Improving Sports Safety with VR and E-learning: The Role of Perspective-Taking in reducing Transgressive Behaviour

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Abstract

Introduction: Literature search has made the lack of effective tools to prevent perpetrators from offending in the field of sports evident. The conducted study aimed to investigate the potential effects of perspective-taking on the reduction of the execution of transgressive behaviours in the context of sport.

Methods: This study choose virtual reality as well as e-learning to train the participants the functioning of perspective-taking. To see the effects and how impactful this method might be, participants were a part of one of three groups (e-learning, VR, control) and were asked to fill in a pre- and post-questionnaire in between which they received their specific form of treatment. A total of 12 participants, who were equipped with a good understanding of the Dutch language, took part in the study.

Results: The findings did not show any significant results with respect to the effects of the specific treatments on the participants' levels of perspective-taking. However, the testing for potential heightened stress levels during the VR treatment were negative, meaning they did not show any abnormalities. In addition, the "Inclusion of Other in the Self" scale showed that the perception of transgressive behaviour among participants was clearly subjective and can therefore vary widely.

Discussion: In conclusion, several limitations, such as the small sample size and inclusion of psychology students, could have caused the non-significant results and should be improved in future research. However, a high need for further research has clearly been found in literature to further investigate the usefulness of the mechanism of perspective-taking to create a safer sports environment for everyone.

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Introduction

Sport is highly recognised in society. In a survey in 2019, the European Commission found that 38% of European citizens over the age of 15 participate in sports at least once a week making it a widely spread leisure activity (Eurostat, 2019).

However, this often performed activity is not always safe. Caine (2009), for example, investigated the display of violence in youth sports. The study showed that violence such as fighting or hazing occurs among youth athletes of all ages and in a variety of different sports. Additionally, in an online survey with over 4.000 Dutch and Belgian adults, it could be found that 38% of participants have encountered psychological violence in sports at least once, while 11% also reported having experienced physical violence, and 14% sexual forms (Vertommen et al., 2016). In a study conducted in the UK, 6000 athletes younger than 15 were questioned regarding their experiences in organised sports. It was reported that 75% of the athletes indicated incidents of emotional abuse, 24% physical abuse, 29% sexual harassment, and 3% sexual harm (Schmidt et al., 2022). The severity of such experiences becomes even more evident when looking at the long term consequences. It has been found that transgressive behaviours within the sport context can lead to depression, exhaustion, eating disorders, anxiety, and somatisation (Schipper-van Veldhoven et al., 2022). However, what makes the issue at hand even more complex is the fact that violence is often implemented in the nature of some sports. This could partially account for the lack of widespread recognition of sports-related violence as a public health issue. This means that the often over-competitive or in case of for example boxing even rather violent nature in sports trivialises transgressive behaviours (Kavussanu, 2008). This seems to overshadow the social environment that sport offers. The social aspect that sport clubs provide has been found to be an effective way for integration and connecting with other people (Ulseth, 2004). This being said, the inherently positive social nature of sports, where participants are encouraged to interact with teammates or other members of the same club, still can create potential for

misconduct such as cheating, lying, intimidating, and injuring of others (Kavussanu, 2008). This emphasises the fact that these two sides of the sport face each other and the potential for misconduct may overshadow the positives when no effective measures exist to prevent harmful behaviour.

Transgressive Behaviour

To gain a better understanding of the aforementioned occurrence of transgressive behaviours in sports, the different underlying terms will be further described and categorised. In literature, different terms have been used to describe acts of transgressive behaviour. For example, aggression is a popular term used and defined as verbal or physical behaviour that is intended to cause harm to another person (Fite et al., 2023). Also antisocial behaviour is a term that is often used to characterise actions taken in sports with the intention of hurting or disadvantaging another person (Kavussanu, 2019). Furthermore, transgressive behaviour can also include the more commonly used term violence. The World Health Organisation (WHO) defines violence as: "the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation" (p. 5). All of the above mentioned terms fall under the concept of transgressive behaviour which combines those different forms of misconduct and therefore served as an overarching term for the present study. Transgressive behaviour itself can be defined as "any form of misuse of relationships of power violating someone's access to safe sport" (Haandrikman & Schipper-van Veldhoven, 2024, p. 19). Imbrogno et al. (2021) have included behaviours such as athlete doping, unsportsmanlike conduct, domestic violence and sexual assault as terms included in the word transgressive behaviour in the context of sports. All of the above mentioned concepts help one understand the particular behaviours included in the used concept transgressive behaviour and therefore what the core of this concept entails.

Taking all of the previously mentioned information into account, it becomes evident that sport has a high risk factor component which could lead to long term consequences. To be able to be more effective in preventing the execution of harmful behaviours in sports, it is important to detect mechanisms that could potentially be helpful. One of such mechanisms could be the one of perspective-taking.

Perspective-taking

Perspective-taking is a crucial element for successful social interactions. People interpret the behaviours of others by assessing their ideas, objectives, and intentions because these actions are not always apparent (Wu & Keysar, 2007). When trying to understand other's actions and behaviours, perspective-taking is at play which Hodgkinson and Ford (2008) defined as a process that "occurs when an observer tries to understand, in a non-judgmental way, the thoughts, motives, and/or feelings of a target, as well as why they think and/or feel the way they do" (p. 152). Connecting to how perspective-taking is needed to understand other's actions and behaviours, it is also generally essential for having successful social relationships. It develops empathy and strengthens interpersonal ties by enabling people to comprehend and relate to the ideas, emotions, and motivations of others (Calvard et al., 2021). Adding to that, researchers found that by allowing people to balance their understanding of others' thoughts and emotions, perspective-taking aids in the solution of difficult social situations such as interpersonal conflict resolution (Gehlbach, 2004). Additionally, Todd and Galinsky (2014) have found additional advantages derived from perspective-taking: improved implicit and explicit intergroup assessments, more approach-oriented action tendencies and constructive nonverbal behaviours, enhanced intergroup assistance, decreased dependence on mental processes that uphold stereotypes, and higher awareness of intergroup differences. Additionally, perspective takers seem to be able to judge people less stereotypically (Ku et al., 2015). All of this shows enhanced skills that

perspective-takers acquire. In the context of transgressive behaviours in sports, skills such as interpersonal conflict resolution or being aware of differences can decrease potential for conflict. Most importantly, ideally individuals would understand and emphasise with other's feelings and viewpoints and therefore withhold from engaging in transgressive behaviours.

