Safe Sports: Perspective-Taking Through VR

B.Sc. Thesis

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Abstract

The current study investigates the effectiveness of Virtual Reality (VR) in enhancing perspective-taking skills within sports environments, compared to E-learning and control conditions. Specifically, the research aims to determine whether VR can better foster psychological safety and reduce transgressive behaviour by improving empathy among athletes, coaches and bystanders ultimately contributing to a more positive and respectful sports environment. Participants (N =11) were randomly assigned to three groups: VR intervention, E-learning only and a control group without any intervention. Using the Interpersonal Reactivity Index, the Perceived Empathy Self-Efficacy Scale and the Perceived Social Self-Efficacy Scale, perspective-taking abilities were measured pre- and post-intervention. Results indicated moderate enhancements in perspective-taking abilities across all conditions, however these changes were not statistically significant. Interestingly, findings, revealed a potential influence of social dynamics on the perception of transgressive behaviour, suggesting further exploration. While VR offers an innovative approach to training, its full potential may be realized through the integration with existing methods such as E-learning. This underscores the crucial need for further research to optimize VR technologies, tailor them to specific educational needs in sports and evaluate their effectiveness in real-world sports settings.

Keywords: *Transgressive behaviour, Sports, Psychological safety, Virtual Realit, E-learning, Psychological abuse*)

Introduction

On July 27, 2021, during the Tokyo Olympics, Simone Biles, one of the greatest gymnasts of all time, made a decision to prioritize mental health over competition, by withdrawing from the event. This decision ignited a worldwide discussion about the psychological pressure athletes face, highlighting the need for psychological safety in sports (Dubinsky, 2022). Simone Biles' decision brought attention to an issue often overlooked: transgressive behaviour in sports, a problem that extends beyond high-profile competitors. While incidents of sexual violence, have received awareness, other forms of transgressive behaviour encompassing, psychological abuse remain less visible but are equally impactful on athletes' mental health (Kerr & Sterling, 2019). They emphasized that psychological form of transgressive behaviour is equally harmful, requiring greater attention and action within the field of sports psychology. Recognizing the need to address transgressive behaviour, researchers like Haandrikman and Schipper-van Veldhoven (2024), have emphasized the need for a collective effort to ensure safe sports for all sports participants. Their work on building a European framework for addressing transgressive behaviour in sports, highlights its significance. Within Europe, the Netherlands also faces challenges in addressing transgressive behaviour in sports (Vertommen et al., 2016; Ohlert et al., 2020). These findings underscore the need for effective interventions to create a safer and more supportive sporting culture. Promoting athlete safety requires adapting to strategies. E-learning platforms; online educational platforms, have become prevalent in various educational settings, including sports (Moustakas & Robrade, 2023). While, valuable for delivering information, e-learning may lack the immersive qualities necessary to confront challenging situations such as transgressive behaviour (Stone et al., 2018). Virtual Reality, with its unique ability to create lifelike scenarios, offers a promising new approach to sports education (Stone et al., 2018).

VR has the potential to place individuals in realistic situations where they can experience the impact of transgressive behaviour, and its consequences from multiple perspectives (Seinfeld et al., 2018). Thus, this thesis investigates the potential of a VR based intervention designed to enhance psychological safety within the Dutch sports community. By examining the effectiveness of this intervention with the aim of reducing transgressive behaviours, this research aims to contribute to the development of effective strategies for creating a more supportive and constructive environment for all sports participants.

Transgressive behaviour in Sports

To understand the scope of transgressive behaviour it is essential to recognize what it entails, who it affects, where and when it occurs, and how it impacts athletes. The term transgressive behaviour includes a broad spectrum of harmful behaviours, ranging from overt physical abuses to more covert psychological abuse such as emotional manipulation, excessive criticism, coercive control, public humiliation, and demeaning comments. These behaviours deeply affect the mental health of athletes and have been found to profoundly diminish their overall well-being (Bode et al., 2023 Broadly defined, transgressive behaviour represents any misuse of a relationship of power that inhibits athletes from safely engage in sports (Haandrikman & Schipper-van Veldhoven, 2024). They stated that such misuses consist of violations of personal boundaries which may compromise physical, sexual, or psychological rights.

In a study conducted by Ohlert et al. (2020), it was found that over 24% of elite athletes in the Netherlands, Belgium and Germany reported experiencing interpersonal violence, with psychological violence being the highest. In the Netherlands surveys involving 1983 young Dutch adults revealed that during their childhood, 32% faced psychological violence, 12% faced physical violence, and 19% faced sexual violence (Vertommen et al., 2016). In this study, psychological violence referred to aggressive

behaviours that cause emotional harm or distress to individuals, including acts such as aggressive verbal intimidation, exaggerated negative comments on performance or body, threats, and neglect. Thus, due the prevalence of this transgressive behaviour, the focus will be placed on psychological abuse.

Within the sports context, psychological abuse, may manifest in various forms, including non-verbal forms like ignoring the athlete, providing minimal feedback, and focusing attention on other players, and verbal abuse such as humiliating the athlete, or name-calling. But also include covert behaviours like spreading rumours about the athletes, or overt behaviours such as displays of negative facial expression and intimidation tactics (Alexander et al., 2023). For instance, an example of an overt form is a coach might employ intense verbal commands, and negative facial expression during training. In a covert scenario a coach may send inappropriate and unsolicited messages to an athlete, blurring the lines between professionalism and personal overreach. These behaviours, whether overt or covert may cause significant psychological harm and distress on an athlete.

The effects of such transgressive behaviours are profound and significantly impact athletes across psychological, social, and professional domains. First, it contributes to mental health. A study by Timpka et al. (2022), illustrates this, demonstrating a correlation between psychological abuse and the onset of anxiety and depression in athletes. In their research, athletes exposed to such behaviours reported a decline in resilience and an increased risk of emotional dysregulation. Furthermore, Radziszewski et al. (2023), focused on the social dynamics within sports teams, finding that teams with high incidences of transgressive behaviour such as public criticism, ostracism or manipulation demonstrate poorer cohesion within the team and lower team morale. These kinds of environments not only reduce the effectiveness of team building but also increase the likelihood of athletes to resorting to

quitting. Athletes who experience psychological abuse exhibit decreased levels of motivation and a decline in their performance (Olsson et al., 2021). Finally, physical health also deteriorates under the strain of ongoing psychological abuse. Athletes exposed to continuous emotional abuse exhibit significant increases in biomarkers of stress, such as hypertension and immune dysfunction (Alexander et al., 2023). All these findings not only highlight the impact of transgressive behaviours in sports, but also emphasize the necessity for an effective and targeted intervention within the sports community.

Importance of Perspective-taking

A key element in combatting transgressive behaviour is the concept of perspective-taking; the ability to understand and share the viewpoints of others (Bertrand et al., 2018). In the context of sports, this is a crucial skill for fostering empathy and resilience, which are important for improving interactions within sports teams and reducing harmful behaviour (Acet et al., 2017). Perspective-taking involves stepping into someone else's point of view to only to see but to feel the world from their viewpoint. According to research by Mahmoudi et al. (2022), perspective-taking exercises in sports settings have shown enhanced empathy among team-members which reduced transgressive behaviours such as bullying and aggression. Similarly, empathy, enhanced through perspective-taking is essential for psychological safety, fostering an environment where athletes feel supported and understood. A study by Jowett and Poczwardowski (2007), demonstrated this, by exploring how coaches' expression of empathy can significantly influence athletes' perceptions of their environment. Coaches who have higher levels of empathy foster a more positive team atmosphere and promote a safer space. Resilience refers to the capacity to withstand and adapt to life's challenges, including adverse experiences such as transgressive behaviours. It involves enduring adverse experiences but also learning from them, which can alter an athlete's perceptions to negative situations (Den Hartigh et al., 2022). According to Den Hartigh et al.

(2022), by enhancing resilience and empathy through interventions with perspective-taking exercises, athletes may be equipped to handle and transform their experiences of transgressive behaviours in constructive ways.

Challenges in E-learning Platforms

Over the years, with the advancement of technology, e-learning platforms have become common in sports education, offering online courses and resources for coaches, athletes, and sports professionals. Within these platforms, learners may engage in interactive scenarios and make decisions based on reflective exercises (Edwards & Finger, 2007). However, their application to perspective-taking training and specifically transgressive behaviour remains relatively underexplored in sports education. This implies that dedicated e-learning programs, specifically designed to cultivate this crucial skill are not yet widespread.

