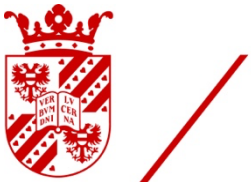

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< The Effects of PETTLEP-Imagery on Motorcycle Racers' Self-Efficacy: A Pilot Study >

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Abstract

The practice of mental imagery is a common tool for athletes of various disciplines. It involves the creation or recreation of an event or scene in one's mind along with associated behaviors in the absence of external stimuli. Mental imagery has been shown to have the potential to improve motor skills, concentration, self-efficacy, confidence, and reduce performance anxiety. This pilot study aims to examine the impact of a PETTLEP-based imagery intervention on amateur motorcycle racers' self-efficacy beliefs. A pre-test/post-test experimental design was employed, with 13 amateur riders randomly assigned to either the experimental group (n = 7) or the control group (n = 6). The experimental group received an 8-minute PETTLEP-based imagery intervention per day, while the control group listened to a motorcycle racing podcast for the same time. Participants practiced the intervention, or listened to the podcast, for seven consecutive days. Results showed a statistically significant increase in self-efficacy across both groups. Unexpectedly, however, relative to the control group, the increase in self-efficacy was not higher in the experimental group. This curious finding needs further exploration in future studies, alongside with the examination of the application of PETTLEP-based imagery interventions for motorcycle racers, with potential practical implications to be determined in future research.

Keywords: PETTLEP-model, mental imagery, self-efficacy, motorcycle racing, visualization

The Effects of PETTLEP-Imagery on Motorcycle Racers' Self-Efficacy

In the competitive world of motorcycle racing, Marc Marquez stands out for his exceptional performance and numerous championship victories. Like many elite athletes, Marquez incorporates mental imagery into his training and preparation. In a recent interview, Marquez revealed that he uses mental imagery to visualize different race scenarios, particularly the turns where the risk of crashing is higher. "You can visualize the turns in which the risks are higher. On any track, you know there are three or four points where people usually crash. So, you know it can happen there, but also you have to be able to see it during the action" (Bueno & García, 2022). By visualizing these scenarios, Marquez is able to be more prepared and confident in the moment of action. Marquez's use of mental imagery is just one example of the many high-performing athletes who have found success through incorporating this technique into their routine (Cumming & Ramsey, 2008; Landers, 1983; Murphy & Jowdy, 1992; Utay & Miller, 2006). Mental imagery has been defined as the process by which an individual creates or recreates an event or scene in their mind, including the associated behaviors, in the absence of external stimuli (Murphy, 1994). It has been shown to be a powerful tool for improving sports performance by enhancing motor skills, concentration, self-efficacy, confidence, and reducing performance anxiety (Martin et al, 1999; Murphy, 1994, 2012; Hodges & Williams, 2012).

Relevance and Purpose

The purpose of the current investigation is to examine the effects of a PETTLEP-based imagery intervention on the self-efficacy beliefs of amateur motorcycle racers. In doing so, this study will provide a comprehensive examination of the PETTLEP-model of imagery and its underlying components. Additionally, we will critically evaluate the impact of

PETTLEP-based imagery on self-efficacy and seek to understand the underlying mechanisms responsible for its effectiveness. By providing a systematic examination of these key aspects, this pilot study aims to contribute to the body of literature on the role of imagery in athletic performance and self-efficacy.

Theoretical relevance

The impact of psychological factors, such as stress and anxiety, motivation, and confidence, on performance in motorcycle racing has been explored in prior studies (D'Artibale et al., 2018; D'Artibale, 2020). The study by D'Artibale (2020) for example, reviewed the available literature on the human performance aspects of motorcycle road racing. The authors found that successful performance in the sport requires not just technical riding skills but also proper levels of body composition, cardiovascular fitness, muscular strength, specific flexibility, and heat tolerance, as well as resistance to inertial stresses, visual acuity, mental and physical resilience, psychological strategies, and behavioral awareness. The authors suggested that further research is needed to profile riders and develop evidence-based methodologies that can improve performance and increase safety. Another study conducted by Kern et al. (2012) revealed that self-esteem, motivation, and stress management strategies are related to the success of motorcycle racers in competition. Previous research, such as the case study conducted by Jevon and O'Donovan (2000), has revealed the positive impact of an intervention program on motivation and confidence in an injured rider. The program utilized various psychological techniques, including imagery, self-talk, and goal setting, to achieve its positive results. Despite the numerous studies examining psychological factors in motorcycle racing, literature regarding the effect of mental imagery interventions on motorcycle racers is very limited. This highlights the need for further investigation in this area, as the examination of the effects of imagery on motorcycle racers may provide valuable insights into improving their performance.

Practical relevance

In motorcycle racing, the performance of riders is influenced by a multitude of variables, including the physical and mental conditions of the rider, track conditions, and machine setup. The unpredictable nature of the sport, with multiple riders vying for positions on the track, adds to the complexity of the performance equation. The constantly changing landscape of the racetracks, coupled with limited training time before each race, can make it challenging for riders to effectively adapt and perform consistently at their best. As such, the mastery of adaptation and the management of the physical and mental demands of the sport are critical components of successful performance in motorcycle racing. The implementation of imagery interventions in motorcycle racing has the potential to provide riders with significant benefits. By incorporating imagery practices, riders can compensate for limited track time by mentally simulating the race and preparing for various scenarios that are likely to occur during competition. One way to create such imagery interventions is by utilizing the PETTLEP-model of imagery (Holmes & Collins, 2001), which will be discussed in the following section.

The PETTLEP-Model of Imagery

The PETTLEP-model of imagery is a framework for understanding and utilizing mental imagery in sports performance. The acronym "PETTLEP" stands for physical, environmental, task, timing, learning, emotion, and perspective. The model was developed by Paul S. Holmes and David J. Collins in 2001 and provides guidelines for the effective use of mental imagery in sports. The model includes seven components that are important in mental imagery of a sport or performance. The *physical component* (P) involves imagining the sensations and movements involved in the performance, including the feel of muscles contracting and the overall physical sensations. The *environmental component* (E) involves

imagining the specific setting and sensory information present during the performance. The *task component* (T) involves imagining the specific actions involved in the performance and rehearsing them in the mind. The *timing component* (T) involves imagining the pace and rhythm of the performance, including the speed and flow of movements. The *learning component* (L) involves imagining the process of acquiring a new skill, including the stages involved in learning. The *emotional component* (E) involves imagining the emotions experienced during the performance, such as confidence, excitement, and motivation. The *perspective component* (P) involves imagining the experience from different perspectives, including first- and third-person perspectives, to gain a deeper understanding of the performance and improve imagery skills.