Empathy is a crucial part in the mechanism of perspective-taking. Colman (2015) defined empathy as "the capacity to understand and enter into another person's feelings and emotions or to experience something from the other person's point of view" (p. 144). This ability, however, necessarily involves the mechanism of perspective-taking. One is only able to feel an empathic concern when also putting themselves in the shoes of that particular person (Malle & Hodges, 2007). This connection was displayed in an experiment by Stotland (1969). Here, participants watched another person whose hand was strapped to a painfully hot object. The participants were then divided into three groups where they were either invited to put themselves in the position of the person they watched, were asked to watch that person carefully, or were invited to imagine how the person must be feeling. The experiment showed that the act of imagination produced a greater psychological response than just watching the other person (Stotland, 1969). The strong link between empathy and perspective-taking is also emphasised by Heydrich et al. (2021). The capacity to assume the viewpoint of another person is a crucial component of social cognition which means that empathy and the perspective-taking ability are closely associated. In the context of this study, the general influence of the participants' ability of feeling empathy might be of interest. As described in this paragraph, the individual's capacity of perspective-taking as well as empathy are strongly combined which means that the connection of both might affect the results of the following study.

To ensure perspective-taking is a fitting mechanism for the study, its effectiveness was investigated through literature search. A fundamental aspect of human interaction with others is the ability to comprehend the ideas and feelings of others. People can act and react

appropriately in a variety of social situations by imagining what other people are thinking and feeling, as well as by projecting what they might do (Thye & Lawler, 2017). Advantages of social perspective-taking that were found show that it can be a way to lessen aggression against others and foster a greater understanding of members of other social groups. Other skills associated with this mechanism are critical thinking, teamwork, communication, and reasoning (Cohen et al., 2023). Further, Ku et al., (2015) also found perspective-taking to be linked to a number of concepts that are important for effective social functioning, including self-esteem, social competence, and cognitive growth. When investigating how social perspective-taking, where the focus lies on the interaction with others, can lead to improvement it has been found that there is a positive effect on problem-solving abilities (Marsh et al., 1980). Also, according to research on the effects of perspective-taking on cognition, perspective-taking can reduce stereotypes of targets and the groups they belong to, increase the value and helpfulness of targets, and increase perceiver–target overlap (Laurent & Myers, 2011). Overall, the research shows how perspective-taking can improve social interactions, reduce aggression, enhance the understanding of others, and also improve skills such as communicating, reasoning, and problem-solving which seems particularly beneficial in the hinderance of pointing aggression towards others.

The enhancement of those skills through perspective-taking was also investigated in the sports context. In a study conducted by Sezen-Balçikanli and Sezen (2017) the relationship between empathy and the amount of yellow/red cards and fouls were investigated. The findings indicate a negative correlation between empathy and fouls and yellow/red cards. It is anticipated that the empathy exercises that will be created for athletes will encourage them to take different perspectives and communicate with one another, enhance their moral outlook and attitudes toward sports, and lessen their tendency toward aggression and self-centred behaviour. In conclusion, the successful application of perspective-taking shows how the

mechanism can play a crucial role in reducing transgressive behaviours in general as well as specifically in sports.

Nonetheless, the mechanism of perspective-taking needs to be trained which can be done through the use of different tools.

E-learning

Electronic learning, or e-learning, is one of such potential tools. It is used to learn new skills in an online environment. E-learning is "the learning supported by digital electronic tools and media" (Hoppe et al., (2003), p. 258). Furthermore, e-learning provides web-based training which could offer a place for a digitally-based collaborative environment and also a platform for assisted learning (Basak et al., 2018). Here, especially the enhanced flexibility to access the platform from anywhere provides an immense advantage (Selviandro & Hasibuan, 2013). When looking at the use of such a tool in enhancing the mechanism of perspective-taking interesting results could be found. A study by Gerry et al. (2022) tested an e-learning app with which improvement in the participants' mental health should be achieved. Additionally, one group was invited to reply to interactive tasks from the perspective of the person they talked to. It was found that the 6-week long training lessened bias and increased cognitive empathy. Additionally, the perspective-taking group showed higher increases of the trait empathy than the control group. This study shows the effectiveness of e-learning in enhancing perspective-taking skills and empathy which can be of benefit for the study to be conducted. To further investigate the applicability of e-learning for the conducted study also its successfulness in the context of sports was investigated. Here a study by Huang et al. (2010) found that e-learning platforms can be an efficient tool to enable athletes to learn certain sport skills. Additionally, it was used to teach rules and also used as a teaching tool for coaches. Taking all of this into account, e-learning has been proved to be successful in

enhancing perspective-taking skills while it is also a useful tool in sports which contributes to the potential effectiveness for the present study.