Generally, e-learning platforms offer the advantage of flexibility and accessible but, they depend heavily on text-based content, which may not effectively engage users or be able to replicate real-world scenarios (Çelik, 2020). Text on its own, may struggle to convey the emotional weight of interpersonal situations (Tian et al., 2011). Perspective-taking requires empathizing with others; feelings, which are often communicated through non-verbal cues, tone of voice, and body language, which are difficult to capture with reliance of text-based, approaches (Raij, et al., 2009). In addition, e-learning platforms oftentimes lack feedback mechanisms for real-world interactions. This means that once a learner selects a particular option, they may be limited to having no feedback provided on the consequences of their decision (Moustakas & Robrade, 2022). The absence of immediate feedback and guidance suggest than individuals may continue to make the same mistakes without realizing errors or exploring better alternatives. Feedback is crucial for correcting actions and motivating learners by demonstrating them the relevance and impact of their decisions (Hattie &

Timperley, 2007). Therefore, effectively integrating perspective-taking exercises to enhance engagement, promote empathy and provide meaningful feedback to learners with e-learning platforms remains a challenge. On the one hand, without the ongoing practice of a learned skill in a realistic environment, long-term behaviour change may be significantly limited (Moustakas et al., 2022). Since e-learning doesn't always provide opportunities for learners to practice applying what they have acquired in relevant contexts, the learned skills may fade overtime. On the other hand, Barry and Tanaka (2023), highlighted that hybrid e-learning models, which combine online learning and hands on activities, improve engagement, however, there is a gap in practical skill application, that may be filled by more immersive technologies like Virtual Reality (Barry et al.,2023).

Potential of Virtual Reality in Sports

Virtual Reality (VR), a cutting-edge technology may have the potential to transform sports training. By offering immersive interactive digital environments enables users to place themselves in a lifelike experience through a headset and motion sensing devices (Kazu & Kuvvetli, 2023). VR stimulates complex real-world scenarios in a controlled, virtual setting, making it a suitable platform for experiential learning (Tan et al.,2022). Which further suggested that this is relevant for perspective-taking training as it allows for a safe space for experimenting with different viewpoints and experience the emotional and social consequences of their actions firsthand. Herrera et al. (2018), found that VR-based, perspective-taking exercises led to more significant and lasting positive changes in attitudes and behaviours, compared traditional methods, such as text-based narratives. Their study may extend to the context of sports, as athletes often face situations requiring empathy and understanding of diverse perspectives. According to Yun-chao et al. (2023) by immersing athletes and coaches in realistic simulations, VR platforms enable users to experience firsthand interactions and decision-making scenarios. In a safe and controlled environment,

these situations may improve the ability of young athletes to take another person's perspective through repeatedly being exposed to them (Pastel et al., 2022). VR can simulate scenarios where athletes witness a teammate being bullied or excluded, it then offers bystanders to experience the situation from multiple perspectives. Another scenario could consist of a young athlete immersed in a VR scenario where a coach is using aggressive coaching tactics. By experiencing these scenarios, even virtually, the athlete coaches and bystanders may safely navigate the situation, which allows the practice of skills without any restrictions and danger that accompany real-life incidents (Farley et al., 2019). With the use of VR, it replicates the aforementioned scenario in a way where, an athlete or a coach may practice different communication styles, without any consequences. Therefore, VR has the potential to be a useful tool for promoting perspective-taking among participants of sports. Considering this, incorporating it into sports training programs, may be an effective training tool to safeguarding sports participants.

Objective of the Study

Thus, the focus of this bachelor thesis is to explore the effectiveness of virtual reality in promoting psychological safety through perspective-taking skills within sports environments. This study aims to investigate the effectiveness of this technology in enhancing perspective-taking skills among athletes, coaches, and bystanders to foster empathy and resilience thereby mitigating transgressive behaviour in sports. Specifically, the following research question emerges: "How effective are VR interventions in enhancing perspective-taking skills in sports environments?". It is hypothesized that after controlling for baseline perspective-taking scores, participants exposed to Virtual Reality interventions aimed at enhancing perspective-taking skills in sports environments will demonstrate a significant improvement in their ability to understand and consider the perspective of others.

Specifically, the VR group is expected to demonstrate a greater increase in perspective-taking scores compared to those in the control group or those participating in E-learning alone.

Method

Participants

Participants were recruited from individuals actively engaged in sports, including athletes, coaches, and bystanders. Flyers advertising the study were distributed across the University of Twente campus. To reach a wider audience, the study was placed on the university's SONA platform, where students could earn 1 credit point for their participation. The inclusion criteria were proficiency in Dutch, with a minimum age of 18 years and active involvement in sports. The study included a total of 11 Dutch participants, with a mean age of M = 28.5 years (SD = 3.52). The sample consisted of 8 females (72.7%) and 3 males. (27.3%).

Ethical Considerations

The study has been approved by the BMS Ethics Committee at the University of Twente. Prior to participation all participants were fully informed about the study's purpose, procedure, potential risks, and benefits. Written informed consent was obtained prior to the experiment (see Appendix A).

Experimental Design

Participants were randomly assigned to three groups: Treatment Group 1 (VR intervention) Treatment Group 2 (E-learning intervention) and Control Group (no intervention). Randomization was achieved through a computer-generated random number sequence to ensure unbiased allocation. Moreover, VR scenarios were developed for this

study and were designed to simulate real-life sports situations which addressed different manifestations of transgressive behaviours, from verbal to covert abuse in sports.

Materials and Measures

VR intervention

To deliver the VR intervention, four unique scenarios were developed, as mentioned before each depicting a different form of psychological abuse within a specific sports context. These scenarios were filmed using a 360-degree camera at Windesheim University of Applied Sciences to create immersive and interactive VR experiences, where actors were filmed following standardized scripts to ensure consistency in the portrayal of transgressive behaviour across scenarios. Participants in the VR intervention group experienced all four scenarios with each including all four scenarios, lasting approximately 5 minutes. The total duration of the VR intervention, including all four scenarios was 30 minutes. Participants rotated through the different athlete, coach, and bystander perspectives. This was achieved using the Oculus Rift S VR glasses, controllers, and the VR software, run on a dedicated computer, in the Flexperiment Room 1 located in the Cubicus building on the University of Twente campus which were also rented from the BMS Lab at the University of Twente.

VR Scenarios

Scenario 1: Verbal Abuse. This scenario depicted a basketball coach using degrading comments and teasing during a group interaction, in front of others team members.

Athlete's Perspective: Directly experiences the demeaning comments, feeling isolated and humiliated.

Coach's Perspective: Displays an approach believing that harsh criticism improves performance.

Bystander's Perspective: A team member witnesses the abuse, struggling to intervene or remain silent.

Scenario 2: Non-Verbal Abuse. This scenario depicted a soccer coach ignoring the emotional needs of the athlete during a soccer training session. Demonstrating lack of responsiveness and attention to the athlete, focusing on other players.

Athlete's Perspective: Feels overlooked an undervalued, affecting their motivation in the training session.

Coach's Perspective: Overlooks the needs of the athlete.

Bystander's Perspective: Other players notice the ignorance.

***Scenario 3: Overt Abuse*.** This scenario depicted a boxing coach using negative facial expression and punitive measures in a one-on-one interaction, using harsh verbal commands. The coach aggression is depicted through facial expression and a loud commanding voice.

Athlete's Perspective: Receives harsh treatments and feels under pressure to perform.

Coach's Perspective: Uses intense verbal language, with the intention of yielding better results.

Bystander's Perspective: Witnesses the aggressive coaching, feeling conflicted about the coaching method.

***Scenario 4: Covert Abuse*.** In this scenario, the gymnastics coach engaged in gossip and negative remarks about the athlete's performance to a bystander, but also sent inappropriate unsolicited private messages to the athlete.

Athlete's Perspective*:* Deals with emotional distress from public criticism to invasion of privacy.

Coach's Perspective*:* Engages in gossip and inappropriate communication.

Bystander's Perspective: Observes the covert interaction and faces moral dilemma of whether to report them or ignore the behaviour.

Outcome Measures

Three scales measure Perspective-taking abilities; the Interpersonal Reactivity index (IRI) and the perceived Empathic Self- Efficacy Scale (PESE), and the Perceived Social Self-Efficacy Scale (PESE). These scales were administered before and after the interventions to all participants across the three groups. The questionnaires were administered using Qualtrics, an online survey platform which facilitates data collection and data management.

Interpersonal Reactivity Index (IRI)

The IRI is a multidimensional scale that measures empathy. It includes subscales for perspective-taking, empathic concern, personal distress, and fantasy (Davis, 1980). This subscale consists of 28 items rated on a 5-point Likert scale from 1 (does not describe me well) to 5 (describes me very well). Higher scores on the perspective-taking subscale, indicate higher tendency to adopt others' points of view. For instance, a participant scoring high on an item such as "I try to look at everybody's side of disagreement before I make a decision" suggest a strong inclination towards considering multiple perspectives.