The application of the PETTLEP-model has been explored in various research studies. For example, a study by Wakefield and Smith (2012) examined the application of the PETTLEP-model in enhancing athletic performance. The authors provide an overview of the various components of the PETTLEP-model, including physical, environmental, task, timing, learning, emotional, and perspective components. The study also examined the empirical evidence supporting the effectiveness of the PETTLEP-model in enhancing athletic performance and skill acquisition. They concluded that the PETTLEP-model offers a comprehensive and effective approach to motor imagery and that it has been shown to be effective in a variety of sport and performance settings. Another study, conducted by Smith et al., (2008), aimed to examine the effect of the PETTLEP-model on golf bunker shot performance. Participants were randomly assigned to either an imagery or control group. The imagery group participated in a PETTLEP-based imagery intervention, while the control group continued with their usual pre-shot routine. The results showed that the participants in the imagery group improved their golf bunker shot performance compared to the control

group. The authors concluded that the PETTLEP-based imagery intervention was effective in enhancing golf bunker shot performance.

The effectiveness of PETTLEP-based imagery interventions is thought to be a result of the interactions between its seven components. The frequency of imagery practice also appears to impact its effectiveness, with more frequent practice yielding greater benefits, as shown in a study by Wakefield and Smith (2009) who found that three times per week of imagery practice was more beneficial than one or two times per week. Taken together, the empirical evidence supports the validity of the PETTLEP-model as an effective approach to imagery interventions. The PETTLEP-model offers a comprehensive framework for creating interventions that incorporate these factors, leading to improved outcomes of imagery interventions.

Mechanism for the Efficacy of PETTLEP-Based Interventions

Functional Equivalence. The leading explanation for the effectiveness of PETTLEP-based imagery interventions is the concept of functional equivalence. According to this idea, the same neural networks in the brain become active when imagining a sequence of behaviors as when the behaviors are actually performed. This mechanism is widely accepted as the primary reason for the success of PETTLEP-based imagery.

A study by Guillot and Collet (2008) reviewed the literature on the use of motor imagery in sport. The authors proposed a theoretical framework, the "motor imagery integrative model in sport," which seeks to integrate and synthesize various perspectives and theories on motor imagery in sport. They argue that the model has several key components, including the mental representation of movement, attentional focus, and functional equivalence. The study highlights the importance of these components in the effective use of

motor imagery and suggest that future research in the area should focus on further exploring and refining the model.

The execution of movement and imagery have been found to have considerable parallels, demonstrated by EMG studies. A study by Guillot et al. (2007) found that mental imagery of a specific movement was associated with EMG activity in the corresponding muscle group. For example, when participants were asked to imagine lifting a weight, the EMG activity in the upper arm muscles reflected the demands of the task. This suggests that mental imagery of a movement can activate the same muscle groups as actual physical performance, providing support for the functional equivalence hypothesis. Other studies have also shown that mental imagery activates relevant muscles in response to imaged behavior (Allison et al., 2010; Lotze & Halsband, 2006;), and that the duration of imaged and executed walking of a certain distance is the same (Decety & Michel, 1989). This neural overlap between imagery and movement preparation and production has been found to result in positive effects on the athlete's performance and mental state (Arora et al., 2011; Cumming & Williams, 2012; Guillot et al., 2009, 2012; Lotze & Halsband, 2006; Lotze & Zentgraf, 2010; MacIntyre & Moran, 2010; Munzert et al., 2009). In conclusion, these findings demonstrate the close relationship between movement execution and mental imagery, thus, providing supportive evidence for the concept of functional equivalence as a key factor for the efficacy of mental imagery.

PETTLEP-Imagery and Self-Efficacy

The concept of self-efficacy was first introduced by psychologist Albert Bandura in the 1970s. Bandura defines self-efficacy as a person's belief in their ability to successfully execute a task or behavior, which has a direct impact on their motivation and goal attainment. Self-efficacy is considered an important aspect of sports performance. Several studies have

investigated the effects of PETTLEP-based imagery interventions on self-efficacy and performance in different sports such as golf, soccer, and archery.

A study conducted by Ismail (2015) found that the use of a PETTLEP-based imagery intervention was effective in improving self-efficacy in golfers. The results showed that the group that practiced imagery based on the PETTLEP-model had higher self-efficacy scores compared to both the traditional imagery group and the control group. The effectiveness of the program was attributed it to the presence of the seven components of the PETTLEP-model of imagery. The procedure used in the PETTLEP-imagery group, which involved standing 10 meters away from the actual putting green, was also found to be effective, as was the use of audio modality to practice imagery, compared to written scripts. A study by Ramsey et al. (2010) investigated the effect of two PETTLEP-based imagery interventions (skill-based and emotion-based) on penalty taking in soccer and compared the results to a stretching group (control). 33 participants were measured for their performance, self-efficacy, and interpretation of anxiety before and after the six-week intervention period. The results showed that both imagery groups had significantly higher performance scores compared to the stretching group, with no difference between the two imagery groups. Another study by Ramsey et al. (2007) conducted a randomized controlled trial to investigate the effects of a PETTLEP-based imagery intervention on soccer performance, self-efficacy, and anxiety in university soccer players. The study recruited 21 participants who were randomly allocated to either the experimental or control group. The experimental group received a PETTLEP-based imagery intervention, while the control group received no intervention. Results indicated that the imagery intervention had a positive effect on soccer performance, self-efficacy, and anxiety, with the experimental group reporting significantly higher levels of self-efficacy and lower anxiety levels compared to the control group. These findings suggest that PETTLEP-based imagery can be an effective intervention for enhancing both performance and

psychological outcomes in university soccer players. A study by Indahwati and Ristanto (2016) aimed to investigate the effects of PETTLEP-based imagery on competitive anxiety and concentration in archery athletes. Participants were assigned to either the experimental or the control group, with the experimental group receiving a PETTLEP-imagery intervention. Results showed that the experimental group had a significant decrease in competitive anxiety and an increase in concentration compared to the control group, supporting the effectiveness of PETTLEP imagery in improving the psychological aspects of athletic performance, such as anxiety and concentration, among archery athletes.

In conclusion, several studies have shown the effectiveness of PETTLEP-based imagery in improving self-efficacy and performance in different athletic domains. These findings suggest that PETTLEP-based imagery can be a crucial factor in building athletes' confidence in their abilities, making it a valuable tool for enhancing athletic performance and overall self-efficacy. As the effects of PETTLEP-based imagery interventions have not been studied in the context of motorcycle racing, the current research aims to address this gap in the literature by examining the effects of a PETTLEP-based imagery intervention on Dutch amateur motorcycle racers' self-efficacy beliefs. We hypothesize that practicing imagery with an audio file based on the PETTLEP-model will significantly increase self-efficacy beliefs among motorcycle racers when compared to a control group.

Methods

Participants

An a priori power analysis was conducted using G*Power3.1 (Faul, et al., 2007) to determine the minimum sample size necessary to achieve 80% power with an effect size of .25 and $\alpha = .05$. The result indicated a required sample size of N = 34. However, due to limitations, the study was only able to recruit 13 participants (12 males and 1 female; M_{age} =

17.77 years, SD = 2.28). These participants were randomly assigned to either the experimental or control condition. The age range of the participants was from 15 to 23 years, and all were members of a racing organization for amateur riders. The motorcycle riding experience of the participants varied from 2 to 11 years (M = 6.54 years, SD = 2.85). All participants were informed of the voluntary nature of the study and provided written informed consent. For participants until the age of 16, informed consent was obtained from a parent or guardian. The study procedure was approved by the ethical committee of the University of Groningen.