Virtual Reality

However, to allow participants to take another's perspectives also other tools can be of usefulness. Virtual reality or VR is an enhanced human-computer interface that replicates a realistic world. In such a VR environment, participants can move around in a virtual world and ideally feel like they are part of that created environment (Zheng et al., 1998). Another part of VR that stands out is the possibility to interact with the virtual environment. Real-time calculations of the location and orientation of physical objects inside a physical space are made possible by tracking systems. Users can move around and interact with items in the virtual world using handheld controllers. In order to improve interactions, haptic devices use physical manipulators to deliver force feedback, which strengthens the understanding of how virtual world items physically interact (Berg & Vance, 2016). This addition compared to e-learning might allow the users to experience the scenario more realistically and enable them to find the learned cues more easily when experiencing such situations in real life. Another very interesting part of VR is experiential learning. Experiential learning can be better understood as "learning by doing" or experience-based learning (Gentry, 1990). Studies showed that the enhanced clarity and interactivity in VR tools allow the user to recognise the seen displays as direct experiences later in real life scenarios (Kwon, 2018). All of the above showed, how VR can be a powerful tool to improve immersive perspective-taking as well as experiential learning to allow users to learn the mechanism at hand in a virtual world to later adopt the learned behaviours in real life.

To investigate the effectiveness of VR for the use of this study, already conducted studies to enhance perspective-taking were examined. In a study where participants were asked to sympathise with a homeless person in a VR environment, positive effects could have

been found. The findings indicated that compared to individuals who merely received information, those who engaged in any kind of perspective-taking assignment reported feeling more sympathetic and connected to the homeless (Herrera et al., 2018). Virtual reality perspective-taking experiments showed that it enhanced helping behaviour, reduced implicit bias, reversed racial in-group bias, and decreased prejudice (Van Loon et al., 2018). A study by Chen et al. (2021) showed how the ability to adopt the perspective of an ethnic minority through the embodiment of an avatar in VR could enhance attitudes toward the minority group. The study contained indication that improving intergroup attitudes was possible through the embodiment of an ethnic minority facing microaggressions. Consequently, these studies highlight how effective VR is at improving people's perspective-taking abilities, which can help prevent transgressive behaviours in sports through enhancing athletes' empathetic concern and understanding of others.

The goal of this study is to examine whether perspective-taking can positively influence the prevention of transgressive behaviour in a sports environment. After gaining an overview through investigating existing literature, it can be hypothesised that the e-learning as well as VR group will show a greater improvement in their perspective-taking scores than the control group while the VR group is hypothesised to show the biggest improvement due to its additional more realistic learning tools. While those receiving treatment are expected to show improvements, the control group is hypothesised to show no significant changes. Furthermore, the role of empathy might contribute to the research as a confounder variable. This means that the general level of empathy a particular participant might have prior to the study is expected to affect the rate of improvement shown through the intervention. A participant already having a high level of empathy coming into the study might show less improvement than one that has more room to improve their empathic concern.

Methods

Participants

The sample consisted of 12 participants between the ages of 22 and 50 (M = 29.1, SD = 9.971) of which 10 also completed the post-questionnaire. Furthermore, the demographics were recorded in the post-test which is why only 10 of the 12 participants gave their answers to the questions. 8 (80%) of them reported being Dutch, one participant (10%) indicated that they were German, and 10% were of other origin or did not report their nationality. Further, 80% identified as being female and 20% as being male. The participants were also asked in which sport they participate where the most frequently occurring one was gymnastics (40%). Other sports were football (20%), biking (10%) and 30% choose the answer option "other". When then asked for the specific sport, they indicated playing water polo, doing cross fit and acrobatic gymnastics. Additionally, 30% of the participants obtained a masters diploma as their highest degree. 40% have obtained a Bachelor's degree and 30% reported having a high school diploma as their highest degree. All participants participate or have previously participated in the sports world. They were recruited through non-probability sampling methods. Tools like the SONA system of the University of Twente, social media, flyers around campus, and the personal network of the researchers were used. The inclusion criteria involved a minimum of 18 years of age, a good understanding of the Dutch language and being active in the sports world as, for example, athlete, coach or bystander.

Materials

Firstly, the participants were randomly assigned to one of three different conditions, namely those receiving VR treatment, e-learning treatment, or no treatment. To do so the platform https://www.randomizer.org was used to randomly assig the participants to one of the conditions. Here the numbers were generated after specifying the amount of participants per condition (25), which were supposed to be divided into three people per set. Additionally, the researchers indicated that the number range is from one to three and that each of the

assigned numbers should be unique. Lastly, another specification was that the generated numbers should not be sorted and that there should be place markers across the numbers. Also, through the tool each participant received an identification number that assigned them to one of the three conditions and also allowed the researchers to connect their data.

Furthermore, all of the participants were invited to fill out both a pre- and post-questionnaire (Appendix A) which were created within the Qualtrics interface and consisted of the same three scales: Interpersonal Reactivity Index, Perceived Empathy Self-Efficacy Scale and the Perceived Social Self-Efficacy Scale. This means that both questionnaires were the same to ensure that the results can be compared properly to analyse the effects of the specific treatment. Also, all of the participants were provided with an informed consent (Appendix B) which was included in the pre-test questionnaire.

Interpersonal Reactivity Index

The Interpersonal Reactivity Index (Davis, 1980) is a scale intended to measure dispositional empathy. It consisted of 28 items which were divided into four different categories. The categories, namely perspective taking, fantasy, empathy concern, and personal distress, each consisted of seven items. Additionally, the items were phrased to invite the participant to think of a certain scenario and indicate to what extent they can relate to that. An example for the perspective-taking category included, "Sometimes I don't feel very sorry for other people when they are having problems." The answer options were a 5-point Likert scale where 1 indicated "does not describe me well" to 5 saying "describes me very well". Here, depending on the phrasing of the question either a high or low score on this scale indicated strongly developed empathy. Additionally, the internal reliability of the scale shows a moderate level due to a Cronbach's Alpha of $\alpha = .61$.

Perceived Empathy Self-Efficacy Scale

The Perceived Empathy Self-Efficacy Scale (Di Giunta et al., 2010) is used to measure people's capacity to feel emotions from another's perspective, react emotionally and

accurately to other's distress and be aware of how one's actions might affect others. It consisted of 6 items where the 5-point Likert scale ranged from the answer option 1 = "not well at all" to 5 = "very well". Therefore, a high score indicates a high level of understanding other's feelings. In this particular scale the participants were asked "how well" they can do an action specified in the questions. One example would be, "Read your friend's mind?". Furthermore, the PESE shows a good internal consistency due to a Cronbach's Alpha of α = .72.