Perceived Empathic Self-Efficacy Scale (PESE)

The PESE assesses individuals perceived confidence in their ability to empathize with others. It includes items rated on a 7-point Likert scale from 1 (not confident at all) to 7 (completely confident). Higher scores indicate higher perceived empathy and self-efficacy. For instance, a high score on an item "I am confident in my ability to understand how someone else feels even when I am upset" indicates that the participant believes strongly in their empathic abilities (Di Guinta et al.,2010).

Perceived Social Self-Efficacy Scale (PSSE)

The perceived Social Self Efficacy Scale measures an individual's belief in their ability to navigate social situations and achieve desired outcomes in interpersonal relationships (Di Guinta et al.,2010). It typically employs items rated on a 5-point Likert scale ranging from 1(Not well at all) to 5 (Very well) for each item. The scale covers a range of social skills such as "How well can you express your opinion to people who are talking about something of interest to you". High scores on the scale indicate greater perceived social self-efficacy, reflecting a stronger belief in one's ability to navigate interactions.

Inclusion of Other in the Self Scale (IOS)

The IOS scale was used in the VR group and E-learning group, which measures participants feelings of closeness to others (Gächter et al., 2015). It uses a visual representation of overlapping circles to represent the inclusion of the self and others ranging from 1 (no overlap) to 7 (almost complete overlap). Higher scores indicating great inclusion of others in the self. For example, if a participant scores high on this scale, suggests they perceive a significant overlap between their identity and that of another person.

Empatica E4 Wristband

The Empatica E4 Wristband, which was also rented from the BMS Lab at the University of Twente, was used to measure physiological responses including heart rate and skin conductance, during the VR sessions.

Realiabiltity Analysis

The IRI, PESE and PSSE scales were combined to provide a measure of perspective-taking, using a 1-5 Likert scale, with response options ranging from 1 “Strongly Disagree” to 5 “Strongly Agree” to ensure consistency and a more straightforward aggregation and comparison of scores across different measures. Therefore, combing these scales, enables a broader assessment of both cognitive (as measured by the IRI) and self-efficacy aspects (as measured by the PESE and PSSE), of perspective-taking, aimed to capture a holistic view of empathy.

Cronbach’s alpha was calculated for the pre-questionnaire and post questionnaires. For the Pre-questionnaire, Cronbach’s alpha was 0.57, indicating moderate reliability. For the Post- questionnaire, Cronbach’s alpha was 0.15 indicating low reliability.

Procedure

VR Condition

At first, participants in the VR condition were greeted and provided with a short description of the experiment, which focused on perspective-taking in sports. Participants were informed that they would follow scenarios through VR glasses displaying different transgressive behaviours in sports. The participants were informed that there would be an audio recording for their answers where they would be also asked to pause after every scenario. They would be displayed a screen, where they would describe with a number where

they included themselves in relation to others. The participants were informed about the use of a biometric wristband to measure their heart rate and skin conductance.

Once the information was clear to the participant, the wristband was placed on them, and they were guided to the Qualtrics questionnaire on a dedicated computer where they were given a pre-test questionnaire to assess their baseline perspective-taking skills. After completing the questionnaire, the researcher provided the participants with the VR glasses and controllers, explained how to use them, and guided them through the audio recording process for their responses about their position in relation to others each immersive scenario. Participants were reminded that they could stop the experiment at any time if they felt discomfort. Upon completing the VR session, participants were assisted to remove the VR glasses and checked for any discomfort. and immediately completed the post-questionnaire to assess any changes in perspective-taking skills. The wristband was removed once they completed the post-questionnaire, marking the end of the experiment. Participants were thanked for their participation.

E-learning Condition

Participants in Treatment Group 2 completed the E-learning modules using the Qualtrics platform, which they could access from any locations using their personal computers. Similar to the VR group, these participants completed both pre-test and post-test questionnaires to assess changes in perspective-taking. The e-learning modules presented to the participants consisted of the VR scenarios in the form of plain videos in the Qualtrics platform. After viewing each scenario, participants were asked to respond a set of questions designed to measure their perspective-taking abilities and rate their level of inclusion of other in the self.

Control Condition

Participants in the Control Group did not receive any intervention. They completed the same pre-test and post-test questionnaires as the other groups to assess perspective-taking. To simulate the time commitment required for the interventions, control group participants were asked to wait at least 30 minutes between filling out the pre-test and post-test questionnaires. They were free to use this time as they wished and could do so from any location.

Data Analysis

The data from the Qualtrics questionnaire, physiological measurements and IOS measures were downloaded as Excel files and imported to the RStudio version 4.2.1 (R Core Team, 2018). The data was first cleaned and prepared for further analysis. Participants with missing responses were excluded from the study. Initially, the study design included randomly assigning participants within each condition to experience the scenarios from one of the three perspectives: athlete, coach, or bystander. However, due to a lower-than-anticipated participant response rate, the analysis plan had to be simplified. The combined data from all the perspectives was merged creating a single perspective-taking score for each participant. This meant that the analysis focused on the overall impact of the interventions rather than the influence of specific perspectives. To reflect this change, a new grouping variable was then created to represent the three experimental conditions: VR, e-learning, and control. The primary variables of interest in the analysis were: Perspective-taking; pre-test and post-test scores of perspective-taking skills from the combined subscales of IRI, PES and PSSE. The physiological responses: average heart rate (beats per minute) and skin conductance level during the VR experience, measured continuously and averaged for each participant. Lastly, IOS scores, measured the immersive presence in the VR group and per

VR scenarios. Descriptive Statistics were calculated for all variables using means and standard deviations. To examine within test for the significance of differences between pre and post -test scores, Wilcoxon's signed rank test was conducted for each experimental condition. Finally, Analysis of Covariance (ANCOVA) was conducted to compare the effectiveness of the interventions, with post-perspective-taking score as the dependent variable, experimental condition as the independent variable, and the baseline (pre-test) perspective-taking score as the covariate. This analysis allowed to examine the differences in post-intervention perspective-taking scores across the three while controlling for baseline (pre-test) scores. Prior to the analysis, assumptions of ANCOVA, such as normality, homogeneity of variance and linearity were met to ensure the statistical appropriateness of the model.

Results

Descriptive Statistics

Descriptive statistics for participants pre-test and post-test scores are summarized in Table 1.

Table 1

Descriptive Statistics for Pre-test and Post-test Scores

Measure	***Mean***	***SD***	***Median***	***Min***	***Max***
Pre-test	3.25	0.22	3.32	2.90	3.56

Post-test	3.28	0.13	3.28	3.08	3.54

The pre-test scores of participants had a mean of *M* = 3.25 (*SD* = 0.219), indicating that on average participants rated their perspective taking ability moderately higher before the intervention. The low standard deviation suggests that participant scores were close to the mean, indicating low variation in pre-test scores.

The post-test scores of participants had a slightly higher mean of *M* = 3.28 (*SD* = 0.132). The increase in the mean score indicates moderate changes in perspective-taking ability after the interventions. The standard deviation is also lower in the post-test scores compared to the pre-test scores, suggesting even less variation and more consistency in participant's responses after the interventions.

Descriptive Statistics by Condition

Detailed descriptive statistics for each condition are presented in Table 2

Table 2

Descriptive Statistics by Condition

Condition	***Measure***	***Mean***	***SD***	***Median***	***Min***	***Max***
Control	Pre-test	3.23	0.21	3.33	2.92	3.33
	Post-test	3.28	0.22	3.28	3.23	3.54
E-learning	Pre-test	3.21	0.27	3.33	2.90	3.38

	Post-test	3.33	0.11	3.33	3.26	3.41
VR	Pre-test	3.26	0.31	3.31	2.93	3.54
	Post-test	3.33	0.31	3.33	3.33	3.33

The Control group demonstrated a slight increase in the mean perspective-taking score from pre-test (M = 3.23, SD = 0.205) to post-test (M = 3.28, SD = 0.218). The E-learning group had a mean pre-test score of M = 3.21 (SD = 0.268) and a post-test score of M = 3.33 (SD = 0.109), indicating a slight increase as well. Lastly, the VR group had the highest mean pre-test score of M = 3.26 (SD = 0.308), with a post-test score of M= 3.33 (SD = 0.308). On these scales, a score of 3 indicates that participants on average, rather their perspective-taking ability as moderate.

