	,476	9,553	11,421
		5	8,897	,336	8,237	9,558

	4		10,114	,355	9,417	10,811
	3		9,452	,533	8,404	10,499
	2		9,882	,720	8,468	11,297
	1	a	.	.	.	.
Vielseitigkeit	0		7,000	2,970	1,168	12,832
	6		11,105	,681	9,767	12,443
	5		9,333	,700	7,959	10,708
	4		10,088	,509	9,088	11,088
	3		10,000	1,328	7,392	12,608
	2		7,750	1,050	5,688	9,812
	1		11,000	2,970	5,168	16,832
Freizeit	0		9,650	,664	8,346	10,954
	6		13,333	1,715	9,966	16,700
	5		12,000	2,100	7,876	16,124
	4		10,333	1,715	6,966	13,700
	3		7,000	2,970	1,168	12,832
	2	a	.	.	.	.
	1		9,000	2,970	3,168	14,832
Western	0		11,429	1,122	9,224	13,633
	6	a	.	.	.	.
	5		14,000	2,970	8,168	19,832
	4		12,000	2,970	6,168	17,832
	3		9,000	1,485	6,084	11,916
	2		10,000	2,970	4,168	15,832
	1	a	.	.	.	.
Voltigieren	0	a	.	.	.	.
	6	a	.	.	.	.
	5	a	.	.	.	.
	4	a	.	.	.	.
	3		9,000	2,970	3,168	14,832
	2		9,000	2,970	3,168	14,832
	1		12,000	2,970	6,168	17,832
schwierige Situation	Dressur	0	28,462	1,043	26,414	30,509
		6	30,280	,752	28,803	31,757
		5	29,513	,610	28,315	30,711

	4		32,236	,627	31,005	33,467
	3		32,643	,821	31,032	34,254
	2		34,160	1,064	32,072	36,248
	1		34,000	3,760	26,616	41,384
Springen	0		33,833	2,171	29,570	38,096
	6		30,718	,852	29,046	32,390
	5		33,744	,602	32,561	34,926
	4		32,786	,636	31,538	34,034
	3		35,484	,955	33,608	37,359
	2		35,471	1,290	32,938	38,003
	1	a	.	.	.	.
Vielseitigkeit	0		28,000	5,318	17,558	38,442
	6		31,105	1,220	28,710	33,501
	5		31,722	1,253	29,261	34,184
	4		33,882	,912	32,091	35,673
	3		38,000	2,378	33,330	42,670
	2		37,250	1,880	33,558	40,942
	1		32,000	5,318	21,558	42,442
Freizeit	0		32,300	1,189	29,965	34,635
	6		30,667	3,070	24,638	36,696
	5		29,500	3,760	22,116	36,884
	4		34,000	3,070	27,971	40,029
	3		33,000	5,318	22,558	43,442
	2	a	.	.	.	.
	1		34,000	5,318	23,558	44,442
Western	0		31,000	2,010	27,053	34,947
	6	a	.	.	.	.
	5		25,000	5,318	14,558	35,442
	4		26,000	5,318	15,558	36,442
	3		29,500	2,659	24,279	34,721
	2		33,000	5,318	22,558	43,442
	1	a	.	.	.	.
Voltigieren	0	a	.	.	.	.
	6	a	.	.	.	.
	5	a	.	.	.	.

	4	a	.	.	.	.
	3	32,000	5,318	21,558	42,442	
	2	32,000	5,318	21,558	42,442	
	1	37,000	5,318	26,558	47,442	

a. This level combination of factors is not observed, thus the corresponding population marginal mean is not estimable.