Perceived Social Self-Efficacy Scale

The Perceived Social Self-Efficacy Scale (Di Giunta et al., 2010) is intended to measure one's capability to understand and deal with other people's emotions and followed a similar schema to the previously mentioned Perceived Empathy Self-Efficacy Scale. The scale consisted of 5 items with an answer scale ranging from 1 = "not well at all" to 5 = "very well" where a high score indicated a high ability to understand other's feelings and appropriately react to them. Additionally, the participants were asked to indicate "How well can you" relating to a question in one of the items. An example would be, "Express your opinion to people who are talking about something of interest to you?" Here the Cronbach's alpha displayed a score of α = .56, indicating a poor reliability. However, even when dropping items, the internal consistency did not improve which lead to the decision to leave all the items in the scale.

Additionally, the VR as well as the e-learning participants were asked to answer questions regarding the "Inclusion of Other in the Self" scale.

Inclusion of Other in the Self Scale

The "Inclusion of Other in the Self" scale (*Inclusion of Other in the Self (IOS) Scale | SPARQTools*, n.d.) was created to detect how close the respondent felt to another person or group. It displayed 7 pictures each consisting of two circles with one being labelled as "other" and the other one as "self". Those circles ranged from only slightly touching each other to

almost completely overlapping. This scale asked the participants to indicate "Which picture best describes your relationship with [this person]?". The answer options varied from 1 = no overlap, 2 = little overlap, 3 = some overlap, 4 = equal overlap, 5 = strong overlap, 5 = very strong overlap, 7 = most overlap where a high score indicates the closest relationship to the other person or group shown.

Additionally, for the VR condition only, working VR goggles and an Empatica E4 wristband tracker were needed for successful execution of the study. The wristband tracker measured the temperature, pulse rate, and respiratory rate of the participant which was implemented to be able to investigate the reactions participants might have to being in a VR environment. This enabled the researchers to account for potential stress that VR might evoke and the effects it could have on the data. Furthermore, while conducting the VR experiment, the researchers had an experiment protocol at hand and also a display of the "Inclusion of Other in the Self" scale to ensure the participants were aware of the numeration used.

Both in the VR as well as in the e-learning condition, the participants saw several videos displaying transgressive behaviours in their particular learning environment. The videos showed four types of transgressive behaviours, namely overt, covert, verbal, and non-verbal behaviours which they saw through the perspective of either the coach, athlete, or bystander. This being said, they were shown the same video with the specific form of transgressive behaviour at display but each video gave them the opportunity to see the scene through a new perspective. The content of the video displaying the non-verbal behaviour showed the athlete clearly frustrated with a situation and tearing up after making a mistake. However, the coach was unsure what do to and instead avoided the situation through continuing the drill with the other athletes. In the verbal scenario, the coach talked to a bystander about the poor performance of one of the athletes. Also, the coach complained about having talked to the athlete about the lack of effort without seeing any improvements. Thirdly, the overt form displayed a situation where the coach explicitly picked out one of the

athletes and openly complained about their performance. While the coach kept on punishing the athlete, the bystander remained silent. Lastly, the covert situation included the athlete feeling uncomfortable by the behaviours displayed by the coach. Comments on the athlete's social media post with inappropriate remarks particularly crossed the line for the athlete. This procedure enabled the participants to see a scenario through their perspective if they, for example, indicated they were an athlete in real life and then they could also see the same scenario from the perspective of the coach or bystander.

For the participants in the control and e-learning condition, it was a prerequisite they were equipped with their own and functioning device. Since, they conducted the experiment in their personal environment, they needed to be able to access the link to the pre- and post-questionnaire and also the website for the e-learning tool.

Procedure

After the study received ethical approval by the Ethics Committee of the Faculty of Behavioural Sciences of the University of Twente, the participants were able to take part in the experiment. Here, as already mentioned before, the participants were divided into three conditions. The general procedure was that each participant filled out a pre-test, then received a specific training or none, and after that filled out the post-test.

In the VR condition the participants were invited to watch the previously described videos through the VR goggles after filling out the pre-questionnaire. In between each video, the participants were asked to answer the following questions: "What did you see happening?", "How do you feel being in that specific position?", and "How would you feel in the position of the other person in the video and what would they think?". Those question were adjusted to fit the certain scenario the participant watched and which particular position they were seeing. Secondly, they were asked to indicate where they perceived themselves to be on the "Inclusion of Other in the Self" scale. Here one could indicate how they see their

self from the specific perspective they are in, in relation to the person they are interacting with in the VR video.

The e-learning condition looked similar to that of the VR group. After filling in the pre-questionnaire, the participants opened the link to the e-learning site. After receiving a general introduction about the procedure, they were invited to watch the first video. After each video, they were asked the same questions as in the VR group and were also invited to indicate where they would see themselves on the "Inclusion of Other in the Self" scale. Just as in the VR group, the participants here also watched the videos from the three different perspectives, athlete, coach, and bystander. The participants were first shown videos displaying non-verbal behaviour, then covert, verbal, and lastly overt behaviour.

Lastly, the control condition was invited to only fill in the pre- and post-questionnaire between which they were asked to wait at least 30 minutes.