Comparisons of Pre and Post-Ttest Scores

To evaluate the effect of the conditions on perspective-taking abilities, pre and post questionnaire scores were compared using the Wilcoxon signed-rank test. The results indicated no statistically significant change in perspective-taking scores across all participants in the three groups, ***V* = 15, *p* = .1195).** This suggests that the conditions did not significantly alter the participants perspective-taking skills.

Analysis Of Covariance (ANCOVA)

An analysis of Covariance (ANCOVA) was performed to assess the effect of the conditions: VR, E-learning, and Control on the post-questionnaire perspective-taking scores while controlling for the pre-test scores. The results of the ANCOVA revealed that there was

no significant effect of condition on post-test scores**, F (2,1) = 0.391, p = .749,** nor there was a significant effect of the pre-test scores, **F (1,1) = 4.932, p = .269.**

Descriptive Statistics for the IOS Scale in VR condition

Table 3 presents the mean and standard deviation for the Inclusion of Others in the Self (IOS) scale. The mean score for the IOS scale was *M* = 3.40 with a standard deviation of *SD* = 1.42. The inclusion of Other in the Self (IOS), scores indicated moderate feelings of closeness among participants to others in the VR group. This scale, ranged from 1 to 5, which indicated that individuals had an average of 3.40, suggesting individual, on average, scores slightly closer to feeling connected to others, than feeling completely separated.

Table 3

Descriptive Statistics for IOS Scores by VR Condition

Measure	*Mean (M)*	*Standard deviation (SD)*	*Median*
IOS	3.40	1.42	3

Descriptive Statistics for the IOS Scale by VR Scenario

Table 4 presents the IOS scores for the VR scenarios, involving non-verbal, verbal, overt and covert forms of transgressive behaviour. Highest scores of feeling closer to others were observed in scenarios involving non-verbal and covert form from the perspective of the coach as ranked below. In the non-verbal form (N_C_S2) the participants had a mean score of *M* = 6.33. In this form, the coach overlooked the needs of the athlete, focusing on the other players. Similarly, the covert form where the coach engaged in gossip and negative remarks,

the participants scored closer to their relationship with others, with a mean IOS score of *M* = 6.00. Additionally, low IOS score were observed in the overt and covert forms of from the perspective of the athlete. In the overt form (O_A_S2), the coach uses negative facial expressions and uses a harsh verbal tone towards the athlete. The participants who were in the perspective of the athlete had a mean of *M* = 1.67, demonstrating very low feelings of closeness to others. Similarly, in the covert form from the perspective of the athlete (C_A_S2), where the coach engages in gossip and sends inappropriate messages to the athlete, the participants scored a mean of *M* = 1.67.

Table 4

Descriptives Statistics of Mean IOS Scores by VR Scenario

Rank	***Scenario Code***	***Mean IOS Score***
1	N_C_S2	6.33
2	C_C_S2	6.00
3	V_C_S1	4.67
…	…	…
34	C_A_S2	1.67
35	O_A_S2	1.67

Note: *The scenario code represents different forms of psychological abuse and perspective roles in the VR simulation (e.g., 'N_C_S2' represents a Non-Verbal from the perspective of*

the Coach in Scenario 2, and 'C_A_S2' represents a Covert form from the perspective of the Athlete in Scenario 2). See Appendix F for the complete table with all scenarios.

Descriptive Statistics for the Physiological Measurements in VR conditon

The heart rate (HR) and electrodermal activity (EDA) were measured using Empatica E4 wristband in the VR intervention. The overall mean HR was *M* = 73.97 bpm (beats per minute), with a standard deviation of *SD* = 13.54. The overall mean EDA was *M* = 1.225, with a standard deviation of *SD* = 1.22. This data demonstrated variability among the participants in the VR condition.

Table 5

Descriptive statistics for Heart Rate (HR) and Electrodermal Activity (EDA)

Measure	***Min***	***1st Quartile***	***Median***	***Mean***	***3rd Quartile***	***Max***
HR	1.00	67.73	73.88	73.97	80.25	106.82
EDA	0.000	0.452	0.932	1.225	1.651	4.537

As observed in Table 6, the data revealed that Participant 1 had the highest mean HR (*M* = 88.9 bpm, *SD* = 4.96), which suggests a higher level of physiological arousal compared to Participants 2 (*M* =73.5 bpm, *SD* = 12.1) and Participant 3 (*M* = 76.2 bpm, *SD* = 5.00). EDA measures also demonstrated variability with Participant 1 indicating the highest mean

EDA (M = 2.90, SD = 1.07), indicating greater electrodermal activity compared to Participant 2 (M = 1.42, SD = 0.92) and Participant 3 (M = 0.25, SD = 0.08).

Table 6

Detailed Descriptive statistics for Physiological Measurements by Participant in VR Condition

Heart Rate (HR)

Participant	*Mean*	*SD*	*Median*	*Min*	*Max*
1	88.9	4.96	89.8	1	99.1
2	73.5	12.1	72.4	1	96.1
3	76.2	5.00	75.7	1	89.1

Electrodermal Activity (EDA)

Participant	*Mean*	*SD*	*Median*	*Min*	*Max*
1	2.90	1.07	2.85	0	5.30
2	1.42	0.92	1.13	0	3.61
3	0.25	0.08	0.25	0	0.39

Discussion

In this research, the VR group was expected to demonstrate a greater increase in perspective-taking scores compared to those in the control group or those participating in E-learning alone. This hypothesis was based on prior research, which suggested that because of VR's immersive environment, it could potentially be beneficial in fostering emotional and cognitive engagement. Such as to enhance empathy, and resilience, key aspects of perspective-taking (Hamilton-Giachritsis et al.,2018; Schutte & Stilinovic, 2017).

Contrary to the hypothesis, the results did not reveal a statistically significant difference in perspective taking scores between the VR, e-learning, and control groups. Even though, the VR group did exhibit a consistent increase, the effect of change was relatively too small to demonstrate any statistical difference. Similar changes were also seen in the e-learning and control groups. This unexpected finding, led to several interpretations. To begin with, the duration and design of the VR intervention may have limited its effectiveness in entirely capturing lasting changes in behaviour. This means that the short exposure to the VR scenarios may not have been sufficient to induce significant behaviour change in complex skills like perspective-taking. It is possible that the single-session of 30 minutes in VR experience was not enough to create lasting shift in perspective-taking. Research suggests that longer and more repeated VR experiences with real-life scenarios could lead to better learning outcomes (Herrera et al.,2018). This is also, consistent with findings from studies on VR-based empathy training, where it was found that longer and more immersive interventions have shown greater success at enhancing perspective-taking and prosocial behaviour (Allcoat & Muhlenen, 2018).

The Inclusion of Others in the Self (IOS) scores provided insights into how participants felt about their closeness to others after experiencing the given VR scenarios. Participants who reported feeling the closest to others, were mainly embodied by the

perspective of the coach. This consisted of the non-verbal transgression and the covert form of transgression. When participants embodied the coach in the non-verbal and covert scenarios, they reported feeling closer to other, even though the coach's actions were harmful. This finding, aligns with the concept of shared transgression, potentially fostering a sense of in-group bias, regardless of whether the behaviour is ethically questionable (Raakman et al., 2010). Embodying the coach, even in a virtual scenario, may have triggered a "we are in this together" feeling, showcasing how group identity and a sense of shared purpose may be used to downplay harmful behaviour (Fransen et al., 2020). Transgressive behaviour, from a position of power, such as a coach, may have led the participants to rationalize such the aforementioned behaviour as necessary for motivation to achieving team goals. In these scenarios the coach had neglected the needs of the athlete but also uses gossip and engages in inappropriate communication with the athlete. Those embodying the coach in the non-verbal form, might have focused on the team's overall progress and felt a sense of unity in striving for a shared goal, even if it came at the expense of an individual player. When participants, embodying the coach, in the covert scenario, it is possible that they felt a sense of shared understanding or secret bond, which may then create a sense of unity. Covert transgressions, by nature involve an element of secrecy, among those aware of the action, even if they don't explicitly condone them (Nurmohamed et al., 2021). This means that the simple act of knowing something that others don't, may have created a connection or closeness among the participants who embodied that behaviour. In contrast, the experience of being on the receiving side, such as the athlete, particularly in scenarios involving overt and covert transgressive behaviour, reported significantly lower feelings of closeness to others. In both scenarios, the athlete experienced harsh criticism and invasion of privacy, explaining the lower IOS scores. A study by Wesselmann et al. (2015), supported this, suggesting how experiencing negative behaviours from a position of lesser, may lead to feelings of isolation.