Procedure

The participants were randomly assigned to either the experimental condition (n = 7, coded as 1) or the control condition (n = 6, coded as 2). The pilot study used a pre-test/post-test experimental design and participants' responses were collected through Qualtrics (see Figure A1 and Figure A2 in Appendix A). In the experimental group, participants practiced an imagery intervention for approximately 8 minutes every evening for seven days. The intervention was based on the PETTLEP model (Holmes & Collins, 2001) and consisted of an audio file that guided participants through the imagery practice in a structured manner, incorporating all components of the PETTLEP model. All participants received an information sheet containing details of the imagery intervention (see Appendix B, Information Sheet for Participants). Participants were specifically instructed to image on how to use their strengths on their current racetrack. Regarding the *physical* elements of the PETTLEP intervention, the participants were asked to use their leather suit, helmet, and gloves, sitting on their motorcycle. The *environment* for the practice was the place they stored their motorcycle. The *task* the participants imaged was a race day procedure, starting with the last moments in the garage before the race, going out on the track with the motorcycle, riding a warm-up lap and standing in the starting position. The *timing* of the intervention refers to

the temporal nature of the practice. Participants were instructed to image in real time. The *learning* component suggests to make adjustments and refinements in response to feedback. *Emotions* are another important component of the model. Here, participants were asked to image positive, but also negative emotions that could occur during a race day. Participants were asked to image from the first person-perspective (1PP) which relates to the *perspective* component of the model. At the end of the audio file, participants were asked to simulate a race with 2 laps and were given some instruction how to do so. The following a full transcript of the audio file, with the components of the PETTLEP model printed bold.

‘’Hello and welcome to this imagery exercise! Okay, so get comfortable **on your bike**, and when you’re ready, close your eyes and settle in for a moment. Take a few deep breaths and try to relax, feel your body, and connect with it. Start by paying attention to your breath. I am now going to guide you through this imagery exercise. If you feel like you need another moment you can pause and continue whenever you’re ready. Please do this exercise **through your own eyes**, and practice in **real time**. Use the track you are **currently practicing on or will be racing on next**. So, I want you to start visualizing yourself shortly before you would go out on the track. Picture the **environment**. Maybe the garage you’re in, or the pavilion. Picture the people around you that are with you during that time. Picture your bike, and all the other equipment that is usually there. Now, I would like you to incorporate your other senses as well - for example the sound of people talking, the noise of a motorcycle engine. Image the smell of that place. Maybe the **smell** of oil, or gas for example - or your leather suit perhaps. Now try to image how your **body feels in that space**. For example, the leather suit on your skin, or the weight of the helmet on your head. Take your time. I would also like you to include your **emotions**. Try and image yourself feeling confident and motivated for the race.

Now I would like you to image **yourself** getting on your motorcycle and riding out to the track. Pay attention to the **environment**. What is the weather like? Is it cloudy, or sunny? - perhaps it is raining a bit. Try to image it as vividly as possible and include **all your senses**.

Now I want you to visualize the procedure before a race. You ride out on the track, you **see** the other riders, perhaps there is a warm-up lap. Again, include all senses. The **sound** of the other motorcycles, the **colors** of the motorcycles and leather suits, the people standing around the track, the **smell** of the burned gasoline. Now take a moment to become aware of how you **feel**. Do you feel nervous or excited for the race? Try to include positive as well as negative emotions, and just accept them and come back to focusing on the race.

I now would like to ask you to **simulate a race with 2** laps on the current track. I will give you some instructions now, and then I will be quiet. When you image, try and include all **senses** again, and now also include how your body feels in space - how does your body feel when you accelerate? Feel the force of the bike launching you forward. Feel the pressure in your arms and shoulders during hard breaking. Feel how you lean into the corner, hit the apex, and accelerate again. Be creative and image an opponent overtaking you, or you overtaking someone else for example. While you do so, try to make use of your **strengths**. Perhaps your strengths are tight, slow corners, or a chicane where you through the bike from one side to the other. Image yourself going around for 2 laps and see this as the end of the race. Image having reached the position that you wanted and picture how that makes you feel. Try and experience the **emotions**. Feel proud and happy for your placement. Maybe you are very excited from the race, you’re celebrating. Okay, so picture the start formation and your place in it. The sounds of the other motorcycles revving. Where are the other riders? Where is your rival? Be focused on the lights. They turn out and the race starts.’’

The participants assigned to the control group were given specific instructions to listen to an episode of The Race MotoGP Podcast (2022) which focused on the current season of the Motorcycle World Championship. The participants were required to listen to the podcast for eight minutes per day, for a period of seven consecutive days. The aim of this intervention was to provide the control group with exposure to a related topic and to provide a baseline measure of their self-efficacy beliefs for comparison with the experimental group.

Measures

Manipulation Checks

To check whether participants adhered to the intervention or the instructions in the control condition, manipulation checks were carried out. Participants were presented with a scale consisting of eight items. The questions asked participants about specific behaviors regarding the intervention during the previous week. In particular, questions one to seven assessed how frequently participants have engaged in imagery practice under the specified conditions (e.g., In the previous week I have practiced imagery through my own eyes for about 8 minutes) with ($\alpha = .93$), indicating sufficient internal consistency (for all items see Table C1 in Appendix C). The last question (Question eight) assessed the number of times participants have listened to a podcast about motorcycle racing, over a seven-day experimental period. Responses were collected on a 6-point Likert scale (1 = ‘not at all’, 2 = ‘once’, 3 = ‘2-3 times’, 4 = ‘4-5 times’, 5 = ‘almost every day (6 times)’, 7 = ‘every day’).

Self-Efficacy Beliefs

Self-efficacy beliefs regarding one’s level of confidence in the ability to practice and apply strengths were assessed by the 11-item Strengths Self-Efficacy Scale (SSES) developed by Tsai et al. (2014). The scale in this research was adapted to fit the context of motorcycle racing (see Table C2 in Appendix C for original and adjusted items). The internal consistency

across items in this study (αpre = .93, αpost = .93) is consistent with that found in the original research, indicating a reliable adaptation of the initial items (Tsai et al., 2014). Participants responded to the scale prior to the intervention, that is, on the first day of the intervention, and again, after the last day of the seven-day experimental period.