Data analysis

After data collection was finalised, the datasets for the pre- and post-questionnaire were downloaded from the platform Qualtrics. This was followed by uploading the dataset into the program R Studio to ensure proper analysis. Firstly, the dataset was skimmed for missing values and participants who did not finish all the parts of the experiment which were then excluded to ensure meaningful results after the analysis. To be able to compare the pre- and post-questionnaire of all conditions, a Wilcoxon signed-rank test was conducted. This test is used to analyse whether the population means in the pre- and post-measure differ. In this analysis, the dependent variable is the score of both test measures and also the paired differences will be taken into consideration. Those are the variations in each participant's pre- and post-test results. Furthermore, an Analysis of Covariance (ANCOVA) was carried out. This analysis focuses on seeing if differences in groups are real or if there are other factors influencing it. The ANCOVA was especially important to be able to compare the differences

between the control group and the two other treatment conditions. In this model, the pre- and post-test scores were used as the dependent variable. In the ANCOVA, it is assessed how the dependent variable is influenced by the independent variable while controlling for the covariate. Additionally, to account for variation in participant's scores, the pre-test score was included as a covariate. By using this method, it can be accounted for any initial differences in the post-test results which enables the researchers to better assess the impact of the intervention. This is because the covariate is suspected to potentially influence the dependent variable. Lastly, the independent variable was the specific condition (VR, e-learning, control) the participants belonged to which was tested for its effect on the dependent variable in this analysis.

Additionally, the biometric measurements tracked by the wristband tracker will be taken a closer look at. This ensures to be able to compare the participants' heart rate and skin conductance to gain a better understanding of the effects of VR. Both the heart rate as well as the skin conductance measurements will be compared through calculating descriptive statistics, meaning the mean, median, minimum, maximum, and the standard deviation. This allows to be able to compare the VR participants' reactions among each other and also with scores that are usual for a non-stress environment. Additionally, the heart rate was displayed in a histogram to be able to look at the distribution of scores. Regarding the skin conductance, a time series plot was created to get an overview of the scores over the course of the experiment.

Lastly, the "Inclusion of Other in the Self" scale was analysed for the VR participants. First of all, the scores for each participant were compared to one another. Following that, a descriptive analysis of the answers was conducted to calculate the mean, standard deviation, and median. Additionally, the researchers took a closer look at scores that particularly differed to the answers of the other participants or if some answers were overall surprising.

Results

In this section the results of the study were analysed in order to draw conclusions about the hypotheses. Several analyses were carried out to analyse the dataset and validate the correctness of the research question. Furthermore, the analyses are based on the decision that the three different perspectives were not distinguished anymore. Meaning, that the athlete, coach, as well as the bystander perspective were analysed together. The researchers made this decision due to the rather small sample size to still be able to conduct the analyses accordingly.

First of all, the dependent variable, namely the pre- and post-test measurements were taken a closer look at.

Table 1

The descriptive statistics of the pre-questionnaire for all conditions

Mean	Sd	Median	Minimum	Maximum
3.25	0.219	3.32	2.90	2.56

The descriptive statistics of the pre-questionnaire showed a rather low standard deviation (.219) which might indicate that the majority of values are clustered rather closely around the variable's mean of 3.35. This indicates that the majority of answers that were chosen were around option 3 on the Likert scale which indicates that the participants neither agree nor disagree. Additionally, the data points lied rather close together and did not contain any extreme outliers, as indicated by the range of minimum to maximum of 2.56 to 2.90. To also gain a first impression of the differences between conditions, the means were also calculated. The control condition, $n = 5$, showed a mean of 3.23 for the pre-questionnaire. Similar results could be found for the e-learning condition, $n = 4$, with a mean of 3.21 and the VR condition, $n = 3$, with a mean of 3.26. Those results show that the answers for each

condition were rather similar and also only deviated slightly from each other as well as from the mean for all conditions.

To complete the first impression of the dependent variable, the descriptive statistics were also calculated for the scores of the post-questionnaire to also be able to draw conclusions regarding the differences between both test results.

Table 2

The descriptive statistics of the post-questionnaire for all conditions

Mean	Sd	Median	Minimum	Maximum
3.28	0.132	3.28	3.08	3.54

Both the pre- and post-test scores indicated a similar tendency because both have a mean and median which was very close to each other. Generally, the dataset's mean, or average value, shows the centre point around which the values are distributed. In this particular case, the post-test seemed to show less variability and a tighter clustering of datapoints around the mean, as indicated by the lower standard deviation. Also, the post-test showed a normal distribution indicated through the mode (3.28) which is identical to both mean and median. The mean of the post-test also suggests that most participants chose answer option 3 and therefore neither agreed nor disagreed to the displayed statements. The results of the pre-test on the other hand suggested a slight skew due to the differing mean and median score. Lastly, the pre-test had a wider range of minimum and maximum than the post-test results did. Regarding the statistics for each individual condition for the post-test, the control condition, n = 5, displayed a mean of 3.38, which deviated slightly from the other two conditions. Both the e-learning, n = 4, as well as the VR condition, n = 2, had a mean of 3.33. Similar to the pre-test, this shows that the answer chosen for each condition were very similar or even the same and it seems that the answers were clustered around answer option 3.

Furthermore, both test were compared among each other. The Wilcoxon signed-rank test, $p = .1195$, V = 15, demonstrated no significant results. Here, the test statistic (V) is the sum of the ranks of the differences between the paired observations which are not zero. Additionally, the p-value indicated that there is no statistically significant difference between the results of the two tests. This is due to the lacking evidence to be able to draw the conclusion that the median of the differences between paired observations differs from zero.

Following that, an ANCOVA was conducted. In this model, the pre- and post-test were used as the dependent variable, with the VR, e-learning, and control condition as the independent variable. Adding to that, the pre-test scores were used as a covariate. This ensured that during the ANCOVA analysis, it was controlled for potential initial differences among the participants before the treatment.

Table 3

ANCOVA analysis

	Df	Sum square	Mean square	F value	Pr(>F)
Condition	2	0.00726	0.00363	0.391	0.749
Pre_Test	1	0.04579	0.04579	4.932	0.269
Residuals	1	0.00928	0.00928		

The ANCOVA results indicated that the independent variable (condition) does not have a significant effect on the post-test scores after accounting for potential individual differences in the participants. Additionally, the covariate also did not significantly predict the post-test scores in this model when looking at the $p = .269$.