In this study, participants embodying athletes experiencing transgressive behaviour may have similarly felt distanced fand isolated from the group. These insights highlight an interesting point: perspective matters. The way we perceive and respond to transgressive behaviour may be dependent and influenced on where we stand in the social dynamic.

The moderate changes in perspective-taking among participants using VR, align with research highlighting the immersive nature of VR of this technology as a key factor for enhancing empathy and engagement (Pan & Hamilton, 2018), as well as the ability of VR to places individuals directly into emotionally inducing scenarios (Bertrand et al., 2018). Interestingly, the slight improvement in the e-learning group, while not statistically significant, challenged the expectation that VR would be inherently superior to e-learning, hence leading to more perspective-taking skills. E-learning may still contribute to positive learning outcomes. From there, the notion of a blended approach emerges: the integration of VR within e-learning systems. Combining strengths of both e-learning and VR, for a holistic learning experience. In a study conducted by Barry et al. (2023), they emphasized that while e-learning offers flexibility and accessibility, VR can be of key for providing realistic training experience in education. In their study it was found that by combining VR with traditional e-learning platforms, a new integrated approach could lead to a better learning outcome and offer a more engaging learning experience. This can be particularly critical in situations where individuals apply learned skills in real world scenarios. Also supported, by Aekanth (2023), who proposed that combining VR into e-learning systems can create a dynamic educational experience which could make use of both methods. Essentially, this dynamic educational experience could blend the “knowing” with the “feeling”. E-learning may effectively deliver knowledge, for instance, type of transgressive behaviour, power dynamics, and groupthink or communication skills for addressing harmful behaviours, while VR may add a deeper, emotional layer of understanding, by immersing users to experience

transgressive behaviour from multiple perspectives or a conversation where users practice responding to the abuse.

Limitations

Future research needs to address several limitations of this study. The small sample size of 11 participants reduced the study's power to detect significant differences. For this reason, a larger sample size is necessary to increase the statistical power of the data and ensure that observed effects are not due to change (Cohen, 1988). A sample size of minimum 30 participants per condition may be more appropriate to detect statistically significant differences and increase generalizability to the general population. Also, the study was limited in its ability to examine the influence of perspective. The initial design included a manipulation of perspectives (athlete, coach, bystander) due to the small sample size; data was merged across perspectives. This may have masked potential differences between the perspectives. For instance, the VR intervention might be more effective for enhancing perspective-taking when participants embody the athlete tole, compared to the coach role. In addition, the tools used to measure perspective-taking may not have fully captured perspective-taking abilities in participants. Traditional self-report questionnaires often rely on participants perceptions and introspection, which may be subjective and susceptible to bias. These tools may fail to capture changes and the depth of emotions (Pan & Hamilton, 2018). Since they capture what individuals say they think or feel, for instance someone might report increased perspective taking ability but not necessary act on it. Moreover, the duration of 30 minutes in the VR intervention may not have been sufficient to produce any significant change. An alternative to this would be extending the duration of VR sessions to more frequent exposure which may lead to improvements in perspective-taking (Makransky & Lilleholt, 2018). Instead of a one-time intervention, implementing several VR sessions over a

series of weeks would enable repeated practice, which may then reinforce learning. Lastly, the reliability of the measurement tools used in the study may have been compromised. Cronbach's alpha, which measures internal consistency, may not have been adequate for the scales used. An insufficient Cronbach's alpha indicated that the items within the scale may not have been measuring the same underlying construct reliably and over time (Tavakol & Dennick, 2011). Since the scores in the post-test demonstrated low reliability, exploring alternative measures of perspective-taking may be crucial to reach reliability.

Recommendations for Future Research

In this study, there was no statistical effect in perspective-taking score across all experimental conditions. However, the observed moderate changes across the VR and e-learning groups establish room for further exploration. Future studies should prioritize recruiting a larger and more diverse sample of participants to allow for a thorough examination of the perspective manipulation. Considering of employing a between-subjects design where participants are randomly assigned to experience VR scenarios from only one perspective (athlete, coach, or bystander), would provide a cleared understanding of how each role influences perspective-taking. Furthermore, to examine the potential for long-term impact, future research could also explore longitudinal studies, assessing the effect of repeated VR experiences on athletes, coaches, and bystanders over an extended period of at least six weeks. Future studies could also directly examine the relationship between changes in perspective-taking and behavioural outcomes, instead or solely relying on self-repost questionnaires. These include examining variables such as communication patterns with coaches, their willingness to support teammates facing abusive behaviours, or their willingness to report abusive behaviours, which may act as mediating factors in terms of responding to transgressive behaviour. Finally, building on the potential of a blended

approach, future research could investigate the effectiveness of combining VR with e-learning platforms to provide a more impactful educational experience to people participating in the sports industry. By integrating the knowledge structure of e -learning, with the immersive interactive elements of VR, this approach may potentially enhance behaviour change and perspective-taking skills to offer a promising pathway towards ensuring psychological safety athletes.

Conclusion

This research examined how the potential use of Virtual Reality (VR) to enhance perspective-taking in sports, and its impact on transgressive behaviour. While the findings demonstrated moderate increases in participants perspective-taking after the VR intervention, these changes did not reach statistical significance. However, they revealed an interesting aspect of interest, social dynamics. This suggests, that while VR holds promise as a tool for fostering perspective-taking, its implementation may potentially require consideration and integration with existing approaches to strengthen its impact. The complexities of perspective-taking in this study highlight the need to view VR not as a standalone solution but as part of a complementary strategy. Integrating VR with e-learning platforms as suggested by Barry et al. (2023) presents a promising path for enhancing perspective-taking skills. E-learning can provide a structured foundation of theoretical knowledge, while VR offers a safe and immersive space to experience challenging situations from multiple perspectives. Such a blended approach may apply the strengths of both platforms, potentially leading to behaviour change (Aekanth, 2023). Future research could investigate components of VR and e-learning for the development of training programs which could integrate addressing individual perspective-taking, but also group dynamics, and their effect on the perception of harmful behaviours. Embracing such innovations may foster a sporting

environment, that prioritizes, respect, understanding and accountability to prevent transgressive behaviour in sports.

References

Acet, M., Karademir, T., & Gökçiçek, S. (2017). Analysis of the Influence of Adolescence Period Sport Activities on Emphatic Tendency. *Universal Journal of Educational Research*, 5(2), 186-193. https://doi.org/10.13189/ujer.2017.050203

Aekanth, S.G. (2023). Transforming E-Learning Through the Use of Virtual and Augmented Reality: A Systematic Review. In: Duffy, V.G., Ziefle, M., Rau, PL.P., Tseng, M.M. (eds) *Human-Automation Interaction. Automation, Collaboration, & E-Services* (Vol 12). Springer, Cham. https://doi.org/10.1007/978-3-031-10788-7_20

Alexander, K. N., Adams, K. V., & Dorsch, T. E. (2023). Exploring the Impact of Coaches' Emotional Abuse on Intercollegiate Student-Athletes' Experiences. *Journal of Aggression, Maltreatment & Trauma*, *32*(9), 1–19. https://doi.org/10.1080/10926771.2023.2166441

Allcoat, D., & von Mühlenen, A. (2018) Learning in virtual reality : effects on performance, emotion, and engagement. *Research in Learning Technology*, 26. 2140. doi:10.25304/rlt.v26.2140 ISSN 2156-7077.

Barry, D. M., Kanematsu, H., & Tanaka, T. (2023). Creative teaching using hybrid e-learning and virtual reality. *Procedia Computer Science*, 225, 1151-1160. https://doi.org/10.1016/j.procs.2023.10.103

Bertrand P, Guegan J, Robieux L, McCall CA, Zenasni F. (2018). Learning Empathy Through Virtual Reality: Multiple Strategies for Training Empathy-Related Abilities Using Body Ownership Illusions in Embodied Virtual Reality. *Frontiers in Robotics and AI,5,* 26. doi: 10.3389/frobt.2018.00026

.

Bode, L., Vertommen, T & Nührenbörger, C. (2023). Safeguarding the young athlete in sport. *Sports Orthopaedics and Traumatology*, *39*(2), 145–154. https://doi.org/10.1016/j.orthtr.2023.04.004

Bredemeier B.L, & Shields D.L. Sports and Character Development. *Journal of Physical Activity and Health.* 3(2):255-256. doi: 10.1123/jpah.3.2.255. PMID: 28834461.