Results

Test of the Assumptions

To determine whether the assumptions of the RM ANOVA were met, several analyses were performed. As the sample in this research was smaller than desired according to the G*Power analysis, a Shapiro-Wilk test was performed to determine whether this had an impact on the normality of the distribution (Shapiro & Wilk, 1965). The results from the test showed that normality was not significantly violated ($W_{EXPpre} = 0.91$, $p = 0.39$; $W_{EXPpost} = 0.92$, $p = 0.45$; $W_{CTLpre} = 0.84$, $p = 0.13$; $W_{CTLpost} = 0.96$, $p = 0.80$). Although QQ-plots are frequently used as a graphical depiction to check for violations of normality, they are deemed unreliable when using small sample sizes (Jones), therefore, they were not used in this analysis. Additionally, a Levene's test was conducted to assess the assumption of homogeneity of variance between the pre- and post-test scores. The results showed that the assumption was met ($F_{PRE}(1, 11) = 0.19$, $p = 0.67$, and $F_{POST}(1, 11) = 0.19$, $p = 0.67$). This implies that the variance between the pre- and post-test scores did not significantly differ.

When conducting a repeated measures analysis with only two levels (pre vs. post), there is no other set of difference scores with which to compare. As a result, the concept of sphericity becomes irrelevant in this specific analysis. In these cases, a RM ANOVA can still be deemed appropriate for the research as it is capable of testing for within-subjects' effects despite the lack of sphericity. In this situation, the RM ANOVA is a useful tool for

investigating the changes in the dependent variable across the repeated measures, in this case the pre and post self-efficacy beliefs.

Manipulation Check

The data was not expected to follow a normal distribution because it measured the frequency of behavior (imagery practice and podcast consumption) in a categorical manner. For example, participants who listened to the podcast were not expected to have practiced imagery, and vice versa. To account for this, a nonparametric test was used. Non-parametric tests are used when the data is categorical because these tests do not assume a normal distribution of the data, which is a requirement for parametric tests. Categorical data, such as frequency of behavior in this study, does not follow a normal distribution and is analyzed using non-parametric tests. These tests are designed specifically for analyzing such data and do not require any assumptions about the underlying distribution of the data (Kuznetsova et al., 2017).

With regard to the Intervention Manipulation Check, the results of the Kruskal-Walli's test revealed a significant difference between the experimental and the control group ($H_{EXP}(1) = 5.34$, $p = 0.02$). This means that, over the 7-day experimental period, participants in the experimental group ($M = 3.86$, $SD = 0.81$) practiced imagery significantly more compared to participants in the control group ($M = 1.98$, $SD = 1.16$). The same analysis with the Control Group Manipulation Check as dependent variable revealed that podcast consumption was significantly higher in the control group ($M = 4.33$, $SD = 1.03$) compared to the experimental group ($M = 1.29$, $SD = 0.49$), ($H_{CTL}(1) = 9.66$, $p = 0.02$). All together, these findings clearly indicate that the intervention can be considered successful.

Test of the Hypothesis

The main hypothesis was that practicing imagery with an audio file based on the PETTLEP-model would increase motorcycle racers' self-efficacy compared to a control group. This hypothesis was tested using a RM ANOVA with time (pre vs. post) as the within-subjects variable, condition (intervention vs. control) as the between-subjects variable, and self-efficacy as the dependent variable. The results show that there was a statistically significant within-subjects main effect ($F(1,11) = 8.54$, $p = .01$, $\eta^2_p = .44$). This means that across both conditions, participants' self-efficacy beliefs at Time 1 ($M = 5.35$, SD = 0.64) were significantly lower than at Time 2 ($M = 5.57$, SD = .77). Unexpectedly, however, the interaction between Time and Condition was not significant, ($F(1,11) = 0.03$, $p = .87$, $\eta^2_p = 0.003$). Furthermore, no significant between-subjects main effect was found ($F(1,11) = 0.35$, $p = 0.57$, $\eta^2_p = 0.03$). In other words, no empirical support was found for the main hypothesis.

Exploratory Analysis

During the analysis it was noted that three participants in the control condition have practiced imagery during the time of the experiment, despite not having received any instructions to do so. In an exploratory analysis, the same RM ANOVA was carried out without these participants. The previous significant main effect of Time was marginally significant, $F(1,6) = 5.21$, $p = .06$, $\eta^2_p = .47$. The main effect of Condition ($F(1,6) = 0.60$, $p = .47$, $\eta^2_p = .09$), and the interaction effect ($F(1,6) = 0.93$, $p = 0.37$, $\eta^2_p = 0.13$), were not significant.

Discussion

The main objective of this pilot study was to explore the impact of a PETTLEP-based imagery intervention on self-efficacy beliefs of Dutch amateur motorcycle racers. Given the limited research in this area, this study aimed to contribute to the existing literature by investigating the effects of PETTLEP-based imagery on self-efficacy beliefs in this specific

population. The results indicated that both the experimental group who practiced PETTLEP-based imagery using an audio file, and the control group who listened to a podcast episode about the current MotoGP season, showed an increase in self-efficacy beliefs. Unexpectedly, the analysis revealed that there was no statistically significant difference between the experimental and control group in terms of their increase in self-efficacy beliefs over time. The analysis of the manipulation check revealed that participants in the experimental group practiced imagery significantly more than participants in the control group, indicating a successful manipulation procedure in eliciting the intended use of PETTLEP-based imagery. Thus, although the intervention itself seems to be successful, the results of this pilot study suggest that the PETTLEP-based imagery intervention did not have a stronger effect on the motorcycle racers' self-efficacy beliefs than the podcast "intervention" in the control group.

No difference between the groups: Possible explanations

Sample size

One possible explanation for the insignificant effect could be the small sample size (N = 13). A small sample size can reduce the statistical power of a study, making it more difficult to detect significant differences between groups. In a study with a small sample size, it is more likely that random fluctuations in the data will account for observed effects, rather than actual differences between groups. This can result in a higher probability of Type II error, where a significant difference is not detected even when one actually exists. According to previous research, the sample sizes of studies investigating the impact of PETTLEP-based imagery on self-efficacy ranged from N = 19 to N = 63 (Ismail, 2015; Ramsey et al., 2007; Ramsey et al., 2010; Indahwati & Ristanto, 2016). Thus, future studies with larger sample sizes are needed to explore the effects of a PETTLEP-based imagery interventions on motorcycle racers self-efficacy beliefs to determine its potential as a performance-enhancing tool.

Experimental period

It is widely recognized that the length of an intervention plays a crucial role in determining the strength and longevity of its effects. In our study, a possible reason for the lack of a significant interaction effect of Time and Condition between the experimental and control group could be the relatively short 7-day experimental period. While some studies have shown that guided imagery can have significant effects on free throw performance after just five days (Ekeocha, 2015), other studies on the effects of PETTLEP-based imagery have had longer experimental periods, ranging from several weeks to months (Ismail, 2015; Ramsey et al., 2007; Ramsey et al., 2010; Indahwati & Ristanto, 2016). Thus, the shorter experimental period in our study may have limited the ability to observe a significant difference between the experimental and the control group. Further research with a longer experimental period is needed to provide deeper insight into the effectiveness of PETTLEP-based imagery interventions, and the differences to a podcast intervention.