Furthermore, the "Inclusion of Other in the Self" scale was investigated through calculating descriptive statistics to identify the differences and similarities across the participant's answers. This measure was only analysed for the participants in the VR condition which is why only three participants are mentioned below.

Table 4

Descriptive statistics for the "Inclusion of Other in the Self" scale by participant ID

ID	Mean	Sd	Median
5	3.40	1.42	3
12	2.91	2.05	2
16	3.57	1.42	4

The means and standard deviations across the participants seem to only differ slightly while the median does differ for every participant. This indicated a broader range of answer choices and differing perceptions of the data they saw. A higher mean on this scale displayed that the participant was more inclined to choose an answer option indicating a closer relationship on the "Inclusion of Other in the Self" scale which ranged from 1 to 7.

Additionally, the individual answers of the participants across scenes were also investigated (Appendix C). Here, some individual differences between the answer choices of the participants stood out.

Table 5

Prominent differences between participants on the "Inclusion of Other in the Self" scale

	Participant ID		
Scene	5	12	16
N_A_S1	5	5	2
N_A_S2	3	4	6

N_A_S3	2	1	6
N_C_S1	4	1	4
N_C_S3	2	7	3
C_A_S3	3	2	6
C_A_S4	2	5	2
C_B_S1	3	7	3
C_B_S2	4	1	4
C_B_S3	5	2	2
V_A_S2	2	1	4
V_C_S2	4	1	4
V_B_S2	5	1	1
O_A_S1	4	1	2
O_A_S3	4	2	2
O_C_S2	5	1	4
O_B_S1	5	1	5

Note. The description of the scenes follows the following pattern. The first letter indicates the form of transgressive behaviour, N = nonverbal, C = covert, V = verbal, and O = overt. Additionally, the second letter stands for the perspective, namely A = athlete, C = coach, and B = bystander. Lastly, the letter and number combination indicates the scene.

The individual answers of participants displayed in table 5 show the most significant differences among the participants' answers on the "Inclusion of Other in the Self" scale. On this particular scale, a high number (7) indicated the closest relationship between the people displayed in the scene, while a low number (1) indicated no relationship. It became apparent that some of the scenes, evoked very different reactions for each individual participant. Additionally, it also stood out that all forms of transgressive behaviours had the potential to elicit different responses in the participants. Only, the verbal behaviour seemed to have the

least room for prominent disagreements, since it might have been the most evident display of transgressive behaviour. What also became evident is that the scenes through the perspective of the bystander appear at the bottom of the list of particularly striking differences. Scenes from the athlete's perspective are the most common to elicit differing responses, closely followed by those from the coach's perspective. Another point to mention is that participant 12 chose the answer option 1 in a lot of the cases which indicated no relationship between the people in the video.

Following that, the heart rate and skin conductance of the participants in the VR condition were measured.
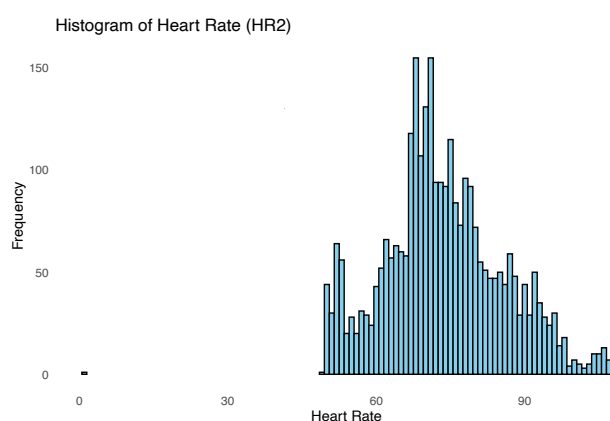
Table 6

The descriptive statistics of the heart rate of all three participants in the VR condition

Minimum	1st Qu.	Median	Mean	3rd Qu.	Maximum
1.00	67.73	73.88	73.97	80.25	106.82

The descriptive statistics of the heart rate show a rather normal range. The participants' heart rate lied between the normal resting heart rate for adults which should be between 60 and 80 bpm (Avram et al., 2019). This is shown through most observations falling between 67.73 to 80.25 bpm which does not particularly indicate any form of stress.

Figure 1

Distribution of heart rate across the VR participants

Histogram of Heart Rate (HR2)

This figure confirms the previously mentioned descriptive statistics. It can be seen that the most activity seems to happen between 67.73 to 80.25 bpm. This indicates a normal range of heart rate among the participants.

Furthermore, the skin conductance of the VR participants was measured.

Table 7

The descriptive statistics of the skin conductance for all three participants in the VR condition

Minimum	1st Qu.	Median	Mean	3rd Qu.	Maximum
0.0	0.452	0.932	1.225	1.651	4.537

When looking at the skin conductance levels of the participants, it seems to range in the normal area for skin conductance indicating no abnormal arousal.

Figure 2

Distribution of skin conductance across all of the VR participants
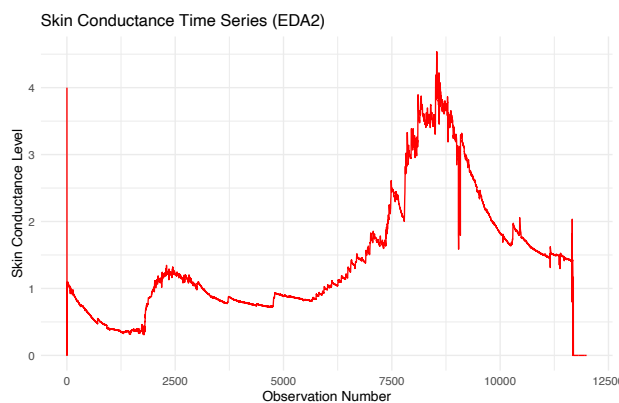
The graph shows that the skin conductance does accumulate at a certain level. This might mean that the participants fluctuated around a certain level of arousal throughout the whole process of the study. This can be connected to a time stamp after filling out the first questionnaire and through the first couple of videos. Additionally, the measure during the pre- and post-questionnaire seems to be less high than during the VR part itself. This means, that filling out the pre- and post-questionnaire caused the participants less stress than when watching the videos through the VR glasses.