Celik, V. (2020). Challenges in distance learning in higher education. *Journal of Educational Technology, 47*(2), 150-165. https://doi.org/10.1016/j.iheduc.2020.100761

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences (2nd ed.). Routledge. https://doi-org.ezproxy2.utwente.nl/10.4324/9780203771587

Davis, M. (1980). A Multidimensional Approach to Individual Differences in Empathy. *JSAS Catalog Selected Douments.in Psychology*, 10.

Den Hartigh, Ruud. J. R., Meerhoff, L. R. A., Van Yperen, N. W., Neumann, N. D., Brauers, J. J., Frencken, W. G. P., Emerencia, A., Hill, Y., Platvoet, S., Atzmueller, M., Lemmink, K. A. P. M., & Brink, M. S. (2022). Resilience in sports: a multidisciplinary, dynamic, and personalized perspective. *International Review of*

Sport and Exercise Psychology, 1–23. https://doi.org/10.1080/1750984x.2022.2039749

Di Giunta, L., Eisenberg, N., Kupfer, A., Steca, P., Tramontano, C., & Caprara, G. V. (2010). Assessing perceived empathic and social self-efficacy across countries. *European Journal of Psychological Assessment, 26*(2), 77–86. https://doi.org/10.1027/1015-5759/a000012

Dubinsky, Y. (2022). The Olympic Games, nation branding, and public diplomacy in a post-pandemic world: Reflections on Tokyo 2020 and beyond. Place Branding and Public Diplomacy. 19(1-12). http://doi.org/10.1057/s41254-021-0025

Edwards, A., & Finger, G. (2007). eLearning and Sport Management: Hyperpedagogy Possibilities. *Sport Management Review*, *10*(2), 191–208. https://doi.org/10.1016/s1441-3523(07)70011-6

Farley, O. R. L., Spencer, K., & Baudinet, L. (2019). Virtual reality in sports coaching, skill acquisition and application to surfing: A review. *Journal of Human Sport and Exercise, 15*(3), 596-607. https://doi.org/10.14198/jhse.2020.153.06

Fransen, K. & Mcewan, D. & Sarkar, M.. (2020). The impact of identity leadership on team functioning and well-being in team sport: Is psychological safety the missing link?. *Psychology of Sport and Exercise*. 51. 101763. 10.1016/j.psychsport.2020.101763.

Gächter, S., Starmer, C., & Tufano, F. (2015). Measuring the Closeness of Relationships: A Comprehensive Evaluation of the 'Inclusion of the Other in the Self' Scale. *PLOS ONE,* 10(6), e0129478. https://doi.org/10.1371/journal.pone.0129478

Haandrikman, M. J. M., & Veldhoven, N. S. (2024). Building European Safe Sports Together: a conceptual framework of transgressive behaviour.*University of Twente Research Information*. https://research.utwente.nl/en/publications/building-european-safe-sports-together-a-conceptual-framework-of-

Hamilton-Giachritsis, C., Banakou, D., Garcia Quiroga, M., Giachritsis, C., & Slater, M. (2018). Reducing risk and improving maternal perspective-taking and empathy using virtual embodiment. *Scientific Reports*, *8*(1), 2970. https://doi.org/10.1038/s41598-018-20384-8

Hattie, J., & Timperley, H. (2007). The Power of Feedback. Review of Educational Research, 77(1), 81–112. http://www.jstor.org/stable/4624888

Herrera, F., Bailenson, J., Weisz, E., Ogle, E., & Zaki, J. (2018). Building long-term empathy: A large-scale comparison of traditional and virtual reality perspective-taking. *PLoS ONE, 13*(10), e0204494. https://doi.org/10.1371/journal.pone.0204494

Hrastinski, S. (2019). What Do We Mean by Blended Learning? *TechTrends*, *63*(5), 564-569. https://doi.org/10.1007/s11528-019-00375-5

Jowett, S., & Poczwardowski, A. (2007). Understanding the Coach-Athlete Relationship.

ResearchGate. https://www.researchgate.net/publication/232506356_Understanding_the_Coach-Athlete_Relationship

Kazu, İ. Y., & Kuvvetli, M. (2023). The Impact of Virtual Reality Technology on Student Engagement and Learning Outcomes in Higher Education. *Journal of Educational Technology Systems*, *51*(1), 48-67. https://doi.org/10.1177/0047239522110049

Kerr, G., & Stirling, A. (2019). Research on abuse in sport in Canada. In N. Holt (Ed.), *The Routledge Handbook of Youth Sport* (pp. 361-370). Routledge. https://doi.org/10.4324/9781315714264-32

Mahmoudi, E., Amin Nakhostin-Ansari, Ranjbar, M., & Amir Hossein Memari. (2022). Are all types of empathy associated with lower aggression in athletes? A cross-sectional study on Iranian athletes. *BMC Psychology*, *10*(1), 1-12. https://doi.org/10.1186/s40359-022-00985-4

Makransky, G., & Lilleholt, L. (2018). A structural equation modeling investigation of the emotional engagement construct in an educational virtual reality game. *Computers & Education*, *134*, 1-14. https://doi.org/10.1016/j.compedu.2019.01.009

Moustakas, L., & Robrade, D. (2022). The Challenges and Realities of E-Learning during COVID-19: The Case of University Sport and Physical Education. *Challenges*, *13*(1), 9. https://doi.org/10.3390/challe13010009

Nurmohamed, S., Kundro, T. G., & Myers, C. G. (2021). Against the odds: Developing underdog versus favorite narratives to offset prior experiences of discrimination. Organizational Behavior and Human Decision Processes, 167, 206-221. https://doi.org/10.1016/j.obhdp.2021.04.008

Ohlert, J., Vertommen, T., Rulofs, B., Rau, T., & Allroggen, M. (2020). Elite athletes' experiences of interpersonal violence in organized sport in Germany, the Netherlands, and Belgium. *European Journal of Sport Science*, 21(4), 604-613. https://doi.org/10.1080/17461391.2020.1781266

Olsson, L. F., Madigan, D. J., Hill, A. P., & Grugan, M. C. (2021). Do athlete and coach performance perfectionism predict athlete burnout? *European Journal of Sport Science, 22*(7), 1–33. https://doi.org/10.1080/17461391.2021.1916080

Pan, X., & Hamilton, A. F. de C. (2018). Why and how to use virtual reality to study human social interaction: The challenges of exploring a new research landscape. *British Journal of Psychology, 109*(3), 395-417. https://doi.org/10.1111/bjop.12290

Pastel, S., Petri, K., Chen, C. H., Wiegand Cáceres, A. M., Stirnatis, M., Nübel, C., Schlotter, L., & Witte, K. (2022). Training in virtual reality enables learning of a complex sports movement. *Virtual Reality*. https://doi.org/10.1007/s10055-022-00679-7

Raakman, E., Dorsch, K., & Rhind, D. (2010). The Development of a Typology of Abusive Coaching Behaviours within Youth Sport. *International Journal of Sports Science & Coaching*, 5(4), 503-515. https://doi-org.ezproxy2.utwente.nl/10.1260/1747-

9541.5.4.503

Raij, A. Kotranza, D. S. Lind & Lok, B. (2009) "Virtual Experiences for Social Perspective-Taking," 2009 *IEEE Virtual Reality Conference, Lafayette*, pp. 99-102, doi: 10.1109/VR.2009.4811005.

Radziszewski, S., Parent, S., St-Pierre, E., & Fortier, J. (2023). “Never having the right to make a mistake, I think that’s the hardest part of being an official”: Exploring young sport officials’ experiences of abuse and their related coping mechanisms. *Journal of Applied Sport Psychology*, 1–23. https://doi.org/10.1080/10413200.2023.2197964

Seinfeld, S., Arroyo-Palacios, J., Iruretagoyena, G., Hortensius, R., Zapata, L. E., Borland, D., de Gelder, B., Slater, M., & Sanchez-Vives, M. V. (2018). Offenders become the victim in virtual reality: impact of changing perspective in domestic violence. Scientific Reports, 8(1). https://doi.org/10.1038/s41598-018-19987-7

Schutte, N. S., & Stilinović, E. J. (2017). Facilitating empathy through virtual reality. *Motivation and Emotion, 41*(6), 708–712. https://doi.org/10.1007/s11031-017-9641-7

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education, 2*, 53-55. https://doi.org/10.5116/ijme.4dfb.8dfd

Tan, M. C. C., Chye, S. Y. L., & Teng, K. S. M. (2022). “In the shoes of another”: immersive technology for social and emotional learning. *Education and Information Technologies*, 27(6), 8165-8188. https://doi.org/10.1007/s10639-022-10938-4

Tian, F., An, B., Zheng, D., Qin, J., Zheng, Q., & Yang, Y. (2011). E-learning oriented emotion regulation mechanism and strategies in interactive text applications. In *Proceedings of the 2011 15th International Conference on Computer Supported Cooperative Work in Design* (pp. 702-709). https://doi.org/10.1109/CSCWD.2011.5960195

Timpka, T., Dahlström, Ö., Fagher, K., Adami, P. E., Andersson, C., Jacobsson, J., Svedin, C. G., & Bermon, S. (2022). Vulnerability and stressors on the pathway to depression in a global cohort of young athletics (track and field) athletes. *Scientific Reports*, *12*(1), 7901. https://doi.org/10.1038/s41598-022-12145-0

Vertommen, T., Schipper-van Veldhoven, N., Wouters, K., Kampen, J. K., Brackenridge, C. H., Rhind, D. J. A., Neels, K., & Van Den Eede, F. (2016). Interpersonal violence against children in sport in the Netherlands and Belgium. *Child Abuse & Neglect*, *51*, 223–236. https://doi.org/10.1016/j.chiabu.2015.10.006

Wesselmann, Eric & Wirth, James & Bernstein, Michael. (2017). Expectations of Social Inclusion and Exclusion. *Frontiers in Psychology*. 8. 10.3389/fpsyg.2017.00112

.