Podcast Intervention

While there is a lack of research on the matter, it is plausible that exposure to motorcycle racing-related content in the podcast may have positively influenced the participants' own career aspirations, leading to increased motivation and a subsequent boost in self-efficacy scores. This could be due to the podcast serving as a source of inspiration or providing insights into successful strategies employed by motorcycle racers, thereby fueling participants' confidence in their own abilities. However, further research would be needed to confirm this hypothesis and determine the extent of the influence of the podcast on self-efficacy beliefs.

Expectancy effects

It is not uncommon for participants in research studies to expect some sort of positive outcome or improvement as a result of their participation. This expectation, also known as the Hawthorne Effect (Adair, 1984), can lead to increased motivation and engagement in the study task, which can in turn lead to positive outcomes, such as an increase in self-efficacy. It might be possible that if participants in the control group had such expectations, it could potentially explain why these participants also experienced an increase in self-efficacy beliefs. It is possible that participants in the experimental group have experienced some sort of expectancy effect as well, potentially influencing the results. Therefore, further investigation is needed to establish the effects of both, a PETTLEP-imagery intervention, and podcast listening on self-efficacy beliefs.

What does this pilot study tell us?

The implications of the findings from this pilot study have important considerations in the field. In terms of theoretical developments, the results of this study can contribute to the existing literature on the efficacy of PETTLEP-based imagery interventions and inform future research in this area. By providing preliminary evidence on the impact of this type of intervention in a specific population (motorcycle racers), this study can help to guide future research that aims to further investigate the issue. Additionally, we have also found preliminary evidence on the impact of a podcast intervention, contrary to our expectations. It is important to note that the practical implications of a PETTLEP-based imagery intervention, and the impact of a podcast intervention require additional research to be fully understood. Further studies with larger sample sizes, different methodologies, and longer intervention periods are necessary in order to more accurately determine the practical applications of these findings.

Although the results of the current study suggest that the PETTLEP-based imagery intervention may have significant effect on amateur motorcycle racers' self-efficacy beliefs, supporting the findings of previous research (Ismail, 2015; Ramsey et al., 2007; Ramsey et al., 2010; Indahwati & Ristanto, 2016), the podcast also had a significant effect on participants self-efficacy beliefs, with no difference between the imagery and the podcast group. This curious finding needs further attention as, according to our literature search, this effect has not been observed before. The study highlights the importance of considering the length of the experimental period, sample size, and overall study design in such interventions. Practitioners and researchers can use these findings to design more effective interventions in the future, considering the limitations of this study and the need for further research.

Strengths and Limitations

We identified several strengths of the current pilot study. Most notably, the PETTLEP-based imagery intervention was successful, based on the results from the statistical analysis. This suggests that the intervention has potential as an effective tool to enhance self-efficacy beliefs in the scenario that was being studied. Additionally, the current research utilized a modified version of the Strength Self-Efficacy Scale (Tsai et al., 2014), to measure the self-efficacy beliefs of the motorcycle racers. The results of the analysis indicated that the adapted scale demonstrated strong internal consistency, as evidenced by the high α coefficients (α_{pre} = .93, α_{post} = .93). This indicates that the adapted scale is a reliable tool for measuring self-efficacy and can potentially be used in future research within the context of motorcycle racing. Furthermore, the pilot study used real-world sample which can enhance the external validity of a study, making the findings more applicable and generalizable to real-life situations. It also allows researchers to investigate the phenomenon of interest in a natural and ecologically valid setting, which can provide valuable insights into the complexity and nuances of the behavior being studied. Additionally, a real-world sample can

help avoid selection bias and increase the representativeness of the sample. The preliminary findings of this pilot study indicate that the PETTLEP-based imagery intervention may have a positive effect on motorcycle racers self-efficacy beliefs, suggesting a promising avenue for future research. However, we have also identified some limitations of the current research.

Study Design

One limitation of the current pilot study was the relatively short experimental period of seven days. Prior studies that have investigated the effects of PETTLEP-based imagery on self-efficacy beliefs used experimental periods of several weeks to months (Ismail, 2015; Ramsey et al., 2007; Ramsey et al., 2010; Indahwati & Ristanto, 2016). The duration of the experimental period in these studies was selected with the aim of providing participants with sufficient time to practice the techniques and potentially observe changes in their self-efficacy beliefs. A longer period could allow for a more thorough examination of the potential effects of a PETTLEP-based imagery intervention on self-efficacy beliefs in motorcycle racers and help to reduce the potential impact of extraneous variables on the results, such as changes in participants' motivation, engagement, or performance, which can occur over time.

The current intervention used the same audio file throughout the seven-day experimental period. This monotony in the audio content could affect participants' level of engagement and motivation, potentially reducing the effectiveness of the intervention, especially in longer intervention periods. Thus, it may be beneficial for future studies to consider incorporating a greater variety of audio content, which would help to sustain participants' interest and engagement throughout the intervention period.

During the analysis, it was noted that some participants have not filled in the post test questionnaire right after the last day of the intervention, which could impact the validity of

the results. When participants are tested at different times, it is possible that factors such as time and memory bias can affect their responses. This can lead to potential differences in their answers that may not accurately reflect their true beliefs and experiences related to the variable being measured. To prevent this, researchers can emphasize the importance of completing the post-test questionnaire immediately following the intervention and encourage participants to do so. They could also consider implementing a reminder system, such as sending email or text message reminders, to help ensure that participants complete the questionnaire in a timely manner.

Future Research

Much work remains to be done before a full understanding of the relationship between PETTLEP-imagery and self-efficacy is established. A possible follow-up study could aim to increase the sample size to a minimum of 35 participants, which would provide 80% statistical power at an alpha level of .05 and a small effect size of .25. This could be achieved by expanding the pool of eligible participants by reaching out to a larger group of potential participants, thereby reducing the risk of encountering insufficient numbers of participants. An effective strategy to boost participant engagement and willingness to participate is to provide incentives, such as a monetary reward. This can serve as an attractive motivator for individuals who might otherwise not be interested in participating in the study. By offering a tangible benefit, researchers can increase the overall participation rate, which in turn increases the sample size and enhances the representativeness and generalizability of the results. However, it is important to ensure that the use of incentives is ethical and does not influence the validity of the results.

Imagery Ability

Imagery ability refers to an individual's cognitive capacity to generate and experience vivid and realistic mental images of sensory experiences, events, or situations, which involves the formation, manipulation, and retention of mental representations of sensory information (Holmes & Collins, 2001). High imagery ability is associated with an increased ability to utilize mental imagery to enhance performance in cognitive and motor tasks, such as sports, music, and surgery, while low imagery ability may impede the effective use of mental imagery for performance support (Pearson et al., 2015). As the current study did not include imagery ability as a moderator, and given the small sample size, it is possible that any differences in imagery ability between groups could have affected the effectiveness of the PETTLEP-based imagery interventions, and thereby influenced the study's findings.