Discussion

This study was conducted to analyse the effect of enhanced perspective-taking on the likelihood to engage in transgressive behaviours in the context of sports. Through virtual reality glasses it was tested how effective this tool can be to teach perspective-taking skills, while also testing two other forms of treatment, namely the e-learning tool and no treatment at all.

The results showed that there was no significance between the scores on the pre- and post-test which lead to rejecting the hypothesis that a general change could be seen. Additionally, it was found that also the different conditions did not have an effect on the outcome of the answers of the second questionnaire which also leads to the rejection of the hypothesis that the different conditions do have an influence on the results. This lead to believe that the VR as well as e-learning treatment did not have a strong effect on the participants and consequently would not result in a change of their behaviour. However, when looking at the VR participants' perceptions shown on the "Inclusion of Other in the Self" scale, differences could be found. It seemed to be very subjective how the participants would see the relationships displayed in the videos they saw in the VR environment. This could mean that some of the videos showed an ambiguity which was judged differently by the participants. Also, empathy might play a role when looking at those scales. A participant who feels strong empathy towards people generally, and in this case the ones in the video, would choose much lower numbers, indicating no to a very distant relationship, on the "Inclusion of Other in the Self" scale. Lastly, the heart rate and skin conductance measures for the VR group did not show abnormalities. The participants all seemed to be in a rather comfortable state and did not show abnormal stress levels. This could be due to the rather relaxed atmosphere where the participants were sitting down while watching the videos.

When relating the findings to other research, a mismatch could be detected. Studies displayed how participants were able to feel more sympathetic towards others through

engaging in perspective-taking tasks in a VR environment (Herrera et al., 2018). Additionally, the use of perspective-taking was also found to reduce bias (Van Loon et al., 2018) and even enhance attitudes toward minority groups (Chen et al, 2021). Such findings in literature displayed the effectiveness of perspective-taking tasks which could not be replicated in the conducted study. This could have happened due to wrongly taken theoretical assumptions. The successfulness of VR interventions is very much dependent on the individuality of participants. Individuals can react differently to the VR environment itself, or the content being displayed. This being said, what worked for the sample of previous studies, does not necessarily have to work for other samples.

Additionally, this mismatch and the non-significant results could have been caused by a variety of different limitations. Firstly, the participant sample was rather small. The study consisted of 12 participants of which only 10 fully completed the study. When looking into literature, it becomes evident that this sample size was too small for the set-up of the study with the different conditions used (Israel, 1992). This limitation also seemed to be an impactful factor for the statistical power. When conducting the analyses, some statistical analyses require a minimal sample size to be able to calculate informative results. In future research more time could be scheduled for participant recruitment, the importance of such research could be highlighted more explicitly, or the amount of recruitment channels could be extended. Additionally, another limitation might lie in including psychology students in the research. It can be argued that through studying psychology students might be more trained in taking another person's perspective which would cause bias in the research. Also, it has been found that the choice of psychology as a major might also be influenced by the person's general level of empathy. This being said, a high level of empathy in people leads them to choose a career in psychology due to thinking that this ability is of need for success in this specific field (Harton & Lyons, 2003). This might lead to the recommendation to exclude psychology students in future research or limit their participation to a representative level

respectively. Furthermore, the reliability of the scales could have been an influence. Especially the Perceived Social Self-Efficacy Scale only showed a poor reliability which indicated the lack of strength of the items. Additionally, the Interpersonal Reactivity Index also only showed a moderate reliability which might be due to its length. It has been found that participants are more likely to choose the same response category without taking the actual question into account with an increasing amount of items (Weathers et al., 2005). This limitation could be resolved through testing renewed phrasing of the items, adding additional ones or the choice to even drop some. Furthermore, the duration of the intervention might have caused an issue in the learning process. The participants might have lacked time to train the new mechanism and also implement it into their behaviour. Participants might need several rounds of treatment through the intervention to actually be able to display learning effects. The successful e-learning study by Gerry et al. (2022), for example, trained the participants in perspective-taking tasks over the stretch of 6-weeks which lead to an increase in empathic concern. Adopting such a time frame in future studies and also including feedback rounds sharing how the participant is performing have been found to be particularly beneficial (Mori & Cigala, 2015). Lastly, the videos used for the VR as well as the e-learning tool lacked quality and sharpness. As a result, the displayed scenes might have been unable to represent a realistic scene from a real-life situation. Through the lack of realism, the participants might have struggled associating with the situation (Debarba et al., 2022). As a result, the participants' learning effect might have been lessened through the lack of realism and therefore their ability to transfer the shown behaviours into real life situations. Through the use of a camera which can film high-resolution videos, this limitation can be avoided in future research.

When looking at the prevalence of transgression in sports, it becomes clear that the study discussed an important matter which needs additional solutions. Other research already showed that through the increased awareness many more initiatives have been organised to

make sports safer for especially young athletes. IOC, the International Olympic Committee, has recognised this issue and already achieved improvements through that (Vertommen et al., 2014). Also in the Dutch context educational programs have been developed to raise awareness regarding the issue and to improve the situation by the NOC*NSF. However, it has been found that those educational programs need more foundation to be able to invite the involved stakeholders to communicate more about the issues and potential tools to adequately deal with such problems. Taking this into account, the relevance of the topic of this study becomes apparent. There is a need for the development of successful tools to be able to prevent acts of transgression in the sports environment and to provide the athletes as well as coaches with those. With the investigation of mechanisms such as perspective-taking, there seems to be a new opportunity to find such tools for achieving improvement. In summary, future research needs to focus on finding more tools to prevent potential perpetrators from engaging in transgressive behaviours. Here adopting someone else's perspective is a particularly important approach that highlights the possible consequences of border-crossing behaviour from the beginning. Through conducting the present study on a larger scale with the previously mentioned improvements, the effectiveness of perspective-taking as a potentially successful tool could be further investigated.