Yun-chao, M., Ren Mengyao, & Li, X. (2023). Application of virtual simulation technology in sports decision training: a systematic review. *Frontiers in Psychology*, *14*. https://doi.org/10.3389/fpsyg.2023.1164117

Appendix A

Informed Consent Form

FACULTY OF BEHAVIOURAL, MANAGEMENT AND SOCIAL SCIENCES

Informatieblad & Toestemmingsformulier Onderzoek

Informatieblad voor onderzoek 'Veilige sport: het potentieel van Virtual Reality'

Beste deelnemer,

Wat fijn dat jij gaat deelnemen aan dit onderzoek. Jouw bijdrage is van grote waarde voor de missie die achter ons onderzoek zit, namelijk het creëren van veilige sport.

Het doel van dit onderzoek is om de rol van Virtual Reality te onderzoeken in het creëren van veilige sport omgevingen en het voorkomen van psychologische vormen van grensoverschrijdend gedrag. We zijn geïnteresseerd in hoe de psychologische toepassing van een Virtual Realitymodule kan bijdragen aan het verbeteren van de veerkracht, het vergroten van de weerbaarheid en het versterken van de mentale gezondheid van individuen in de sport.

Dit onderzoek wordt geleidt door drs. Marleen Haandrikman in samenwerking met studenten Helen Geise, Olivia Georgiou en Desi Giebels.

Hoe gaan we te werk?

Je neemt deel aan een onderzoek waarbij we informatie zullen vergaren door het invullen van een vragenlijst. De onderzoeksgegevens die we verzamelen zullen uitsluitend worden gedeeld binnen ons onderzoeksteam en in eigendom blijven van de Universiteit Twente.

Potentiële risico's en ongemakken

Tijdens je deelname aan deze studie kunnen er vragen worden gesteld die je als persoonlijk kunt ervaren, vanwege de gevoelige aard van het onderwerp. Wij stellen deze vragen enkel en alleen in het belang van het onderzoek. Je hoeft echter geen vragen te beantwoorden die je niet wilt beantwoorden. Jouw deelname is vrijwillig en je kunt jouw deelname op elk gewenst moment stoppen.

Indien deelname aan een e-learning module:

- Het zien van potentieel psychologisch grensoverschrijdend gedrag kan mogelijk ongemakken veroorzaken, bijvoorbeeld als deze gedragingen verontrustend worden ervaren. Indien deze ongemakken ontstaan, kunnen deze worden aangegeven bij de onderzoekers om waar nodig ondersteuning te bieden.

Indien deelname aan een Virtual Reality module:

- Het zien van potentieel psychologisch grensoverschrijdend gedrag kan mogelijk ongemakken veroorzaken, bijvoorbeeld als deze gedragingen verontrustend worden ervaren.
- Sommige mensen kunnen symptomen van simulatorziekte ervaren tijdens of na het gebruik van VR-technologie (bijv. duizeligheid, misselijkheid, hoofdpijn).

Indien (één van) deze ongemakken ontstaan, kunnen deze worden aangegeven bij de onderzoekers om waar nodig ondersteuning te bieden.

Vergoeding

Voor deelname aan dit onderzoek ontvangt u geen vergoeding. Studenten van de Universiteit Twente kunnen SONA-credits ontvangen ten behoeve van hun opleidingseisen.

Faculty of Behavioural, Management and Social Sciences

Informatieblad & Toestemmingsformulier Onderzoek

Vertrouwelijkheid van gegevens

Wij doen er alles aan jouw privacy zo goed mogelijk te beschermen. Er wordt op geen enkele wijze vertrouwelijke informatie of persoonsgegevens van of over jou naar buiten gebracht, waardoor iemand je zal kunnen herkennen.

Voordat onze onderzoeksgegevens naar buiten gebracht worden, worden jouw gegevens zoveel mogelijk geanonimiseerd. In een publicatie van de onderzoeksresultaten zullen anonieme gegevens worden gebruikt. De audio-opnamen, formulieren en andere documenten die in het kader van deze studie worden gemaakt of verzameld, worden opgeslagen op een beveiligde locatie bij de Universiteit Twente en op de beveiligde

(versleutelde) gegevensdragers van onderzoeker Marleen Haandrikman. De onderzoeksgegevens worden bewaard voor een periode van 5 jaar. Uiterlijk na het verstrijken van deze termijn zullen de gegevens worden verwijderd of worden geanonimiseerd zodat ze niet meer te herleiden zijn tot een persoon.

De onderzoeksgegevens worden indien nodig (bijvoorbeeld voor een controle op wetenschappelijke integriteit) en alleen in anonieme vorm ter beschikking gesteld aan personen buiten de onderzoeksgroep.

Tot slot is dit onderzoek beoordeeld en goedgekeurd door de ethische commissie van de faculteit BMS (domein Humanities & Social Sciences).

Vrijwilligheid

Deelname aan dit onderzoek is geheel vrijwillig. Je kunt als deelnemer jouw medewerking aan het onderzoek te allen tijde stoppen, of weigeren dat uw gegevens voor het onderzoek mogen worden gebruikt, zonder opgaaf van redenen. Het stopzetten van deelname heeft geen nadelige gevolgen voor jou.

Als je tijdens het onderzoek besluit om jouw medewerking te staken, zullen de gegevens die jij reeds hebt verstrekt tot het moment van intrekking van de toestemming in het onderzoek gebruikt worden.

Wilt u stoppen met het onderzoek, of heb je vragen en/of klachten? Neem dan contact op met de onderzoeksleider (m.j.m.haandrikman@utwente.nl).

Voor bezwaren met betrekking tot de opzet en of uitvoering van het onderzoek kunt u zich ook wenden tot de Secretaris van de Ethische Commissie (domein Humanities & Social Sciences) van de faculteit Behavioural, Management and Social Sciences op de Universiteit Twente via ethicscommittee-hss@utwente.nl. Dit onderzoek wordt uitgevoerd vanuit de Universiteit Twente, faculteit Behavioural, Management and Social Sciences. Indien u specifieke vragen hebt over de omgang met persoonsgegevens kun u deze ook richten aan de Functionaris Gegevensbescherming van de UT door een mail te sturen naar dpo@utwente.nl.

Tot slot heb je het recht een verzoek tot inzage, wijziging, verwijdering of aanpassing van jouw gegevens te doen bij de onderzoeksleider.

Faculty of Behavioural, Management and Social Sciences

Informatieblad & Toestemmingsformulier Onderzoek

Door dit toestemmingsformulier te ondertekenen erken ik het volgende:

1. Ik ben voldoende geïnformeerd over het onderzoek door middel van een separaat informatieblad. Ik heb het informatieblad gelezen en heb daarna de mogelijkheid gehad vragen te kunnen stellen. Deze vragen zijn voldoende beantwoord.
2. Ik neem vrijwillig deel aan dit onderzoek. Er is geen expliciete of impliciete dwang voor mij om aan dit onderzoek deel te nemen. Het is mij duidelijk dat ik deelname aan het onderzoek op elk moment, zonder opgaaf van reden, kan beëindigen. Ik hoef een vraag niet te beantwoorden als ik dat niet wil.

Naast het bovenstaande is het hieronder mogelijk voor verschillende onderdelen van het onderzoek specifiek toestemming te geven. Je kunt er per onderdeel voor kiezen wel of geen toestemming te geven. Indien je voor alles toestemming wil geven, is dat mogelijk via de aanvinkbox onderaan de stellingen.