Imagery ability can be assessed by various measures, including self-reported imagery vividness, objective behavioral performance, and physiological responses. By including imagery ability as a moderator, researchers can better isolate the effect of the intervention on the outcome variable, reducing the potential for alternative explanations of the results. This is particularly important when investigating the effectiveness of mental imagery interventions, as individuals with high imagery ability may respond more positively to such interventions than those with low imagery ability, resulting in greater improvements in the outcome variable. Therefore, including imagery ability as a moderator can help to improve the validity and reliability of studies that investigate the effects of imagery in performance outcome variables.

Additional Outcome Variables

In order to obtain a more comprehensive understanding of the effects of PETTLEP-based imagery interventions, it may be beneficial for future studies to combine different measures of outcome variables. This approach would allow for a more comprehensive

assessment of self-efficacy, as well as control for potential confounding variables that could impact the results. Specifically, it may be useful to combine the self-report measure used in this study with behavioral assessments, such as tracking lap times of motorcycle racers. By using multiple measures, researchers can gain a more accurate evaluation of the effects of the imagery intervention on an individual's self-efficacy.

Conclusion

Prior studies like the one conducted by Ramsey et al., (2007) for example, examined the effects of PETTLEP-based imagery on penalty kick performance, indicating a more tailored approach than the one used in this study. In the interview, Marc Marquez too highlighted the importance of visualizing specific race situations, indicating the potential efficacy of a targeted approach in PETTLEP-based imagery interventions. This approach involves specifying the particular scenario to be improved upon by customizing the imagery intervention, potentially resulting in more successful outcomes than using a generalized approach. Although this pilot study suggests a positive effect of a PETTLEP-based imagery intervention on Dutch amateur motorcycle racers' self-efficacy beliefs, we suggest a more tailored approach for future studies. As suggested by the eight-time MotoGP world champion for example, if an athlete is struggling with a particular aspect of their performance, such as high-risk turns in motorcycle racing, the PETTLEP-imagery intervention could be tailored to specifically target this scenario. This approach allows for a more precise examination of PETTLEP-based imagery interventions effectiveness in specific scenarios. Ultimately, a well-designed and rigorously conducted future study could provide valuable insights into the effectiveness of PETTLEP-based imagery as a performance-enhancing tool for athletes and potentially enable the new generation of motorcycle racers to go head-to-head with the ever so dominating eight-time world champion Marc Marquez.

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Appendix A

Qualtrics Questionnaire

Figure A1

Pre-Test Qualtrics Questionnaire

Pre-test questionnaire

Start of Block: Condition

*

Condition Please enter the one digit number the researcher has given you

_____

End of Block: Condition

Start of Block: Information Control

General Information Hello!

Welcome and thank you for your interest in our research! We are interested in the

effectiveness of imagery/visualization for motorcycle riders. If you are taking part in this study you are going to answer a few questions, and will then over the coming weeks, practice an exercise. After you have completed the intervention, you are asked to answer the questions again.

The study is conducted by Dario Girolamo, a Master student at the University of Groningen, and supervised by Prof. Dr. Nico W. van Yperen. The study was approved by the Ethical Committee of Psychology at the University of Groningen.

Do I have to participate in this research?

Participation in this study is voluntary. Please read all provided information carefully. Afterwards you may decide if you want to participate, and eventually give your consent. If you decide not to participate, there is no need to explain why, and there will be no negative consequences for you. You have the right to drop out of the study at any point during your participation. In this case, your data will be deleted. Also, you can request for your data to be deleted up to two weeks after participation is possible.

How will we treat your data?

The data will be electronically collected and handled only by our research team. It will be used for academic and educational purposes. Prepared data will be made publicly available too. Some participants might be re-identifiable through a certain combination of demographic information that will be collected (gender, age, years in sport).

What else do you need to know?

You may always ask questions about the research: before, during, or after participation. You

can do so by emailing Dario Girolamo (D.Girolamo@student.rug.nl).

Do you have questions or concerns regarding your rights as a research participant? For this, you may also contact the Ethics Committee Psychology of the University of Groningen: ecp@rug.nl.

Page Break

Control age Age

Page Break

Display This Question:

If If Age Text Response Is Greater Than or Equal to 16

Informed Consent Informed Consent Form

Imagery/Visualization in Motorcycle Riders

I hereby agree to take part in the study "Imagery/Visualization in Motorcycle Riders." I understand that my participation is entirely voluntary; that my responses will be kept strictly confidential; that I have the option to withdraw from this study at any time, without penalty; that I have the right to request my responses not to be used. The researcher is responsible for a safe storage of the data. For questions about privacy protection: mr. A.R. Deenen (privacy@rug.nl, data protection officer of University of Groningen).

The following points have been explained to me:

1. The goal of this study is to assess the effects of imagery/visualization on self-efficacy beliefs. Participation in this study should help advance our understanding of the relationship between the intervention and self-efficacy beliefs.

2. I will be asked to listen to an audio file for 8 minutes every day in the evening, for one week.

3. The current questionnaire will take approximately 10 minutes. The researchers will provide me with more information on the study after participation.

4. My responses will be treated confidentially.

5. The researcher (or the contact person) will answer any questions I might have regarding this research, now or later during the course of the study. I hereby consent to be a participant in the current research.

Page Break

Display This Question:

If If Age Text Response Is Less Than 16

Informed Consent Par Informed Consent Form Parents

Imagery/Visualization in Motorcycle Riders

I hereby agree that my child takes part in the study "Imagery/Visualization in Motorcycle Riders." I understand that their participation is entirely voluntary; that their responses will be kept strictly confidential; that they have the option to withdraw from this study at any time, without penalty; that they have the right to request their responses not to be used. The researcher is responsible for a safe storage of the data. For questions about privacy protection: mr. A.R. Deenen (privacy@rug.nl, data protection officer of University of Groningen).

The following points have been explained to me:

1. The goal of this study is to assess the effects of imagery/visualization on self-efficacy beliefs. Participation in this study should help advance our understanding of the relationship between imagery/visualization and self-efficacy beliefs.

2. My child will be asked to listen to an audio file for 8 minutes every day in the evening, for one week.

3. The current questionnaire will take approximately 10 minutes. The researchers will provide

them with more information on the study after participation.

4. Their responses will be treated confidentially.

5. The researcher (or the contact person) will answer any questions I or they might have regarding this research, now or later during the course of the study. I hereby consent to be a participant in the current research performed by Prof. Dr. Nico W. van Yperen (n.van.yperen@rug.nl).

Page Break

Display This Question:

If Informed Consent Form Parents Imagery/Visualization in Motorcycle Riders I hereby agree that my c... Is Displayed

Consent Parents Do you consent that your child participates in this study under the previously mentioned conditions?

- ○ Yes (1)
- ○ No (2)

Page Break

Display This Question:

If Informed Consent Form Imagery/Visualization in Motorcycle Riders I hereby agree to take part in t... Is Displayed

Consent Confirmation Do you consent to participate in this study under the previously mentioned conditions?