Findings of this research could be beneficial for various forms of applications. The VR environment could be used to show the participants the consequences of their behaviour more evidently to enhance self-reflection. This study's findings could also be used in conflicts where athletes and their rivals are invited to take the perspective of the other party before risking escalation. Most particularly, the study could serve as a testing for the implementation of programs for empathy training. Here athletes would be invited to take the perspective of teammates, opponents, or officials through the use of VR or also e-learning tools. This would enable athletes or others participating in sports to see potential consequences behaviours

could have. Through seeing how actions make others feel, they are possibly more aware and refrain from engaging in transgressive behaviour from the beginning.

Conclusion

In conclusion, the study aimed to investigate the influence of perspective-taking to reduce transgressive behaviours in the sports context through the use of VR as well as e-learning. Even though, the findings did not show any significance, the need for further research became evident through literature search. This study's limitations offer new insight for future research and provide ground to improve on. Most importantly, the insights provide opportunities for the field of sports in general to focus on finding effective measures to make the sports world a safer space.

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Appendix

Appendix A

Scales included in the Questionnaire

Personal Reactivity Index

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	5
2.	I try to look at everybody's side of a disagreement before I make a decision	1	5
3.	I sometimes try to understand my friends better by imagining how things look from their perspective	1	5
4.	If I'm sure I'm right about something, I don't waste much time listening ot other people's arguments (-)	1	5
5.	I believe that there are two sides to every question and try to look at them both	1	5
6.	When I'm upset at someone, I usually try to "put myself in his shoes" for a while	1	5
7.	Before criticising somebody, I try to imagine how I would feel if I were in their place	1	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	5
2.	I really get involved with the feelings of the characters in a novel	1	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	5
4.	Becoming extremely involved in a good book or movie is somewhat rare for me (-)	1	5
5.	After seeing a play or movie, I have felt as though I were one of the characters	1	5
6.	When I watch a good movie, I can very easily put myself in the place of a leading character	1	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	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	5
2.	Sometimes I don't feel very sorry for other people when they are having problems (-)	1	5
3.	When I see someone being taken advantage of, I feel kind of protective towards them	1	5
4.	Other people's misfortunes do not usually disturb me a great deal (-)	1	5
5.	When I see someone being treated unfairly, I sometimes don't feel very much pity for them (-)	1	5
6.	I am often quite touched by things that I see happening	1	5
7.	I would describe myself as a pretty soft-hearted person	1	5

Personal Distress		Does not describe me well	Describes me very well
1.	In emergency situations, I feel apprehensive and ill-at-ease	1	5
2.	I sometimes feel helpless when I am in the middle of a very emotional situation	1	5
3.	When I see someone get hurt, I tend to remain calm (-)	1	5

4.	Being in a tense emotional situation scares me	1	5
5.	I am usually pretty effective in dealing with emergencies (-)	1	5
6.	I tend to lose control during emergencies	1	5
7.	When I seem someone who badly needs help in an emergency, I go to pieces	1	5

Perceived Empathy Self-Efficacy Scale

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

Perceived Social Self-Efficacy Scale

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	5
2.	Work or study well with others?	1	5
3.	Help someone new become part of a group to which you belong?	1	5
4.	Share an interesting experience you had with other people?	1	5
5.	Actively participate in group activities?	1	5

Appendix B

Informed Consent

By signing this consent form, I acknowledge the following:

1. I have been adequately informed about the study through a separate information sheet. I have read the information sheet and then had the opportunity to ask questions. These questions have been sufficiently answered.

2. I am voluntarily participating in this study. There is no explicit or implicit compulsion for me to participate in this study. I am clear that I can terminate participation in the study at any time, without giving a reason. I do not have to answer a question if I do not want to.

3. I consent to the processing of the data collected from me during the study as contained in the attached information sheet. This consent therefore includes the processing of data concerning my ethnic origin and biometric data.

4. I give permission to make an audio recording during the Virtual Reality module to elaborate my answers in a transcript (if applicable).

5. I give permission for the research data collected from me to be retained and used for future research and educational purposes.

Appendix C

The answers of the participants in the VR condition on the "Inclusion of Other in the Self" scale

Participant ID	5	12	16
Video			
N_A_S1	5	5	2
N_A_S2	3	4	6
NA_S3	2	1	6
N_C_S1	4	1	4
N_C_S2	6	7	6
N_C_S3	2	7	3
N_O_S1	3	3	2
N_O_S2	2	2	3
N_O_S3	1	2	3
C_A_S1	2	1	3
C_A_S2	3	1	1
C_A_S3	3	2	6
C_A_S4	2	5	4
C_C_S1	5	4	4

C_C_S2	6	6	6
C_C_S3	2	2	2
C_C_S4	2	1	3
C_O_S1	3	7	3
C_O_S2	4	1	4
C_O_S3	5	2	2
V_A_S1	2	3	4
V_A_S2	2	1	4
V_C_S1	6	4	4
V_C_S2	4	1	4
V_O_S1	3	3	3
V_O_S2	5	1	1
O_A_S1	4	1	2
O_A_S2	2	1	2
O_A_S3	4	2	2
O_C_S1	2	3	3
O_C_S2	5	1	4
O_C_S3	4	5	4
O_O_S1	5	1	5
O_O_S2	4	1	4
O_O_S3	2	5	5