3. Ik geef toestemming om de gegevens die gedurende het onderzoek bij mij worden verzameld te verwerken zoals is opgenomen in het bijgevoegde informatieblad. Deze toestemming ziet dus ook op het verwerken van gegevens betreffende mijn etnische afkomst en biometrische gegevens.	JA □	NEE □
4. Ik geef toestemming om tijdens de Virtual Reality module een geluidsopname te maken om mijn antwoorden uit te werken in een transcript (indien van toepassing)	□	□
5. Ik geef toestemming om de bij mij verzamelde onderzoeksdata te bewaren en te gebruiken voor toekomstig onderzoek en voor onderwijsdoeleinden.	□	□
Ik geef toestemming voor alles dat hierboven beschreven staat.	□	

Naam Deelnemer: Naam Onderzoeker:

Handtekening: Handtekening:

Datum: Datum:

Appendix B

Interpersonal Reactivity Index

28-item scale measured via a 5-point Likert scale (1 = does not describe me well to 5 = describes me very well)

Interpersonal Reactivity Index | SpringerLink

	Perspective Taking	Does not describe me well				Describes me very well
1.	I sometimes find it difficult to see things from the "other guy's" point of view (-)	1	2	3	4	5
2.	I try to look at everybody's side of a disagreement before I make a decision	1	2	3	4	5
3.	I sometimes try to understand my friends better by imagining how things look from their perspective	1	2	3	4	5
4.	If I'm sure I'm right about something, I don't waste much time listening ot other people's arguments (-)	1	2	3	4	5
5.	I believe that there are two sides to every question and try to look at them both	1	2	3	4	5
6.	When I'm upset at someone, I usually try to "put myself in his shoes" for a while	1	2	3	4	5
7.	Before critising somebody, I try to imagine how I would feel if I were in their place	1	2	3	4	5

	Fantasy	Does not describe me well				Describes me very well
1.	I daydream and fantasize, with some regularity, about things that might happen to me	1	2	3	4	5
2.	I really get involved with the feelings of the characters in a novel	1	2	3	4	5
3.	I am usually objective when I watch a movie or play, and I don't often get completely caught up in it (-)	1	2	3	4	5
4.	Becoming extremely involved in a good book or movie is somewhat rare for me (-)	1	2	3	4	5
5.	After seeing a play or movie, I have felt as though I were one of the characters	1	2	3	4	5
6.	When I watch a good movie, I can very easily put myself in the place of a leading character	1	2	3	4	5
7.	When I am reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me	1	2	3	4	5

	Empathy Concern	Does not describe me well				Describes me very well
1.	I often have tender, concerned feelings for people less fortunate than me	1	2	3	4	5
2.	Sometimes I don't feel very sorry for other people when they are having problems (-)	1	2	3	4	5
3.	When I see someone being taken advantage of, I feel kind of protective towards them	1	2	3	4	5
4.	Other people's misfortunes do not usually disturb me a great deal (-)	1	2	3	4	5
5.	When I see someone being treated unfairly, I sometimes don't feel very much pity for them (-)	1	2	3	4	5
6.	I am often quite touched by things that I see happening	1	2	3	4	5
7.	I would describe myself as a pretty soft-hearted person	1	2	3	4	5

	Personal Distress	Does not describe me well				Describes me very well
1.	In emergency situations, I feel apprehensive and ill-at-ease	1	2	3	4	5
2.	I sometimes feel helpless when I am in the middle of a very emotional situation	1	2	3	4	5
3.	When I see someone get hurt, I tend to remain calm (-)	1	2	3	4	5
4.	Being in a tense emotional situation scares me	1	2	3	4	5
5.	I am usually pretty effective in dealing with emergencies (-)	1	2	3	4	5
6.	I tend to lose control during emergencies	1	2	3	4	5
7.	When I seem someone who badly needs help in an emergency, I go to pieces	1	2	3	4	5

Appendix C

Perceived Social Self-Efficacy Scale

5-item scale measured via a 5-point Likert scale (1 = not well at all to 5 = very well)

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3018073/

	How well can you...	Not well at all				Very well
1.	Express your opinion to people who are talking about something of interest to you?	1	2	3	4	5
2.	Work or study well with others?	1	2	3	4	5
3.	Help someone new become part of a group to which you belong?	1	2	3	4	5
4.	Share an interesting experience you had with other people?	1	2	3	4	5
5.	Actively participate in group activities?	1	2	3	4	5

Appendix D

Perceived Empathy Self-Efficacy Scale

6-item scale measured via a 5-point Likert scale (1 = not well at all to 5 = very well)

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3018073/

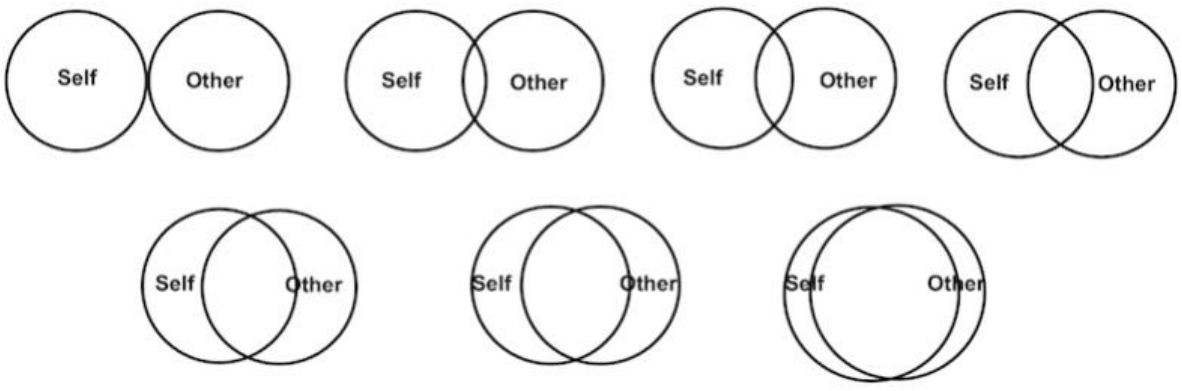
	How well can you...	Not well at all				Very well
1.	Read your friends' needs?	1	2	3	4	5
2.	Recognise when someone wants comfort and emotional support, even if (s)he does not overtly exhibit it?	1	2	3	4	5
3.	Recognize whether a person is annoyed with you?	1	2	3	4	5
4.	Recognize when a person is inhibited by fear?	1	2	3	4	5
5.	Recognize when a companion needs your help?	1	2	3	4	5
6.	Recognize when a person is experiencing depression?	1	2	3	4	5

Appendix E

Inclusion of Other in the Self

https://sparqtools.org/mobility-measure/inclusion-of-other-in-the-self-ios-scale/#all-survey-questions

Instructions	Respondents see seven pairs of circles that range from just touching to almost completely overlapping. One circle in each pair is labeled "self", and the second circle is labeled "other". Respondents choose one of the seven pairs to answer the question, "Which picture best describes your relationship with [this person]? Researchers indicate what person the "other" circle stands for
Scoring	To score this scale, researchers record the number of the pair (1 to 7) the respondent selected
Response format	Respondents choose a pair of circles from seven with different degrees of overlap. 1 = no overlap, 2 = little overlap, 3 = some overlap, 4 = equal overlap, 5 = strong overlap, 5 = very strong overlap, 7 = most overlap



Appendix F

Rank	*Scenario Code*	*Mean IOS Score*
1	N_C_S2	6.33
2	C_C_S2	6.00
3	V_C_S1	4.67
4	C_C_S1	4.33
5	C_O_S1	4.33
6	N_A_S2	4.33
7	O_C_S3	4.33
8	C_C_S4	4.00
9	N_A_S1	4.00
10	N_C_S3	4.00
11	O_O_S3	4.00
12	C_A_S3	3.67
13	C_A_S4	3.67
14	O_O_S1	3.67
15	O_C_S2	3.33

16	C_O_S2	3.00
17	C_O_S3	3.00
18	NA_S3	3.00
19	N_C_S1	3.00
20	O_O_S2	3.00
21	V_A_S1	3.00
22	V_C_S2	3.00
23	V_O_S1	3.00
24	N_O_S1	2.67
25	O_A_S3	2.67
26	O_C_S1	2.67
27	N_O_S2	2.33
28	O_A_S1	2.33
29	V_A_S2	2.33
30	V_O_S2	2.33
31	C_A_S1	2.00
32	C_C_S3	2.00

33	N_O_S3	2.00
34	C_A_S2	1.67
35	O_A_S2	1.67