- ○ Yes (4)
- ○ No (5)

End of Block: Information Control

Start of Block: Demographic information

Instruction Please fill out the following information.

Gender Gender

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ Prefer not to say (4)

Years Sport How many years have you practiced the sport?

_____

End of Block: Demographic information

Start of Block: Questions 1-11

Instructions Please read the statements below and respond to each of the items thoughtfully. Consider your experience within the **past week**.

There are no right or wrong answers. Use the 7-point scale below to rate each of the statements as it applies to you.

Question 1 How confident are you in your ability to use your strengths at racing a motorcycle?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 2 How confident are you in your ability to use your strengths without any struggles?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 3 How confident are you in your ability to find ways to apply your strengths in the things you do related to racing a motorcycle?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 4 How confident are you in your ability to accomplish a lot using your strengths?

- (1) Not confident at all (1)
- (2) Slightly confident (2)
- (3) Somewhat confident (3)
- (4) Moderately confident (4)
- (5) Fairly confident (5)
- (6) Very confident (6)
- (7) Extremely confident (7)

Page Break

Question 5 How confident are you in your ability to apply your strengths at racing?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 6 How confident are you in your ability to use your strengths in many racing situations?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 7 How confident are you in your ability to use your strengths to succeed?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 8 How confident are you in your ability to find ways to use your strengths at training sessions?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Page Break

Question 9 How confident are you in your ability to use your strengths at any time when racing?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 10 How confident are you in your ability to use your strengths to achieve your goals related to racing a motorcycle?

- (1) Not confident at all (1)
- (2) Slightly confident (2)
- (3) Somewhat confident (3)
- (4) Moderately confident (4)
- (5) Fairly confident (5)
- (6) Very confident (6)
- (7) Extremely confident (7)

Question 11 How confident are you in your ability to practice your strengths in areas where you excel?

- (1) Not confident at all (1)
- (2) Slightly confident (2)
- (3) Somewhat confident (3)
- (4) Moderately confident (4)
- (5) Fairly confident (5)
- (6) Very confident (6)
- (7) Extremely confident (7)

End of Block: Questions 1-11

Start of Block: Remarks

ID Here is your ID number: ${e://Field/Random%20ID}

Please copy this number or write it down and save it in a secure place. You will need it at the end of the study.

Page Break

Remarks If you have any comments or remarks about the survey, please let us know here.

_____

End of Block: Remarks

Start of Block: Information EXP

Page Break

General Information Hello!

Welcome and thank you for your interest in our research! We are interested in the effectiveness of imagery/visualization for motorcycle riders. If you are taking part in this study you are going to answer a few questions, and will then over the coming weeks, practice an imagery/visualization exercise. After you have completed the intervention, you are asked to answer the questions again.

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Page Break

Question 1 Age

_____

Page Break

Display This Question:

If If Age Text Response Is Greater Than or Equal to 16

Informed Consent Informed Consent Form

Imagery/Visualization in Motorcycle Riders

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The following points have been explained to me:

1. The goal of this study is to assess the effects of imagery/visualization on self-efficacy beliefs. Participation in this study should help advance our understanding of the relationship between imagery/visualization and self-efficacy beliefs.

2. I will be asked to practice an imagery/visualization exercise for one week, every day in the evening.

3. The current questionnaire will take approximately 10 minutes. The researchers will provide me with more information on the study after participation.

4. My responses will be treated confidentially.

5. The researcher (or the contact person) will answer any questions I might have regarding this research, now or later during the course of the study. I hereby consent to be a participant in the current research.

Display This Question:

If If Age Text Response Is Less Than 16

Informed Consent Par Informed Consent Form Parents

Imagery/Visualization in Motorcycle Riders

I hereby agree that my child takes part in the study “Imagery/Visualization in Motorcycle Riders.” I understand that their participation is entirely voluntary; that their responses will be kept strictly confidential; that they have the option to withdraw from this study at any time, without penalty; that they have the right to request their responses not to be used. The researcher is responsible for a safe storage of the data. For questions about privacy protection: mr. A.R. Deenen (privacy@rug.nl, data protection officer of University of Groningen).

The following points have been explained to me:

1. The goal of this study is to assess the effects of imagery/visualization on self-efficacy beliefs. Participation in this study should help advance our understanding of the relationship between imagery/visualization and self-efficacy beliefs.

2. My child will be asked to practice an imagery/visualization exercise for one week, every day in the evening.

3. The current questionnaire will take approximately 10 minutes. The researchers will provide them with more information on the study after participation.

4. Their responses will be treated confidentially.

5. The researcher (or the contact person) will answer any questions I or they might have regarding this research, now or later during the course of the study. I hereby consent to be a participant in the current research performed by Prof. Dr. Nico W. van Yperen (n.van.yperen@rug.nl).

Display This Question:

If Informed Consent Form Parents Imagery/Visualization in Motorcycle Riders I hereby agree that my c... Is Displayed

Consent Parents Do you consent that your child participates in this study under the previously mentioned conditions?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Informed Consent Form Imagery/Visualization in Motorcycle Riders I hereby agree to take part in t... Is Displayed

Consent Confirmation Do you consent to participate in this study under the previously mentioned conditions?

- ○ Yes (4)
- ○ No (5)

End of Block: Information EXP

Figure A2

Post-Test Qualtrics Questionnaire

Post-test questionnaire

Start of Block: Information

Information Hello!

One weeks ago you have started a scientific study concerning the effects of an imagery/visualization exercise on self-efficacy beliefs. Thank you for that!

In this follow up you are going to respond to the initial items again. After you have filled in the questionnaire you participation is complete.

End of Block: Information

Start of Block: ID

ID Please enter the ID that you have received during the first questionnaire.

_____

End of Block: ID

Start of Block: Questions 1-11

Info Please read the statements below and respond to each of the items thoughtfully. Consider your experience within the **past week**.

There are no right or wrong answers. Use the 7-point scale below to rate each of the statements as it applies to you.

Question 1 How confident are you in your ability to use your strengths at racing a motorcycle?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question2 How confident are you in your ability to use your strengths without any struggles?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 3 How confident are you in your ability to find ways to apply your strengths in the things you do related to racing a motorcycle?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 4 How confident are you in your ability to accomplish a lot using your strengths?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Page Break

Question 5 How confident are you in your ability to apply your strengths at racing?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 6 How confident are you in your ability to use your strengths in many racing situations?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 7 How confident are you in your ability to use your strengths to succeed?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 8 How confident are you in your ability to find ways to use your strengths at training sessions?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Page Break

Question 9 How confident are you in your ability to use your strengths at any time when racing?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 10 How confident are you in your ability to use your strengths to achieve your goals related to racing a motorcycle?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

Question 11 How confident are you in your ability to practice your strengths in areas where you excel?

- ○ (1) Not confident at all (1)
- ○ (2) Slightly confident (2)
- ○ (3) Somewhat confident (3)
- ○ (4) Moderately confident (4)
- ○ (5) Fairly confident (5)
- ○ (6) Very confident (6)
- ○ (7) Extremely confident (7)

End of Block: Questions 1-11

Start of Block: Manipulation Check Items

Intro In the previous week I have ... for about 8 minutes.

Q1 ... practiced imagery through my own eyes.

- ○ not at all (1)
- ○ once (2)
- ○ 2-3 times (3)
- ○ 4-5 times (4)
- ○ almost every day (6 times) (5)
- ○ every day (6)

Q2 ... practiced imagery in the evening.

- ○ not at all (1)
- ○ once (2)
- ○ 2-3 times (3)
- ○ 4-5 times (4)
- ○ almost every day (6 times) (5)
- ○ every day (6)

Q3 ... practiced imagery in real time.

- ○ not at all (1)
- ○ once (2)
- ○ 2-3 times (3)
- ○ 4-5 times (4)
- ○ almost every day (6 times) (5)
- ○ every day (6)

Q4 ... practiced imagery on the racetrack I am currently racing/training on.

- ○ not at all (1)
- ○ once (2)
- ○ 2-3 times (3)
- ○ 4-5 times (4)
- ○ almost every day (6 times) (5)
- ○ every day (6)

Q5 ... practiced imagery by using an audio file.

- ○ not at all (1)
- ○ once (2)
- ○ 2-3 times (3)
- ○ 4-5 times (4)
- ○ almost every day (6 times) (5)
- ○ every day (6)

Q6 … practiced imagery by sitting on my motorcycle, wearing my helmet, suit, and gloves.

- ○ not at all (1)
- ○ once (2)
- ○ 2-3 times (3)
- ○ 4-5 times (4)
- ○ almost every day (6 times) (5)
- ○ every day (6)

Q7 … practiced imagery and simulated a race with two laps.

- ○ not at all (1)
- ○ once (2)
- ○ 2-3 times (3)
- ○ 4-5 times (4)
- ○ almost every day (6 times) (5)
- ○ every day (6)

Q8 … listened to a podcast about motorcycle racing.

- ○ not at all (1)
- ○ once (2)
- ○ 2-3 times (3)
- ○ 4-5 times (4)
- ○ almost every day (6 times) (5)
- ○ every day (6)

End of Block: Manipulation Check Items

Appendix B

Information Sheet for Participants

Information Sheet

Imagery Intervention

The intervention you will be performing will be based on the PETTLEP model (Physical, Environment, Task, Timing, Learning, Emotion, Perspective). You are asked to practice ***every day in the evening*** for a time that is convenient for you, over the next week. Please do your best to adhere to the guidelines, this will ensure the biggest chance of success.

I will now shortly explain the different components of the PETTLEP model. You can find more information in the table.

Physical

This relates to the physical components of the practice. You will practice sitting on your motorcycle, with your leather suit, helmet, and gloves on. You will occupy the body position you usually have when your sit on your motorcycle. The practice should be close to how you would perform in reality, therefore, including the physical component is an important factor.

Environment

You will be practicing at the place where you store your bike. Preferably you would want to practice in a place that comes closest to the actual environment, however, for practical reasons you will perform the exercise in the place where your bike is located.

Task

The task relates to what you will be imaging. The audio file is going to guide you through the procedure.

Timing

The timing component relates to the timely nature that the practice is performed in. For this intervention you will be practicing in real time.

Emotions

An important part of imagery is to include one's affective emotional responses and states. This can greatly increase the vividness of the practice. You are asked to try and include emotional responses you might experiences during a race. This can be nervousness, joy, excitement, but also feelings of proud when you reach a good position for example. The audio file will also introduce this component.

Perspective

The perspective component relates to the perspective from which you image from. For this intervention you are asked to visualize from the first-person perspective.

There are 5 key characteristics of an imagery process. I will describe how each one is defined and what it includes.

Modality

This relates to the senses that are involved. To make the process as vivid as possible, you are asked to try to include as many as you can. The modalities are *visual, auditory, olfactory, tactile, and kinesthetic*. The audio file will elaborate and give examples for those.

Perspective

The visual perspective you are going to adapt is the *first-person* perspective (internal imagery)

Agency

This relates to the agent you are imaging to be. You are going to image *yourself* performing the actions.

Deliberation

This relates to the degree to which the imagery is consciously employed. You are going to deliberately practice every evening; therefore, the practice is considered not spontaneous.

Note. At the end of the audio file, you are asked to simulate a race. You are asked to visualize 2 laps going around the current track. After I guide you through the start, the audio file will end. Please keep going until you have finished the 2 laps. After that you have ***completed the practice*** for that day.

Appendix C

Scales

Table C1

Manipulation Check Items and Response Scale

In the previous week I have for about 8 minutes ….
… practiced imagery **through my own eyes**.
… practiced imagery in the **evening**.
… practiced imagery **in real time**.
… practiced imagery on the racetrack I am **currently racing/training on**.
… practiced imagery by **using an audio file**
… practiced imagery by **sitting on my motorcycle, wearing my helmet, suit, and gloves**
… practiced imagery and **simulated a race with two laps**.
… listened to a podcast about motorcycle racing.
Response Scale:
not at all
once
2-3 times
4-5 times
almost every day (6 times)
every day

Note. For the statistical analysis the response scale was coded as follows. 1 = not at all, 2 = once, 3 = 2-3 times, 3 = 4-5 times, 5 = almost every day (6 times), 6 = every day.

Table C2

Strength Self-efficacy Scale (SSES), Tsai (2014)

Original Items	Adjusted Items
How confident are you in your ability to use your strengths at work?	*How confident are you in your ability to use your strengths at racing a motorcycle?*
How confident are you in your ability to use your strengths without any struggles?	How confident are you in your ability to use your strengths without any struggles?
How confident are you in your ability to find ways to apply your strengths in the things you do every day?	*How confident are you in your ability to find ways to apply your strengths in the things you do related to racing a motorcycle?*
How confident are you in your ability to accomplish a lot using your strengths?	How confident are you in your ability to accomplish a lot using your strengths?
How confident are you in your ability to apply your strengths at work/school?	*How confident are you in your ability to apply your strengths at racing?*
How confident are you in your ability to use your strengths in many situations?	*How confident are you in your ability to use your strengths in many racing situations?*
How confident are you in your ability to use your strengths to succeed?	How confident are you in your ability to use your strengths to succeed?

Original Items	Adjusted Items
How confident are you in your ability to find ways to use your strengths at work/ school every day?	*How confident are you in your ability to find ways to use your strengths at training sessions?*
How confident are you in your ability to use your strengths at any time?	*How confident are you in your ability to use your strengths at any time when racing?*
How confident are you in your ability to use your strengths to achieve your goals in life?	*How confident are you in your ability to use your strengths to achieve your goals related to racing a motorcycle?*
How confident are you in your ability to practice your strengths in areas where you excel?	How confident are you in your ability to practice your strengths in areas where you excel?

Note. Item in italics were adjusted to the context of motorcycle racing.